

4D Printing in Healthcare Market: A Study of the Key Applications and Technologies by Emergen Research

Technological advancements in 3D printing and operation of 4D printing technology in dentistry are some of the crucial factors driving the market revenue growth

VANCOUVER, BRITISH COLUMBIA, CANADA, June 3, 2024 /EINPresswire.com/ -- The global [4D printing in healthcare market](#) size was USD 11.4 Million in 2022 and is expected to register a revenue CAGR of 29.9% during the forecast period. The healthcare industry is experiencing significant growth with the advent of 4D printing technology, which is expected to revolutionize medical treatments and procedures. This innovation, building on the success of 3D printing, is driven by technological advancements and an increasing demand for organ transplants.

Market Drivers

Shift from 3D to 4D Printing Devices The transition from 3D to 4D printing devices is a key factor accelerating market growth. In November 2022, 4D Biomaterials launched its 4D Design medical device innovation services at Formnext, a major event for additive manufacturing. This new service addresses the growing demand for enhanced innovation support, allowing for the creation of materials that can change their properties in response to environmental factors such as pressure, moisture, or temperature.

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Increasing Demand for Organ Transplants The demand for organ transplants is rising, significantly boosting the 4D printing market. According to the Health Resources & Services



Administration (HRSA), over 42,000 organ transplants were performed in the U.S. in 2022, a 3.7% increase from the previous year. With more than 104,000 individuals on the national transplant waiting list, 4D printing offers a promising solution by enabling the production of personalized and adaptable organ constructs.

Market Restraints

High Development Costs and Skilled Workforce Shortage Despite its potential, the 4D printing market faces challenges such as high development costs and a shortage of skilled professionals. Additionally, the complexity of treatments, like cancer chemotherapy, that can benefit from 4D printing, adds to these challenges. The high costs associated with research and development and the low adoption rate in emerging economies are further hindrances to market growth.

Segment Insights

Component Analysis

The 4D printing market in healthcare is segmented into software & services, equipment, and programmable materials.

Software & Services Dominance The software & services segment led the market in 2022, with significant applications in designing, creating, and assembling healthcare models. Despite being in its early stages, the demand for new software and machinery for 4D printing is growing.

Rapid Growth of Programmable Materials The programmable materials segment is expected to see the fastest growth. This technology involves materials that can change shape or properties in response to stimuli like temperature or moisture, creating self-assembling and self-repairing structures.

Technology Insights

Fused Deposition Modeling (FDM) Leading the Market Fused Deposition Modeling (FDM) held the largest market share in 2022. This method uses a shape memory composite combining shape memory alloy and shape memory polymer, which changes shape in response to temperature.

Selective Laser Sintering (SLS) Fastest Growing Selective Laser Sintering (SLS) is the fastest-growing segment, used for creating complex structures with industrial-grade precision. This technology is now being explored for manufacturing medicines, showcasing its versatility.

Application Insights

Dental Segment Leading In 2022, the dental segment dominated the market. 4D printed dental implants offer enhanced functionality and adaptability, potentially reducing the need for manual adjustments. Future advancements could lead to low-cost, smart dentures made from biocompatible materials.

Prosthetics Segment Growth The prosthetics segment is set for significant growth. 4D printing can create highly personalized and functional prosthetics, improving quality of life for patients.

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End-Users Insights

Hospital Segment Dominance Hospitals accounted for the largest market share in 2022 due to increasing patient admissions and the adoption of advanced medical technologies. The 4D Health hospital, a virtual training environment, exemplifies the potential of 4D printing in medical education and patient care.

Pharmaceutical & Biotechnology Companies Growth Pharmaceutical and biotechnology companies are expected to see substantial growth. 4D printing has applications in targeted drug delivery, where medications are precisely delivered to specific areas in the body, enhancing treatment effectiveness.

4D Printing in Healthcare Top Companies and Competitive Landscape

The global 4D printing in healthcare market is fragmented with many large and medium-sized players accounting for majority of market revenue. Major players are deploying various strategies, entering into mergers & acquisitions, strategic agreements & contracts, developing, testing, and introducing more effective 4D printing in healthcare solutions.

Some major players included in the global 4D printing in healthcare market report are:

- Hewlett Packard Enterprise Development LP
- Autodesk Inc.
- Stratasys
- CT CoreTechnologie Group
- Organovo Holdings Inc.
- Dassault Systemes
- ExOne
- ENVISIONTEC US LLC
- Materialise
- 3D Systems, Inc.

For more informative information, please visit us @ <https://www.emergenresearch.com/industry-report/4d-printing-in-healthcare-market>

4D Printing in Healthcare Market Segment Analysis

For the purpose of this report, Emergen Research has segmented global 4D Printing in

Healthcare market on the basis of component, technology, application, end-users, and region:

- Component Outlook (Revenue, USD Billion; 2019-2032)

- o Software & Services
- o Equipment
- o Programmable materials

- Technology Outlook (Revenue, USD Billion; 2019-2032)

- o Stereolithography
- o Fused Deposition Modeling (FDM)
- o Polyjet
- o Selective Laser Sintering (SLS)
- o Laser-Assisted Bioprinting

- Application Outlook (Revenue, USD Billion; 2019-2032)

- o Dental
- o Prosthetics
- o Orthopedic plantation
- o Tissue Engineering
- o Medical Components
- o Others

- End-Users Outlook (Revenue, USD Billion; 2019-2032)

- o Hospitals
- o Dental clinics & Laboratories
- o Pharmaceutical & Biotechnology Companies

- Regional Outlook (Revenue, USD Billion; 2019–2032)

- o North America

1. U.S.

2. Canada

- o Europe

1. Germany

2. France

3. U.K.

4. Italy

5. Spain

6. Benelux

7. Russia

8. Rest of Europe

- o Asia Pacific

1. China

2. Japan

3. South Korea

4. India

5. ASEAN Countries

6. Oceania

7. Rest of APAC
 - o Latin America
 1. Brazil
 2. Mexico
 - 3. Rest of LATAM
 - o Middle East & Africa
 1. GCC Countries
 2. Israel
 3. Turkey
 4. South Africa
 5. Rest of MEA

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