

VR MOTION PLATFORM DEVELOPMENT COURSES

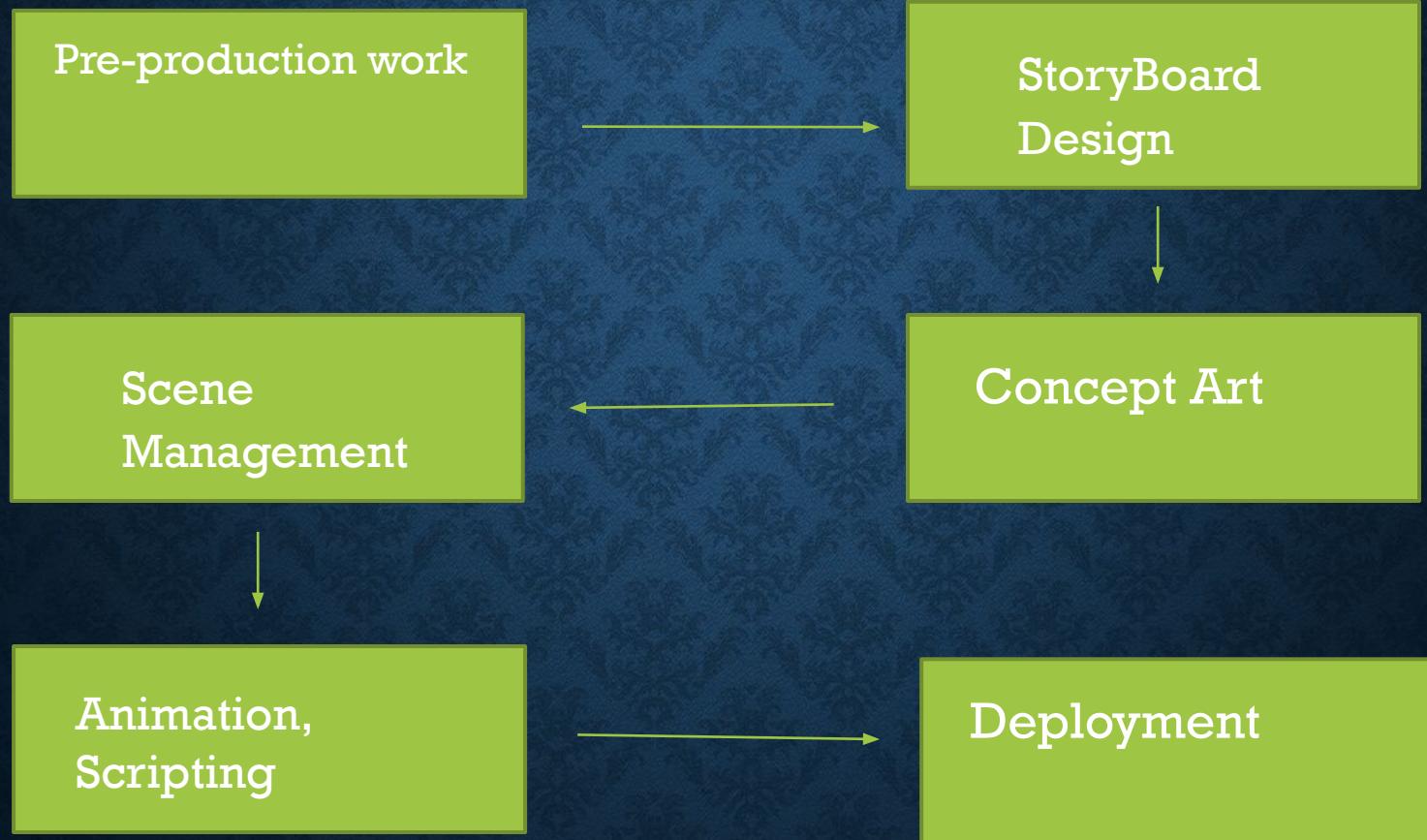
Unit 5

Game Production, WebVR, Game Market

TOPICS

- Game Production
 - Art, Engineering, Design Integration
 - Building and Deployment the Game
- Marketing and Public Relations
- Testing and Code Releasing
- Multiplayer platform

GAME PRODUCTION



BUILDING AND DEPLOYMENT THE GAME

- ArtWork
 - Raw Artwork
 - Internal Server in FTP
 - In-game artwork
 - Internal Gitlab Server for VC
- Whole Game Deployment
 - Unity Cloud
 - UE4 Cloud
 - Google Stadia
 - Azure Gaming
 - **Amazon's Project Tempo**
- Local

UNITY - SET UP A SMART GAME DEVELOPMENT PIPELINE

- Unity can provide an smart development pipeline for rapid development.
- Step 1 : Map features to target platforms
- Step 2 : Specify the minimally supported devices for your project
- Step 3 : Build Prototype
 - Set frame and asset budgets early on
 - Set Scene and prefab decomposition early on
 - Plan your asset pipeline process
 - Line up your Build and QA process
- Step 4 : Start actual project from scratch
- <https://unity.com/how-to/set-smart-game-development-pipeline>

UNITY DEVELOPMENT PIPELINE

- DEFINE BUDGETS

- Define budgets for:
 - Models: number render model
 - Assets: consider models and textures detail
 - Scripts and rendering: define frame for logic, rendering, effects and other subsystems

UNITY DEVELOPMENT PIPELINE

- ASSET PIPELINE PROCESS

- Set Scene and prefab decomposition early on
 - Split levels into (additively loaded) scenes.
 - Move separate objects into Prefabs. Nested Prefabs further increase scene decomposition and reduce merge conflicts.
 - Agree on the main scene locking mechanism.
- Plan your asset pipeline process
 - The import process needs to accommodate artists' specs for assets.
 - If possible, involve a technical artist from the beginning to define this process.
 - Define clear guidelines on asset formats and specs.
 - Use Asset Postprocessors to automate asset importing.

UNITY DEVELOPMENT PIPELINE

- ASSET PIPELINE PROCESS

- Asset pipeline process new Tools : Asset Import Pipeline
 - Support Unity 2019.3 or above
 - AssetDatabase
- Features
 - Dependency Tracking
 - Fresh Project Import
 - Fast Platform Switching
- Link :
[https://blogs.unity3d.com/2019/10/31/the-new-asset-import-pipeline
solid-foundation-for-speeding-up-asset-imports/](https://blogs.unity3d.com/2019/10/31/the-new-asset-import-pipeline-solid-foundation-for-speeding-up-asset-imports/)

UNITY DEVELOPMENT PIPELINE - LINE UP YOUR BUILD AND QA PROCES

- Set up a build machine, or, turn on and set up Unity Teams.
- Establish a process:
 - Publishing features to the release build
 - Testing new builds
 - Automating tests
 - Recording statistics

LINE UP YOUR BUILD AND QA PROCESS - UNITY CLOUD BUILD

- **Unity Cloud Build**
 - Unity **Cloud Build** is part of Unity teams and provides continuous integration services for Unity projects
- **Unity Terms**
 - <https://unity.com/products/unity-teams? qa=2.205023767.660806025.1595314532-1407925918.1582959089>

PROTOTYPE IDEAS, BUT PREPARE TO START ACTUAL PROJECT FROM SCRATCH

- After building a prototype and getting it approved by the management, strongly consider starting it from scratch.
- Decisions made during prototyping usually favor speed.
- Basing your game on a bunch of hacks is not a good start for any project.

MARKETING AND PUBLIC RELATIONS

- Online Channel :

- Youtube
- Steam
- Twitter
- Facebook
- Events

MARKETING AND PUBLIC RELATIONS

- Offline Channel :
 - Events
 - PAX events (All year!)
 - Global Game Jam 2020 (January 31-February 2)
 - Taipei Game Show (February 6-9)
 - The International 2020 (August 18-23)
 - Tokyo Game Show (September 12-15)
 - 2020 台北國際電玩展
 - 亞洲遊戲展 (AGS)
 - C3日本動玩博覽
 - 香港動漫電玩節 2019
<https://www.eneba.com/blog/gaming-events-schedule-for-2020/>
 - <https://www.gamesindustry.biz/network/events?year=2020>

TESTING AND CODE RELEASING

- Unity Test Framework (UTF)-

<https://docs.unity3d.com/Packages/com.unity.test-framework@1.1/manual/getting-started.html>

- Tutorial -

<https://unity.com/how-to/unity-test-framework-video-game-development>

- About Unity Test Framework -

<https://docs.unity3d.com/Packages/com.unity.test-framework@1.1/manual/index.html>

TESTING AND CODE RELEASING

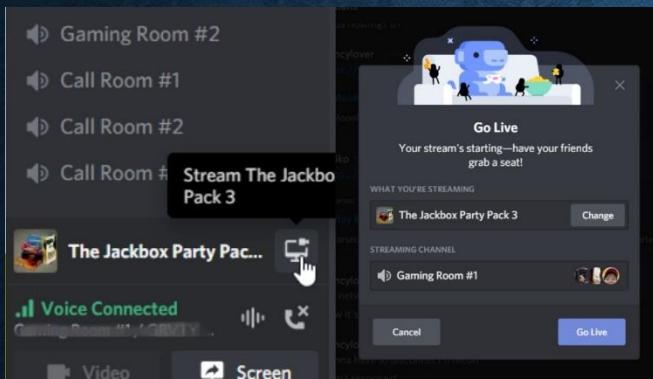
- **Introduction To Unity Unit Testing**
- <https://www.raywenderlich.com/9454-introduction-to-unity-unit-testing>
- How to use the Integration Test Framework
- <https://bitbucket.org/Unity-Technologies/unitytesttools/wiki/IntegrationTestsRunner>

MULTIPLAYER PLATFORM

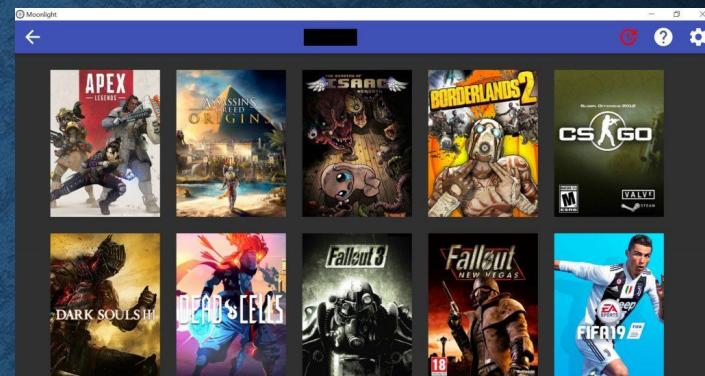
- **PS3, PS4, PlayStation Vita**
- **Xbox One**
- **Nintendo Switch**
- **PC**
 - **Microsoft Windows**
 - **OS X**
 - **Linux**
- **Mobile**
 - **iOS**
 - **Android**

MULTIPLAYER PLATFORM

1. Discord



2. Moonlight Game Streaming



3. Parsec

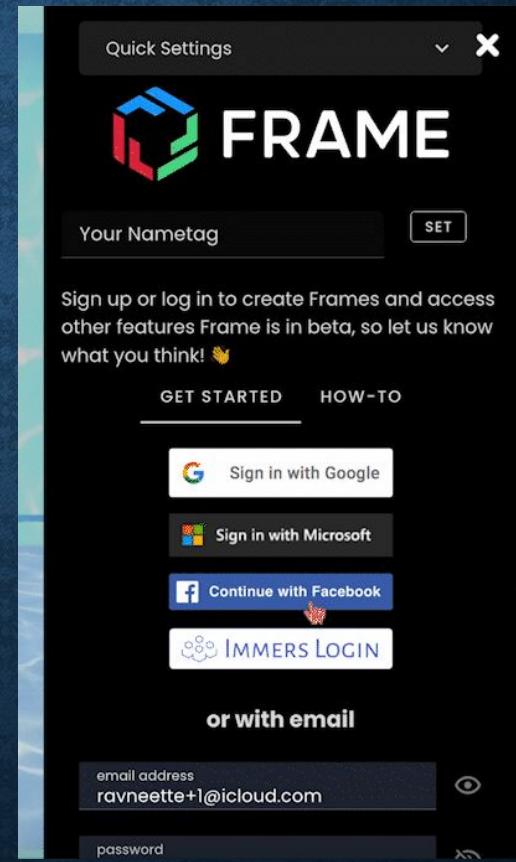


4. Steam Remote Play



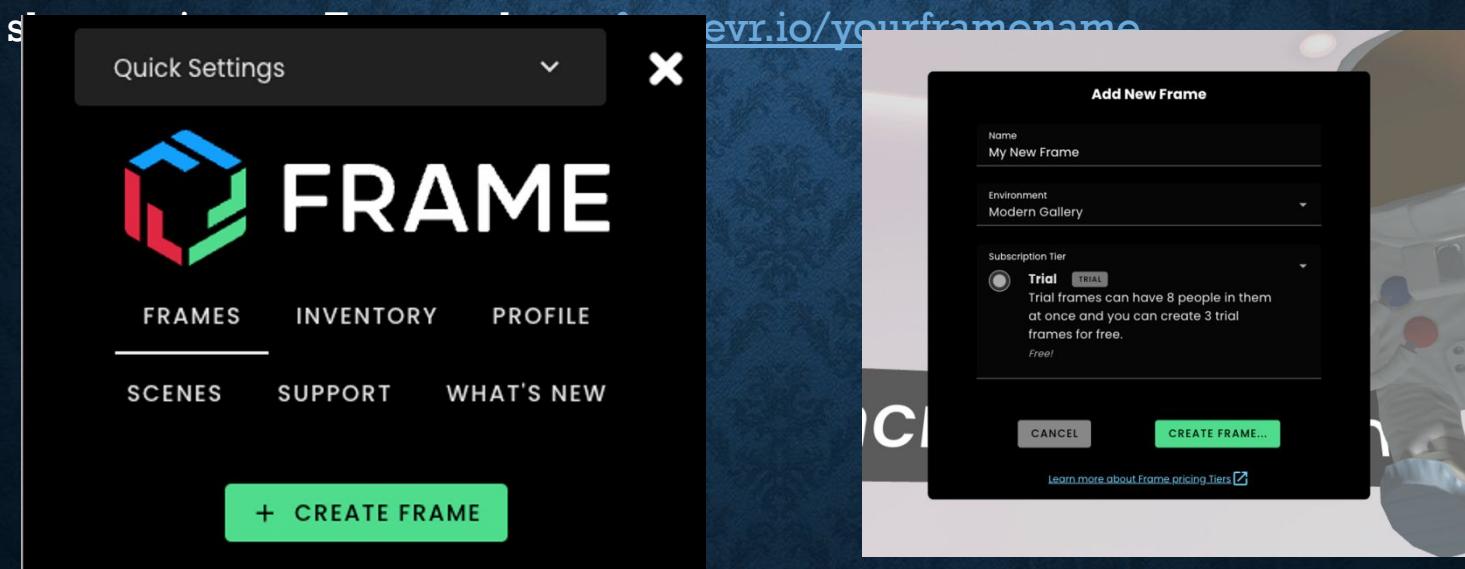
CREATE YOUR WEBVR PROJECT

- Create Your First Frame
- Create an Account



CREATE A FRAME

- Once logged in, find and click the green “Create a Frame” button in the sidebar
- Give your Frame a name and pick an environment. The name you pick will



GETTING AROUND

- You can navigate in the following:
 - Desktop Navigation
 - Mobile Navigation
 - VR Navigation

DESKTOP NAVIGATION

- When using Frame on a desktop computer, you have several options to move around:
- **Keys:** You can use the arrow keys or the WASD keys to move around. Additionally, you can hold down the Shift key to move faster while you are in motion.
- **Mouse/Touchpad:** You can look around by moving your mouse or touchpad. To move, double-click where you want to go. If you want to teleport, hold down the Shift key and double-click where you want to go.

MOBILE NAVIGATION

- When using Frame on a mobile device, you have fewer options to navigate, but they are still easy to use:
- **Circle Gyroscope:** You can move around in Frame by moving your device in the direction you want to go. This feature is called the circle gyroscope and it allows you to move naturally and intuitively.
- **Swipe Screen:** You can look around by swiping your finger on the screen. This feature allows you to explore your environment with ease.

VR NAVIGATION

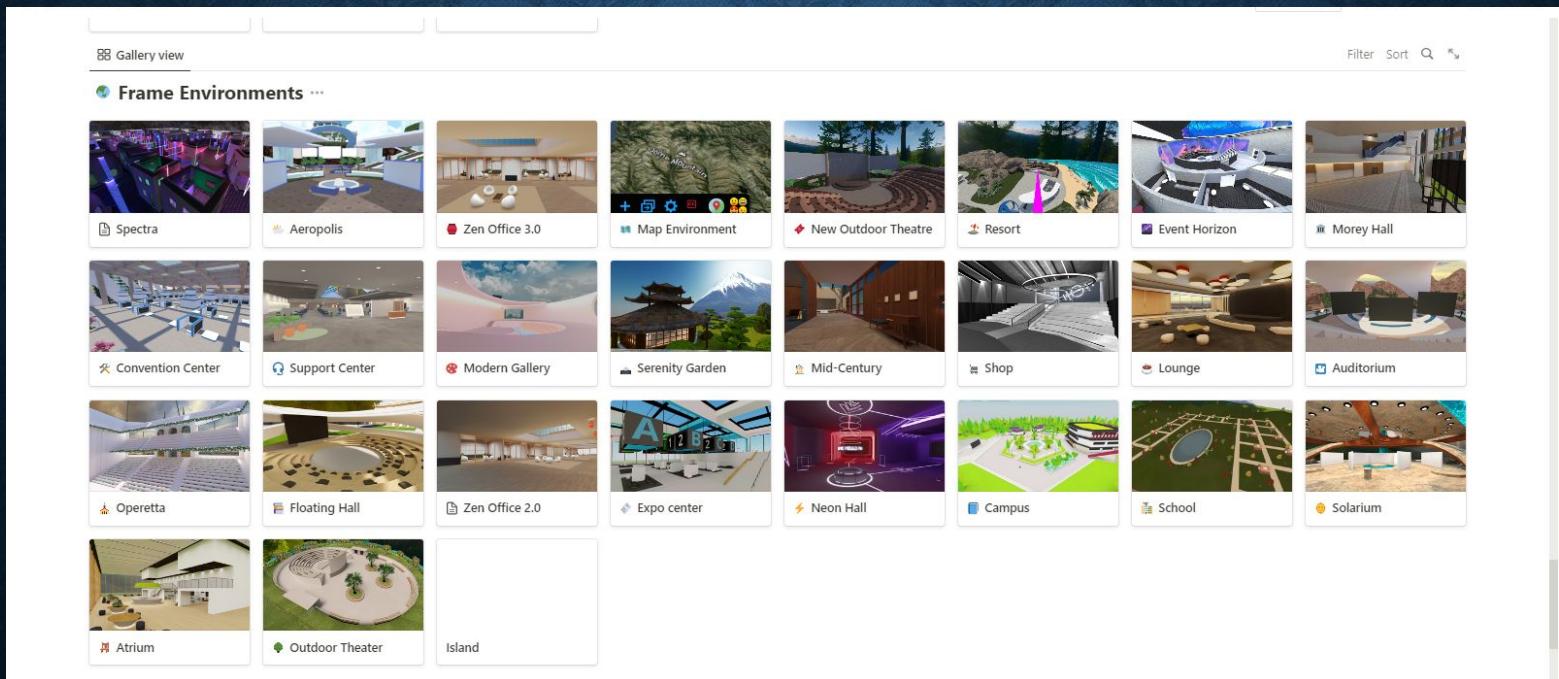
- When using Frame on a VR headset, you have access to even more immersive ways to navigate:
- **Controllers:** You can use the controllers that come with your VR headset to teleport. Simply point where you want to go and press the appropriate button.
- **Joystick:** You can use the joystick on your VR headset to look around. This feature allows you to explore your environment with precision and control.

EDIT YOUR AVATARS

- Users can change the avatar in the Profile section in the sidebar or by pressing the key C

Avatar Version	Description
Android bot	Default avatar for users without an account
Human	Full body human avatars for users to save to their Frame account
RPM	Integration with readyplayerme for users to use their RPM account avatars in Frame

FRAME ENVIRONMENT



FRAMEVR CASES

- EXPO CENTER - <https://framevr.io/expocenter-example>
- Campus - <https://framevr.io/demo-campus>
- EXPO CENTER - <https://framevr.io/atrium>
- Explore Mars - <https://framevr.io/exporemars>
- Demo Island - <https://framevr.io/demo-island>
- PHOTOSPHERE - <https://framevr.io/photosphere>
- Education Use case - <https://framevr.io/education-use-cases>

ADDITIONAL

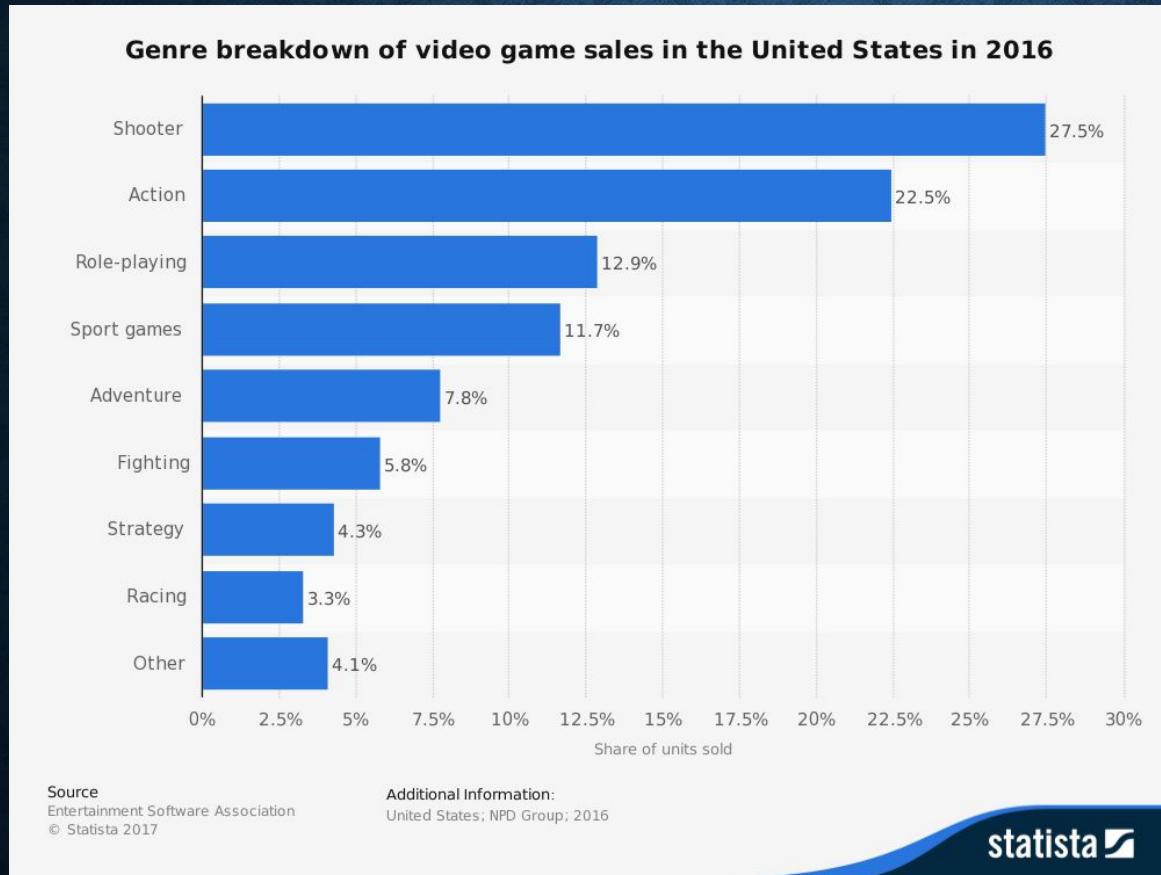
- <https://framevr.notion.site/Frame-Knowledge-Base-cfc4bc81aa1442a9a2dd9e995dbaeab0>

TOPICS

- Popular game types in different countries
- Game Engine Advantages
- Game platform categories
- 3D modelling, graphics-texture, animation, sound.
- Physics engine, UI layout, AI engine.
- Multi-players, Game Server, Virtual Reality.
- Criteria of Good Prototyping.

POPULAR GAME TYPES IN DIFFERENT COUNTRIES

GLOBAL MARKET



COUNTRIES FOR DELIVERY GAME

- Hong Kong
- Taiwan
- Japan
- Mainland China – are difficult to enter :
 - “Insufficient Knowledge of Intellectual Property Rights” (67.8%)
 - “Differences in Work Culture” (60.9%)
 - “Unsound Rule of Law“ (52.2%)

COUNTRIES FOR DELIVERY GAME

6.2.1. Countries / Regions of Main Customers

Q. What countries / regions do your main customers (In terms of the amount of sales transactions) come from?

	Digital Entertainment (Overall) (n=138)	Comics (n=45)	Computer Animation (n=27)	Digital Effect (n=15)	Game (n=34)	Interaction Design (n=17)
Hong Kong	92.8% ^a	95.6% ^a	92.6% ^a	100.0% ^a	82.4% ^a	100.0% ^a
Macau	14.5%	11.1%	0%	20.0% ^c	23.5%	23.5% ^c
Mainland	45.7% ^b	40.0% ^b	37.0% ^b	100.0% ^a	29.4% ^c	58.8% ^b
Taiwan	28.3% ^c	31.1% ^c	18.5%	6.7%	44.1% ^b	23.5% ^c
Japan	6.5%	2.2%	7.4%	6.7%	14.7%	0%
Korea	0.7%	0%	0%	0%	2.9%	0%
Singapore	2.2%	0%	3.7%	0%	2.9%	5.9%
Malaysia	2.9%	6.7%	3.7%	0%	0%	0%
Russia	0.7%	0%	0%	0%	2.9%	0%
Australia	1.4%	0%	0%	0%	5.9%	0%
America	11.6%	4.4%	18.5%	0%	23.5%	5.9%
Europe	13.0%	13.3%	22.2% ^c	6.7%	11.8%	5.9%
Middle East	2.2%	0%	3.7%	0%	5.9%	0%
Others	2.2%	2.2%	3.7%	0%	2.9%	0%

HONG KONG MARKET

- According to the estimation of HKDEA, there are about 108 companies with game as major business in Hong Kong. The game industry has a higher revenue and profit than other digital entertainment industries.
- Reason : Development of computer game -> online game -> mobile phone game
- Payment platforms of online game and mobile game are less affected by online piracy.
- Third-party payment system

HONG KONG MARKET

- Total 147 company were ultimately received.
- Established between 2011 and 2016.



HONG KONG MARKET

- Around 72% of the companies had 10 or less employees in Hong Kong.
- Most of the companies (92.2%) had employees aged 26 to 40 in Hong Kong, 58.4% had employees aged 25 or below, only 28.6% had employees aged 41 or above. (Table 6.3.2.).

HONG KONG MARKET

6.1.1. Year of Establishment

Q. The year your company started in Hong Kong

Digital Entertainment (Overall) (n=138)	Comics (n=43)	Computer Animation (n=28)	Digital Effect (n=14)	Game (n=35)	Interaction Design (n=18)
1990 or before	3.6%	7.0%	0%	7.1%	0%
1991 – 1995	5.8%	14.0%	3.6%	0%	2.9%
1996 – 2000	11.6%	20.9%	3.6%	7.1%	8.6%
2001 – 2005	14.5%	16.3%	10.7%	14.3%	17.1%
2006 – 2010	15.9%	11.6%	10.7%	14.3%	25.7%
2011 – 2016	48.6%	30.2%	71.4%	57.1%	55.6%
Total	100%	100%	100%	100%	100%

HONG KONG MARKET -> MAINLAND CHINA

6.1.3. Number of Branches in the Mainland

Q. Number of branches in the Mainland

	Digital Entertainment (Overall) (n=79)	Comics (n=7)	Computer Animation (n=20)	Digital Effect (n=12)	Game (n=29)	Interaction Design (n=11)
0	75.9%	100.0%	85.0%	75.0%	72.4%	54.5%
1	13.9%	0%	10.0%	25.0%	17.2%	9.1%
2	5.1%	0%	5.0%	0%	6.9%	9.1%
3	1.3%	0%	0%	0%	0%	9.1%
4	1.3%	0%	0%	0%	0%	9.1%
14	1.3%	0%	0%	0%	0%	9.1%
31	1.3%	0%	0%	0%	3.4%	0%
Total	100%	100%	100%	100%	100%	100%

HONG KONG MARKET -> OVERSEAS

6.1.4. Number of Branches in Overseas

Q. *Number of branches in Overseas*

	Digital Entertainment (Overall) (n=73)	Comics (n=7)	Computer Animation (n=17)	Digital Effect (n=10)	Game (n=28)	Interaction Design (n=11)
0	83.6%	100.0%	100.0%	100.0%	67.9%	72.7%
1	12.3%	0%	0%	0%	28.6%	9.1%
3	2.7%	0%	0%	0%	0%	18.2%
13	1.4%	0%	0%	0%	3.6%	0%
Total	100%	100%	100%	100%	100%	100%

HONG KONG POPULAR GAME TYPE

[HTTPS://WWW.SIMILARWEB.COM/APPS/TO P/GOOGLE/STORE-RANK/HK/GAMES/TOP-P AID](https://www.similarweb.com/apps/top/google/store-rank/hk/games/top-paid)

Top Free

Mobile App Ra
Top Google Play apps in Hong Kong | Ga

Google Play Store ▾ Hong Kong ▾ Games

Leader Board ⚒ App Trends ⓘ

App ⓘ	Publisher ⓘ	Category ⓘ	Usage Rank ⓘ
1 My Tamagotchi Forever	BANDAI NAMCO Entertainment Europe	SIMULATION	-
2 食之契约	Inch Interactive Entertainment(TWCARDS Ltd 1	-	-
3 逃脫遊戲 謎言遊戲	STUDIO WASABI	ADVENTURE	-
4 Knives Out	NetEase Games	ADVENTURE	-
5 Super Mario Run	Nintendo Co., Ltd.	ACTION	-
6 將星之演武-港澳	GameBeans Ltd.	CARDS	-
7 Lapse: A Forgotten Future	Cornago Stefano	STRATEGY	-
8 大清攝政王-原創大清宮廷官鬥劇情，經典模擬經營富官子遊	Dream Game Ltd.	STRATEGY	-

Top Pay

Mobile App Ra
Top Google Play apps in Hong Kong | Ga

Google Play Store ▾ Hong Kong ▾ Games

Leader Board ⚒ App Trends ⓘ

App ⓘ	Publisher ⓘ	Category ⓘ	Usage Rank ⓘ
1 Cytus II	Rayark International Limited	GAME_MUSIC	-
2 Minecraft	Mojang	ARCADE	-
3 Iron Marines	Ironhide Game Studio	STRATEGY	-
4 InseAquarium Deluxe - Feed Fishes! Fight Aliens!	.STRONG	ARCADE	-
5 ICEY	X.D. Network	RPG	-
6 Florence	Annapurna Interactive	PUZZLE	-
7 WitchSpring3	Kiwiwalks	RPG	-
8 Hitman Sniper	SQUARE ENIX Ltd	ACTION	-
9 Agent A: A puzzle in	Yak & Co.	PUZZLE	-

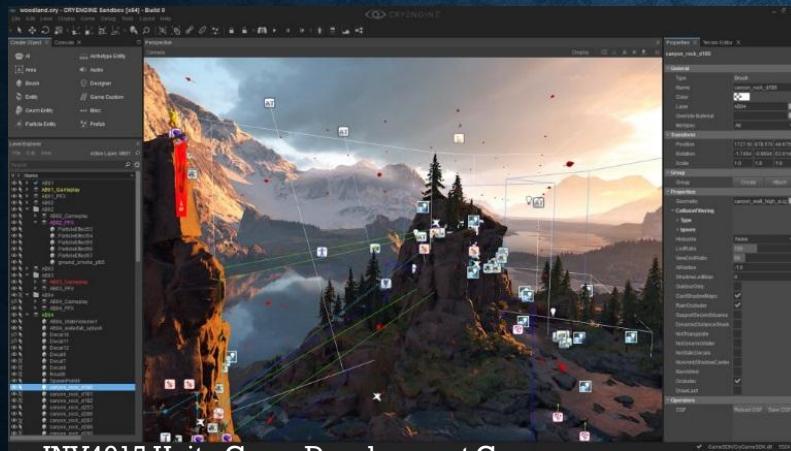
GAME ENGINE ADVANTAGES

WHAT IS A GAME ENGINE?

- Game Engines
 - Commercial
 - Open source
- Provide for underlying technologies
 - Graphics Rendering
 - Physics engine
 - Sound
 - Scripting
 - Animation
 - Artificial Intelligence
 - Networking

TOP 10 COMMERCIAL ENGINES (<https://blog.instabug.com/2017/12/game-engines/>)

- Unreal
- Unity
- CryEngine



INV4015 Unity Game Development Courses



GAME ENGINE ADVANTAGES

- **Why use a game engine:**
 - Less development time required
 - Less testing and debugging
 - Many features directly available
 - Better focus on the game design
- **Why not use a game engine:**
 - No control over the implementation of features
 - Adding features not yet in the game engine might be cumbersome
 - Dependent on other licensing scheme for release
 - Other libraries/toolkits linked with the game engine (physics, AI...)

GAME ENGINE COMPARISON (UNITY VS UNREAL)

Game Engine	Unity	Unreal 4
Console	Xbox 360; Xbox One; Wii U;	PlayStation 4, Xbox One
targets	PlayStation 3; PlayStation 4; PlayStation Vita; Nintendo Switch; Nintendo 3DS	Nintendo Switch
Desktop targets	Windows, Mac OS X, Linux	Windows, Mac OS X, Linux, SteamOS, HTML5
Dev platforms	Windows; OSX	Windows, Mac OS X, Linux
Languages	C#	C++, Blueprints (Visual Scripting)

GAME ENGINE COMPARISON (UNITY VS UNREAL)

Unity	Unreal Engine 4
Supports 21+ Platforms Including Mobile, Web, PC and Console	Supports mainly PC and Console Games
C#, UnityScript, Boo	C++
Great for 2D and 3D	Better powered for 3D games
No Profiler for free version	Profiler
Limited graphics	Next generation graphics.
\$1500 Pro Version or \$75/month	Free with 5% revenue share
Better option for novices	Only for pro's
Programmer AND Designer friendly	Designer friendly only
Detailed documentation	Lacklustre documentation
Multitude of community and official tutorials for developer support	Tutorials largely catering to designers rather than programmers
Free after a revenue turnover of <\$100k	Free after a revenue turnover of <\$50k
Perfect tool for building any sort of game	FPS built, so better suited for FPS based games only

GAME ENGINE COMPARISON (UNITY VS CRYENGINE)

Game Engine	Unity	Unreal 4
Console targets	Xbox 360; Xbox One; Wii U;	Xbox One, PS4
targets	PlayStation 3; PlayStation 4; PlayStation Vita; Nintendo Switch; Nintendo 3DS	Nintendo Switch
Desktop targets	Windows, Mac OS X, Linux	Windows, Linux
Dev platforms	Windows; OSX	Windows
Languages	C#	C++, C#, Lua
Mobile targets	Windows Phone; iOS; Android; BlackBerry 10; Tizen	iOS, Android
VR targets	Oculus Rift; Gear VR; Google Daydream, Cardboard; SteamVR/HTC Vive	Oculus Rift, HTC VIVE

GAME ENGINE COMPARISON

References :

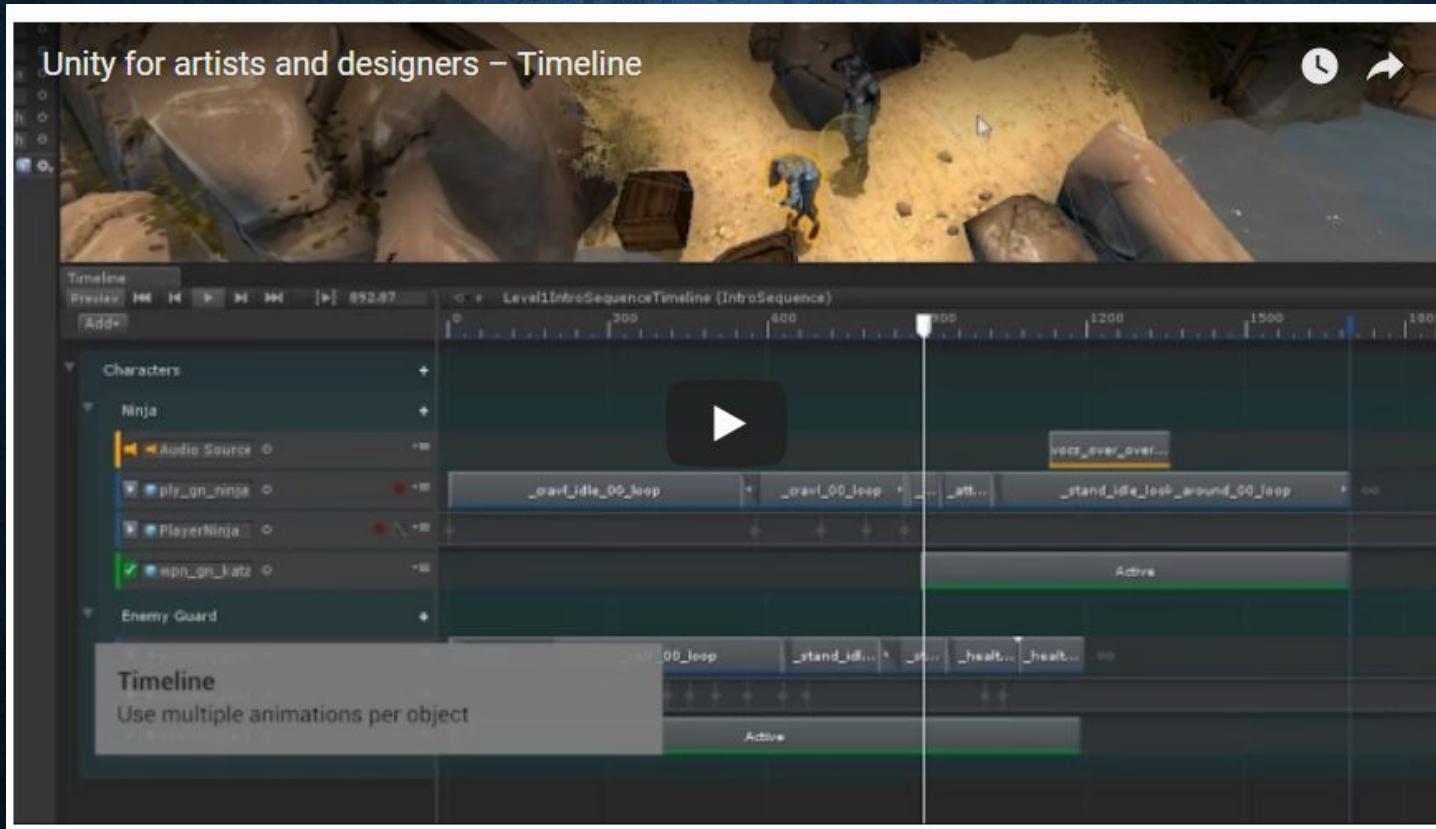
[https://www.slant.co/versus/5128/5125/~unreal-engine-4 vs cryengine](https://www.slant.co/versus/5128/5125/~unreal-engine-4_vs_cryengine)

UNITY GAME ENGINE FEATURES

UNITY 5 What's included	PERSONAL EDITION		PROFESSIONAL EDITION	
	Info	✓	✓	✓
Engine with all features	Info	✓	✓	✓
Royalty-free	Info	✓	✓	✓
All platforms (limitations apply)	Info	✓	✓	✓
Customizable Splash Screen		✗	✓	
Unity Cloud Build Pro - 12 Months	Info	✗	✓	✓
Unity Analytics Pro	Info	✗	✓	
Team License	Info	✗	✓	
Prioritized bug handling	Info	✗	✓	
Game Performance Reporting	Info	✗	✓	
Beta access	Info	✗	✓	
Unlimited Revenue and Funding	Info	✗	✓	
Future platforms included	Info	✗	✓	
Professional editor skin		✗	✓	
Asset Store Level 11	Info	✗	✓	
Professional Community Features	Info	✗	✓	
Source code access	Info	✗	\$	
Premium Support	Info	\$	\$	

UNITY 2017.1 NEW FEATURES

Timeline



INV4015 Unity Game Development Courses

UNITY 2017.1 NEW FEATURES

▀ Cinemachine



3D MODELLING, GRAPHICS-TEXTURE, ANIMATION, SOUND

UNITY 3D MODEL FORMAT

- Supports importing Meshes from two different types of files:
 - Exported 3D file formats
Support .fbx, .dae (Collada), .3ds, .dxf, .obj,
and .skp files
 - Proprietary 3D or DCC (Digital Content Creation)
application files
Support .max and .blend
Software : Max, Maya, Blender, Cinema4D, Modo,
Lightwave & Cheetah3D)
- References : <https://docs.unity3d.com/Manual/3D-formats.html>

UNITY TEXTURE FORMAT

- Default
- Normal Map
- Editor GUI and Legacy
- Sprite (2D and UI)
- Cursor
- Cookie
- Lightmap
- Single Channel
- import format: JPG, PNG, PSD, TGA

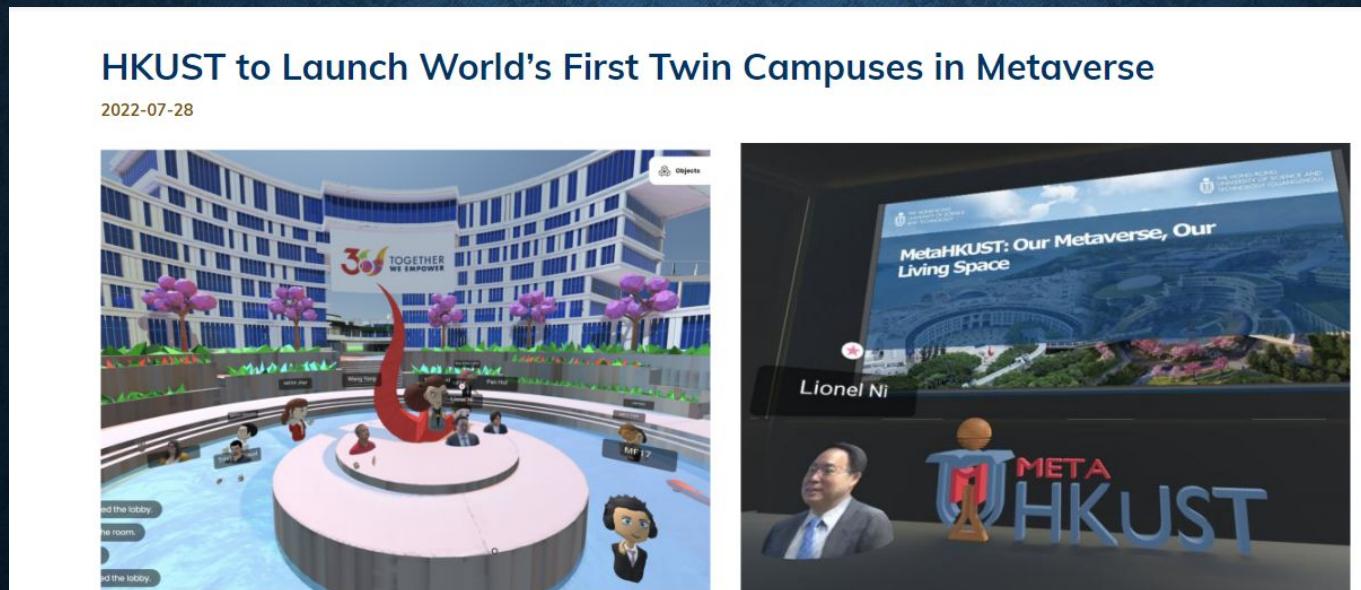
UNITY SOUND FORMAT

- Supports formats

format	Extensions
MPEG layer 3	.mp3
Ogg Vorbis	.ogg
Microsoft Wave	.wav
Audio Interchange File Format	.aiff / .aif
Ultimate Soundtracker module	.mod
Impulse Tracker module	.it
Scream Tracker module	.s3m
FastTracker 2 module	.xm

NEWS

- <https://hkust.edu.hk/news/research-and-innovation/hkust-launch-worlds-first-twin-campuses-metaverse>



HEALTHCARE IN THE METAVERSE AT SEOUL NATIONAL UNIVERSITY BUNDANG HOSPITAL



CASE STUDIES

Use Cases

1. Training & Simulation
2. Recruiting
3. PTSD Treatment
4. Meetings & Collaboration
5. Augmented Maintenance
6. World-Scale Visualization



PROJECTION FLIGHT SIMULATOR



ARTILLERY SIMULATOR



CESIUM 3D GEOSPATIAL



AR FIELD MAINTENANCE (PTC)



3D ENGINE VISUALIZER

