Beamit.space

Transform 2D any PFP/NFTs into metaverse-ready, controllable 3D Avatars with AI.

A dapp built by Starbreeder PTE Ltd.

Thomas Heindl, founder

"Some people say, "Give the customers what they want."

But that's not my approach.

Our job is to figure out what they're going to want before they do."

Steve Jobs

1. Executive Summary

Beamit.space is a dapp right at the nexus of 4 trends in decentralized technology:

<div align="center">

the open metaverse
artificial intelligence
digital identity
interchain

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Breaking the barriers of siloing of open metaverse worlds, beamit.space makes it easy for users and projects to generate and beam 3D avatars into any possible digital realm, lowering the cost of creation and deployment by 10x, and decreasing time of creation by a 100x.

Making use of cutting edge AI and machine learning models, beamit.space enables anyone to convert PFP, NFTs, ordinals or even real life images to metaverse-ready, controllable 3D avatars. Optimizing these models for any integrated metaverse world, using beamit.space is a game changer in the realization of consistent digital identities across the open metaverse, lowering the barriers, acting as a transforming beam into any meta-realm.

Providing proof of provenance smart contracts, beamit.space also provides a solution to protect and monetize intellectual property (IP) of NFT holders and contributes to the challenge of maintaining the digital identity for the holder.

Integrating our AI and IP protection tools into potentially any open metaverse project, game, NFT Launchpad, AR/VR/MX app, via API, we aim to become an interdimensional teleport device for digital identities, to manifest in the metaverse.

2. Introduction

2.1. Market Environment

The decentralized metaverse is rapidly expanding, with hundreds of projects across various blockchains, complementing centralized counterparts like Fortnite and Roblox. This growth is underpinned by advancements in virtual, augmented and mixed reality technology, with significant contributions from Apple, Oculus, Meta, Microsoft, Alphabet, and HTC, as well as next generation network standards, signaling a push towards mass adoption of 3D integrated user interfaces. The metaverse market is expected to see a user base of 2.6 billion by 2030, while the addressable market is estimated to range between 1.91 and 4.44 Trillion USD.

Concurrently, the 3D avatar market is forecasted to grow significantly from USD 139.2 million in 2023 to USD 2,040.0 million by 2033[1], driven by the desire for consistent digital identities and the expansion of online social interactions, particularly in Web3 communities.

2.2. Problem Statement

When it comes to availability of custom 3D avatars, the metaverse ecosystem is facing several problems.

1. **3D Avatar creation is costly and time consuming**
   The production of a custom 3D Avatar from 2D images such as NFTs or real life portrait pictures, let alone creating from a simple text description (prompt) specifically designed for specific metaverse worlds, is today costly and time intensive, and involves several complex steps, especially in the decentralized economy. For most people it will be necessary to hire a 3D designer to produce the 3D avatar that meets the requirements of the specific world.

2. **Incompatibility between metaverses**
   While the metaverse is open in theory, there are relatively high barriers to maintain a desired avatar constantly switching these worlds. Most worlds come with their own technical requirements and limitations. Also, each metaverse project is deployed in a different environment, mostly on different blockchains. This means that in most cases users will have to create a new Avatar for each world they want to use it in, and repeat the work steps stated above.

3. **Protection and monetisation of Intellectual Property**
   While NFTs are non-fungible, the artwork itself is not. This means, anyone can create a 3D avatar based on any image of an NFT, and use it in the metaverse. Also, for the real holder of an NFT, there is no easy way to prove his ownership in different metaverse worlds. This situation comes with problems of provenance, lack of proof of identity and ownership, which in case of avatars is often problematic.

1 Market Statsville Group MSG

4. **Creating 3D objects is complex and time consuming**
   Creating any kind of 3D objects for the open metaverse of any kind is either a time consuming or expensive task as it requires hiring 3D designers. Even though there are 3D builder tools available for some projects, the entry barrier to build daps and games in the open metaverse is relatively high.

5. **Centralized AI integration is not a for the open metaverse**
   When it comes to the open metaverse, the benefits of decentralization are in many cases an important pillar of user autonomy, freedom and self-empowerment. While from today's perspective AI is the obvious answer when it comes to creating a vibrant experience with abundance and freedom of creativity, the available services are mostly centralized and do not match the ideals and needs of a decentralized open economy the open metaverse community is seeking to experience.

2.3. Solution

1. 2D PFP to 3D Avatar NFTs via beamit.space

   The Beamit.space AI-dapp allows users to transform any PFP, NFT, Ordinals or even real life portrait pictures into a controllable 3D Avatar optimized for any metaverse. Facilitating and combining various AI-models, Beamit.Space is achieving results of generating 3D avatars that match the quality of professional 3D-designers. Achieving results within minutes, the service cuts delivery time at a factor of 1000. And as a result, this service allows anyone to generate such a 3D avatar for the fraction of a cost of hiring 3D designers. Also, minting directly on beauty.space makes the experience of minting metaverse-ready avatars on any integrated chain convenient.

2. Any metaverse on any chain

   The vast amount of metaverse worlds brings opportunity and entertainment in many ways. Porting a 3D avatar into a different world with beamit.space is just a click away. Users will be able to choose the metaverse world to beam their avatar into. The Protocol will do the work, and deliver an avatar ready to get minted, that meets all the requirements of the destination metaverse.

3. Proof of Provenance - Protection and monetization of IP, ID verification

   Beamit.space is introducing proof of provenance ("POP") smart contracts for diverse NFT utilities. The beamit.space smart contracts "know" if the source NFT is part of an original collection and also if the avatar user is currently holding the original, and is able to communicate this information in real time. These POP smart contracts allow to project this information in any integrated metaverse or augmented/mixed reality app. The POP feature can also be utilized with ID verification services, which enables 3D avatars to contain proof of identity. Also, in real life applications, this feature can be used to communicate selected verified data such as age, memberships and subscription.

A unique utility that opens up new possibilities for games, dapps, metaverse and gaming, and real life utility: Access management, IP monetisation and even targeted ads.

4. Create 3D objects and NFTs in seconds

The beamit.space app with text-to-3D and image-to-3D capabilities, as well as a combination of both, makes it easy to create 3D objects and mint them metaverse ready.

5. API for decentralized AI

With the Beamit.space API metaverse worlds, games, launchpads and/or other entities are enabled to integrate cutting edge decentralized AI technology into their environments.

2.4. Beneficiaries of beamit.space

Beamit.space will bring tremendous value to various shareholder groups:

- **Games and Metaverse users** get an easy way to convert their PFP collectibles and portrait images into 3D avatars, tailored for the target game or metaverse project. PoP grants protection, monetisation and other utility for their NFT IP.

- **NFT & Ordinals collections and DAO** can take advantage of our products to find new ways to monetize and upsell their communities and IP.

- **Metaverse projects** can provide better and more powerful services for their users and easier access for their building tools, including AI and PoP.

- **Game/metaverse Designers** can increase their productivity by building 3D worlds with the help of generative AI. PoP is a game changer for games and metaverses by enabling developers to manage access and other functionality such as targeted ads, giveaways, collaborative gaming, skills and so on.

- **B2B users** (such as fashion brands, IP owners and other market participants) benefit from faster, easier and cheaper access to 3D design.

- **Other API providers** beamit.space is integrating (such as OpenAI services, Midjourney, Meshly and more) besides its own AI model API, benefit from increased usage.

3. Market Analysis

3.1. Metaverse

The decentralized metaverse is taking shape: More than 250 metaverse and open world gaming projects on dozens of blockchains are currently under construction or already accessible. The multitude of realms in the metaverse will only become greater, as these projects will line up to become available for billions of users, besides established decentralized worlds such as Decentraland and The Sandbox, Otherside by Yuga Labs, but also centralized projects such as Fortnite, Horizon Worlds and Roblox.
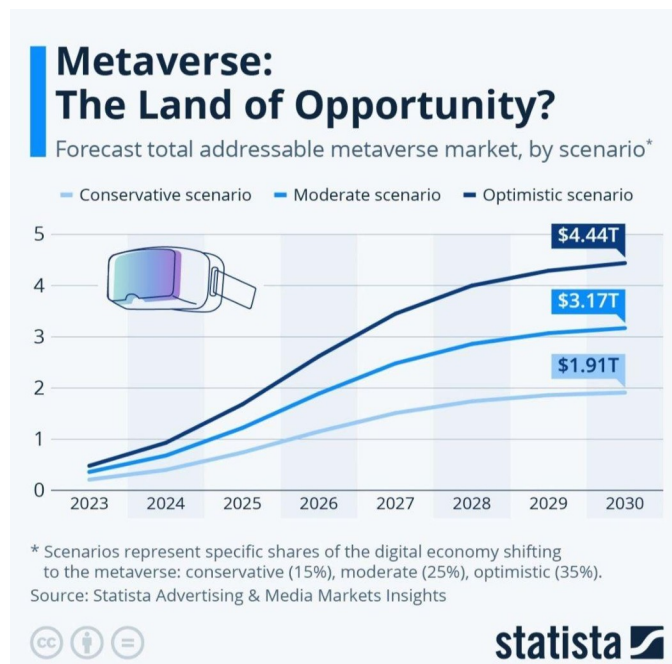
At the same time, in the mid 2020s, VR/AR/MR hardware is getting ready for mass adoption. Apple's Vision pro recently dominating the news, Oculus releasing updates to their devices, as well as Microsoft, Alphabet, Samsung, Sony and HTC as other competitive players - consumers will be provided excellent tech to experience the digital realm in many ways. Also the 5G standard is enabling 3D rendered information transfers for billions of mobile users.

As large amounts of capital are flowing into this sector, it seems inevitable that metaverse mass adoption is imminent. By 2030, according to Statista, the number of users in the Metaverse market is expected to reach 2,6 Billion[2].

Most recent update: Oct 2023

Source: Statista Market Insights
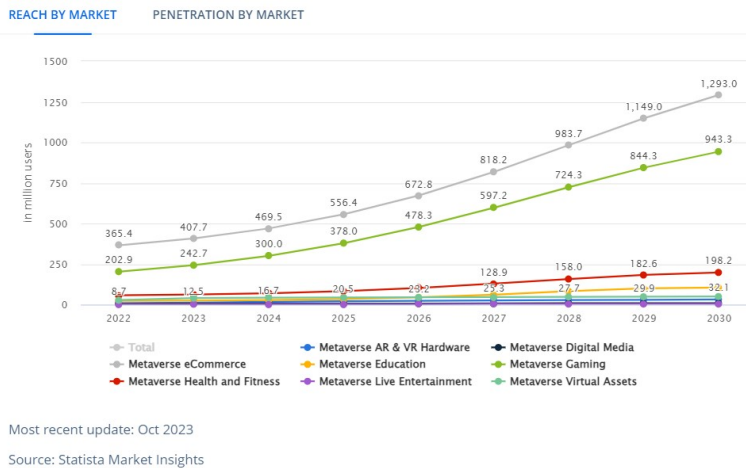
The metaverse is predicted to be a market opportunity between 1.9 Trillion and 4.4 Trillion US-Dollars by 2030. In the last years we have seen major tech companies as well as decentralized organizations and start-ups enter the market with different platforms, either hardware or software. Meta is known to have invested more than 10 Billion USD into their Horizon World, while Apple has just launched their technologically advanced VR/AR headset vision pro. Also, Fortnite being an example of a closed metaverse, the user base of more than 220 million monthly active users[3] shows the great potential this industry is seeing.

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2 https://www.statista.com/outlook/amo/metaverse/worldwide#:~:text=By%202030%2C%20the%20number%20of,market%20holds%20significant%20potential%20worldwide.

Metaverse: The Land of Opportunity?

Forecast total addressable metaverse market, by scenario*

The expected market size of the overall metaverse ecosystem is expected to exceed 500 Billion USD by 2030, with an expected annual growth rate (CAGR 2024-2030) of 37.73% from 2022[4].

3.2. 3D Avatars and Digital Identity

Obviously 3D metaverse worlds require 3D Avatars. Looking at the global 3D avatar solution market size, Market Statsville Group MSG gives an estimation of an annual growth from USD 139.2 million in 2023 to USD 2,040.0 million by 2033, at a CAGR of 30.8% from 2023 to 2033[5].

Another study by Spherical Insight, is estimating an explosive growth of the global digital avatar market, valued at USD 7.55 Billion in 2022. The study is estimating a CAGR of 43.7% from 2022 to 2032, and expecting this market to reach USD 283.47 Billion by 2032[6].

At the same time, the desire for people to expose a consistent digital identity has proven persistently in the last years, and already today Avatars play a great role in social networks. Especially in web3 communities on platforms such as Discord or X.com, 2D PFP of NFT collections are common, and users tend to maintain them as they become part of their digital identity and means of status. NFTs are the obvious solution[7] to satisfy this demand.

3 https://www.demandsage.com/fortnite-statistics/#:~:text=Fortnite%20has%20over
%20500%20million,revenue%20came%20in%202022%20alone.
4 https://www.statista.com/outlook/amo/metaverse/worldwide#:~:text=By%202030%2C%20the
%20number%20of,market%20holds%20significant%20potential%20worldwide.
5 https://www.marketstatsville.com/3d-avatar-solution-market
6 https://www.sphericalinsights.com/reports/digital-avatar-market
7 https://www.ft.com/partnercontent/crypto-com/nfts-identity-in-the-metaverse.html

Anticipating the availability of technology that makes attractive 3D environments accessible for more and more people, the demand for 3D avatars will increase. As people spend more and more time online, besides the time, also the choice of environments, in which users can expose their digital identity, is growing. At the same time the open metaverse is on the rise, with a myriad of 3D games, worlds and spaces evolving.

In this booming multiplatform metaverse, the users will find an increasing number of attractive worlds to explore. Both in the decentralized metaverse, as well as in closed world metaverse environments, hundreds of projects are in the making, with the current availability just being the tip of the iceberg of what VR/AR/MR is capable of.

With the number of available worlds to explore, also the incentives and desire to spend time in multiple worlds will increase. With play2earn gaming, metaverse festivals, regular game seasons and other incentives, metaverse users will likely switch worlds regularly, just like they are now switching between games, social networks, streaming services, websites and other means of entertainment and work.

And therefore there will be a great demand for applications to create 3D avatars in a convenient way.

3.3. 3D Objects

The global market for 3D models, valued at USD 1,255.8 million in 2022, is projected to expand at a robust CAGR of 19.04%, reaching approximately USD 3,573.08 million by 2028. This growth is spurred by increasing demands across diverse sectors such as architecture, engineering, product design, and entertainment, particularly in digital content creation for films and video games. Using AI to generate high quality 3D Objects for specific metaverse specifications via text-to-3D, 2D-image-to-3D, or a combination of both, will be a groundbreaking service of Beamit.space.

3.4. Market Needs

Generally, the 3D avatar market will be growing rapidly in the upcoming decade. At the same time, creating custom 3D avatars manually is a costly and time consuming task. Even though services that offer ai-generated avatars started to become available recently, most of them are focusing on 2D images. Projects for generating 3D Avatars or 3D objects via AI, mostly do not come with the capabilities necessary to allow users:

1. Generating any 2D PFP (also in common torso perspective) into a full body avatar
2. Automatically "rig" the Avatar with a virtual skeleton and therefore make it controllable in 3D environments
3. to be used on multiple metaverse platforms (technical requirements)

4. directly mint these avatars/objects as NFTs on multiple chains
5. apply proof of provenance NFT utility for IP protection and more utility.

3.5. Competition Analysis: Assess the existing solutions and their limitations.

There are several services and software tools that offer creating 3D meshes from images using AI. While many of them are available in the shape of plugins for 3D render software such as blender or autocad, most of them do not specifically focus on avatars. Here is an overview on end user-friendly web services, that come closest to what beamit.space is offering:

3.5.1. Meshly

Meshly is a platform that allows users to create 3D avatars and other objects via text-to-3D and image-to-3D. There are currently 3 different styles available. The service can not create a full body image from a PFP, and is also not providing NFT minting. Also, there are no other technical specifications offered, other than polygon reductions.

3.5.2. Avaturn

Avaturn is a service that allows generating 3D Avatars from selfie pictures. They offer a modular service, which merges the 3d mesh of the AI generated mesh with a prefabricated body, which can be modified in shape, clothing and color. This makes their service limited to humanoid bodies, while beamit.space can theoretically any body shape of animals, dragons and so aon. The service can also be integrated as a plugin into software environments, and the avatars can get exported to several common file formats.
However, there is no full body ai rendering, no rendering from other PFP than human selfies, and no optimisation for metaverse requirements.

3.5.3. Alpha 3D

Alpha 3D is offering 3D renders from text-to-3D and image-to-3D. While the user can prompt the first 50 renders for free, there is a subscription model as well as a custom price model available. The service is not offering complete avatars from PFP, and also no character rigging automation. Also, it doesn't allow me to mint NFTs. Also the possibility to render avatars and objects according to specific requirements is limited.

3.5.4. Adobe Mixamo

Mixamo is a service that allows Creative Cloud subscribers to auto-rig 3D Avatars. This fast and solidly working service allows also to apply a large selection of predefined animations. The service can only be used with a Creative Cloud membership, and is limited to the rigging process - and no AI mesh generation. Also, there are no NFT minting integration and metaverse specifications available.

Concluding, while there are several services that offer 3D renderings from images or text-to.3d, currently there are no direct competitors that focus on 3D avatars for the use in the open metaverse.

4. Introducing Beamit.Space

4.1. Concept and Vision

The Beamit.space platform enables users to facilitate the most advanced AI models to create 3D objects and 3D Avatars, with optional IP protection and other features of our Proof of Provenance (PoP) smart contracts, for the open, decentralized metaverse.

- Transform 2D PFP, NFTs, Ordinals or even real life portrait images into a fully controllable, metaverse ready 3D Avatar.
- Create fully controllable, metaverse-ready 3D Avatars from scratch via text-to-3D, image-to-3D or combined
- Generate 3D objects of any kind, for multiple metavers platforms
- Mint all of these objects as NFTs, ONFTs for multiple blockchains
- with PoP, the versatile NFT utility that enables IP protection and monetisation, as well as other utility

With beamit.space, the Starbreeder PTE Ltd. team is driven to contribute to the open metaverse, by lowering the barrier of utilizing their beloved NFT collections and other artwork for any 3D environment. With the help of cutting edge AI models we cut both cost and delivery time for high quality 3D Avatars by many factors. Our PoP utility opens the doors for new use cases unseen before in the metaverse and augmented reality.

Anticipating the Cambrian explosion of open metaverse and AR/MR worlds and games released to the public, we are providing the go-to solution to maintain a digital identity through multiple worlds for the anticipated 2 billion users that will enter the next iteration of the internet in the coming years.

4.2. Features and Functionality

Beamit.space is the go-to dapp for metaverse ready 3D avatars and 3D object NFTs, that meet technical requirements of any integrated metaverse environment. PoP enables metaverse specific NFT utilities with many potential use cases.

4.2.1. Metaverse-ready 3D Avatars from 2D PFP

Users that want to generate a 3D avatar from one of their NFTS, do this by simply connecting their wallet. In the first step, a full body image is generated using our custom trained stable diffusion model. The full body image then gets transformed into a 3D mesh. To render a model that meets design and polygon (resolution) criteria, the second step is executed. Next the rig

("skeleton") is applied with the third AI model, to make the 3D avatar controllable in the metaverse. The finished 3D Avatar is then saved to IPFS and ready to be minted on any desired blockchain of our network, optionally with PoP features.

4.2.2. PoP - Proof of Provenance

Users minting 3D avatars as NFTs with Beamit.Space, can opt-in for proof of provenance. This way the 3D Avatar NFT will contain a variety of metadata. First of all this will serve as a proof, it has been made from an original held in the wallet by the user at time of generation. This way the NFT has proof the user is for example a collection holder, which may open up for all kinds of utility within the metaverse worlds. As this information can be used by metaverses and other projects to deal with permissions and other aspects, the PoP features works as a protection mechanism for the users intellectual property. While there will always be a simple way to copy/paste an NFT PFP and create 3D avatars from them, it will not be possible, to prove originality and realtime ownership, unless you actually hold the NFT in the wallet you use to mint your 3D avatar on beamit.space. Facilitating dynamic NFTs, also realtime information will be available - for example the proof that the user is currently still holding that specific NFT.

This utility opens up a myriad of use cases in the open metaverse:

<u>Verify ownership and originality</u>
NFTs are already used for access to closed parties and VIP areas in real life events. In the open metaverse there is currently no simple way of implementing this utility into 3D avatars of holders of certain collections. With PoP NFTs by beamit.space this utility becomes easy to use in a very inclusive way.

<u>Collection affiliation</u>
Group membership has always been a big topic when it comes to real life gatherings or events. Also in the metaverse this has large potential - and beamit.space smart contracts make this possible. It becomes easy to recognize affiliated NFTs of collections or similar metadata, to easily integrate in games and experiences.

<u>Programmable, targeted ads</u>
Our PoP NFTs can be used to define if, and which kind of ads you will accept to consume.

4.2.3. Protect & Monetize your Intellectual Property

Since the first bull market in NFTs, there have been some projects established that have high value intellectual property (IP) for its holders. The problems of sufficient protection and monetisation if this IP has yet to be solved. With the PoP NFTs by beamit.space, there is a new solution available, which specifically covers the metaverse economy. Proof of originality is a powerful IP protection utility by itself, as this metadata can be used to restrict access and permissions to certain areas and functionality. Same applies to real time ownership. Further Pop can be used to specifically target IP holders with deals and opportunities.

Further, the beamit.space AI itself is a means of IP monetisation. As these models need to get trained, and the users provide that data by rendering 3D avatars, they will get rewarded the governance token doing so.

4.2.4. Omnichain: From any Chain to any Metaverse

The open metaverse is built in multiple ecosystems. While many decentralized worlds are built on blockchains such as Ethereum, Avalanche or Cosmos, centralized metaverses will likely play a major role in this market. Integrating as many worlds as possible to our services, we enable our users to beam their Avatars into multiple worlds, with render fees much lower than the creation by a 3D designer would cost and the availability to generate a new 3D avatar or object within less than 2 minutes.
3D avatars and objects will be specifically generated according to the technical requirements of multiple metaverses.

4.2.5. API

In the rapidly evolving landscape of digital assets, particularly Non-Fungible Tokens (NFTs) and 3D avatars, interoperability and seamless integration across platforms have emerged as pivotal elements driving user engagement and platform innovation. To this end, we are building a robust, versatile **Application Programming Interface (API) designed to democratize access to our cutting-edge 3D Avatar and Object NFT services**. This API serves as a conduit for third-party services, enabling them to harness the full spectrum of functionalities our platform offers, including the creation and management of optionally design- and specification-tailored 3D Avatar NFTs, alongside advanced features like PoP.

This way metaverse projects are able to integrate beamit.space into their builder tools, and in the future potentially directly into their 3D environments, enabling their users to use generative AI directly inside the metaverse via prompts.

4.3. Products

Here's an overview on how to monetize our tech. For further details on the marketing please request our *Marketing Strategy and GTM* paper.

4.3.1. B2C

4.3.1.2. B2C 3D Avatar & Object NFT Minting
Enabling image-to-3D, text-to-3D, or 2D image-to-image, text-to-image.

This dapp for users who want to mint a 3D avatar from their NFT or Ordinal or real image PFP, or generate a 3D Avatar via text prompt, will be available on the beamit.space website. Also, the product allows creating and minting 2D images via image-to-image, text-to-image.

Target Group:

- Users of any 3D open metaverse or gaming environment, including VR/AR//MR.
- Any user who wants to create a 2D image NFT.

Monetisation: Pay per mint, Subscription deals.

4.3.1.2.B2C 3D Avatar & Object NFT Launchpad

Enabling image-to-3D, text-to-3D, or 2D image-to-image, text-to-image.
This dapp for creators or IP holders who want to mint a 3D avatar from their NFT or Ordinal or real image collection, or generate a 3D Avatar collection via text prompt, will be available on the beamit.space website.

Target Group: Users of any 3D open metaverse or gaming environment, including VR/AR//MR.
Monetisation: Pay per mint, Subscription deals.

4.3.1.3.B2C AI 3D rendering

Enabling image-to-3D, text-to-3D rendering.
The AI modules beamit.space is providing can also be used without minting NFTs, just for rendering 3D avatars and objects.

Target Group: 3D creators and studios.
Monetisation: Pay per mint, Subscription deals.

Target Group: Users of any 3D open metaverse or gaming environment, including VR/AR//MR.
Monetisation: Pay per mint, Subscription deals.

4.3.2. B2B

4.3.2.1 Brand and Collection deals

For dozens, if not hundreds of NFT and Ordinals collections, 3D Avatars are an attractive way to upsell to their communities. We offer package deals for any brand, collection or IP to deliver complete 3D avatar collections or tailored mints for our clients.

Target Group: NFT & ordinals collections & DAO, fashion brands, IP holders, IP agencies
Monetisation: Pay per collection, pay mint fees (via Launchpad).

4.3.2.1. API & Integrations

The powerful beamit.space API allows any project to integrate our services into their environments. This means for example, metaverse projects can iterate our decentralized AI directly into their builder tools, to allow their users to create landscapes, architecture, avatars and games items via AI. Also, the AI aims to integrate 3D builder tools such as Blender via Plugins, to enable 3D designers and game studios to use our AI with our smart contracts for IP protection (PoP) directly when creating.

Target Group: open metaverse projects, games projects, games studios, 3D software.
Monetisation: Pay per render use, subscriptions.

4.4. Technology Stack

Beamit.space stands at the forefront of ai-based 3D design and identity innovation, merging blockchain's decentralized power with advanced artificial intelligence. Our project is uniquely positioned to revolutionize the creation of 3D avatars by combining several cutting-edge AI models, and introducing the trailblazing POP NFT utility. The project further leverages cutting-edge blockchain technology to redefine the creation and utilization of 3D avatars across multiple metaverse projects.

A pivotal component of the expansion of our service is the development and deployment of a comprehensive Application Programming Interface (API). This API is designed to enable seamless integration for a diverse range of platforms, including metaverse environments, NFT launchpads, and gaming services.

4.4.1. AI Components

In order to achieve high quality meshes fast and in high quality, we implemented a workflow combining several AI model modules. To grant the user always gets the most advanced models, we will provide models built and trained by the team, as well as potentially some other available, powerful models.

4.4.1.1. AI Module 1: Full Body Image

The first AI model applied (when necessary) is for creating full body images from NFT PFP pictures or portrait images from real people or pets, facilitating a fine tuned diffusion model. *Diffusion* is a popular generative deep learning model that has been created through a collaboration between Stability AI, Runway, and researchers including Robin Rombach, Andreas Blattmann, Dominik Lorenz, Patrick Esser, and Björn Ommer, based on an open source license. Leveraging the groundwork laid in "High-Resolution Image Synthesis with Latent Diffusion Models," this open source model has proven to be a leading instance of how latent text-to-image and image-to-image diffusion models operate. By utilizing a subset of the LAION-5B database, the model was initially trained to generate detailed 512x512 images, making creative processes more accessible and versatile.

At its core, the open-source platform Stable Diffusion employs a latent diffusion process, integrated with a CLIP ViT-L/14 text encoder that interprets text prompts to guide the image synthesis, but is also capable of processing image to image. With its compatibility with the diffusers library, the generation of images or modify existing ones by inputting descriptive prompts becomes possible.

To achieve ideal results for the requirements of Beamit.Space, a diffusion model is trained especially for Metaverse worlds' specifications and styles, focusing on generating full-body images suitable for NFT profile picture (PFP) art. This entails curating a training dataset enriched with specific content, and adjusting the model's parameters to prioritize these

elements. Professional AI training techniques, including targeted data augmentation and iterative feedback loops are leveraged, to enhance the model's performance and fidelity in producing detailed, full-body representations while maintaining the unique aesthetics required. This approach ensures our model delivers tailored, high-quality images for different Metaverse worlds and NFT markets. Alternatives to the diffusion model trained by beamit.space that may be integrated are DallE by Open AI and Midjourney.

4.4.1.2. AI Module 2: 3D Mesh

For the generation of the 3D mesh from the avatar full body image, objects image or alternatively text-to-3D meshes, the beamit.space team is building on the open source model DreamGaussian, the cutting-edge AI technology designed for efficient 3D generation. By leveraging Gaussian Splatting, one of the breakthrough models for AI in 3D, DreamGaussian is able to significantly accelerate the optimization process typically associated with 3D generation, delivering high-quality textured meshes within minutes.

Gaussian Splatting is a computational technique used primarily in 3D graphics and data visualization, introduced in 2023. The concept involves the representation of 3D information, such as shapes or fields, using a collection of Gaussian functions. These functions, often referred to as "splats," help in reconstructing or visualizing complex 3D surfaces or volumes from scattered data points.

The Dreamgaussian framework introduces an innovative approach where 3D Gaussian distributions are used to model objects, simplifying the optimization landscape compared to traditional Neural Radiance Fields. This enables quicker convergence to a detailed 3D shape. Additionally, DreamGaussian incorporates an efficient mesh extraction process that translates these Gaussian distributions into a usable mesh format, followed by a UV-space texture refinement stage to enhance the final texture quality.

Training the Dreamgaussian framework according to the requirements of every integrated metaverse project, Beamit.Space is converting full body images and objects generated by the stable diffusion module or a text prompt, into a high quality 3D mesh.

Additionally beamit.space will offer the user alternative ai-based 3D mesh generative models such as Meshly and Midjourney via API integration.

4.4.1.3. AI module 3: Skeleton Rigging

In order to be controllable in a metaverse or gaming environment, 3D avatars need a skeleton which needs to be perfectly aligned with the shape of the 3D mesh. RigNet is a deep-learning-based technology tailored for the automated rigging of 3D characters. Integrating this innovative approach to the Beamit.Space production workflow, we are able to significantly streamline the rigging process. Unlike traditional methods that rely heavily on manual adjustments and predefined skeletal templates, RigNet provides a more dynamic and adaptable solution.
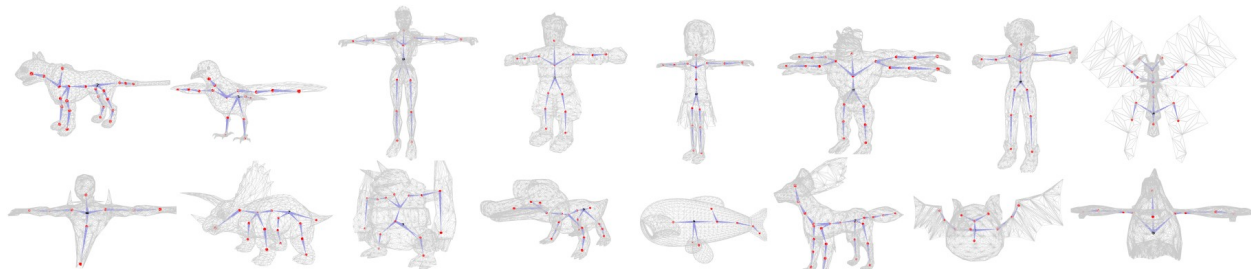
The RigNet system works by analyzing an input 3D model and automatically generating a corresponding animation skeleton and skin weights. This process is facilitated by a modular architecture comprising several key components: a graph neural network that predicts joint locations and placements, a module for determining the hierarchical structure connecting these joints, and finally, a mechanism for assigning skin weights to each mesh vertex based on the formed skeleton.

One of RigNet's standout features is its ability to cater to various character forms without the constraints of fixed skeleton structures. This versatility is achieved through its deep learning framework, trained on a diverse collection of rigged models. The result is a rigging solution that not only aligns with animator expectations in terms of joint placement and movement but also adapts to the unique articulation structure of each character.

Moreover, RigNet introduces an element of user control, allowing for adjustments in the level-of-detail of the output skeleton. This flexibility ensures that the rigs can be tailored to specific animation requirements for any metaverse. By automating the rigging process and providing high levels of customization and adaptability, RigNet offers a practical and efficient tool for Beamit.space to enable users to generate metaverse-ready 3D avatars.

4.4.2. Mesh Polygons and other metaverse requirements

The last step of the 3D avatar generation workflow is optimizing them for various technical requirements by various metaverse platforms. This optimization involves for example the reduction of polygon count in the avatar mesh. In order to make the 3D Avatar mesh lightweight and performant for the metaverse requirements, without compromising their aesthetic integrity, we are adapting the *Blender Decimate Modifier* for our specific needs via automated scripts. Python based Blender scripts will be integrated into our DApp's backend, triggering the optimization process as a final step before the avatars are deployed/submitted as NFTs. Depending on the metaverse requirements, we will use additional blender scripts to ensure exporting in the correct file formats required.

4.4.3. Render scaling solution

To ensure our AI model scales efficiently and maintains a maximum 3-minute wait time for render completion, we leverage a robust architecture. Our solution involves deploying multiple optimized instances of our models using a Kubernetes cluster with automatic scaling. Incoming client requests are managed by a RabbitMQ job queue, which distributes tasks to available worker nodes. A load balancer ensures even distribution of requests to the queue. The worker nodes, running as Kubernetes pods, handle these tasks asynchronously, enabling us to scale dynamically based on demand.

4.4.3. Smart Contracts

The smart contracts of Beamit.space are specifically designed to mint 3D NFTs from 2D originals held in a wallet of the user, or completely generated from scratch via our AI stack, using image-to-3D or text-to-3D. These interoperable NFTs can be deployed as required by the user across different chains. For each blockchain, the smart contract's logic and capabilities are tailored to align with the unique attributes and consensus mechanisms of that chain, ensuring seamless functionality. Our PoP utility builds a robust metadata structure that optionally includes proof of originality, real-time ownership. This metadata is stored securely, ensuring that the authenticity and ownership history of each NFT are verifiable.

Additionally, PoP can store other metadata such as proof of identity and criteria for targeted ads. This is achieved through dynamic NFTs and reactive smart contracts developed in collaboration with Coinweb. Coinweb's technology facilitates the integration of these advanced features, leveraging their cross-chain capabilities and providing a scalable solution for targeted advertising and identity verification. Special attention is given to the security aspects, with contracts undergoing rigorous audits to mitigate potential vulnerabilities, thereby safeguarding user assets across chains.

4.4.4. Cross-Chain Oracles and Listeners

To facilitate real-time synchronization and validation across different blockchains, we integrate cross-chain oracles and event listeners. These components play a crucial role in monitoring events (such as minting or sending of NFTs) on one blockchain and triggering corresponding

actions such as Proof of Provenance on another blockchain. This architecture enables our platform to maintain consistency and integrity of NFT states across the ecosystem, ensuring that an NFT held or locked on one chain is accurately represented on another.

4.4.5. Interchain Communication Layer

Leveraging advanced interchain communication protocols such as Layer Zero, Cosmos IBC and Coinweb, our platform establishes a seamless, efficient bridge for NFTs to traverse and communicate across blockchains. This layer acts as the foundation for our omnichain capabilities, enabling not just the transfer of NFTs, but also the synchronous update of NFT states and attributes across multiple blockchains.

4.4.6. 3D Data Storage

In our commitment to decentralization and permanence, we employ the Interplanetary File System (IPFS), and optionally other services such as Filecoin and Storj for storing NFT metadata. This choice guarantees that NFT metadata is not only tamper-proof but also perpetually accessible, addressing common concerns around data longevity and integrity in the NFT space. IPFS's decentralized nature eliminates single points of failure, ensuring that the metadata for each 3D Avatar NFT remains intact and retrievable, thus preserving the essence and utility of NFTs across blockchains.

4.4.7. 3D Avatars on Bitcoin: Recursive Inscriptions

Specifically for deploying on Bitcoin as ordinals, we are looking into recursive inscriptions to avoid extremely high inscription fees on the bitcoin blockchain due to the large file size of 3D meshes. We do this because in the ordinals community storing all data on-chain is considered essential, but exposed to high price pressure due to competing transactions and inscriptions on the Bitcoin blockchain. Alternatively, we will also deploy on Layer 2 solutions, such as Bitlayer, Opal and Merlin Chain.

4.4.8. Beamit.Space API

The architecture of our API is rooted in RESTful principles, ensuring it is both scalable and intuitively navigable. Security is paramount; thus, integrate sophisticated authentication and authorization protocols, such as OAuth 2.0, coupled with stringent rate limiting and data encryption measures, to safeguard user data and interactions.

By furnishing developers with the tools to integrate 3D Avatar NFT functionalities directly into their platforms, we're not only enhancing the accessibility of NFT technologies but also paving the way for new applications and use cases. This initiative represents a significant leap forward in our mission to bridge the gap between traditional digital environments and the burgeoning realm of NFTs, offering a glimpse into the future of digital interaction and asset management.

4.4.10. Governance and Upgradability

Recognizing the rapid evolution of blockchain technology and NFT standards, we design our smart contracts and platform infrastructure to be upgradable. Governance mechanisms are put in place, allowing our community to vote on crucial updates and enhancements. This approach ensures that our platform remains at the forefront of technological advancements, continuously adapting to new capabilities and user needs.

4.4.11. Security and Compliance

Security is paramount in our development process. Beyond smart contract audits, we implement multi-layer security protocols, including encryption of sensitive data, secure cross-chain communication channels, and compliance with leading security standards. We also stay abreast of regulatory developments, ensuring that our platform adheres to legal standards across jurisdictions, protecting our users and their assets.

By addressing these key components with a meticulous and forward-thinking approach, we aim to establish a robust, scalable, and user-friendly omnichain NFT platform. Our commitment to innovation, security, and community engagement positions us to lead in the creation of a truly interoperable NFT ecosystem, where 3D Avatar NFTs unlock unprecedented possibilities across virtual spaces and applications.

4.4.12 Decentralized Cloud Rendering

Cloud rendering offers scalable, high-performance computational power. Utilizing idle GPUs for parallel processing and reducing costs is common in the space, and also is a great solution for beamit.space. The scalability of cloud computing allows us to handle workloads efficiently, as high-performance GPUs and parallel task processing help improve our AI model training and inference speeds, accelerating development cycles and reducing time-to-market. A decentralized approach democratizes access to our powerful AI rendering capabilities, fostering growth and competitiveness. Beamit.space aims for maximum decentralization also for another reason: As the team is aware of the benefits of an AI not controlled by a single centralized entity, the goal is to hand over control over the AI models to the DAO. This also means allowing any party to participate in the processing of beamit.space demand for rendering. For at least the first year in operation, Starbreeder PTE Ltd. will operate the cloud rendering for better practicability. After establishing a sustainable workflow, the DAO will decide on how to decentralize cloud rendering - the team will submit proposals for solutions to achieve a level of decentralization that suits the project best. At current state we anticipate to propose:

- Self-developed model for decentralized rendering: While the operation of the Beamit.space ai models is handled by Starbreeder PTE Ltd. (as governed by the DAO), the render cloud may be decentralized, combined with financial benefits for providers. This may also support the governance/utility token for a more diverse ecosystem, which brings many benefits. In this case building a solution will be advertised and financed by the DAO.

- The use of the beamit.space AI models is intended to be opened up to other entities via governance proposals.
- The processing of beamit.space AI and 3D renderings may be delegated to a decentralized cloud rendering project such as RNDR via suitable partnership.

5. Tokenomics or Economics

The Beamit.space governance and utility token is designed to empower our community and foster a decentralized governance structure. This token not only symbolizes ownership and a stake in the platform but also serves as a vital tool for facilitating user engagement, incentivization, and decision-making processes within the ecosystem.

5.1. Token Utility

The utility of our governance token extends across several aspects:

Governance Participation: Token holders who stake their tokens are granted the ability to participate in governance decisions, including proposing and voting on platform upgrades, feature implementations, and changes to the ecosystem's policies. This ensures that our platform evolves in alignment with the community's interests and needs.

Staking for Influence, contribution Rewards: Users may stake their tokens to gain staking rewards, distributed in the form of additional tokens, incentivize long-term holding and active participation in the ecosystem's governance. Also, as users contribute to the training of the beamit.space decentralized AI models, a significant amount of rewards is allocated to users of our platform.

Discounts and Privileges for users: Tokens can be used to access discounts on services within the platform, such as reduced fees for NFT minting, discounted subscriptions and access to exclusive launches and mints. This utility aims to enhance user retention and increase the token's intrinsic value.

API user and Node permissions
In the case of decentralization of cloud rendering, staking a certain amount of tokens may be required to run a beamit node. Same may apply for users of the beamit.space API.

5.2. Distribution and Allocation

The distribution and allocation of our governance tokens are meticulously designed to ensure fairness, sustainability, and long-term growth of the ecosystem:

Investors 10%: An allocation is reserved for pre-seed investors of beamit.space.

Public Sale 10%: An allocation of 10% of the token is reserved for the public token sale of beamit.space.
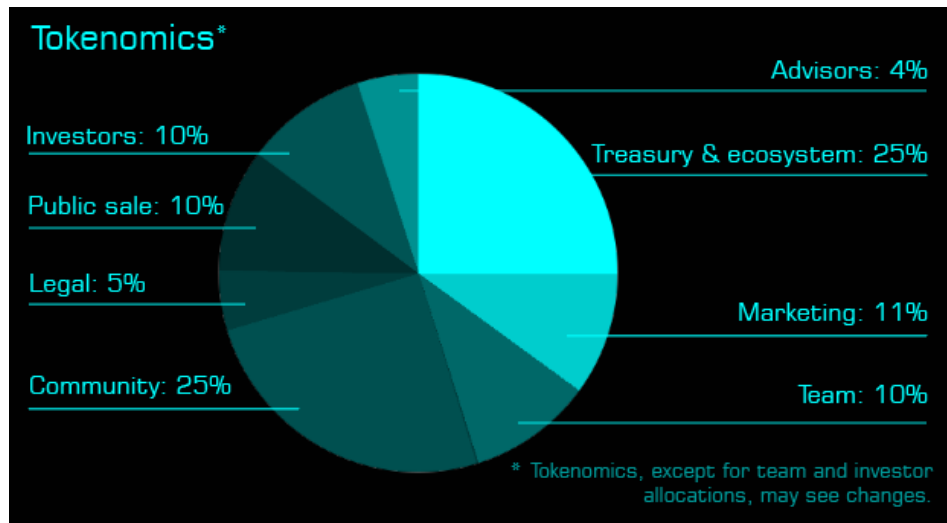
Treasury and Ecosystem Growth 25%: A reserve is set aside for forming strategic partnerships, collaborations, and expanding the ecosystem. This includes integrations with third-party services, marketing, community-building initiatives and funding projects and individuals using beamit.space and extending the core repos. A portion of the tokens may be dedicated to providing liquidity on various exchanges, facilitating easy trading and ensuring price stability.

Community and User Incentives 25%: Another portion of the tokens is allocated for community rewards and incentives, aimed at fostering engagement and rewarding contributions to the ecosystem.

Marketing 11%: Marketing initiatives and campaigns are allocated up to 11% of tokens.

Team 10%: Tokens are allocated to the beamit.space team.

Advisors 4%: Tokens are allocated to the beamit.space advisors and ambassadors.

Tokenomics*

Advisors: 4%
Investors: 10%
Treasury & ecosystem: 25%
Public sale: 10%
Legal: 5%
Marketing: 11%
Community: 25%
Team: 10%

* Tokenomics, except for team and investor allocations, may see changes.

6. Governance and Decentralisation

Especially for AI dapps, decentralization makes the difference. The current discussions about AI making their owners too powerful as a result of the race to AGI, proves that. The Starbreeder PTE Ltd. team believes that a DAO is a powerful governance system to prevent an AI from being abused by a few. That is why we aim to decentralize beamit.space.

The DAO will govern all important decisions to be made around the maintenance, development and utilization of the beamit.space AI. At the same time, also the decentralization of rendering is part of the goals we have in our roadmap.

Another aspect of the decentralization of beamit.space is the avoidance of the data exploitation of the users, as ist is currently practiced by the large majority of entities operating powerful AI. At beamit.space, the user is considered part of the DAO, just as the investors, team members and other contributors are. And this is not only an idealistic stance, but true in the sense that users' renderings will be used to train and finetune our models. To achieve this we will set up a reward model that will allocate tokens to our users.

7. Roadmap

04/2024	Starbreeder PTE Ltd. set up
06-07/2024	Seed round
07/2024	MVP, incentivized alpha mint Ethereum
08/2024	incentivized alpha mint Solana, Bitcoin L2
09/2024	PoP smart contracts alpha alpha mint EVM 1, EVM 2
10/2024	beta: incentivized mint EVM 3, Aptos skeleton rig module beta LIVE
11/2024	public token sale
12/2024	mint per avatar official launch 3 optional styles
03/2025	API beta PoP V1 launch - ownership, originality mint available on 12 chains bitmap render alpha
05/2025	mint available on 16 chains DAO live
08/2025	metaverse integrations PoP v2 - expanded metadata

	bitmap render public beta
10/2025	API official release
Q1/2026	more metaverse integrations launchpad
Q2/2026	AI landscapes alpha decentralized rendering
2026	AI landscapes public beta

8. Team

Thomas Heindl - CEO
With 10 years of experience in multimedia productions in various formats, digital marketing and business leadership, Thomas Heindl is a passionate Web3 entrepreneur (Cryptosquad, Fundsquad, Blockturns, Starbreeder DAO) and AI experimenter.
in: thomasheindl

Shefeeque Mohamed - machine learning, blender scripts
Python and C++ developer with extensive knowledge in Blender scripts, start-up experienced.
in: shefeequebk

Prince Kumar - full stack developer
Technical Architect with +10 years of experience and extensive knowledge in MERN, Java, .NET, smart contracts.
in: prince-kumar-8203a4134

Rachel Draelos - artificial intelligence
CEO and founder at the healthcare AI-Startup Cydoc, Physician Scientist, PH.D. in Artificial Intelligence Ph.D. + Physics.
in: rachel-draelos

Dae Lim Chung - artificial intelligence
AI developer and researcher from Dartmouth College, Software Engineer at CaroCaro, AI Consultant Vismedica AI.
in: dae-lim-chung-3b702b19a

Muntaha Shams - artificial intelligence
AI Engineer with 4 years of professional experience in AI, worked on various AI domains such as Computer Vision, Deep Learning, Natural Language Processing and Reinforcement Learning.

Adi Suryawan - graphic design

Graphic designer with +10 years of experience in UI and corporate branding.

Kayol Tavia - community manager, graphics
+2 years of experience in graphic design and community management on discord and x.com.
x: kajoltavia

Claire Yoku - community & collab manager
+3 years of experience in community and collaboration management.

8.1. Advisors

Moe Imam
Moe is known as a Startup Whisperer, and as a CEO and founder of the accelerator FoundersHub. With his extensive network and the experience of launching several crypto projects.
in: moeiman

Mesrop Yaghubian
CEO of the swiss Company RockIT and also a successful agile coach specialized in Kanban. In 2023 he was one of the projekt teamleaders in one of the most important swiss banks for the integration of crypto into the banking system - with the Digital Asset Specialist CAS (certified on studies) from HWZ in Zurich. More than 18 years of leadership experience and organization development in IT companies and Banking.
in: mesrop-yaghubian-8559109

9. Legal Considerations

9.1. Intellectual Property (IP) Rights

IP Ownership: The ownership rights related to the 3D avatars created from Profile Picture (PFP) NFTs, especially those that are IP protected, are paramount. Users who opt-in to train the AI and receive governance tokens must confirm their ownership of the PFP's IP. The original PFP NFT IP remains with its holder, and this ownership is preserved as the origin PFP NFT metadata is retained within the 3D avatar NFT.

DMCA Compliance: Our platform adheres to the requirements of the Digital Millennium Copyright Act (DMCA) and similar laws.

9.2 Data Privacy and Consent

User Consent: User consent for using their PFPs to create 3D avatars is managed transparently through smart contracts.

Data Protection: We prioritize compliance with Singapore's Personal Data Protection Act (PDPA) and other applicable data protection laws. User data handling and storage are conducted with stringent measures to ensure privacy and security.

9.3. Tokenomics and Securities Law:

The distribution of governance tokens to users participating in AI training is structured within a robust legal framework. These tokens serve as incentives for contributions to AI development and governance within our platform. The governance tokens fall either under securities or utility regulations in Singapore or other jurisdictions. To ensure compliance, rigorous measures are implemented to meet regulatory requirements and safeguard token holder interests.

9.4. DAO Governance

The DAO to be set up at a later stage of the project, following Starbreeder PTE Ltd. governing the AI, operates under a legal structure aligned with Singaporean law, typically structured as a decentralized entity governed by smart contracts, or, if suitable in a different legislative. This structure ensures transparency and accountability in DAO operations, facilitating efficient governance processes.

Token holders enjoy essential rights and responsibilities in governance processes. These include voting on critical decisions such as system upgrades, proposals concerning funding for marketing and development activities, and other strategic initiatives aimed at enhancing platform functionality and user experience.

Certainly! Here are the sections focusing on Compliance and Regulatory Considerations, Risk Factors, and Dispute Resolution:

9.5. Compliance and Regulatory Considerations

Singaporean Regulatory Landscape: Our operations adhere strictly to Singapore's regulatory framework governing blockchain, AI, and decentralized projects. This includes compliance with relevant laws and guidelines issued by the Monetary Authority of Singapore (MAS) and other regulatory bodies.

AML/KYC: Anti-money laundering (AML) and know-your-customer (KYC) procedures are implemented where applicable to mitigate financial risks and ensure the integrity of transactions

within our platform. These procedures are designed to comply with Singapore's regulatory standards and international best practices.

Tax Implications: We carefully consider the tax implications for both token holders and our startup. This includes taxation on token rewards and governance activities, ensuring compliance with Singaporean tax laws and providing clarity to stakeholders regarding their tax obligations.

9.6. Risk Factors

9.6.1. Technology Risks

Risks associated with AI training, data breaches, and technological failures are meticulously assessed. We employ robust security measures such as encryption protocols and regular security audits to mitigate the risk of unauthorized access to user data. Redundancy protocols, including backup systems and failover mechanisms, are implemented to ensure continuous availability and reliability of our platform. Common risks include:

- AI Training Risks: Potential biases in AI algorithms affecting avatar creation accuracy.
- Data Breaches: Unauthorized access to user data stored within our platform.
- Technological Failures: Server downtime or infrastructure failures impacting service availability.

9.6.2. Regulatory Risks

We acknowledge and monitor risks stemming from evolving regulatory environments in Singapore and globally. Our proactive approach includes staying abreast of regulatory changes and adapting our operations to remain compliant and mitigate regulatory risks effectively. Common risks include:

- Compliance Changes: Rapid changes in blockchain and AI regulations requiring immediate adaptation of platform policies.
- Legal Uncertainty: Interpretation differences in how digital assets and decentralized platforms are regulated globally.
- Jurisdictional Challenges: Navigating differing regulatory frameworks across multiple jurisdictions where our platform operates.

9.6.3. Market Risks:

Risks related to market acceptance of 3D avatars and objects, token value volatility, and user adoption are carefully evaluated. We engage in strategic planning and market research to mitigate these risks and enhance the sustainability and growth of our platform. Common risks include:

- User Adoption: Initial skepticism or slow adoption rates of 3D avatars and decentralized platforms among target users.
- Token Volatility: Fluctuations in governance token value affecting user incentives and investor confidence.

- Competitive Landscape: Emergence of competing technologies or platforms offering similar services impacting our market position and growth trajectory.

9.7. Dispute Resolution

Jurisdiction and Governing Law: Legal disputes related to our startup and its operations are governed by the jurisdiction of Singapore. Singaporean law provides a stable and supportive legal environment for resolving disputes related to blockchain and decentralized technologies.

Arbitration vs. Litigation: Disputes will primarily be settled through arbitration, leveraging efficient and confidential dispute resolution mechanisms. This approach promotes fairness and expediency in resolving conflicts. Additionally, mechanisms within our DAO framework ensure transparency and adherence to governance principles in dispute resolution processes.