

ICON

Opportunity Audit

Joshua Castellano | Mackenzie Thomas | Eli Saghbini | Siddh Bathla

Executive Summary

ICON is a pioneer in advanced construction technologies, notably using 3D printing for building affordable, resilient, and sustainable homes. The selection of ICON for this audit stems from its innovative approach to addressing housing crises and its potential to significantly impact ecological and social sustainability. This audit utilized a comprehensive methodology encompassing analysis of ICON's projects, sustainability practices, and alignment with global sustainability goals.

Key findings highlight ICON's success in reducing construction waste, lowering carbon footprints, and contributing to affordable housing solutions. However, opportunities for further enhancement of its sustainability practices were identified, suggesting areas for improvement and expansion to elevate ICON's impact on global sustainability efforts.



Introduction

The rationale for selecting ICON is grounded in its groundbreaking approach to construction, leveraging 3D printing technology to address critical issues of affordability, resilience, and sustainability in housing. ICON stands out for its commitment to innovation, significantly contributing to sustainable development by reimagining construction methods to reduce waste, lower emissions, and improve efficiency.

The initial perception of ICON's impact is one of a transformative force in the construction industry, offering scalable solutions to global housing challenges while prioritizing environmental stewardship. This audit aims to critically evaluate ICON's sustainability practices, identifying strengths and uncovering opportunities for further advancements.



ICON's use of **3D printing technology** not only speeds up the construction process but also **reduces waste** compared to traditional building methods. This innovation aligns with **SDG 9** by fostering innovation and **SDG 12** by ensuring **responsible consumption** and production patterns.

The scope encompasses an analysis of ICON's ecological and social sustainability efforts, with objectives to assess its alignment with global sustainability goals and to propose actionable strategies for enhancing its positive impact on society and the environment.

Current Impact

ICON's business model focuses on addressing housing shortages and building resilient structures, aiming to solve global housing crises while promoting sustainability. Through collaborations with various stakeholders and a commitment to research and development, ICON is paving the way for a new era of construction that promises to transform communities worldwide.

Based on their current models, their impact can be evaluated through the following criteria:



Environmental



Social



Economic



Regulatory Compliance



Innovation Trajectory

Methodology

The methodology for assessing ICON's sustainability encompasses a multifaceted framework focusing on ecological, social, and economic dimensions. This approach is informed by criteria derived from global sustainability standards, including the Paris Accord, the United Nations Sustainable Development Goals (SDGs), and principles of the circular economy.

The assessment involves a comprehensive review of ICON's construction projects, technologies, and business practices, evaluating their impact on resource efficiency, carbon footprint reduction, social inclusivity, and economic viability. Data sources include ICON's official publications, industry reports, sustainability certifications, and scholarly articles. Research methods combine qualitative analyses of ICON's initiatives and quantitative metrics to gauge environmental and social performance, ensuring a holistic understanding of its sustainability impact.



The methodology assesses ICON's sustainability against global standards, focusing on environmental, social, and economic impacts. Through a detailed evaluation of ICON's projects and practices, it showcases the company's commitment to sustainability and innovation. Aligning with initiatives like the Paris Accord and the UN SDGs, this framework positions ICON as a sustainability leader, contributing significantly to global efforts for a more sustainable and equitable future.

Current Impact Analysis

ICON's impact on sustainability is significant across environmental, social, and economic dimensions. Environmentally, ICON's 3D printing construction technology reduces waste and energy use compared to traditional construction methods. Socially, ICON has made strides in affordable housing, creating homes that are accessible to low-income families, thereby addressing the global housing crisis. Economically, ICON's innovative approach reduces construction costs and timelines, offering a scalable solution to rapidly deliver housing. Projects like the community in Tabasco, Mexico, showcase these impacts, where ICON's technology has been used to create affordable, sustainable homes for families in need, highlighting the company's commitment to positive social and environmental outcomes.



ICON's sustainability impact is multifaceted, encompassing environmental, social, and economic benefits. Through its 3D printing technology, ICON drastically cuts waste and energy use, offering a greener alternative to traditional construction methods. Socially, the company enhances affordable housing availability, making sustainable homes accessible to low-income families and addressing the housing crisis. Economically, ICON's approach reduces construction costs and speeds up project delivery, providing a scalable solution for rapid housing development.

The Current Business Model

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITION	CUSTOMER RELATIONS	CUSTOMER SEGMENTS
<ul style="list-style-type: none"> Construction Technology Firms Sustainable Material Suppliers Architectural and Design Firms Real Estate Developers Government Housing Authorities Research Institutions and Universities NGOs: New Story Charity, Mobile Loaves & Fishes 	<ul style="list-style-type: none"> Research and Development in 3D Printing Technologies Design and Construction of Sustainable Housing Community Development Projects Collaboration with Governments on Housing Policies Continuous Innovation in Construction Materials 	<p>ICON's value proposition is to deliver customizable, sustainable housing through innovative 3D printing technology, merging eco-efficiency with modern living.</p>	<ul style="list-style-type: none"> Eco-conscious Homebuyers Property Development Companies Governments and NGOs Focused on Affordable Housing Sustainable Urban Development Projects 	<ul style="list-style-type: none"> Eco-conscious Homebuyers Property Development Companies Governments and NGOs Focused on Affordable Housing Sustainable Urban Development Projects
COST STRUCTURE <ul style="list-style-type: none"> Investment in R&D for Sustainable Technologies Operating Costs of Printing Facilities and Equipment Marketing and Customer Acquisition Costs Staffing and Training of Design and Construction Teams 		REVENUE STREAMS <ul style="list-style-type: none"> Sales of 3D Printed Homes and Buildings Licensing of Technology and Designs to Third Parties Consulting Services for Sustainable Development Projects Government Grants for Innovation in Sustainable Housing 		

Evaluation Framework

The evaluation framework for assessing ICON's sustainability is based on a set of detailed criteria that align with key global sustainability frameworks and references, such as the Paris Accord and the United Nations Millennium Development Goals (MDGs). The ecological sustainability assessment focuses on energy efficiency, reduction in construction waste, use of sustainable materials, and the overall carbon footprint of construction processes. Social sustainability criteria examine affordability, accessibility, community impact, and contribution to solving the housing crisis.

Economic sustainability assesses the long-term viability of ICON's business model, including cost-effectiveness and market impact. These criteria provide a comprehensive basis for evaluating ICON's performance and identifying areas for further improvement and innovation in sustainable construction practices.



Environmental Impact

This would assess ICON's sustainability practices and how their operations affect the environment. It includes their carbon footprint, resource usage, and waste management.



Social Impact

This would involve ICON's contributions to society, such as job creation, community initiatives, and their role in social change.



Economic Impact

This will evaluate ICON's economic contributions, like revenue generation, economic growth in their operational regions, and their overall market influence.



Regulatory Compliance

This would be an assessment of how well ICON adheres to laws and regulations in their industry, including safety standards, employment laws, and financial regulations.



Innovation Trajectory

This will reflect on ICON's investment in research and development, the novelty and marketability of their products, and their potential for future growth.

The framework assesses ICON's sustainability against global standards such as the Paris Accord and the UN Millennium Development Goals, focusing on energy efficiency, waste reduction, sustainable materials, affordability, and community impact. It evaluates ecological, social, and economic sustainability, highlighting ICON's commitment to sustainable construction.

Opportunity Sectors



✳ **Bioreactive Buildings**

Develop buildings with living biological materials that can react to the environment, such as algae-infused walls that absorb CO2 and change color based on air quality.

✳ **Self-Healing Concrete**

Invest in R&D for self-healing construction materials that use bacteria or nanotechnology to repair cracks and maintain structural integrity.

✳ **Urban Vertical Farms**

Build multi-story hydroponic or aeroponic farms within urban areas, significantly reducing the carbon footprint of food transportation and increasing local food security

✳ **Climate Adaptive Buildings**

Design buildings with dynamic exteriors that can adapt to changing weather conditions, reducing energy consumption for heating and cooling.

✳ **Atmospheric Water Generation**

Integrate systems within buildings that can harvest water from the air, providing sustainable water sources and reducing building impact on local water resources.

✳ **Wildlife Integration Features**

Design buildings with integrated habitats for local wildlife, such as bird nests and bee colonies, promoting biodiversity in urban areas.

✿ **Disaster Resilient Schools**

Partner with governments to replace vulnerable schools with 3D-printed structures designed to withstand extreme weather and seismic events.

✿ **Cultural Heritage Restoration**

Use 3D printing technology to accurately restore and reconstruct damaged historical monuments and sites, preserving cultural heritage.

✿ **Housing Equity Initiatives**

Create a portfolio of designs tailored for low-income families, improving living conditions and fostering social equity.

✿ **Automated On-Demand Housing**

Use AI to design houses that can be printed on-demand for immediate disaster relief or to combat homelessness, adapting in real-time to the needs of the occupants.

✿ **Universal Design Homes**

Advance the development of homes with universal design principles that are accessible for all, regardless of age, disability, or other factors.

✿ **3D-Printed Community Centers**

Develop multipurpose community centers in underserved areas that can be rapidly constructed, serving as hubs for education, healthcare, and social services.

Zero-Waste Construction Ecosystems

Create closed-loop construction sites where all materials are recycled and reused, with 3D printers that can reprocess on-site waste into new building materials.

Construction Tech Startups

Create a venture capital fund to invest in innovative construction technology startups, gaining access to new ideas and technologies.

Real Estate Development Funds

Establish investment funds focused on properties developed using ICON's technologies, appealing to investors interested in cutting-edge, sustainable real estate.

Global Licensing Models

License the 3D printing construction technology to companies in other countries, enabling global reach without the need for extensive physical presence.

Prefabricated Home Components

Offer a range of smart home components that can be easily integrated into new or existing structures, enhancing the functionality and value of homes.

Construction Automation Hubs

Set up centralized control rooms where a small team can oversee and coordinate fleets of automated construction drones and printers across multiple sites.

Global Construction Protocol Initiative

Lead the creation of a global set of standards for 3D printed structures, ensuring compliance and safety in different regulatory environments.

Remote Inspection Drones

Use drones equipped with cameras and sensors to perform remote inspections of buildings, ensuring compliance with safety and quality standards.

International Expansion Advisory

Assist other companies with navigating the complexities of expanding construction technology into new countries with varying regulations.

Building Code Software

Develop AI-based software that can automatically check designs against a comprehensive database of international building codes.

Automated Compliance Monitoring

Offer training programs and certifications for construction professionals in the use of 3D printing technology, emphasizing regulatory compliance.

Sustainability Certification

Provide consultancy services for projects seeking green building certifications like LEED, WELL, or BREEAM.

🔗 **Adaptive Living Environments**

Create smart buildings with embedded AI that learn and adapt to optimize space and energy usage based on occupant behavior and environmental conditions.

🔗 **AI-Driven Design Optimization**

Utilize artificial intelligence to optimize building designs for energy efficiency, structural integrity, and material usage, potentially revolutionizing the design phase of construction.

🔗 **Construction Robotics as a Service**

Provide a fleet of construction robots, including 3D printers, drones, and automated machines, for lease to construction companies, complete with technical support and maintenance.

🔗 **Sustainable Off-Grid Communities**

Design and build entirely self-sustaining communities with off-grid capabilities, including renewable energy generation, water recycling, and waste-to-resource systems.

🔗 **Transit-Oriented Development**

Collaborate on futuristic transportation hubs with integrated residential and commercial structures, facilitating hyperloop or drone-based transport systems.

🔗 **Interplanetary Architecture**

Pioneering architecture and construction methodologies for other planets, focusing on sustainability and self-sufficiency, using in-situ resources for building extraterrestrial settlements.

Transformation Opportunities

For ICON to extend its model, several transformative opportunities can be explored:

Bioreactive Buildings

Integrating living materials that respond to environmental conditions, ICON could develop buildings that self-regulate temperature, air quality, and even generate renewable energy, enhancing sustainability.

Automated On-Demand Housing

Leveraging AI and machine learning, ICON could offer personalized, on-demand housing solutions that adapt to user needs and preferences, optimizing resource use and minimizing waste.

Zero-Waste Construction Ecosystems

By adopting circular economy principles, ICON can aim for zero-waste construction sites where all materials are reused, recycled, or composted, significantly reducing environmental impact.

Integrated Renewable Energy Solutions

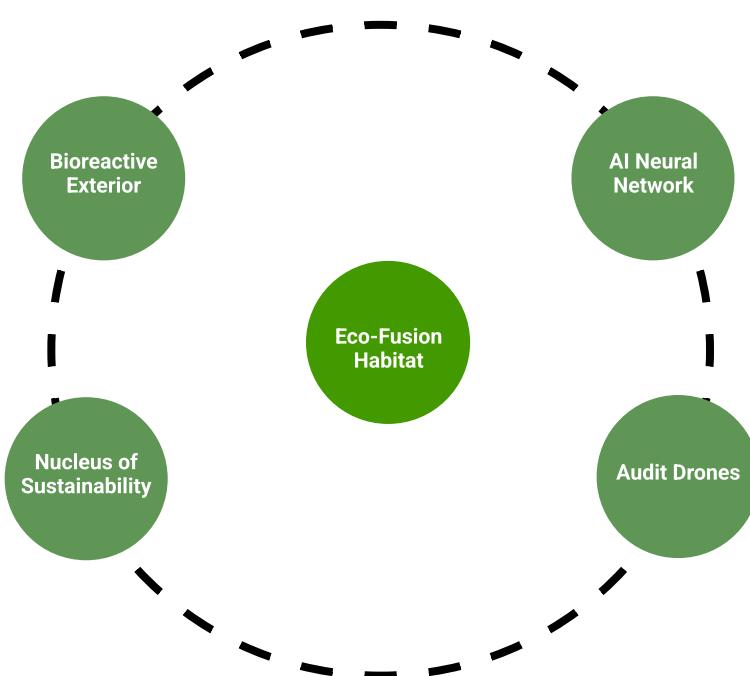
Incorporating solar panels, wind turbines, and other renewable energy sources into the construction process to create self-sustaining homes that produce more energy than they consume.

Community-Centric Designs

Focusing on community-driven projects that not only provide housing but also foster social cohesion, economic development, and access to essential services.

Conceptualizing Future Direction

ICON's "Eco-Fusion Habitats" are not just innovative housing solutions; they are a transformative approach that integrates advanced technology with sustainable principles to create living spaces that function as self-sustaining ecosystems. This groundbreaking concept goes beyond traditional home construction, embodying a commitment to crafting harmonious habitats that serve as sanctuaries for their inhabitants while contributing positively to the planet's health. By promoting a symbiotic relationship between human habitation and environmental preservation, ICON leads the industry towards a new era of eco-intelligent, adaptive ecosystems. These habitats are designed to optimize energy use, reduce waste, and utilize sustainable materials, ensuring that each home not only minimizes its carbon footprint but also enhances the surrounding environment.



Technologies Built Into Eco-Fusion Habitat

Bioreactive Exterior

These habitats feature a living, **bioreactive exterior** that purifies the air, **optimizes temperature**, and **shifts hues** to reflect air quality, bringing a dynamic visual element to environmental responsiveness. **Nestled within the walls**, self-adjusting biological organisms work in concert with the habitat's systems to foster a living space that breathes in unison with its surroundings.

Nucleus of Sustainability

The core of each home is a nucleus of sustainability – **vertical farms spiral upwards**, drawing on nutrient-rich recycled water, and provide residents with fresh produce, while **comprehensive water recycling** systems ensure every drop is used to its fullest potential.

AI Neural Network

These **autonomous habitats**, spawned from AI's neural networks, are rapidly deployable to any environment, be it urban or remote, designed to meet the pressing demands of **disaster-struck regions or underhoused communities**.

Audit Drones

Drones act as the **custodians of quality** and adherence to safety standards, ensuring the integrity of these **off-grid, self-powered communities** that chart a course for a sustainable future.

The New Business Model

KEY PARTNERS <ul style="list-style-type: none">• Bioengineering Research Institutes• Smart City Infrastructure Developers• Sustainable Living NGOs• Advanced AI and Data Analytics Companies• Drone Technology Providers	KEY ACTIVITIES <ul style="list-style-type: none">• Researching and Developing Bioreactive Building Materials• Designing AI-Powered On-Demand Housing Solutions• Implementing Zero-Waste Construction Processes• Conducting Remote Drone Inspections for Quality Control• Developing Off-Grid Community Infrastructures	VALUE PROPOSITION <p>Offering cutting-edge, eco-intelligent homes for a fully sustainable, self-regulating living experience</p>	CUSTOMER RELATIONS <ul style="list-style-type: none">• Personalized Home Customization Experiences• Continuous Engagement Through Smart Home Tech Support• Educational Initiatives on Sustainable Living Practices• Investment Opportunities in Sustainable Development Projects	CUSTOMER SEGMENTS <ul style="list-style-type: none">• Future-Focused Eco-Investors• Disaster Relief Organizations• Environmentally Progressive Homebuyers• Urban Planners Looking for Sustainable Community Solutions
KEY RESOURCES <ul style="list-style-type: none">• Bioreactive Materials and Advanced 3D Printing Facilities• AI Algorithms for Housing Design and Resource Management• Fleet of Inspection and Maintenance Drones• Renewable Energy Systems for Off-Grid Functionality			CHANNELS <ul style="list-style-type: none">• Interactive Design Platforms for Customized Housing• Educational Webinars and Virtual Tours of Model "Eco-Fusion Habitats"• Community Workshops on Sustainable Living• Online Marketplaces for Smart, Sustainable Home Buying	
COST STRUCTURE <ul style="list-style-type: none">• R&D for Bioreactive Materials and AI Integration• Production and Maintenance of Advanced 3D Printing Technology• Investment in Smart City and Drone Technologies• Development and Upkeep of Off-Grid Systems		REVENUE STREAMS <ul style="list-style-type: none">• Sales of "Eco-Fusion Habitats"• Licensing of Bioreactive Materials and AI Designs• Service Contracts for Ongoing Maintenance and Data Analytics• Partnerships with Cities and Communities for Sustainable Development Projects		

The Role of Design

Design in 3D printing construction is crucial for developing sustainable, innovative buildings. It focuses on **resource efficiency**, environmental integration, and **future resilience**. Design dictates the sustainability and efficiency of construction projects, shaping their impact and effectiveness in **meeting eco-friendly goals**. The role of **design** can be broken down into 5 key components:

Sustainability Integration

Serves as a sustainable construction blueprint.



Waste Minimization

Significantly lowers material waste.



Energy Efficiency

Boosts energy optimization of buildings.



Environmental Harmony

Ensures construction complements ecosystems.



Resilience and Adaptability

Prepares buildings for future environmental changes.



The Role of the Designer

Designers in 3D printing construction play a vital role, merging innovation with sustainability. They **create structures that are functional**, visually appealing, and **environmentally conscious**. By combining creativity and technical expertise, designers drive the industry towards greener and more **innovative building solutions**. The role of a **designer** can be broken down into 5 key components:

Visionary Thinking

Leads in eco-innovative construction designs.



Interdisciplinary Collaboration

Unites various experts for green building solutions.



Ethical Responsibility

Champions sustainable practices for future wellbeing.



Educational Role

Advocates for and educates on green construction technologies.



Innovation and Research

Pioneers in applying cutting-edge materials and methods.



The Role of Design Management

Design management in 3D printing construction ensures projects are **executed seamlessly**, blending sustainability with practical execution. It coordinates resources, upholds quality, and **streamlines stakeholder communication**, making it key for achieving efficient, eco-friendly construction results. The role of **design management** can be broken down into 5 key components:

Project Coordination

Ensures seamless integration of design, technology, and execution, aligning project goals with sustainability objectives.



Resource Optimization

Manages the efficient use of materials and resources, promoting cost-effectiveness and minimizing environmental impact.



Quality Assurance

Upholds high standards of construction quality, overseeing the adherence to design specifications and eco-friendly practices.



Stakeholder Communication

Facilitates clear and continuous communication among all project stakeholders and clients, ensuring that sustainability goals are understood.



Innovation Integration

Guides the adoption and implementation of innovative 3D printing technologies and materials, fostering a culture of continuous sustainability.



Conclusion

ICON has demonstrated a strong commitment to sustainability through its innovative 3D printing technology in construction. The audit reveals ICON's significant contributions to reducing construction waste, improving efficiency, and enhancing affordability in housing. To achieve a higher level of sustainability, ICON is recommended to further integrate renewable energy sources, develop circular economy practices, and expand its community engagement. Future research should explore advanced materials for 3D printing that are more sustainable and the potential for scaling ICON's model globally to maximize its social and environmental impact.



ICON's use of 3D printing technology marks a significant stride towards sustainability in construction, reducing waste and making housing more affordable and efficient. While the audit highlights ICON's progress, further enhancements are suggested, such as adopting renewable energy, embracing circular economy practices, and widening community engagement. Future research should focus on sustainable materials for 3D printing and the feasibility of scaling ICON's model globally to enhance its environmental and social impact. Advancing these areas could solidify ICON's role as a leader in eco-friendly construction, showcasing the potential of 3D printing to revolutionize sustainable development and foster more sustainable, inclusive communities worldwide.



Visualizing Data

Holistic Health Visualization System (FitSphere)

A health tracker that visualizes wellness metrics (activity, nutrition, sleep, mental health, heart health) through "Balance Rings" for real-time monitoring and goal setting.

Activity Measurement and Motivation Module (Activity Orbit)

A component that quantifies physical activity (steps, exercise intensity, active/sedentary time) using gamification to boost movement and fitness engagement.

Nutritional Intake and Hydration Tracking System (Nutrition Orbit)

A subsystem that tracks nutrient intake, hydration, and dietary goals, promoting balanced eating with real-time feedback and personalized insights.

Restorative Rest and Recovery Assessment Tool (Recovery Orbit)

A module that evaluates sleep patterns and recovery, tracking REM and deep sleep stages for optimal rest strategies.

Mental Evaluation and Enhancement Tool (Mental Wellness Orbit)

A tool assessing stress and mood, offering mindfulness and meditation recommendations for mental and emotional balance.

Cardiovascular Health Monitoring System (Heart Health Orbit)

A component for tracking heart metrics (resting heart rate, variability, cardio zones), providing insights for heart health.



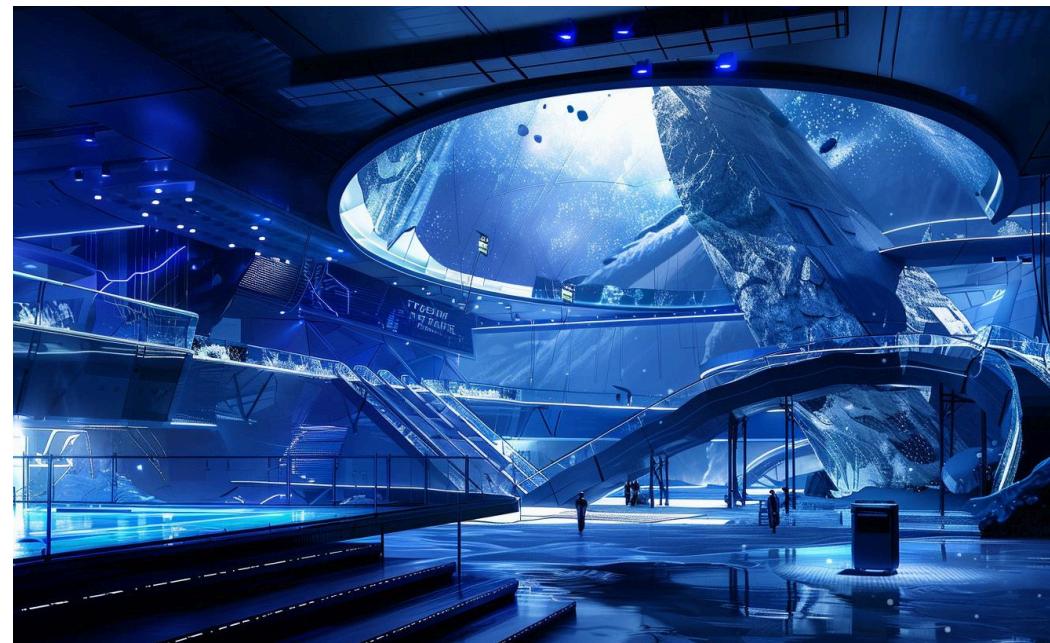
Implementation Strategy



The Evolutionary Blueprint of Future Fit

A Strategic Roadmap

The rollout of Future Fit is envisioned as a strategically phased approach, ensuring a smooth transition from a robust technological foundation to a widespread user-adoption, and finally to global scaling. Each phase is meticulously planned to build upon the previous one, guaranteeing system integrity, user satisfaction, and long-term success.



Phase 1: Foundation and Infrastructure

In the initial phase, we're laying a solid foundation for Future Fit by developing core AI algorithms, setting up a scalable cloud infrastructure for data needs, forming key partnerships, and establishing strong security measures to protect user data.



Phase 2: Integration and Testing

During integration and testing, Future Fit's AR/VR and bio-responsive technologies are combined. Beta testing refines the user experience with real feedback, as we build a comprehensive content library.



Phase 3: Launch and User Acquisition

The official launch of Future Fit starts its public journey, with a marketing campaign targeting early adopters and the release of the FlexFit app, emphasizing user engagement and community growth.



Phase 4: Expansion and Scale

After a successful launch, Future Fit begins its expansion, targeting broader markets and scaling operations. Content and capabilities grow, partnerships widen, and new revenue streams are explored for sustainability and reach.



FUTUREPROOFING

LONGEVITY

Innovating for a Healthier Tomorrow

Future Fit introduces a new era of personalized wellness by **merging advanced technology with daily health habits**, using augmented and virtual reality, AI, and biometrics for an immersive fitness experience. It goes beyond traditional health management by offering personalized fitness plans and community wellness challenges, leading to improved health, longevity, and adaptable wellness routines. **Future Fit evolves with users**, using data for ongoing improvement and promoting a holistic lifestyle and a global health-conscious community.



POTENTIAL DISRUPTIONS

Evolving Personal Health Tech

Future Fit is **revolutionizing the health and wellness** landscape with its synergistic blend of **AR/VR and AI technology** for a **customized** fitness **experience**. It goes beyond traditional exercise by incorporating **bio-responsive tech** and **real-time data analysis**, offering immersive, **personalized workout environments**. This innovative approach transforms fitness into a **dynamic, adaptable journey**, fostering a connected community and a **proactive approach** to wellness. Future Fit is not just a product but a **movement**, leading the charge towards **a healthier future** with every update and iteration.



Conclusion



Fitness Reimagined

Tomorrow's Legacy Today

As we conclude our journey, Future Fit stands at the forefront of a wellness revolution, redefining health and fitness. More than a platform, it's a catalyst for transformation, merging technology and ambition to guide us to optimal health. Built on advanced AI and bio-responsive technologies within a community-focused ecosystem, Future Fit is set to elevate wellness to new levels. We envision a future where everyone is empowered to achieve their highest potential, supported by an adaptive, evolving ecosystem. Together, we're not just shaping futures; we're creating a lasting health legacy.



References

References

Bennett, Michael G, and R. John Naranja. "Getting Nano Tattoos Right—a Checklist of Legal and Ethical Hurdles for an Emerging Nanomedical Technology." *Nanomedicine: Nanotechnology, Biology and Medicine*, vol. 9, no. 6, 1 Aug. 2013, pp. 729–731, www.sciencedirect.com/science/article/abs/pii/S1549963413001780#:~:text=The%20nano%20tattoo%20is%20an%20intradermally%20embedded%20array,detection%20and%20the%20potential%20transformation%20of%20diabetic%20care., <https://doi.org/10.1016/j.nano.2013.04.006>. Accessed 7 Mar. 2024.

gazettebeckycoleman. "Feeling Woozy? Time to Check the Tattoo." *Harvard Gazette*, Harvard Gazette, 28 Sept. 2017, news.harvard.edu/gazette/story/2017/09/harvard-researchers-help-develop-smart-tattoos/. Accessed 6 Mar. 2024.

inkonsky. "The Rise of Bio-Responsive Tattoos: Ink That Adapts to Your Body." *Inkonsky.com*, 2024, en.inkonsky.com/articles-on-tattooing-uk/the-rise-of-bio-responsive-tattoos-ink-that-adapts-to-your-body. Accessed 6 Mar. 2024.

"MIT Researchers Develop Temporary Tattoos That Can Control Smartphones." YouTube, 16 Aug. 2016, www.youtube.com/watch?v=GVt7v4rQ2JI. Accessed 6 Mar. 2024.

Reynolds, Emily. "Biotech Tattoos: The Reality and the Future in 2016." WIRED UK, WIRED UK, 4 Dec. 2015, www.wired.co.uk/article/biotech-tattoos-biowearable. Accessed 6 Mar. 2024.

"Smart Tattoos Can Tell You What's Going on in Your Body." Digital Trends, 2 Oct. 2017, www.digitaltrends.com/cool-tech/smart-tattoos-health-wearable-news/. Accessed 6 Mar. 2024.

