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Digital transformation through mixed reality in architecture at DesignHub

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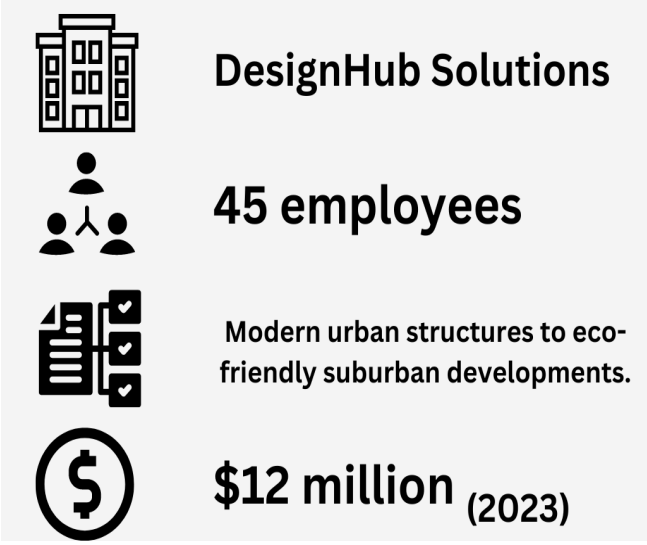
Introduction

DesignHub Solutions is a leading firm known for its innovative architectural designs and commitment to excellence. In this proposal, we propose to digitally transform how DesignHub employees collaborate and how the firm engages with its customers. Our proposal is based on the transformative effects of mixed reality in the architecture industry and its potential to streamline processes, improve design skills, and drive business growth.

DesignHub Solutions is based in a bustling metropolitan area of Boston. Established in 2010 by a team of passionate architects and designers, the company has steadily built a reputation for delivering innovative and sustainable design solutions across residential, commercial, and institutional projects. The company has 45 employees and had a revenue of $12 million in 2023. DesignHub's portfolio showcases a diverse range of projects, from modern urban structures to eco-friendly suburban developments.

Mixed reality in architecture represents a shift to ambient, collaborative, and data-driven information-guided design processes. With a clear understanding of business requirements, industry trends, and technological capabilities, DesignHub is poised to effectively leverage MR technology and unlock new levels of creativity, efficiency, and customer satisfaction.



Company Background

Business Goals

DesignHub Solutions aims to become a leading player in the architectural industry, known for its cutting-edge designs, client-centric approach, and sustainable practices.

The company's primary goals include expanding its market reach, fostering innovation in design processes, enhancing client satisfaction, and achieving sustainable growth.

Business Scope

DesignHub operates at a regional level, primarily focusing on projects within the metropolitan area and nearby regions. However, the company has ambitions to extend its services nationally and potentially internationally in the next five years. The business scope encompasses architectural design, interior design, project management, and consultancy services.

Business Current Situation

Currently, DesignHub relies on traditional offline workflows for design collaboration, client presentations, and project visualization. Communication within the team and with clients primarily involves face-to-face

meetings, emails, and phone calls. While the company has established a strong reputation for design excellence, there's a growing recognition of the need to embrace digital technologies to stay competitive and meet evolving client expectations. DesignHub has been observing that the market and client expectations are changing. The firm submitted proposals to 12 architecture tenders in 2022 and 2023 and many of the tenders included requirements to use digital technologies such as augmented-reality. The firm management decided to engage a business and technology consulting company to study how the emerging technologies impact the firm competitiveness.

The study results showed that the firm's revenues decreased from $17 million in 2020 to $12 million in 2023. A deeper analysis showed the revenue decline was closely linked to the lack of expertise in digital technologies and the inability to offer innovative services using artificial intelligence and mixed reality solutions.

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SUMMARY

In summary, DesignHub Solutions is a forward-thinking architectural firm with ambitious goals of leveraging technology to enhance its design capabilities, improve client engagement, and achieve sustainable growth. The proposed mixed reality project aligns perfectly with DesignHub's future visions and ambitions, promising to unlock new levels of creativity, efficiency, and client satisfaction.

Competitor Analysis

Considering the potential changes in the market, the competitors have already launched their digital transformation journey.

State of the Architectural Services Market

Due to the increased use of digital technologies in the industry, the competition for clients is expected to increase. The market conditions show that the firm needs to prepare for increased competition. As the demand for construction decreases, the buyers of architectural services will have increased bargaining power.

While workforce supply in the industry is not expected to change drastically, vendors of architectural design software such as Autodesk will increase their bargaining power. Increased use of artificial intelligence in architecture poses additional risks, especially to small architecture firms. AI-generated designs can decrease the demand for the services of the company. The wide availability of sophisticated software that can automate many architecture design tasks can increase the number of companies.

Considering the potential changes in the market, the competitors have already started their digital transformation journey. They aim to increase the use of mixed reality technologies to appeal to more clients and increase their share in the market.

SWOT ANALYSIS

Strengths	Weaknesses
• Strong expertise in architecture • Presence of financial resources for development • Rich client portfolio • Innovation-oriented company culture	• Lack of expertise in XR applications • Lack of expertise in cloud computing • Inefficient legacy work processes • Lack of strong IT infrastructure
Opportunities	**Threats**
• Advances in Building Information Modelling and Mixed Reality technology • Cost-cutting through digitalization • Expansion to new markets with remote collaboration	• AI in architecture increases competition • Clients demand MR experiences during design • Rivals heavily invest in digitalization • Young talent prefers digitalized firms

SWOT Analysis describes the internal factors such as strengths and weaknesses of DesignHub and external factors such as opportunities and threats in the market. The analysis is based on market research and focus group discussions with DesignHub employees.

Table 1. How do competitors deploy MR in architecture?

Company	Use of MR in Practice
Ackroyd Lowrie (2024)	develops a 'Pre-Occupancy Evaluation' methodology to deliver a five-stage immersive experience
Vellum AD (2024)	uses MR for design reviews, on-site construction management, and client presentations
Gensler (2020)	uses software-enabled environments to integrate visual, audio, and interactive elements within a single, immersive platform.
AECOM (2016)	utilizes HoloLens devices for engineers and architects across various continents. This enables them to collaboratively interact with identical holographic models in real time via the Internet.
Allford Hall Monaghan Morris (2019)	uses cloud-based algorithmic tools to produce alternative graphics designs fast

Table 2. Comparison of DesignHub and Allford Hall Monaghan Morris processes

Process	DesignHub	Allford Hall Monaghan Morris
Website engagement	Static pictures and pre-rendered videos on the corporate website with project descriptions	Engaging blogs with demonstration pictures of MR usage in architecture
Collaboration real-time	Architects and clients come together in-person to discuss projects	Architects and clients communicate on cloud platforms and work together on real-time rendered projects
Presentation of projects	Demonstration of pre-rendered videos of architectural designs by sharing videos or playing during meetings	Uses VR headsets, and AR apps to present engaging demonstration experiences to clients
Corporate IT infrastructure	Computers at the company office in Boston, Dropbox file sharing platform	AWS Cloud is used for real-time rendering and virtual desktops used for separate projects
Projects with XR expertise	No XR-involving projects won due to lack of XR expertise	9 XR-involving projects were delivered in 2023

Business Challenges

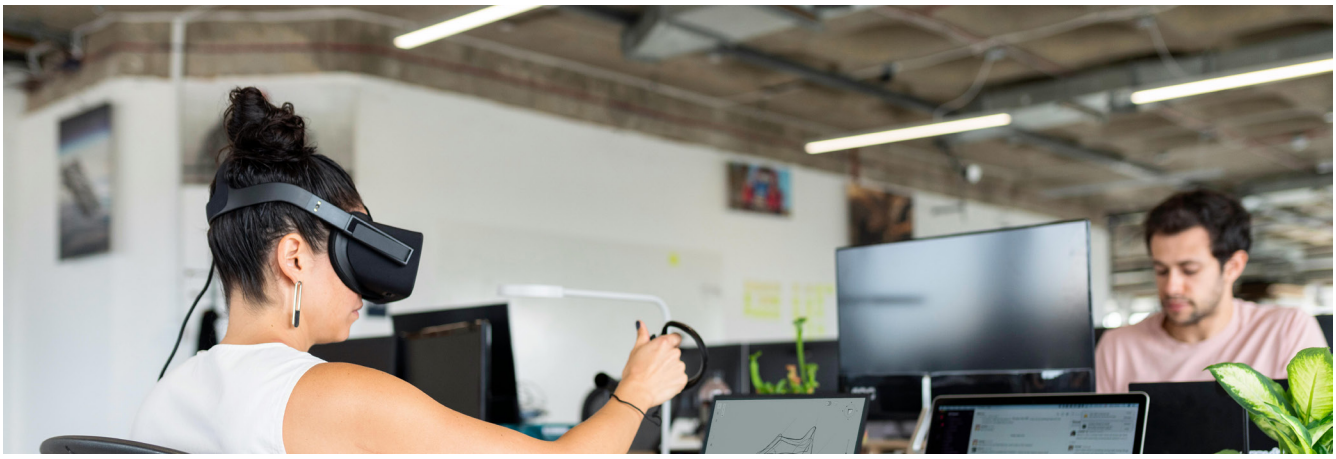
DesignHub is commited to transform itself by investing in hardware, train its teams, and work with partners to achieve its vision.

Current Communication and Information Flows and Management

DesignHub's communication and information flows are structured around face-to-face interactions, email correspondence, and physical design presentations. Project information is typically managed using traditional project management tools and spreadsheets, with limited integration of digital platforms for collaboration and data analysis.

Future Visions and Ambitions

DesignHub envisions a future where technology plays a central role in enhancing design creativity, streamlining workflows, and delivering exceptional client experiences. The company aims to leverage advanced digital tools such as mixed reality (MR) technology to revolutionize its design processes, improve collaboration, and provide immersive client experiences. The ambition is not only to stay ahead of industry trends but also to set new standards for innovation and excellence in architectural design.



Proposed Solution

Business Requirement: Implementing Mixed Reality in DesignHub Solutions

Transitioning from a predominantly offline operational model to implementing mixed reality (MR) technology requires DesignHub Solutions to address specific business requirements. These requirements encompass various aspects of technology integration, workflow optimization, and client engagement. The key business requirements include:

1. Technology Integration Strategy: DesignHub needs a comprehensive strategy for integrating mixed reality technology into its existing workflow seamlessly. This involves evaluating MR hardware and software solutions, determining compatibility with existing tools, and establishing protocols for data transfer and collaboration.

2. Skill Development and Training: To leverage MR effectively, DesignHub must invest in training and upskilling its workforce. This includes educating architects, designers, and project managers on MR tools and techniques, enabling them to harness the full potential of this technology in design collaboration and client presentations.

3. Infrastructure and Hardware Investment: Implementing MR necessitates investment in suitable hardware infrastructure, such as MR headsets, spatial mapping devices, and computing systems capable of handling complex 3D models and simulations. DesignHub needs to assess its current infrastructure and procure or upgrade hardware as per MR requirements.

4. Data Management and Security: With MR integration, there's a significant influx of digital data related to design iterations, client feedback, and project simulations. DesignHub must establish robust data management protocols, including data storage, backup, and security measures to protect sensitive project information and ensure compliance with data privacy regulations.

5. Collaborative Design Platform: DesignHub requires a collaborative MR platform that enables real-time design collaboration among team members, clients, and stakeholders. This platform should facilitate seamless communication, version control, and simultaneous editing of 3D models, enhancing productivity and decision-making processes.

35% OF ARCHITECTS ALREADY USE AT LEAST ONE MIXED, AUGMENTED, OR VIRTUAL REALITY TECHNOLOGY NOW, AND 29% PLAN TO USE MIXED, AUGMENTED, OR VIRTUAL REALITY WITHIN THE NEXT FIVE YEARS.

6. Client Engagement and Experience Enhancement: MR offers unique opportunities to enhance client engagement and experience through immersive design presentations and interactive virtual walkthroughs. DesignHub needs to develop tailored MR experiences that showcase design concepts, simulate real-world environments, and gather actionable feedback from clients for iterative design improvements.

Project Management Integration: Integrating MR into project management workflows is crucial for DesignHub's operational efficiency. This involves synchronizing MR data with project management tools, estab-

lishing milestones, tracking progress, and aligning MR simulations with project timelines and deliverables.

7. Continuous Innovation and Adaptation: As MR technology evolves, DesignHub must prioritize constant innovation and adaptation. This includes staying on top of industry trends, exploring new MR trends and applications, and improving MR implementation strategies to stay ahead of competitors and deliver innovative creative solutions. By meeting these specific business requirements, DesignHub's solutions have been successful.

Mixed reality in the architecture industry

Digital transformation is being adopted fast in the architectural industry and remaining competitive will require aligning with the trend. According to a survey of 300 professionals working in architectural practices and other built environments, only 10% of respondents have yet to start the digital transformation journey and 90% say that digital technologies are changing how they work. More than 75% of respondents believe that digital technologies are making their projects more efficient. 35% of architects already use at least one mixed, augmented, or virtual reality technology now, and 29% plan to use mixed, augmented, or virtual reality within the next five years.

There is an ongoing transition from pre-rendered models to live rendering visualization tools. Clients, stakeholders, and local authorities increasingly expect businesses to be able to present live-rendered virtual reality experiences for their projects. 58% of architects agree that architectural practices that do not adopt digital ways of working will go out of business (RIBA Architecture.com & Microsoft, 2019).

Benefits of Mixed Reality

The benefits of MR are numerous and applicable to both small and large architectural practices (Chandran, 2024):

1. Enhanced Visualization

- MR allows architects and clients to visualize the end product in a standalone form and its intended environment.
- MR enables real-time manipulation of design elements and making informed decisions about materials and textures.
- MR allows users to perceive the scale and proportion of the designs in real-world environments.

2. Improved Collaboration

- With MR, stakeholders collaborate in real-time remotely and make design adjustments without costly rendering processes.
- MR enables clearer communication among stakeholders through immersive visualizations.

3. Quality Assurance

- MR allows for a detailed inspection of the design in its intended environment before construction begins thus reducing the risk of errors and costly corrections.
- MR increases safety and compliance by simulating various scenarios and allows architects to predict and mitigate potential safety issues.

4. Client Engagement

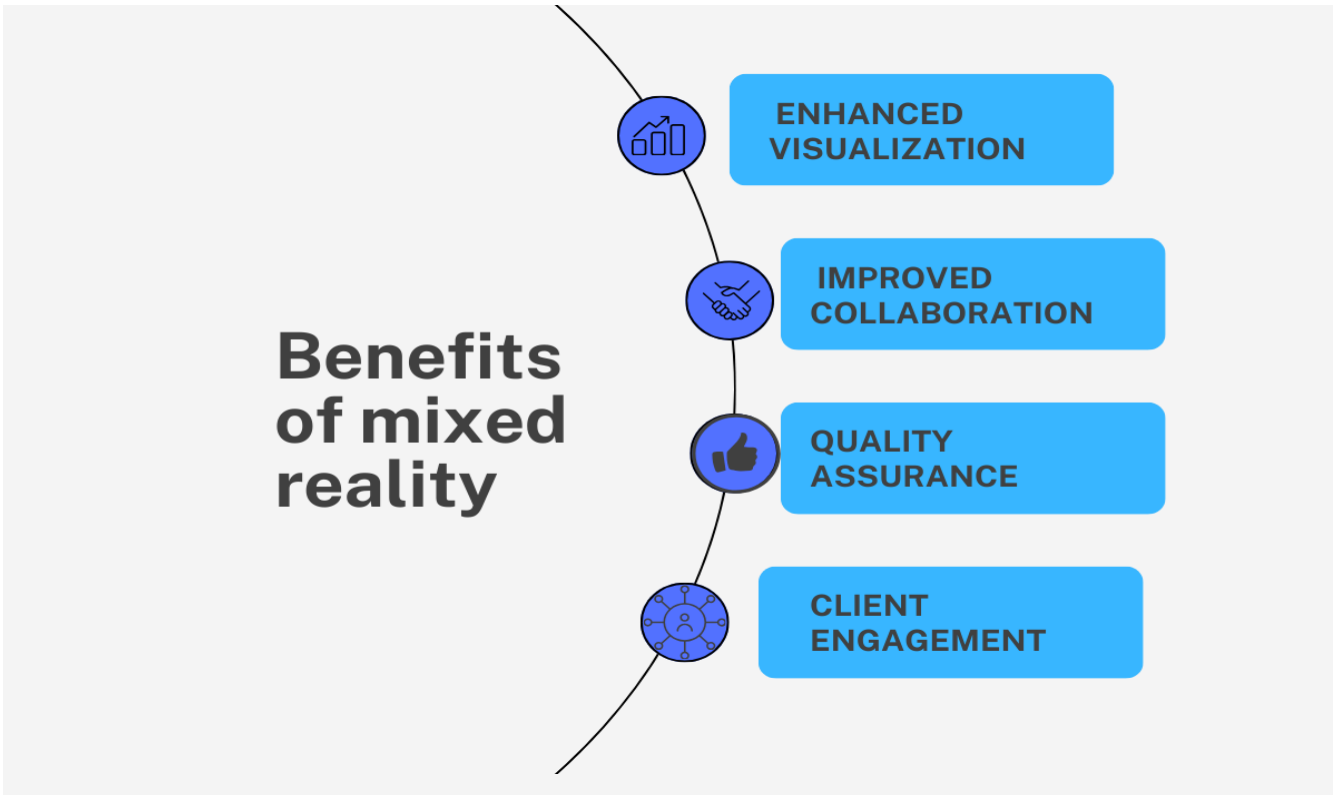
- MR enables clients to sense the space, light, and scale in immersive experiences and make informed decisions.
- The immersive MR strengthens an emotional connection between the clients and the project and creates value for the business.

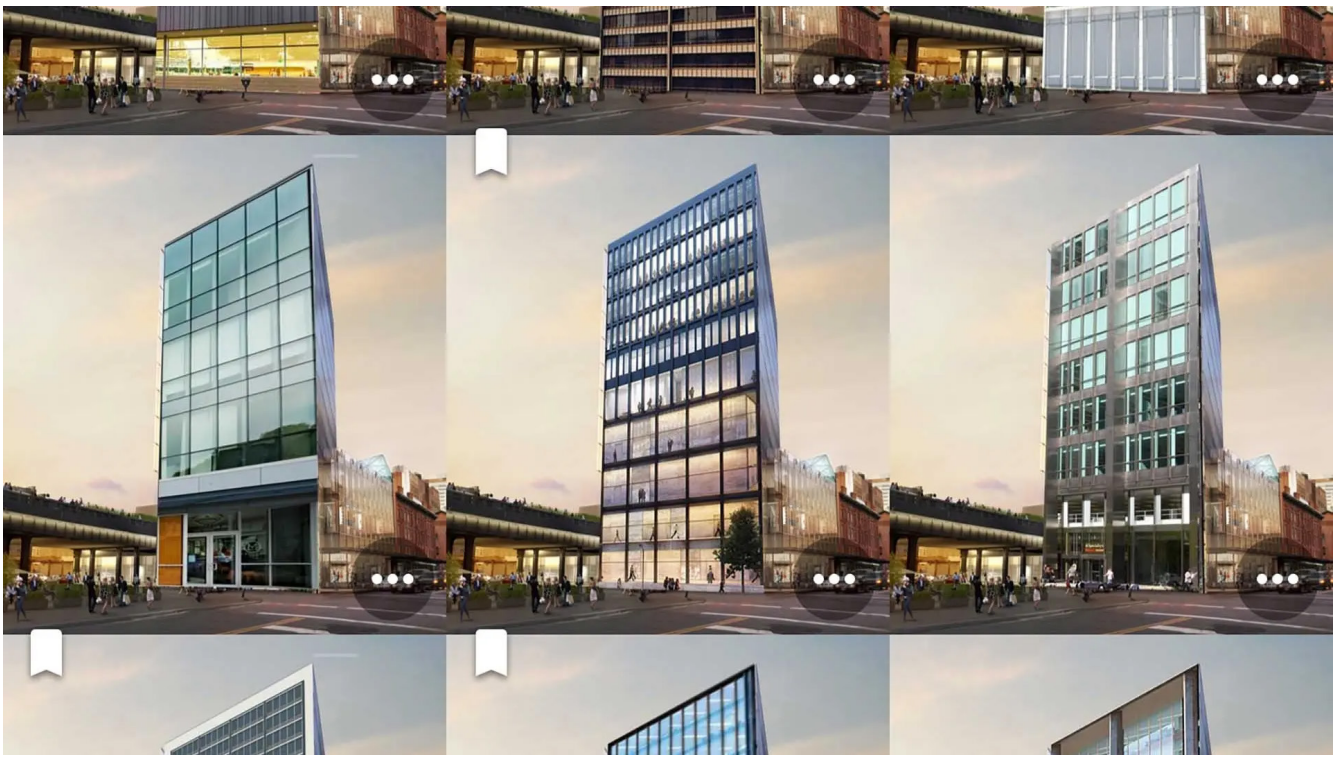
Key tools and platforms

The digital transformation in the industry builds upon recent advances in key technologies and businesses have now access to a wide range of choices in platforms and tools. BIM (Building Information Modelling) is one of them. It involves creating and managing information on a construction project across its lifecycle. Creating a digital Building Information Model allows architects and clients to interact and make better-informed decisions and enables collaborative, efficient, and technically innovative processes.

Artificial intelligence tools had an immense positive impact on the architecture industry. Architectural firms now deploy generative AI technology on the cloud to produce a great number of alternative designs for clients. Autodesk Forma is an example of a cloud-based tool that can make design adjustments in real time with support from AI (Autodesk, 2024).

Mixed reality technology enables the creation of fully immersive virtual reality (VR) experiences or putting augmented reality (AR) architectural models in real-life environments. Unity and Unreal Engine are feature-rich game engine platforms with advanced support for creating graphically intensive XR experiences for architecture. Advances in **real-time render technology** enable visualization of architectural projects as a fully rendered 3D experience that can be seen from every angle. For example, D5 Render is a real-time renderer used for architecture designs.





Designers use AI tools to generate design variations instantly. (Source: autodesk.com (2024)).

Business Process

Step 1: Technology Integration Strategy

Key People Involved:

IT Managers: Responsible for evaluating and implementing MR hardware and software solutions.

Architects and Designers: Utilize MR tools for design collaboration and client presentations.

Required Actions:

Evaluate MR Hardware and Software: Assess different MR headsets, spatial mapping devices, and software platforms to determine compatibility with existing tools and project requirements.

Establish Data Transfer Protocols: Develop protocols for seamless data transfer between MR systems and existing design software to ensure smooth workflow integration.

Conduct Pilot Testing: Test selected MR solutions in pilot projects to evaluate performance, usability, and impact on design processes.

Resources Needed:

MR Headsets and Devices: Procurement of MR hardware such as headsets, spatial mapping devices, and computing systems capable of handling complex 3D models.

Software Licenses: Acquisition of MR software licenses or subscriptions for design collaboration, virtual walkthroughs, and real-time simulations.

Training Materials: Development of training materials, user guides, and tutorials to educate architects and designers on MR tools and techniques.

Technology:

Mixed Reality (MR) Hardware and Software

MR headsets and devices provide immersive 3D experiences, allowing architects to visualize designs in real-world contexts and make informed decisions.

MR software platforms enable real-time collaboration, design iteration, and client presentations, enhancing communication and decision-making processes within the design team and with clients.

Step 2: Skill Development and Training

Key People Involved:

HR Managers: Responsible for developing training programs and coordinating training sessions.

Training Coordinators: Conduct workshops and provide ongoing support for MR skill development.

Design Teams: Participate in MR training programs to enhance proficiency in MR tools and techniques.

Required Actions:

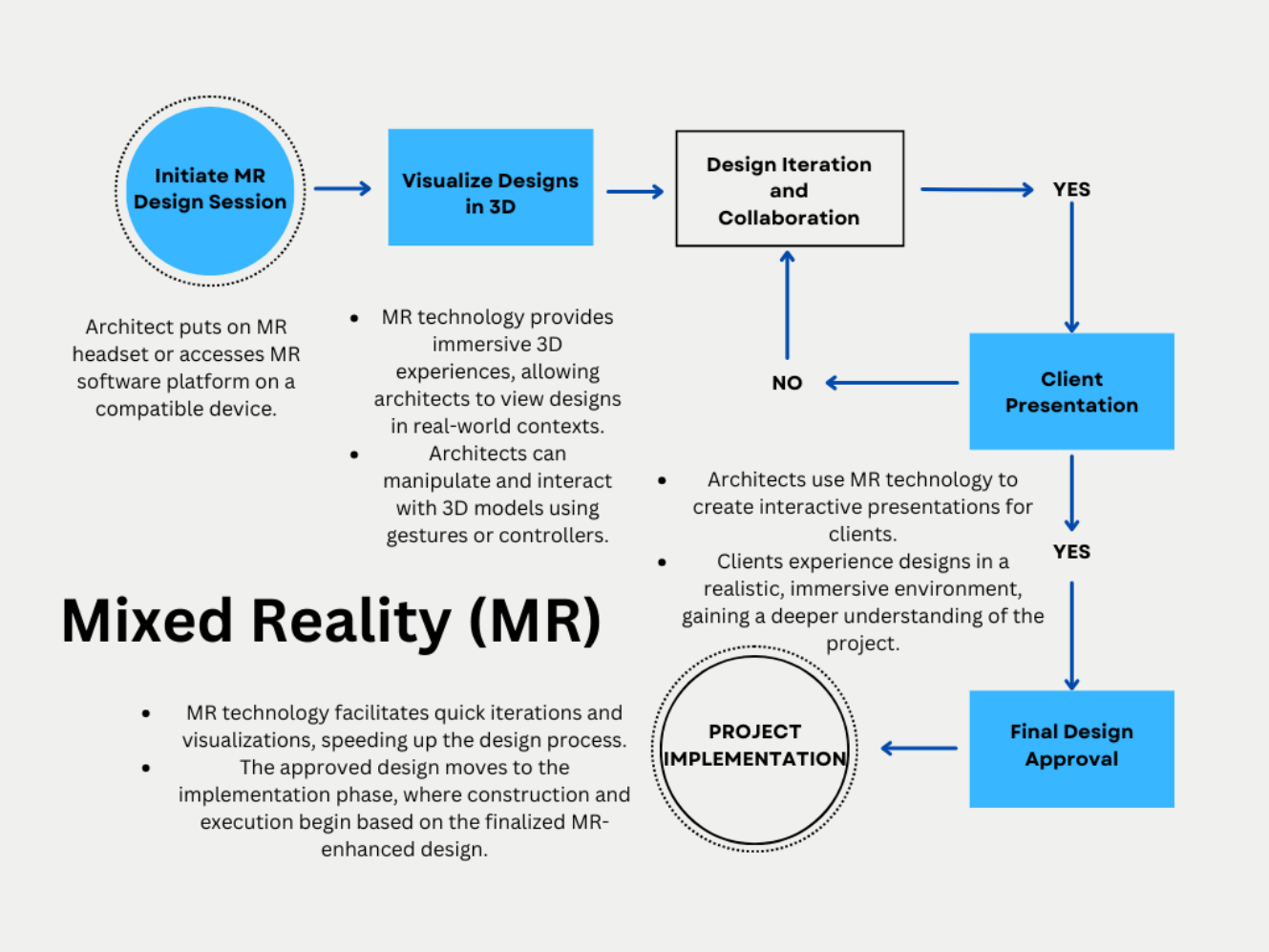
Develop Training Programs: Design and implement structured training programs on MR tools, including workshops, seminars, and hands-on exercises.

Provide Ongoing Support: Offer continuous support and resources for design teams to practice and apply MR skills in their daily workflows.

Track Progress and Proficiency: Monitor employee progress, assess skill proficiency, and identify areas for further training or improvement.

Resources Needed:

Training Facilities: Setup MR simulation labs or dedicated training rooms with MR hardware and software for hands-on training sessions.



This user flow diagram outlines the sequential steps that architects follow when using MR headsets, devices, and software platforms to enhance their design processes, collaborate effectively, and engage clients in immersive presentations.

Expert Trainers: Engage MR experts or trainers to lead training workshops, provide guidance, and share best practices.

Training Modules: Develop interactive MR modules within a Learning Management System (LMS) to facilitate self-paced learning and skill assessment.

Step 3: Infrastructure and Hardware Investment

Key People Involved:

Procurement Managers: Responsible for procuring MR hardware and devices.

IT Specialists: Ensure compatibility, setup, and maintenance of MR infrastructure.

Finance Team: Allocate budget and resources for hardware procurement and upgrades.

Required Actions:

Procure MR Hardware: Source and acquire MR headsets, spatial mapping devices, and computing systems capable of supporting MR applications and simulations.

Upgrade Infrastructure: Ensure existing IT infrastruc-

ture, network bandwidth, and computing resources meet the requirements for MR integration.
Test and Validate Hardware: Conduct compatibility tests, setup configurations, and validate performance of MR hardware and devices.

Resources Needed:
Budget Allocation: Allocate funds for MR hardware procurement, upgrades, and ongoing maintenance.
Technical Specifications: Determine hardware specifications, system requirements, and compatibility with existing software platforms.
Vendor Contracts: Establish partnerships with MR hardware vendors, suppliers, and service providers for procurement and support services.

Technology : Building Information Modeling (BIM) Software
BIM software platforms integrate MR capabilities into design workflows, enabling architects to create intelligent 3D models, visualize designs in real-world contexts, and collaborate seamlessly with stakeholders.
BIM software supports data management, design iteration, project coordination, and performance analysis for enhanced project outcomes.

This user flow diagram of BIM software outlines the sequential steps that users follow when using Building Information Modeling (BIM) software with Mixed Reality (MR) capabilities for creating intelligent 3D models, visualizing designs, collaborating with stakeholders, and optimizing project outcomes.

Steps explained :

1. Access BIM Software:
User logs into the Building Information Modeling (BIM) software platform.

2. Create Intelligent 3D Models:
User starts a new project and creates intelligent 3D models of architectural designs, structures, and components using BIM tools.
Example software: Autodesk Revit, Trimble Tekla Structures

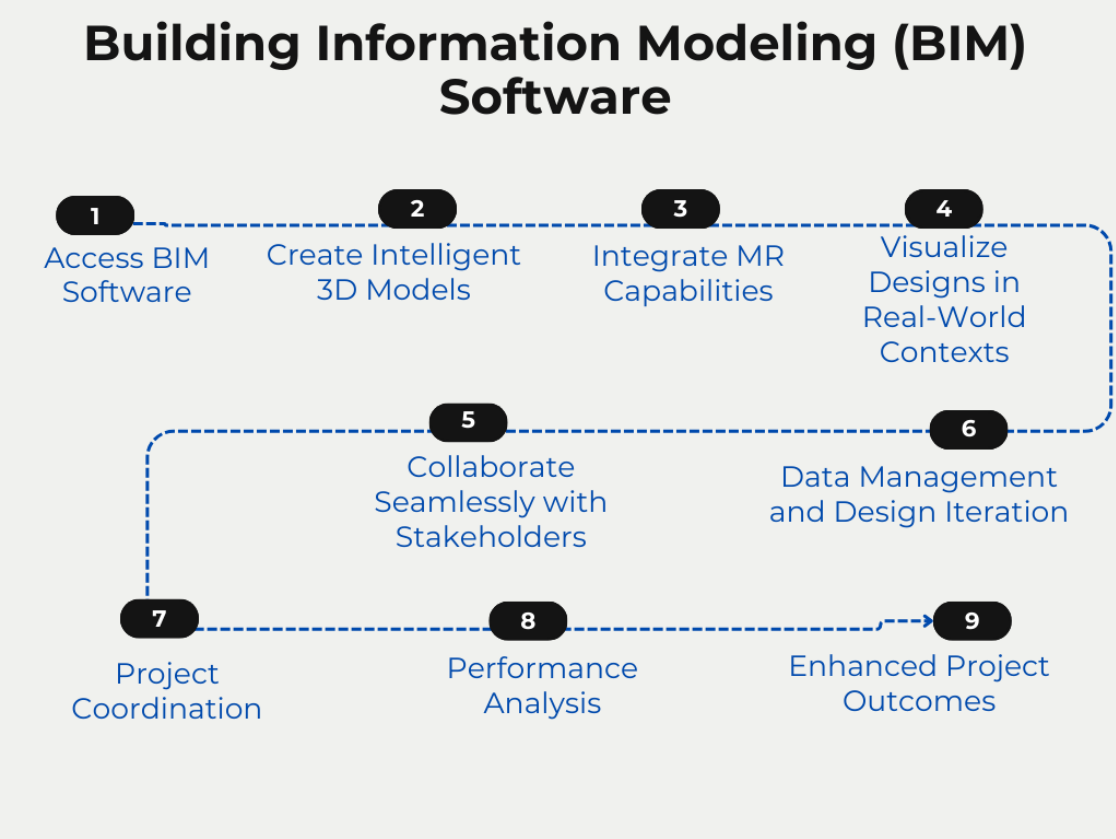
3. Integrate MR Capabilities:
User integrates Mixed Reality (MR) capabilities into the BIM software for immersive visualization and real-world context.
Example hardware: Microsoft HoloLens 2, Magic Leap One

4. Visualize Designs in Real-World Contexts:
User accesses MR features within the BIM software to visualize designs in real-world environments, such as placing virtual building models on physical construction sites.
Example software: Unity Reflect, Trimble Connect for HoloLens

5. Collaborate Seamlessly with Stakeholders:
User collaborates with stakeholders, including architects, engineers, clients, and contractors, by sharing MR-enhanced 3D models for review and feedback.
Example software: BIM 360, Autodesk BIM Collaborate Pro

6. Data Management and Design Iteration:
User manages project data, revisions, and design iterations within the BIM software, incorporating feedback from stakeholders.
Example software: Bentley ProjectWise, Procore

7. Project Coordination:
User coordinates project tasks, timelines, and resources through BIM software, ensuring alignment among team members and project objectives.
Example software: Autodesk Navisworks, Bluebeam



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8. Performance Analysis:

User conducts performance analysis, simulations, and virtual tests using BIM software with MR capabilities to optimize designs for efficiency and sustainability.

Example software: Autodesk Insight, DIALux

9. Enhanced Project Outcomes:

Through the integration of MR into BIM workflows, user achieves enhanced project outcomes, including improved design accuracy, reduced errors, efficient collaboration, and better communication with stakeholders.

Step 4: Data Management and Security

Key People Involved:

Data Managers: Develop data management protocols and ensure data integrity.

Security Analysts: Implement cybersecurity measures and data protection strategies.

Compliance Officers: Ensure compliance with data privacy regulations and industry standards.

Required Actions:

Establish Data Management Protocols: Define data storage, backup, and access control policies for MR-related data and project information.

Implement Cybersecurity Measures: Deploy encryption, authentication, and access control mechanisms to protect sensitive data and prevent unauthorized access.

Ensure Data Compliance: Adhere to data privacy regulations, industry standards, and client confidentiality requirements in managing MR data and project documentation.

Resources Needed:

Data Storage Systems: Deploy secure and scalable data storage solutions for storing MR data, project files, and design documentation.

Encryption Tools: Implement encryption algorithms and protocols for securing data in transit and at rest.

Compliance Frameworks: Develop and enforce data compliance frameworks, privacy policies, and information security protocols to ensure legal and ethical data handling practices.

Cloud-Based Data Management Platforms: Cloud-based data management platforms offer centralized storage, backup, and access control for MR data, project files, and collaboration documents.

Cloud platforms support scalable infrastructure, disaster recovery, and data protection measures, ensuring data integrity, availability, and compliance with regulatory requirements.

Step 5: Collaborative Design Platform

Key People Involved:

Project Managers: Coordinate design collaboration efforts and monitor project progress.

Design Leads: Manage design workflows, version control, and quality assurance.

Client Liaisons: Engage clients, gather feedback, and facilitate client presentations.

Required Actions:

Implement Collaborative MR Platform: Select and deploy a collaborative MR platform that enables real-time design collaboration, version control, and client engagement.

Train Users: Educate design teams, clients, and stakeholders on using the collaborative MR platform for design reviews, feedback sessions, and virtual walkthroughs.

Establish Communication Protocols: Define communication channels, project milestones, and deliverables within the collaborative MR platform for seamless collaboration and project management.

Resources Needed:

Collaborative MR Software: Procure and integrate a collaborative MR platform with features for real-time editing, feedback integration, and immersive design presentations.

Project Management Tools: Integrate collaborative MR software with project management tools for task tracking, progress monitoring, and milestone management.

Communication Channels: Setup communication channels such as video conferencing, messaging platforms, and document sharing within the collaborative MR platform for effective team collaboration and client communication.

Technology: Unreal Engine for Collaborative MR Experiences

Game engine platforms like Unreal Engine offer collaborative MR features for real-time design collaboration, version control, and immersive client presentations.

Collaborative MR platforms support simultaneous editing, feedback integration, and communication tools for enhanced collaboration and decision-making in architectural design projects.

By following these detailed steps and integrating the recommended technologies into its business processes, DesignHub Solutions can effectively implement mixed reality (MR) technology, streamline workflows, improve collaboration, enhance client engagement, and achieve sustainable growth in the competitive architectural industry.

Required Budget for the Transformation

Hardware

MR Headset

Product: Microsoft HoloLens 2 by Microsoft

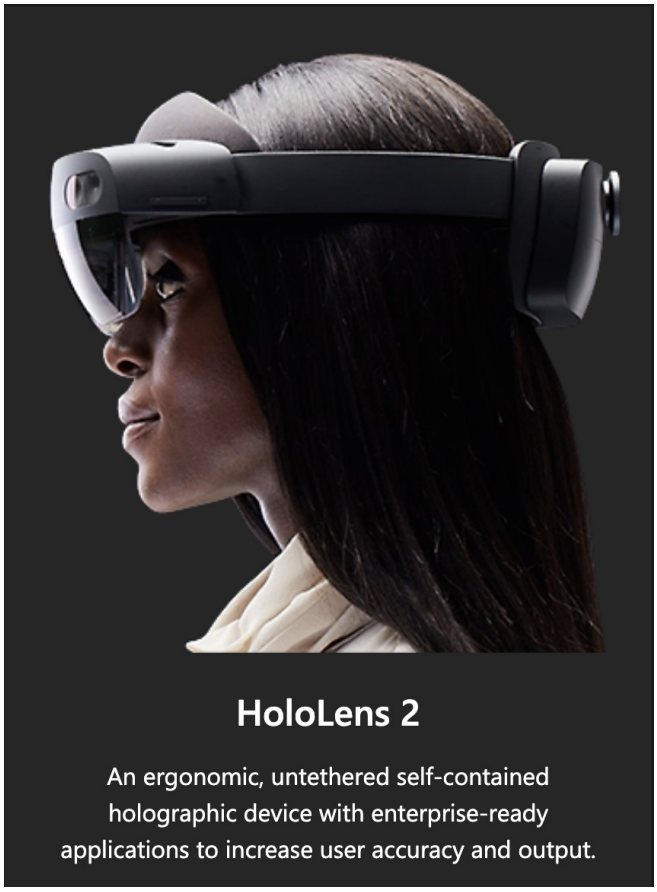
Model: HoloLens 2

Cost: Starting at around $3,500 (as of 2022)

The Microsoft HoloLens 2 is a leading MR headset known for its advanced spatial mapping, gesture recognition, and immersive holographic experiences. It is widely used in various industries, including architecture, engineering, healthcare, and education.

Networking Equipment

DesignHub will purchase an enterprise-grade firewall security to protect its information architecture from malicious attacks. Palo Alto Networks PA-820 Enterprise Firewall Security provides a reliable hardware security wall.



Source: microsoft.com

Software

Software for creating extended reality experiences

Unreal Engine is a software application that allows architects to create immersive extended reality experiences in architecture. It is one of the most widely used applications in architecture. The cost of the application is based on the revenue of the company. If the company makes more than $1 million in the past 12 months licensing fees apply. The cost of licensing per developer is $1,850 per seat per year.

Cloud service for online collaboration

Azure provides a cost-effective solution for creating virtual desktops. Virtual desktops are necessary for remote collaboration. Using them architects, clients, and other relevant stakeholders can work together on the projects remotely.

Virtual desktops are used to serve operating systems and specialized software applications. There are many alternative providers of similar services. However, Azure offers the best value for money in terms of secure cloud and cost-effective services. The cost of virtual desktops for 10 users is calculated with Azure Pricing Calculator. The monthly cost of using Azure Virtual Desktop service is $1,204.54. DesignHub will

Azure Remote Rendering servers for GPU intensive real-time rendering operations and Azue Digital Twins service to create digital twins of buildings and structures when clients request. Remote Rendering supports HoloLens 2 and Windows 11 PC's that DesignHub is using. These services do not have upfront costs and the costs depend on the usage.

Digital certificate for authentication and encryption

To encrypt online communication DesignHub will use an SSL certificate. The certificate ensures that both sides can be sure that the communication is originating from DesignHub and not any other party. Comodo SSL Store's Premium SSL Certificate is a good choice for DesignHub.

Human Resources

Hiring an XR developer and Cloud Engineer

DesignHub will hire an XR developer to create extended reality presentations. The average salary of an XR developer in the current market is $100,000.

DesignHub will also engage the services of a Cloud Engineer which will be hired on hourly basis as required for the delivery of projects.

Table 3. Total initial cost of the proposed digital transformation

#	Item	Cost per unit	Quantity	Item Total
		Software		
1	Unreal Engine License for 3 developers	$1,850 per developer per year	3 developers	$5,550.00
2	SSL certificate	$68.99	1 year	$68.99
		Cloud Services		
3	Azure Virtual Desktop	$1,204.54	12 months	$14,454.48
4	Azure Digital Twins Server	$2000 per year	1 year	$2,000.00
5	Azure Remote Rendering Server	$2000 per year	1 year	$2,000.00
		Hardware		
6	Microsoft HoloLens 2	$3,500	3 pcs	$10,500.00
7	Trimble XR10 with HoloLens 2	$5,199	3 pcs	$15,597.00
8	Palo Alto Networks PA-820 Enterprise Firewall Security	$285	1 pcs	$285.00
		Human resources		
9	XR developer	$100,000 per year	1 full-time staff	$100,000.00
10	Cloud Engineer	$60 per hour	416 hours per year	$24,960.00
CONSULTANCY SERVICE		$5000 per month	8 months	$40,000.00
TOTAL				$215,415.47

Privacy and Security Analysis

The main objective of the information security system of DesignHub is to ensure the confidentiality, integrity, and availability of its information system for internal and external stakeholders. The enterprise information architecture is presented in the figure below. To achieve its objective DesignHub will use the Defense in Depth (DiD) security strategy. It establishes multiple layers of control in the information system of the company.

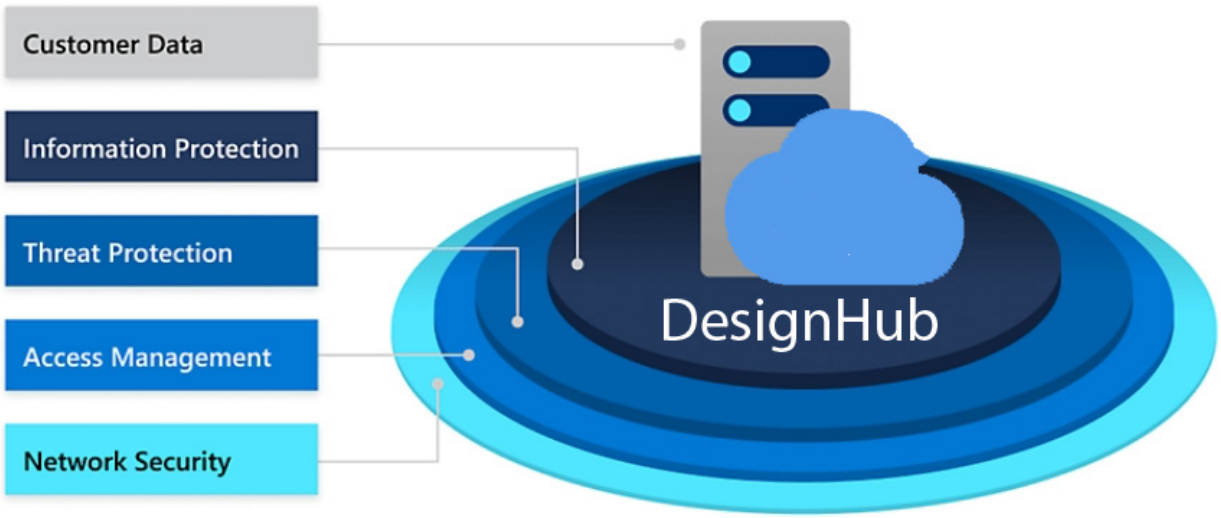
With the usage of cloud services for online collaboration a new set of security considerations will need to be addressed. DesignHub's extender reality collaboration platform will be in the private cloud. The following risks will apply to the digital transformation of how DesignHub works:

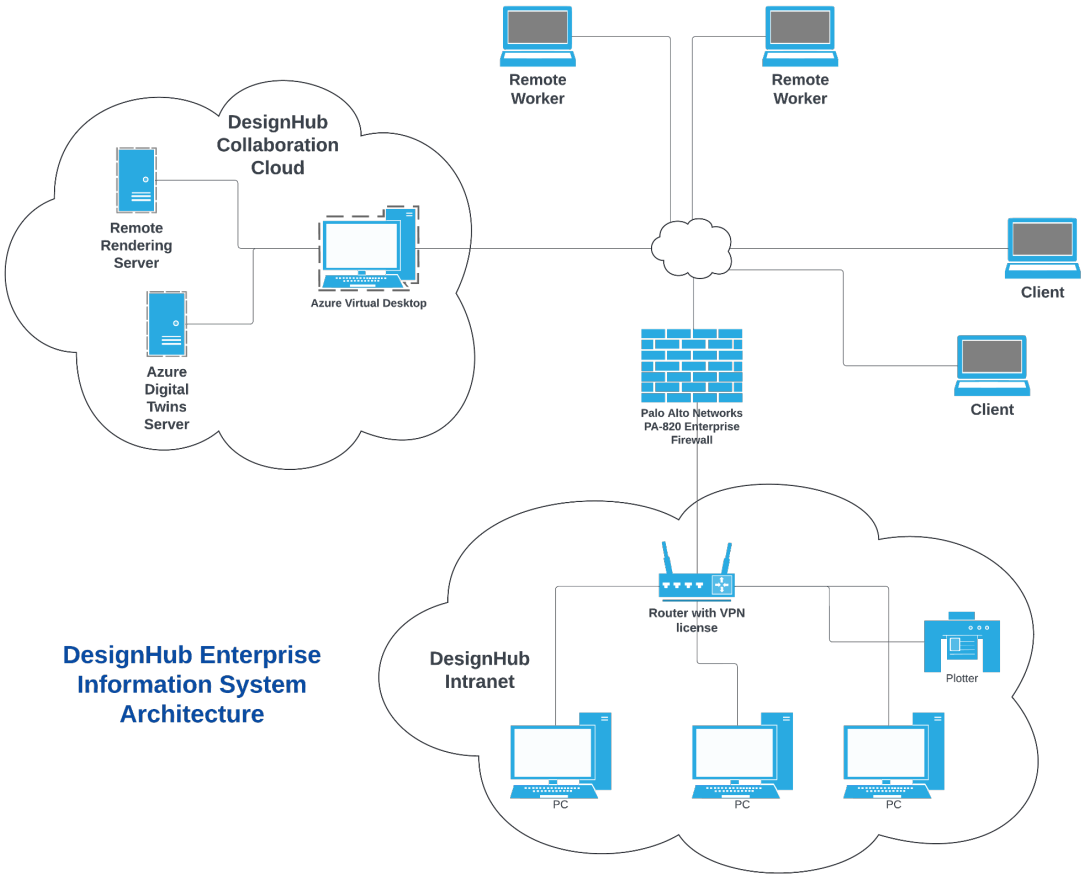
Network security

Communication over networks creates opportunities for malicious actors. To secure networks the first step is to create firewalls. Firewalls are the first line of defense in an information system. They filter network traffic and prevent the intrusion of unauthorized users into the network. The company will use hardware and software firewalls. Palo Alto Networks PA-820 Enterprise Firewall Security provides a reliable hardware security wall. VPN technology will be used to enable access to enterprise resources. Cloud Engineer will perform the setup and management functions.

Access management

DesignHub will strengthen its authentication and authorization mechanisms with strong password, and password renewal policies. Each employee and client will be issued a unique user account and password. The accounts of former employees and clients will be locked and destroyed in the period required by the company policies. Two-factor authentication (2FA) will





DesignHub Enterprise Information System Architecture

be mandatory for all stakeholders. Windows domain server and Active Directory service will be used for user account management.

Threat protection

The risks to the company cloud can result from easy or leaked passwords, social engineering, man-in-middle-attacks, spyware, keyloggers, viruses, denial of service attacks, and trojan horses. DesignHub will require installation of software firewall, and antivirus software on all computers using the enterprise information system. Only authorized staff of the IT department can disable threat protection software for technical maintenance purposes.

Information Protection and Customer Data

The company's data, which includes architectural designs, and employee and client data will be stored in the cloud for effective collaboration. With increased usage of the cloud and the web, DesignHub's data will be transmitted over the network in large amounts. Such transmission needs to happen in encrypted channels and protocols.

The current industry standard uses the Transport Layer Security (TLS) communication protocol. TLS enables encryption of communications using digital certificates. The digital certificates are used to authenticate the company and to encrypt the messages that

travel between client and server computers. DesignHub will need to buy an SSL certificate from a trusted certificate provider.

DesignHub will store data in encrypted form. Private Certification Authority will be established to issue certificates for encryption. Data transmission over the network will take place only through encrypted channels. The corporate website and email exchange will be encrypted using SSL/TLS certificates.

Project Timeline

The project will be implemented in four main phases. It begins with the planning phase, where objectives are set, tasks are defined, and resources are allocated.

The procurement phase follows, focusing on acquiring all necessary materials and services, ensuring that everything needed is obtained at the right time and cost. Procurement will include hardware, software, and hiring a full-time XR developer and an hourly Cloud Engineer to support the transition phase.

The training phase is crucial for equipping the project team with the necessary skills and knowledge. The training materials will be custom-developed for the company, considering the specific learning needs of IT staff, architectures and designers. The trainings will focus on long term retention of the learned skills and approaches.

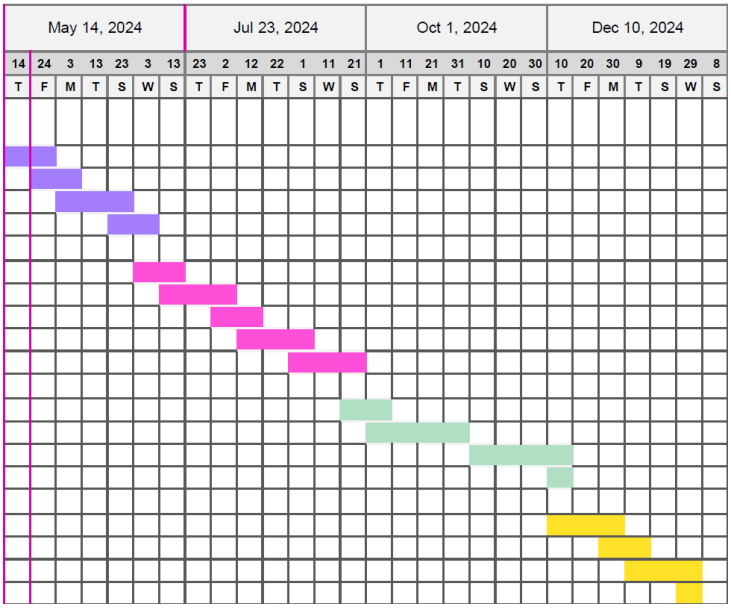
Finally, the evaluation phase involves assessing the project's performance against the initial goals, analyzing outcomes, and identifying lessons learned to inform future projects. In the end, the company board will be briefed about the results of the digital information project.

This structured approach ensures that the project progresses smoothly from conception to completion, with each phase building upon the previous one to achieve the desired results.

Table 4. Timeline of tasks

TASK	START	END
Planning and design		
Define goals	5/18/24	6/2/24
Develop plan	6/2/24	6/12/24
Set up transformation team	6/12/24	6/24/24
Communicating the plan	6/28/24	7/3/24
Procurement		
Clarifying specifications	7/6/24	7/16/24
Hardware and software	7/18/24	8/2/24
Cloud services	8/2/24	8/17/24
Hiring XR developer and Cloud Eng.	8/17/24	9/1/24
System integration	9/2/24	9/27/24
Training of staff		
Preparation of training	9/29/24	10/9/24
Training for IT staff	10/10/24	11/9/24
Training for architects and designers	11/11/24	12/11/24
Training brief for managers	12/12/24	12/14/24
Evaluation		
Monitor progress	12/16/24	12/31/24
Test meetings with clients	12/31/24	1/15/25
Develop lessons learned report	1/16/25	1/31/25
Brief for company board	2/3/25	2/6/25

Gantt chart



Team

Harshita Nimbal

Master's degree in Informatics, Northeastern University
Expert in UI/UX, AR/VR and digital transformation

Harshita is a seasoned Digital Transformation Specialist with over five years of in-depth experience in UI/UX design and AR/VR technologies. With a keen eye for design and a passion for immersive technologies, Harshita has successfully led multiple digital transformation initiatives, integrating cutting-edge user interfaces and virtual environments to enhance user engagement and streamline business processes.

As a forward-thinking innovator, she has a track record of designing intuitive user experiences that are both aesthetically pleasing and functionally robust. Harshita's expertise in user-centered design principles has enabled her to craft bespoke solutions that resonate with users and drive adoption.

Nazar Mammedov

Master's degree in Informatics, Northeastern University
Strong expertise in Cloud Architecture and Security

Nazar stands at the forefront of digital transformation, boasting over seven years of experience in Cloud Engineering and Information Security. A visionary in integrating cloud infrastructure with robust security measures, Nazar has been instrumental in driving innovation and resilience in digital operations across various industries.

With a deep understanding of cloud architectures and a commitment to safeguarding digital assets, Nazar has led numerous projects that have transitioned traditional IT systems to scalable, secure cloud solutions. His expertise in deploying cloud services while maintaining compliance with industry standards has earned them recognition as a leader in digital security.

Conclusion

To maintain a competitive edge in the dynamic architecture and design industry, digital transformation is imperative. This proposal outlines a strategic roadmap to modernize DesignHub Solutions by harnessing cloud-based solutions, extended reality (XR), and mixed reality (MR) technologies. This comprehensive approach aims to strengthen the firm's market position, elevate client experiences, and drive significant revenue growth.

XR: Transforming Design and Collaboration

Extended Reality (XR), encompassing VR, AR, and MR, will be our key differentiator. It merges the physical and digital, creating immersive experiences that empower our teams and clients.

- Architects can visualize designs in 3D, explore virtual spaces, and collaborate seamlessly – regardless of location.
- Clients can walk through lifelike, future spaces before construction begins, promoting informed decision-making.

The Cloud: Building a Strong Foundation

Migrating to the cloud unlocks agility, scalability, and accessibility. Cloud-based collaboration tools enable:

- Real-time communication among project teams, fostering efficient information sharing.
- Effortless collaboration between architects, engineers, and clients for informed decision-making.

Enhanced Efficiency and Safety with XR

Field teams will significantly benefit from XR:

- Imagine architects using AR glasses to overlay digital blueprints onto construction sites, streamlining inspections.
- Training modules and safety protocols delivered via XR can reduce errors and enhance workforce safety.

Driving Revenue and Client Satisfaction

By embracing XR and the cloud, DesignHub will:

- Streamline project lifecycles, reducing rework and accelerating decision-making – leading to increased revenue.
- Deliver exceptional client experiences through innovative XR-powered walkthroughs, leading to faster approvals and referrals.

Leading the Digital Future

DesignHub's commitment to digital transformation positions it as industry leader. It will invest in XR hardware, train its teams, and collaborate with technology partners to achieve this vision.

Conclusion: This is not just about technology; it is about empowering DesignHub's people, delighting its clients, and securing a thriving future in the digital age. Let's embark on this exciting journey together!

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