



# 3d Print Technology As Per Interior Design Perspective



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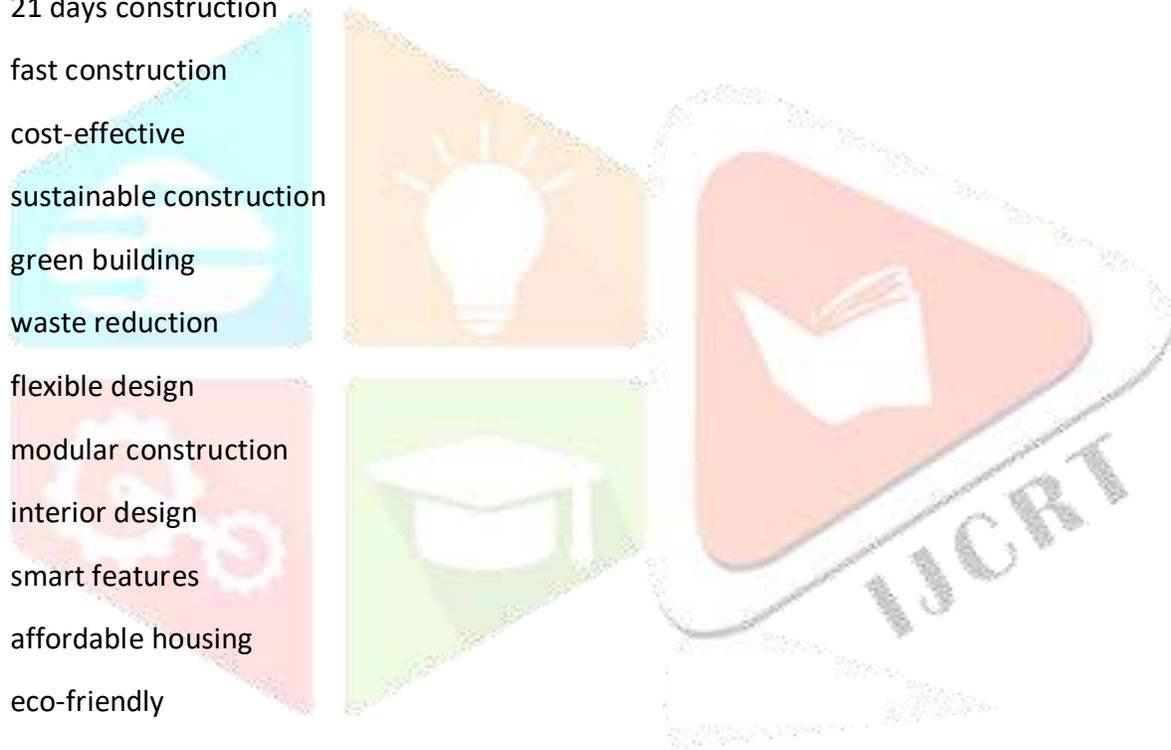
## **ABSTRACT:**

Finance Minister Ms. Nirmala Sitharaman inaugurated India's first 3D-printed house designed and constructed by Tvasta Manufacturing Solutions, an IIT Madras-incubated company. The house was built in 21 days on a small area of 600 sq ft by using a new concrete mix and 3D printing technology that helps in building construction to be efficient, cost-effective, and environmentally sustainable. Low waste is created through this method, and designs can be more creative, and green buildings can be funded. It can also apply to interior

design and save time and money, provide more design choices, and incorporate smart, sustainable elements—a plus for affordable housing.

### **KEYWORDS:**

- 3d-printed house
- india
- tvasta manufacturing solutions
- iit madras startup
- nirmala sitharaman
- 600-square-foot house
- 21 days construction
- fast construction
- cost-effective
- sustainable construction
- green building
- waste reduction
- flexible design
- modular construction
- interior design
- smart features
- affordable housing
- eco-friendly
- technology in housing
- customizable spaces
- time-efficient



## INTRODUCTION

A house built in Chennai by Tvasta Manufacturing Solutions—an IIT-educated Indian start-up is the first 3D-printed house in India and reflects a brand new generation in the construction business. Initiated by the Finance Minister Ms. Nirmala Sitharaman, this 600 sq ft was built in 21 days through 3D printing technique. The proposed techniques provide more effective execution strategies concerning speed, cost, and environmental impact, which lessen a structure's waste and allow for personalized architectural designs. These particulars run through this project to show how 3D printing can solve housing problems, and work for sustainable and green smart living environments.



### Objectives

The goal of the project to build a



3D-printed house is to explain how the approach to constructing homes can be accelerated through the added use of 3D printers in construction. It is thought to minimize waste, utilize sustainable resources and bring flexibility and adaptability to the designs. The project also aims to show that 3D printing can indeed offer solutions in the construction of inexpensive houses and extensive use of smart space and green technology. The idea is to bring novel approaches to housing construction that are durable and efficient in terms of financial investment.

## RESEARCH PAPER

### 1. Introduction

In construction innovation, IIT Madras can light up with India's first 3D-printed house. The project was launched by IIT, Chennai and the start-up company Tvasta Manufacturing Solutions, focusing on the availability of affordable housing and environment-friendly and time-efficient construction. The blue-eyed 3D-printed house shows how technology can be applied to increase the existing housing stock in India and ensure low-cost and environmentally friendly houses.

### 2. What does 3D printing in construction mean?

Sustainable construction is the building process through 3D printing in which objects are built from the layers of the materials used in construction, for instance, concrete. Also, it is different from conventional construction techniques where pre-manufactured wall and floor elements are lifted into the building site 3D printing constructs each layer in situ. It is also quicker, less wasteful, and more sustainable than traditional marketing communication.

### 3. Project details

While the experimental house at IIT madras was built in about 21 days, the house-printing process itself took only 5 days. the house is about 600 sq ft and was constructed using concrete that was custom-formulated. the building structure was pre-manufactured in printed form in segmented blocks in a factory in Chennai and then

installed on the site. this project is a good example of how using 3d gears it is easy and inexpensive to build affordable houses in India compared to the conventional practices.

#### 4. Advantages of 3d-printed houses

**Faster construction:** erecting a house through conventional construction may even take several months, but using 3d-printed technology, a house was constructed in 21 days.

**cost-effective:** 3d printing helps to minimize the amount of labor input and materials in construction, thereby lowering the costs of construction. this all goes a long way toward making housing more affordable.

**customizable designs:** another benefit of a house made by 3d printing is that its design is easily changeable to meet the needs of the owner. if this is the case, it may produce homes that are much more creative and something different from one another.

**sustainability:** the process consumes fewer raw materials, hence properly aligning with the green approach to the construction of homes.

**less labour needed:** 3d printing means that the number of workers required will be greatly reduced since the construction process becomes streamlined.

#### 5. Applications and impact

The 3d-printed house from IIT madras has several significant applications:

**affordable housing:** in aspects of construction, 3d printing is useful because it will help in cutting costs, hence making it possible to construct homes for the needy.

**disaster relief:** this technology can easily provide refuge within a short period following the disaster to those who have lost their homes.

**eco-friendly homes:** due to the nature of 3d printing, the new homes can be designed with specific energy-efficient characteristics and even use sustainable materials to further fuel the need for green-contained buildings.

#### 6. Potential and Existing Difficulties

While the 3D-printed house at IIT Madras is a major accomplishment, there are still challenges to overcome:

**Material Limitations:** While concrete is the most common building material for constructing 3D-printed houses, some of the company's leaders recognize the necessity of continuing research on stronger and more enduring material to unlock the potential of 3D printing in the construction industry.

**Regulations:** The construction laws and regulations should be upgraded to incorporate 3D-printed houses to add to the idea until it becomes extended.

**Scaling Up:** Even though the project based at IIT Madras is working fine, organized formation of big-sized 3D-printed housings will not be possible by leaving the walls of cost, technology, and all other related problems.

## 7. Conclusion

The decision of IIT Madras to create a special 3D-printed house may be considered a step forward in constructing houses for all that are cheap and environmentally friendly. Due to the assistance of 3D printing technology, a house was created much faster, at a lower cost, and without extra materials. This project demonstrates how new technologies can be used to address housing challenges in India and other parts of the world to create a future where homes can be constructed more efficiently and at a lower cost in a shorter timeframe than it would take using conventional construction methods. With the advancement of 3D printing technology, it is more likely to revolutionize the construction of homes worldwide.

### **RESEARCH GAP**

**Research Gaps in 3D-Printed Housing:** Where cost and price are major factors that can be linked with LCC strategies such as outsourcing and adoption of off-the-shelf software solutions, durability.

Despite the immense potential, there are some issues and gaps in the knowledge that have to be filled to develop 3D printing for constructing houses. Some of them are the issue of the cost of materials, the total price for 3D printed homes, the problem of life sustainability of the structures, and the challenges in making the technology affordable.

#### 1. Cost of Material and Accessibility

As it is today, some of the materials used in creating homes through 3D printing, such as special concrete, may prove to be very expensive. There is a need for further studies to produce cheaper solutions for constructing the materials to be used in 3D printing as well as inclined towards environmentally friendly materials. This would assist in ensuring that the technology costs are reduced, making it easier to implement the technology in places such as India with a pressing need for affordable housing.

**Research Gap:** The costs of producing houses must be reduced through the use of cheap and efficient materials in 3D printing.

## 2. Cost vs. Price Analysis

While the consumption of labour and material is low through 3D printing, this is upheld by the fact that both the machines and technology itself are expensive. More studies need to be conducted to obtain an insight into the cost savings increased in the future by embracing 3D printing relative to the costs incurred on the technology.

Research Gap: It is necessary to analyse the total cost of 3D printing, which we should compare to the cost of 3D printing over a certain time.

## 3. Pricing of 3d-printed homes

Though utilizing 3d printing reduces construction costs, the cost of a 3d-printed house is unknown. this is because companies that construct structures add genetic variations to the structures' specifications with the location, the design, and the scale of production of the structures. further studies are necessary to determine the accurate cost structures that will enhance the manufacturing of affordable 3d-printed homes.

research gap: it is also important for us to come up with a system that can better put the cost of 3d-printed homes that are measurable in areas and other needs.

## 4. Thus, costs incurred on developing labor and skill were:

Despite this, 3d printing minimizes the involvement of manpower, but this technology needs well-experienced personnel to operate the bicycles and design homes. this implies that there are costs for recruiting and developing human capital and, more so, skilled workers. there is a need to conduct a study to determine the cost involvement of this training and how it has an influence on the gains made in 3d printed homes affordability.

research gap: further research is necessary to investigate the costs of training and retaining a qualified workforce for 3d printing for construction.

## 5. Costs as to durability and long-term costs

The question of the longevity of 3d-printed houses has not been conclusively answered. one of the most underlying issues is how well these 3d-printed houses perform in terms of exposure to weather conditions, tear, and wear, as well as other aspects of their environmental fitness. this will include attempting to forecast maintenance costs and ensuring that such homes only deteriorate over time.

research gap: further studies are required to establish whether 3d-printed homes can maintain themselves and the recurrent costs of their maintenance.

## 6. Regulations and building codes compliant with fire code regarding occupant load.

Presently, there are no guidelines on construction and safety concerning the construction of these houses, which have been 3d printed. without these regulations, it is difficult to establish 3d printing as a standard form of construction for homes. it was established that the academy needs to guide the rules and standards of implementing additively manufactured concrete components in construction.

research gap: therefore, safe and reliable 3d-printed homes need to be equipped with well-defined building codes and safety standards.

## 7. Scalability and mass production

While it is easy to apply 3d printing for small constructions, it is harder to do the same for the construction of many houses at the same time. further studies are required to understand how adjustments could be made to 3d printing technology that would make the construction of multiple homes much faster and cheaper.

research gap: more research has to be carried out on the best ways through which 3d printing can be deployed for large substantive housing projects without necessarily increasing costs.

## 8. Market acceptance

A widely received house with a certain scepticism, as people can be afraid of getting into houses that are printed in 3d for sure, the quality, and the design. there are so many questions about this new technology that people can be asked, including how they feel about it or what exactly will make them embrace these new houses that are 3d printed.

## **METHODOLOGY**

STEP 1: Introducing about the topic selected.

STEP 2: Describing aim, objective, scope and limitations.

STEP 3: Literature study on one international one two national

STEP 4: Case study on near by 3d printer

STEP 5: Analysing the different aspects of literature study and case study

STEP 6: Planning concept designs

STEP 7: 2D and 3D elevations of concept

STEP 8: Model making

## **LIMITATIONS**

The use of 3D printing in building houses is viable, although it has some issues. It is a costly technology that is not easily adopted by the smaller builders. The employment of materials such as concrete in the structures' construction obstructs the degree of strength and elasticity allowed by the designs. It is also not easy to apply 3D printing on large-scale housing constructions. In this context, people still do not know any defined protocols for the construction of 3D-printed homes, and people are still in doubt about their security standards. The technology also requires manpower for its operation and is very power-receptive. Before 3D printing can be adopted for affordable houses, the following issues are vital to resolve:

## **AIM**

3D-printed housing is meant to be cheaper, constructed much more quickly, and environmentally friendly. For construction, it enhances cost reduction and minimizes construction waste and time while providing the opportunity to be flexible in design. The objective is to provide affordable housing and better solutions to individuals in search of homes and to advance a better way of building homes.

## **OUTCOME**

The end product of 3D-printed housing is affordable, quicker, and a durable housing. Building with foam insulation can lead to a lower construction price and is less wasteful, as well as facilitating more creative structures. This technology could go a long way to solving housing deficiencies and also offer a better solution to building structures. Ultimately it may make homes more affordable and therefore more accessible to the general population.

## **CONCLUSIONS**

Therefore, housing through the use of 3D printing could revolutionize conventional home construction through the provision of lower cost, faster construction, and the use of environmentally sustainable techniques. Though there are negative sides, as it is rather costly and the choice of materials is rather small, there are positive aspects: it is eco-friendly and the construction is done rather quickly. Over time, the shortcoming could be eased with the help of 3D printing, which can assist in addressing housing deficits as well as costing of houses to be within the reach of many people aside from being environmentally friendly.

