

Project

by Sasha Stepanov

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RESEACRH

Igor the conqueror

RPG game

Sasha Stepanov

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Proposal

Title

Role Playing videogame - "**Igor the conqueror**"

Goal

By doing this project, I want to get enough skills and knowledge about the process of creating an interactive product. The ultimate goal is to create an simple RPG game that meets all the requirements of both an ethical and legal nature, as well as a technical one. The game should be interesting and easy to play.

Target audience

My target audience is probably in their mid-20s to mid-30s, who grew up with a 2D games consoles such as Gameboy, Sega Mega Drive 2, Nintendo etc, who likes music from Arcade games machines. By this age my target person would have a family or start one. Might have a full-time job/student. This game will be perfect for person who likes Single-dimensional (SD) games with a little of story that easy to follow. Some experience in gaming is preferable. My target audience is not necessarily cares about graphics. Whenever client has a free time she or he can dive into game and play it.

Objectives

Main goal of a RPG game is Entertainment.

Since the product is an RPG game, it develops such qualities as motor skills, logical thinking, and memory. The game will be completely free and devoid of unnecessary ads every 30 seconds.

Может еще что-то

Content

Classic RPG game with build in menu (with an opportunity for an Android in future), bosses, battles, dialogs, money, shops.

Player spawn at main map with shops and different exit for exploring the different maps, where adventure await. Game will include bosses, shopping for a weapon etc.

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How to control: Four keyboard keys that are used to interact with video games in Arrow keys or a controller. W and S control forward and backward movement, while A and D are left and right.

Arrows also can be used by default.

All actions such as battles, dialogues, purchases for simplicity are carried out by pressing the left or right mouse button

Language: English

Game is 2D and pixelated.



Content treatment

I imagine a product presentation in a comfortable environment, perhaps similar to home, where the user would feel comfortable. The game will already be downloaded and built on the user's computer. The user will be given 100% freedom in choosing further actions, there will be no pressure or instructions from my side, since he himself must understand both how to control and the rules of the game. After all, if he does not do this himself without the help of the creator of the game, then this is an unfinished product. I do not expect any fantastic reaction, because the RPG genre is far from new and therefore it is very difficult to surprise a new user, especially from the first minutes. Therefore, the most pleasant thing that I can hear from the user is that the controls are simple, the game is exciting. It will be very important for me if the user's feedback coincides with the GOAL of the project.

Delivery / development platform.

The Unity Game Platform will be used to create the game. It is ideal for creating both 2D and 3D games. All the functions, methods and features I need are already installed in the platform. It also has all the necessary assets for playing and creating maps and heroes. Other software and hardware will be more or less standard and may change depending on the situation.

Visual Studio - text editor.
GoldWave - Music editor.
GIMP – graphic editor (including video and pictures).
C# - programming language.

Media Assets

Everything needs to be done according to requirements and standards. Audio, pictures, game-plan.

Why I choose and what I choose to create a game.

Image: For my project RPG Game PNG format was chosen as a format that support alpha transparency which is extremely important for a 2D Game Developing. Another advantage of this format is lossless compression. Most software supports writing it, most libraries support reading it, it's a standard popular format. Besides PNG another format might be very useful for creating a sprites and maps is PSD, as photoshop is very useful tool for game developing.

PNG is a best choice for UNITY platform as a no matter what you use Unity will Convert them to DDS DXT5(not always DXT5) when you build or when you run the game.

Audio: For my project I am going to use Ogg format with a bit rate of 128Kbps, because size of a file is very small, which will be very useful for a game. However, Unity supports Ogg, MP3, and WAV, it is the best practice to import audio files in any of those formats uncompressed and let the Unity do the encoding.

In addition, Unity sets all audio assets to Vorbis by default.

By default, Unity sets all audio assets to Vorbis. At first, this seems like an attractive setting because all the files are much smaller. However, this combination requires a lot of precious CPU resources for decompression and makes load times significantly higher.

Ogg Vorbis	44100Hz	128Kbps	245Kb	Very good
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Text: When choosing the color of the font and background, you need to consider that the client may be dyslexic, epileptic, or colour-blind person. Therefore, it is necessary to exclude such combinations of colors as red and green, blue, and purple. Increase the spacing between lines and letters to make it easier for dyslexics to read. Do not use too bright and flashing combinations.

Font size will be large enough for the main menu aprox.72pt, medium for the game menu and dialogues aprox.20pt.

As for the font family, I decided to use the most standard - Verdana despite the fact that the game has a fantasy concept.

Video: Classical animation will be used for animation in my project. For movement, 4 pictures in different positions will be used to create the illusion of walking. To do this, the unit has a special future, the necessary pictures need to be arranged in the right order and the time between adjacent speed pictures must be set. It is very important that the last picture is added again to create the complete illusion of walking.

The format for animation is pixel art with PNG extension, the quality of the images is in last place, as this is a 2D pixel game.

For storyboarding I am going to use Go-Pro with a stop motion feature to create animation by changing and move objects and background.

For recording my tutorial, I am going to use screen recorder, fortunately market full of them. For example, Filmora, Gimp, Game Bar – built-in Windows 10 screen recorder, Bandicam etc. GIMP provides a wide range of features, easy to use, change size of PC screen, moreover I am using it already as my photo editor.

Ethical and legal issues

Idea must be unique, preferably licensed. With no copyright problems. All pictures, video, images, animation, and sounds will be from an open source, which means I am not going to violate act of privacy. No information will be collected from a clients/(customers) player. Game will be free to use.

To avoid any conflict situations, the initial plan is to use, if possible, only open sources with free use. I will indicate the sources of the content. Game assets for the game are available in the public domain, some of them are free.

No collection of customer data will be carried out due to its uselessness. Therefore, all legal problems should not affect my project. Provided that the product is

uploaded to the play market, Google will have standard information, but it does this for its own selfish purposes. Unfortunately, this cannot be changed or waived.

Upon successful creation of a finished product, a license can be issued free of charge or purchased on the creativecommons website. This will allow me to create rights to my product and protect me from intellectual property theft.

Total time estimated

140 hours at least I will need to finish this project. It will vary and will depend on my workload and health, also serviceability of hardware and software.

Project Plan: 2D RPG Game with UNITY by Sasha Stepanov

Phase	Activity	Estimated Time (hrs)	Due Date	Actual Time (hrs)	Actual Date	Variance (hrs)
Discovery	Client Interview	1		1		0
	Define Objectives and Goals	0.5		0.5		0
	Target audience	0.1		0.1		0
	Information gathering repository	5		6		1
	Proposal/Wision Statement	4		6		2
	Risk Analysis	2		1		-1
Exploration	Plan	2		3		1
	Specifications	10		15		5
	Initial storyboard	2		2.5		
	Further refined storyboard	0.5		1		
Refinement	Completed storyboard	2		3		
	Test prototype	20				
	Testing of prototype	5				
Production	Refinement of prototype	10				
	A production of the prototype	30				
	Creating a tiles/maps	10				
	Game Production (player,b)	25				
	User Testing	2				
Implementation	Product changes/polish	5				
	User testing	2				
	Changes made	3				
	Client presentation	0.5				
	Product delivered	1				
		total time	143.6	39.1	Total Variance	8

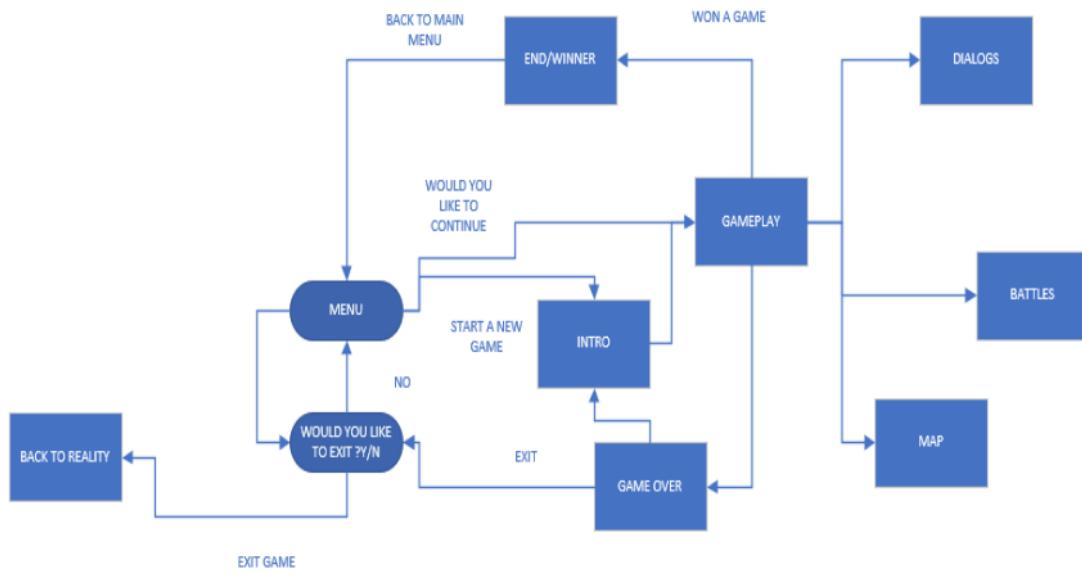
Risk assessment

A baseline risk assessment was conducted to assess the possible reasons for the failure of the project.

A	B	C	D	E	F	G	H	I	J	K	L
#	Risk Statement		(Scale)	(Scale)	Exposure	Mitigation	Contingency	Triggers			
	Condition	Consequence	Probability	Impact							
3	covid	no face-to-face study	20	10	200	set up everything for self	everyone in online studying	no self isolation etc			
4	WW3	very big	3	60	180	negotiation	hard life for everyone	russian invasion			
2	computer breakdown	hard to carry on on doing homework	10	10	100	look after it,use a bag,case	buy another one	dropping down			
5	accident to family member	dropping class immediately	1	100	100	look after family members,health	orange a break date and	accident			
1	faulty hard drive	loosing a whole study materials	5	7	35	GitHub,backups	have a second laptop/harddrive	viruses etc			
6											
7											
8											
9											
10											
11											
12											
13											
14											

Navigation Map

For a better understanding of the game, a navigation map has been created.



Low-fidelity prototype.

For my low-fidelity prototype I have chosen a storyboarding card. With the help of especially handmade cards, I will be able to illustrate the scheme and plot of the game for my client. In addition, the client will be 100% involved, as he will follow my commands by moving the figure around the cards and performing basic commands, such as draw a sword or start a dialogue.

REPORT SECTIONS

Implications and Ethics

In today's world, you need to be careful and make sure that the product is legal and safe to use. This chapter will address ethical issues and implications.

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Implication of a screen time



<https://www.verywellfamily.com/the-negative-effects-of-too-much-screen-time-1094877>

Potential harm of an excessive screen time.

A growing body links excessive and addictive use of digital media to physical, psychological, social, and neurological adverse effects. Research is more focused on mobile device usage, and research shows that duration, content, night-time usage, media type, and number of devices are key components in determining the effects of screen time. Physical health implications: Excessive screen time is associated with poor sleep and cardiovascular risk factors such as high blood pressure, obesity, low HDL cholesterol, poor stress regulation (high sympathetic arousal and dysregulation of cortisol), and insulin resistance. Depressive symptoms and suicidal ideation are associated with screen time, late-night digital device use, and sleep deprivation caused by cell phone addiction. Early and long-term exposure to violent content is also associated with reduced risk of antisocial behaviour and reduced prosocial behaviour. Psychological and neurological effects: The use of

screen time addiction reduces the ability to deal with social problems and is accompanied by passionate behaviour similar to that of drug addiction. Structural brain changes associated with cognitive control and emotional regulation are associated with addictive behaviour in digital media.⁷

Conclusions

Excessive use of digital media by children and adolescents appears to be a major factor that may hinder the development of healthy psychophysiological resilience.⁵⁰ [https://pubmed.ncbi.nlm.nih.gov/29499467/#:~:text=Physical%20health%20effects%3A%20excessive%20screen,dysregulation\)%2C%20and%20Insulin%20Resistance.](https://pubmed.ncbi.nlm.nih.gov/29499467/#:~:text=Physical%20health%20effects%3A%20excessive%20screen,dysregulation)%2C%20and%20Insulin%20Resistance.)

What can help: Reducing screen time can significantly improve a child's health and development.

Ages 0-2: No viewing at all

Age 3-7: ³² 0.5-1 hours a day

Age 7-12: 1 hour a day

Age 12-15: 1.5 hours a day

Age 16 and older: 2 hours a day

Recommendations to Reduce Damage to the Eyes

- Reduce brightness of a screen
- Use breaks (pomodoro system)
- Use correct lighting
- Wear special glasses

⁹⁴ <http://www.netivei-reshet.org/en/node/76>



⁵⁹ https://www.rcpch.ac.uk/sites/default/files/2018-12/rcpch_screen_time_guide_-_final.pdf

³⁵ Positive impact of a screen time

1. Screen time is good when technology is used as a tool
2. Screen time leads to writing more
3. Screen time helps your child learn discernment
4. Screen time helps families set boundaries
5. ⁶⁶ Screen time is educational
6. Screen time can lead to responsible children

<https://literateforlife.org/screen-time-benefits/>

Licensing

The license for the product must be issued in accordance with all standards. The ⁸⁰ standards can be found at <https://creativecommons.org/licenses/by-sa/4.0/>

This will prevent plagiarism and protect the product with the principles of private and intellectual property, which is very important in the digital age.

If the product has a license, this does not mean that all ethical and legal difficulties have been resolved. It is very important to know and follow the 13 principles of the privacy act.

Privacy Act

The Privacy Act 2020 stays about rules that user's information can be collected, stored, shared, or viewed.

It guarantees that:

If you want - you can get an access to your information.

You must be notified if and when your information is collected.

All information that have been collected is used in shared in an appropriate way.

All information is secure and safe.

There are twelve main principles that create a whole act about privacy.

Principle is about reason for collection.

Principle is staying that information that collected must be from a source.

Principle saying that organization should be open for the reason of gathering information.

Principle is about way of collecting information.

Principle is about security and the way is information is going to be stored.

Principle is about person's right to access his own information.

Principle staying that person is allowed to correct it in a right way.

Principle staying that organization must check for correctness of information they are collecting.

Principle staying that all information that has been gathered should have an expiration day.

Principle says that there are limits of the ways collected information can be used.

⁶² Principle states that the information collected may only be used for the purposes for which it was originally collected.

⁷⁸ Principle states that the information collected may only be used for the purposes for which it was originally collected and do not leave New Zealand.

Principle states that organizations cannot assign an ID to a customer, unless specified.

Following these principles will help avoid any legal issues.

⁸⁷ <https://privacy.org.nz/privacy-act-2020/privacy-principles/>

Dark Patterns

Another very important aspect in the development of any IT product is to be aware of dark patterns.

It is very important that the product, whether it be a website or an application, a game, leave a good impression on the user. Therefore, it is very important not to use or limit the use of dark patterns. After all, no one likes to be deceived.

Darke patterns is a way of tricking a user, make him act like you want it, signing up for something without fully realization of what is happening.

The away dark pattern work is very simple. Usually, it works on customer misunderstanding or laziness of a user to read everything.

There are few types of dark patterns, there is no point in going into details as the title explains itself:

- ⁴⁶
- Trick questions
 - Sneak into basket
 - Roach motel
 - Privacy zuckering
 - Price comparison prevention
 - Misdirection
 - Hidden cost (Personally my favourite)
 - Bait and switch
 - Confirm shaming
 - Disguised advertisement
 - Forced continuity
 - Friend spam

⁸⁸
The use of any of these dark patterns can lead to a loss of trust or complete loss of a client. All of these patterns are legal or semi-legal in the gray area.

⁹¹
<https://www.darkpatterns.org/types-of-dark-pattern>

Analysis of ethical issues

Type of collected data	likelihood of giving consent	Comment
Geolocation	8/10	Used everywhere already.
Name, surname, dob.	10/10	That information is not private anymore.
Credit card information	4/10	Must be a good reason for giving such a sensitive data.
Access to microphone	5/10	Need to be a good reason for a collecting.

Access to media and files	2/10	Feels like a breach of privacy.
Access to contact	5/10	Need to be a good reason for a collecting.
Researched history	4/10	Most of the website doing it anyway with a cookies.

After analyzing the types of data that are usually requested on sites or when installing an application, we can conclude that such sensitive information as a credit card or personal files from a device is not readily given by users. If possible, it is better to avoid collecting too much personal data, because this can look suspicious and alienate a future client. In addition, it may violate human rights to private property.

Design Thinking & User Experience

Both methods are fundamental for any interactive media projects. Despite obvious similarity between method there are some significant different between them. The user-centred design or UCD and design thinking or DT method became extremely popular in finding solution to a problem.

User Centered Design

UCD is an approach to design that place users' needs front and in the center. Method is carried out based on iterative design process where user is involved on every iteration. Major part of design decisions is made based on user's expectations and needs, however requirements of the company are still considered and taken to process. The main purpose of UCD is to work with an user and create a product that will satisfy all desires and functional wishes of an user.

There are five key principles that guide user-centered design and four main steps that make up the UCD process.

To successfully used this method, it is important to follow main principles of UCD:

The main principles of UCD are:

- An end user involvement. User must be involved at the very beginning.
- A clear comprehension of goals and user needs
- Regular “check-in”, analysis, and collection of feedbacks from the user.
- Keep using iterative design until goal is reached and user is happy
- Implementation of a user-centric approach is crucial.
- Employing a user-centric approach to product development and delivery procedures

The four steps of the UCD process are following from 5 main principles. Those steps are illustrated below.

The UCD Process

.....



⁴³
<https://careerfoundry.com/en/blog/ux-design/design-thinking-vs-user-centered/>

1. Customer insights and understanding of a problem and a context of use.
2. Specify. Why this product is beneficial for an user and a company.
- ⁸⁴
3. Create design solutions.
4. Evaluate. Design checking and testing.

After all iterations of the UCD process has been completed, there is no need to stop, company should keep iterating through them until desired solution is created.

Design Thinking

When creating an app or game or website - one of the most important aspects must not be forgotten it is to design a user-centred product. Companies often believe that ²² they have the perfect solution for their customers and want to participate in the development process before asking themselves - "Is this really what my customers / users want?" Design thinking is a creative problem-solving process and is the key to how new project should be started. Design thinking discourages everyone from starting with assumptions and building products on them before testing their validity. Rather, it encourages the team to take a step back and focus on the people product will be created for. This will ultimately lead to better, more useful apps. Design Thinking is the process by which users research, gather facts, identify personas, consult with subject matter experts, and brainstorm to generate

maximum ideas. From these ideas, the best idea is prototyped and quickly tested what works best for the user and how it works best to improve.

<https://freshworks.io/design-thinking-process/>

Design thinking ¹⁶ it is a process which is highly and progressively user-centric. There are 4 principles of Design Thinking:

1. The human rule. All design activity is social in nature.
2. The ambiguity rule. Ambiguity is inevitable – experiment at the limits of your knowledge.
3. All design is redesign. While technology and social circumstances may change, basic human needs remain unchanged.
4. The tangibility rules. Prototypes help to make ideas tangible, enabling designers to communicate the effectively.

The Five Phases of Design Thinking

⁷⁹ From these four principles 5 stages of design thinking follow. There are Empathize, Define, Ideate, Prototype, Test and the sixth is Implement, but sixth one is not going to happen until product is ready passed all stages, sometimes more than ones.



<https://freshworks.io/design-thinking-process/>

⁸ While these steps may seem sequential, it's important to understand that design thinking does not follow a strictly linear process. At each step of the process, you can make new discoveries that require you to go back and repeat the previous step.

Stage 1: Empathize

⁶¹ Research and process the user's needs and wishes, you need to gain an empathetic understanding of the problem you are trying to solve, usually through user research. One of the keys of this step is -leaving all assumptions behind and let a customer to speak. This way you gain real insight about users and their needs.

² https://canvas.unl.edu/courses/73802/pages/5-stages-of-design-thinking?module_item_id=1968000

²⁵ Stage 2. Define

Based on what have been learned during the empathy phase, the next step is to define a clear statement of the problem. Problem statement identifies the specific challenge needs to be solve. It will guide the entire design process from now on, give a fixed goal to focus on. When crafting problem statement, it is necessary to focus on the needs of users rather than the needs of company. A good problem statement is people-centred, broad enough to be creative, but specific enough to provide guidance and direction.

⁸ <https://www.invisionapp.com/inside-design/what-is-design-thinking/>

Stage 3. Ideation

In this step Challenge Assumptions and idea creation is happening

The knowledge base learnt from the first two stages now can be used "thinking outside", looking for alternative ways of looking at problems, and identifying creative problem solution statement. Brainstorming is especially helpful at this stage.

² https://canvas.unl.edu/courses/73802/pages/5-stages-of-design-thinking?module_item_id=1968000

Stage 4: Prototype

After all ideas have been narrowed down to a few, next step is turn them into prototypes or "miniature" versions of the product or concept needs to be tested.²⁵ The prototyping phase gives a chance to "build" something tangible that can be tested on real users. This is important to maintain a user-centric approach.⁸ Depending on what needs to be tested, prototypes can take many different forms, from basic paper models to interactive digital prototypes. Before create a prototype, a clear goal must be in mind; know exactly what prototype need to represent and then test it.

⁸

<https://www.invisionapp.com/inside-design/what-is-design-thinking/>

Stage 5: Test

Improve the product During this phase, by running/making tests for the product using the discoveries and solutions discovered during the prototyping phase.¹² While this is the final stage of design thinking, it's important to note that this is not where it stops. Because the design thinking process is iterative, the results generated from testing can often lead users to redefine the problems that needs to be solved.¹² This means you can regularly go back and revisit other design stages to refine the product to be as efficient as possible. Thorough testing can really give a deeper understanding of a product and users.¹² Therefore, returning to other phases should not be considered as failure, but improvements.

¹²

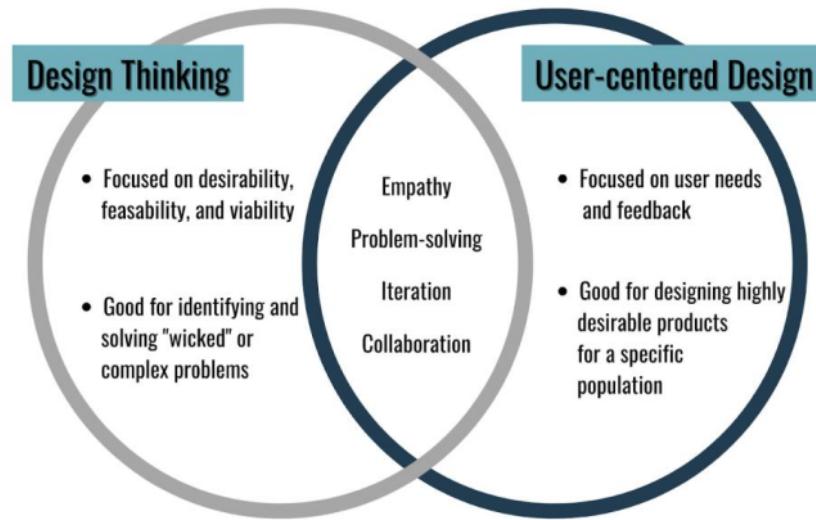
<https://www.maqe.com/insight/the-design-thinking-process-how-does-it-work/>

CONCLUSION

By using Design Thinking method natural flow is created, which makes process of idea and research to rollout faster and easier.

Dive into "customer head" can produce a very important data which can be transformed into insights, which might lead to change of a design.

Difference between DT and UCD



In conclusion there are a lot of similarity between those two methods - both methods are contained 4 stages that should be iterated constantly.

Main different between those two methods is focus. UCD is focused on user needs and feedback, on the other hand DT is based on desirability, feasibility, and viability.

⁴³
<https://careerfoundry.com/en/blog/ux-design/design-thinking-vs-user-centered/>

Design Planning Techniques (Low – High Fidelity)

⁷⁴

As a fourth stage of design thinking process **prototype** is one of the most important stages, especially because user or customer is finally involved. At this stage customer will receive some idea or rough model of what it's going to look like, at this stage customer can add some requirements and specifications.

⁹

A **prototype** is a draft version of a future product that can help to explore any ideas and describe a particular feature or the overall design concept to users. It is

important to do this stage before any proper design developing started. There are two types of prototypes **high-fidelity** (fully functioning site/template with some functionality) and **low-fidelity** (usually paper drawings). <https://www.visual-paradigm.com/guide/ux-design/wireframe-vs-storyboard-vs-wireflow-vs-mockup-vs-prototyping/>

High-fidelity prototyping

High-fidelity prototyping is an ⁶⁴ interactive representation of the future product in its closest similarity to the final design, including colors, details, and functionality". The "high" refers to the level of fullness that allows to examine usability questions in detail and make conclusions about the user's behaviour. High-fidelity prototypes look very similar to the end product.

Advantages of high-fidelity prototypes

- More interaction for the user.
- Likeliness of a user to navigate and work through a product on themselves with not much help from a designer.
- The closer to the completion of the product, the clearer the designer sees the final product
- Stakeholders able to see final product, after revision they can finalize some aspects of design to be changed.

Disadvantages of high-fidelity prototypes

- Takes more time to produce
- User might go to deep into details and ask to many questions about some minor things, because product looks almost finish and very realistic.
- At this stage it is very hard for designers to take criticism and implement changes for their working prototype.

Both prototype methods are often applied on the same product, with low-fidelity prototypes at the start of project and high-fidelity prototypes towards the end when reviews and tests become more refined.

2

<https://blog.prototypr.io/high-fidelity-prototyping-what-when-why-and-how-f5bbde6a7fd4>

Example of high-fidelity prototype.

Very good example of a high-fidelity prototype is Mockup. It is static design for representing a future product. Mockup is representation of an actual final screen, where wireframe shows only a structure. This design helps to make a final decision about color schemes or layout of elements, but at this stage it is still not clickable or interactive. It also helps to give the user a more realistic impression of a final product. Despite lack a functional part, mockup can provide a final look for a customer, sometimes that is all what they want to see.

2

<https://www.visual-paradigm.com/guide/ux-design/wireframe-vs-storyboard-vs-wireflow-vs-mockup-vs-prototyping/>

Low-fidelity prototype

Low-fidelity prototype represent a kind of sketch or paper model of the future product. With this model the client can interact and start making their own adjustments, which will be installed in high-fidelity prototype.

Advantages of low-fidelity prototypes

- Fast
- Inexpensive
- Can be changed very quickly
- Disposable
- Helps the designer to see a whole overview of a future product
- anyone can make a low-fidelity prototype, even unexperienced person
- Fosters design thinking

Disadvantages of low-fidelity prototypes

- Not realistic
- Bad quality and accuracy prototypes may lack validity
- May not be applicable for some products
- Some help from a designer might be necessary when user is going to interact with a prototype

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<https://www.workshopper.com/post/design-thinking-phase-4-everything-you-need-to-know-about-prototyping>

Examples of low-fidelity prototypes:

Sketching

Sketching is a low fidelity prototype method that can help to visualize at the very beginning of developing process. Can be done by pencil and paper. Wireframe and storyboarding are based on sketching.

Storyboarding

9

A storyboard is a visual representation of the scenes, dialogs, action in a sequential specific order. It is a method used to imitate ideas, designs and concepts for websites usually by presenting a sequence of wireframes in a order which could be already developed in the earlier development stage.

Storyboards can help to get a visual overview of a product. This is especially useful when creating a game that might contains many steps. This is a very quick way to see what game will look like before prototype or test it. Storyboarding the interaction between game history and different gameplays is an easy way to unravel problem areas before they appear in the expensive development phase.

2

<https://www.visual-paradigm.com/guide/ux-design/wireframe-vs-storyboard-vs-wireflow-vs-mockup-vs-prototyping/>

Storyboard for game

At the very beginning of storyboard is creating "cards" that would describe plot points and events. Each card might be a few lines of text, script, a scribbled-down idea, or a sketch of a scene or even just a picture.

To accomplish the best result in creating a storyboard card some tactics might be handy.

First tactic is to create cards that would describe plot and idea. For example:

- Primary Event Cards
- Secondary Event Cards
- Gameplay Event Cards
- Bonus Cards
- Character, attributes (sword for example)
- Bosses or battle stage

Second tactic is to organize the board. Once all the story cards are created, it's time to put them into order. It is very important to start from somewhere, even if order is wrong, it is very easy to fix it by just shifting the around until desired result is achieved. It can be done in Chronological Order or State or Sequence Order.

Third tactic or step is review and revise. After some "playing" with a cards, putting them in different order it is important to step back and review what is accomplished so far. Some feedback on what have been accomplished is required.

<https://gamescrys.com/blog/how-to-storyboard-your-game/>

Wireframe

A wireframe is a sketch design of the future system, which must be fulfilled before any design work is started. Through clearness and simplicity, it allows anyone to read and understand it easily. Wireframe shows information with not many details, but enough to see a full picture and visualize a future product. At this method scenario can be showed to a customer for a future specialization and list of requirements from a customer. Wireframe can be called a blueprint, as it defines structure, content and functionality.

Benefits of wireframing are:

- Wireframes are easy to draw. Can be completed by pencil and paper
- Usually, it is easy to understand wireframes
- Easy to modify.
- No coding needed.
- In-line annotations. Specification and annotations can be showed on sketches.

² <https://www.visual-paradigm.com/guide/ux-design/wireframe-vs-storyboard-vs-wireflow-vs-mockup-vs-prototyping/>

Wireframe vs Storyboard

Comparison Chart

Wireframe	Storyboard
A wireframe is a visual representation of the layout of your website without the fancy elements, such as fonts, colors, etc.	A storyboard is high level and more detailed wireframing that can be used to create mock-up screens.
A wireframe is a linear representation or framework of a website or application.	A storyboard is more dynamic in structure in terms of grouping and ordering.
Wireframes allow you to establish hierarchy of information on the website or application.	Storyboards act as a catalyst for further discussions with your client (or clients).

¹¹ <http://www.differencebetween.net/technology/difference-between-wireframe-and->

storyboard/#:~:text=A%20storyboard%20is%20quite%20similar,goes%20further%20inside%20the%20application.

Paper prototyping

Paper prototyping is a good way to create and test new designs in a short period of time. If paper prototype used correctly, it can provide maximum learning for minimum effort. Paper prototype a mix of techniques such as drawing, simulating, testing in according to create quickly “interface” for an user to interact with.

Cons of Paper Prototyping.

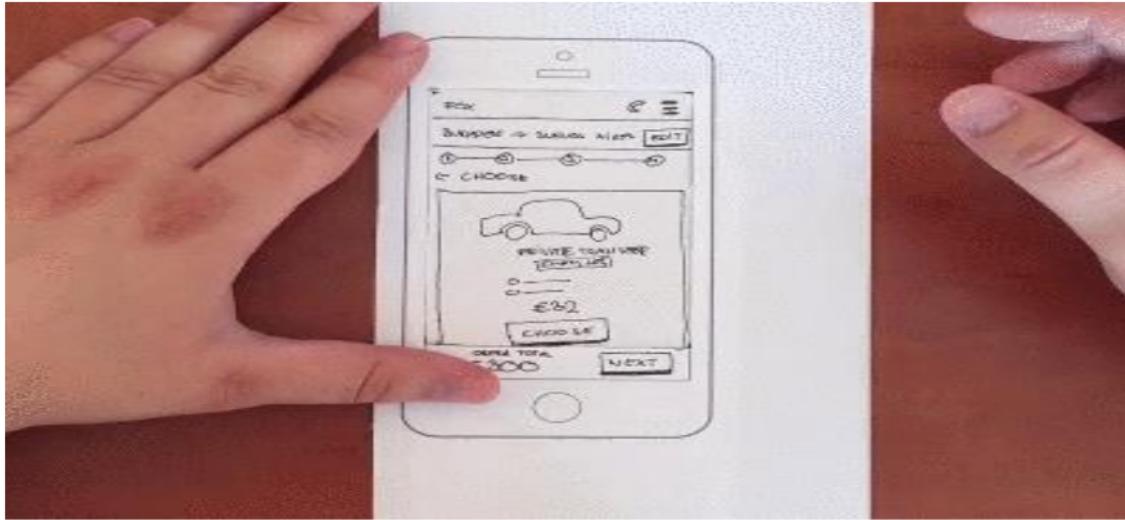
- User interaction at an early stage
- Cheap
- Encourages creativeness and imagination
- No design or coding skills required
- Minimum resources needed
- Fast evaluation and testing
- Assists in documentation
- Very popular in IT industry

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<https://usabilitygeek.com/paper-prototyping-as-a-usability-testing-technique/>

Disadvantages of a paper prototypes.

- Might be hard to explain design.
- No testing online, only in person
- Limited context and interaction



<https://uxplanet.org/the-magic-of-paper-prototyping-51693eac6bc3>

Summary

Wireframes and storyboards are very similar, they basically follow the same pattern of navigation scheme and layout with no visual elements, thereby make life of web designers and web developers easier. Both wireframing and storyboard are proposed techniques that are applied at very early stages as prerequisites in the web development process. However, storyboard can be called - high level wireframing with better representation, sketches, layouts to share with the client to make sure that everybody is on the same page and work toward a goal. Wireframe and storyboard are playing one of the most crucial parts in UX deliverables.

¹¹
<http://www.differencebetween.net/technology/difference-between-wireframe-and-storyboard/#:~:text=A%20storyboard%20is%20quite%20similar,goes%20further%20inside%20the%20application.>

Testing of functionality and usability

Difference between usability and functionality testing

Functional testing

Functional testing is a necessary step to accomplish a good quality IT product. This testing is necessary in order to make sure that the product behaves exactly as the ball is programmed, it is important to understand that this testing does not include testing the design part of the product. Testing usually involves using a different input data to discover that a feature is not working properly.

In turn, usability testing is responsible for ease of use by the customer. It is important that the user himself performs the entire procedure and the desired result is obtained without any external assistance. This testing includes such aspects as: testing the overall structure, the arrangement of elements on the page, content clarity, game play and overall behavior of the product.

First, functional testing is carried out, then, if any shortcomings or errors are identified, these errors are eliminated, or in other words bugs are fixed. Then usability testing is carried out already on a working product, since if you conduct a usability test on a product that has problems with the functional part, this will only add difficulties and confusion for the user.

Both tests must be conducted by a person who is not associated with the production of the product to eliminate bias.

Usability testing process

The user must complete a certain number of steps in order to complete some action or use of the product. After each completed action, the user answers certain questions related to the task. Questions should be of a different nature and structure. For example, multiple choice questions should be used to make it easier for the participant to answer them without feeling pressure from outside. Often participants are asked to comment on what is happening and think out loud, while

describing their emotions is welcome. It is very important to get a full review with comments about the test after ³⁹ usability testing.

<https://qualitestgroup.com/insights/white-paper/functional-testing-vs-usability-testing/#:~:text=A%20simple%20way%20to%20think,and%20successfully%20use%20the%20product.>

Ten simple rules for a proper usability testing:

- Keep feedback with a user.
- User speaks, not programmer.
- Make sure there is an undo and quick get-aways for a user.
- Make sure testing is based on standards and consistency.
- Keep error alerts away from customer.
- Users need to learn, not to memorise.
- Provide a user with a shortcut key, access key and other helpful tips if necessary.
- Minimum design - maximum functionality.
- Show a user how to recognize, diagnose and recover from mistakes.
- Document all answers, behaviour, all help that have been provided.

Functionality testing example based on future game

test id	test description	Steps including testing data	expected result	actual result	pass/fail
1	verification for: game is building (starting)	1. double click with an LMB 2. or right click + open	game is opening and main menu should appear		
2	verification for: all buttons and background is loaded	Observation	1. Background picture should appear 2. "Continue", "New Game", "Exit" button should appear		
3	verification for: exit button is working	Click on EXIT button with an LMB	Exiting a game		
4	verification for: new game button is working	Click on NEW GAME button with an LMB	Starting a new game, menu for a player is appearing		

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NOTE

LMB – left mouse button

RMB – right mouse button

Full Initial functionality test will be provided with all accompanying documents

Usability testing example based on future game

A special stencil will be used for usability testing. A special setting will be selected or created for the test subjects. In addition to the setting, the conditions under which the user will want to download the game will be created or told. At this stage of the project, one scenario for one user will be described.

Settings: special arcade / adventure music will be playing in a background. Test will be held in a comfortable environment like a home.

Scenario: Client is in a long wait for WOF at AA. He was scrolling a PLayMarket and found a new free game with no ads. Client downloaded game and started to play.

Reason for testing: Checking whether the logic of the game is clear, the relationship of characters and maps.

Prototype: For prototype purpose storyboarding cards will be provided. Cards contain characters, maps, shops, battle stage etc.

Consent: Before an interview and test user will be explained the main reason for this test and will be asked to sign a consent agreement. Permission for recording an process will be asked.

Evaluation:

- The assessment of the test will take place in four forms. The first is my evaluation of how well or poorly the subject is doing with the game. It is very important to understand that I will evaluate the comprehensibility of the product and not the ability of the user.
- The second is the likert chart that will be given to the client at the beginning of the test.
- The third is user comments. Commenting on their actions, the user will greatly help assess the usability of the product.
- The forth form is Feedback Capture Grid: I like...I wish....What if...

User will be given a full freedom for answering those questions.

Likert Scales

Please circle the number that represents how you feel about the computer software you have been using

I am satisfied with it

Strongly Disagree ---1---2---3---4---5---6---7--- Strongly Agree

It is simple to use

Strongly Disagree ---1---2---3---4---5---6---7--- Strongly Agree

It is fun to use

Strongly Disagree ---1---2---3---4---5---6---7--- Strongly Agree

It does everything I would expect it to do

Strongly Disagree ---1---2---3---4---5---6---7--- Strongly Agree

I don't notice any inconsistencies as I use it

Strongly Disagree ---1---2---3---4---5---6---7--- Strongly Agree

It is very user friendly

Strongly Disagree ---1---2---3---4---5---6---7--- Strongly Agree

Example of likert chart

USABILITY TEST PLAN DASHBOARD

AUTHOR	CONTACT DETAILS			FINAL DATE FOR COMMENTS
PRODUCT UNDER TEST What's being tested? What are the business and experience goals of the product?	TEST OBJECTIVES What are the goals of the usability test? What specific questions will be answered? What hypotheses will be tested?	PARTICIPANTS How many participants will be recruited? What are their key characteristics?	TEST TASKS What are the test tasks?	RESPONSIBILITIES Who is involved in the test and what are their responsibilities?
BUSINESS CASE Why are we doing this test? What are the benefits? What are the risks of not testing?		EQUIPMENT What equipment is required? How will you record the data?		LOCATION & DATES Where and when will the test take place? When and how will the results be shared?
PROCEDURE What are the main steps in the test procedure?				

The Usability Test Plan Dashboard is licensed under the Creative Commons Attribution-Share Alike 3.0 Unported License. Attribution: www.userfocus.co.uk/dashboard

Example of a usability task form.

Audio

²⁴ Sound is a type of energy generated by vibration. When an object vibrates, the surrounding air molecules move. These molecules collide with nearby molecules and cause them to vibrate as well. This causes them to encounter closer air molecules. This "chain reaction motion," known as a ²⁴ sound wave, continues until the molecule runs out of energy.

¹³ **Frequency.** If your ears are within the range of such vibrations, you will hear the sound. However, to hear the vibration, the vibration requires a certain speed. For example, you may not hear the slow vibrations that occur when you wave your hand in the air. The slowest vibration audible to the human ear is 20 vibrations per second. It will be a very low tone. The fastest vibration we can hear is 20,000

vibrations per second, which is very high-pitched. The frequency per second is called the frequency of the object and is measured in hertz (Hz).

¹⁸
Pitch is frequency related. Frequency is a scientific measure of pitch. The frequency is objective, but the pitch is completely subjective. The sound wave itself has no pitch. It is possible to measure their vibrations and give them frequencies, but the human brain needs to map them to their inherent pitch quality. The pitch of the sound is mainly determined by the mass (weight) of the vibrating object. In general, the heavier the mass, the slower the vibration and the lower the pitch. However, you can change the pitch by changing the tension or stiffness of the object. For example, a heavy E-string on an instrument may sound higher than a light E-string by tightening the tuning pegs to tension the strings.

¹³
When molecules vibrate in a medium, they can move back and forth or up and down. Sound energy causes molecules to move back and forth in the same direction that sound is propagating. This is called a longitudinal wave. (Shear waves occur when a molecule oscillates up and down perpendicular to the direction of wave propagation).

¹³
Speech (like hearing) is accompanied by vibration. When we speak, we move the air across the vocal cords, causing them to vibrate. Stretching these vocal cords changes the sound we make. Stretching the vocal cords produces high-pitched sounds and loosening them produces low-pitched sounds. This is called the pitch.

Vocabulary

amplification: The process of increasing or making stronger.

compression: The process of squeezing together or closer.

frequency: A measure of the number of vibrations per second.

Hertz: The metric unit for frequency (1 Hertz (Hz) = 1 vibration per second).

longitudinal wave: A wave with particles vibrating in the same direction that the wave is travelling.

medium: A material (solid, liquid or gas) that is used or travelled through.

molecule: A particle made up of particular atoms.

oscillation: Vibration.

percussion instrument: Any musical object that produces a sound when hit with an implement, shaken, rubbed, or scraped, or by any other action which causes the object to vibrate in a rhythmic manner.

pitch: The quality of the actual note behind a sound, such as G sharp; a subjective definition of sounds as high or low in tone.

pressure: Applied force.

rarefaction: The process of spreading apart, or decompressing.

resonance: The tendency of an object to vibrate at its maximum wave size (amplitude) at a certain frequency.

tension: A tightening stress force related to stretching an object.

tone: The quality of sound (e.g. dull, weak, strong).

transverse wave: A wave with particles vibrating perpendicular to the direction that the wave is travelling; this type of wave is not produced in air, like longitudinal sound waves.

vibration: Repetitive motion of an object around its resting point; the backbone of sound.

<https://www.scienceworld.ca/resource/sound/>

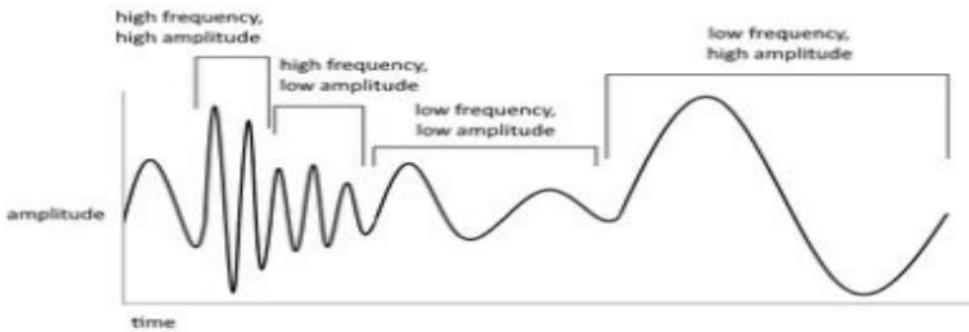
Digital audio files

49

Digital audio files are formats for storing digital audio data on a computer system and digital representation of the sound that can be heard on audio device. Audio files contain information about recordings such as voice, music, and even white noise. This information includes how the volume and pitch of these recorded sounds change, and the total recording time. The sound can be very quiet and high-pitched, like the bark of a cat, or loud and deep, like the roar of an explosion. As shown

30

below, the frequency and amplitude of sound can also be visually represented by so-called waveforms.



<https://www.omnicalculator.com/other/audio-file-size>

All audio files people are working with in the internet has to be stored somewhere. Depending on preferable format each of them displays the same information at different storage sizes or quality levels. In addition, some audio file formats contain metadata that provides information about the file or its contents.

Lossless and lossy audio files

There are two main types of audio file—lossless file formats, and lossy file formats.

1 The difference between the two has to do with data compression.

1 Some methods of data compression make the file smaller, but still retain 100% of the information in the raw audio stream. These are known as **lossless** compression formats.

Other types of compression work by eliminating data in the audio that does not significantly affect the sound. These are called **lossy** compression formats because this method discards some information.

1 Uncompressed audio formats

There are other audio file formats that do not use data compression. These are called **uncompressed** audio formats. These file types act as containers for raw audio data without affecting size or quality. Uncompressed audio files are most commonly used for recording and mixing music in digital audio workstation. Nevertheless, there are also uncompressed audio files with different quality levels. These are based on the precision and precision with which analog audio signals are converted to digital. The higher the sample rate and bit depth used the more information will be captured by the conversion process. Bit depth represents the accuracy of the AD / DA converter for measuring the amplitude or loudness level of the signal.

Sample rate means how many measurements are made per second. A higher sampling rate means that more individual measurements have been made, measured in hertz (**Hz**), or **Cycles** per second.

Some of the most common quality levels are listed below:

Uncompressed audio formats

Bit Depth	Sample Rate	Application
16 bit	44.1 kHz	CD quality audio
24 bit	48 kHz	High quality music production
24 bit	96 kHz	Archival quality audio

The most common formats of audio files

There are only few commonly world-wide used audio files.

1 Audio File Formats: How to Choose the Right File Type

The three major groups of audio file format

Uncompressed audio format	Formats with lossless compression	Formats with lossy compression
■ WAV	■ FLAC	■ MP3
■ AIFF	■ APE	■ WMA
■ AU	■ WV	■ MUSEPACK

<https://pt.slideshare.net/lesleyw/audio-codec-presentation/5>

MP3

1 mp3 ²⁹ are the most common file type for general listening. ²⁹ MPEG-1 Audio Layer-3: software that enables files to be compressed quickly to 10% or less of their original size for storage on disk or hard drive or esp (electronic skip protection) for transfer over the internet.

(<https://www.collinsdictionary.com/dictionary/english/mp3>).

83 AAC

An audio coding standard for lossy digital audio compression. Developed as a successor to the ⁵⁶ MP3 format, AAC typically delivers better sound quality than MP3 encoders at the same bit rate.

https://en.wikipedia.org/wiki/Advanced_Audio_Coding

AAC is a standard format for Apple devices (iPod).

Ogg Vorbis

Newer open-source codec. It is of good quality, free to use and does not require a license fee. It's also an irreversible codec, but much more efficient than MP3s, especially at low data rates.

This format is ¹ alternative to lossy compressed formats like MP3. It's notable for being the file type used for audio material on Wikipedia.

70 FLAC

FLAC is an audio coding format for lossless compression of digital audio. This file format ⁵⁷ provides a bit-perfect copy of a CD, but at half the size. FLAC files make ¹ listening to lossless audio possible on devices with limited storage.

⁶³ <https://www.cnet.com/tech/home-entertainment/what-is-flac-the-high-def-mp3-explained/>

WAV

¹⁴ Waveform audio files (also known as WAV files) are one of the most popular digital audio formats and the “gold” standard for studio recording. WAV files are not compressed, ¹⁴ the data is stored unchanged in its original format and does not require decoding.

AIFF

AIFF (Audio Interchange File Format) works almost the same way: ¹⁴ Provides studio quality audio recording and playback. AIFF offers sample rate and bit depth options such as WAV files and registers audio waveforms in the PCM as accurate samples (slices) to provide the best possible audio recording quality and sound reproduction. Like WAV, AIFF stores data in uncompressed, lossless format. In other words, the quality is not compromised, only pure sound enjoyment is obtained.

How to choose an audio file format

1

Simple guidelines for choosing an audio file format:

- Use uncompressed audio with high sample rate and bit depth (24-bit / 48kHz WAV or AIFF) for music production
- High bitrate compressed format (320 kbps MP3, AAC etc) - for general listening
- Lossless compressed format (FLAC) - for critical listening,

Tip: In the music production process, if the audio quality does not already exist, it cannot be restored. To get the highest quality files from LANDR mastering, you need to start with high resolution files. It is recommended that you set your DAW session to at least 24-bit / 44.1kHz, or higher if possible.

<https://blog.landr.com/audio-file-formats/>

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Codec

A standard for compressing and decompressing digital media, especially audio and video. Codecs are used to save files to disk and transfer media over a computer network. Rapid compression and decompression of this data reduces bandwidth requirements and increases the amount of interactive and multimedia content accessed and transmitted over the network.

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Different types of video are better encoded in different formats, just as some audio codecs better encode human voice and others better encode musical instrument music. In general, the most efficient codecs also require considerable processing power. Multimedia distribution always requires a balance between computing power and bandwidth.

<https://www.britannica.com/technology/codec>

20

Embedding audio in HTML documents

Inserting audio into a web page has never been easier, as web browsers did not have a consistent standard for defining embedded media files such as audio. Using HTML5 audio elements. The newly introduced HTML5 <audio> Element provides a standard way to embed audio in web pages. However, although the audio element is relatively new, it works with most modern web browsers

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<https://www.tutorialrepublic.com/html-tutorial/html5-audio.php>

HTML <audio> Autoplay

To start an audio file automatically, use the `autoplay` attribute:

Example

```
<audio controls autoplay>
  <source src="horse.ogg" type="audio/ogg">
  <source src="horse.mp3" type="audio/mpeg">
Your browser does not support the audio element.
</audio>
```

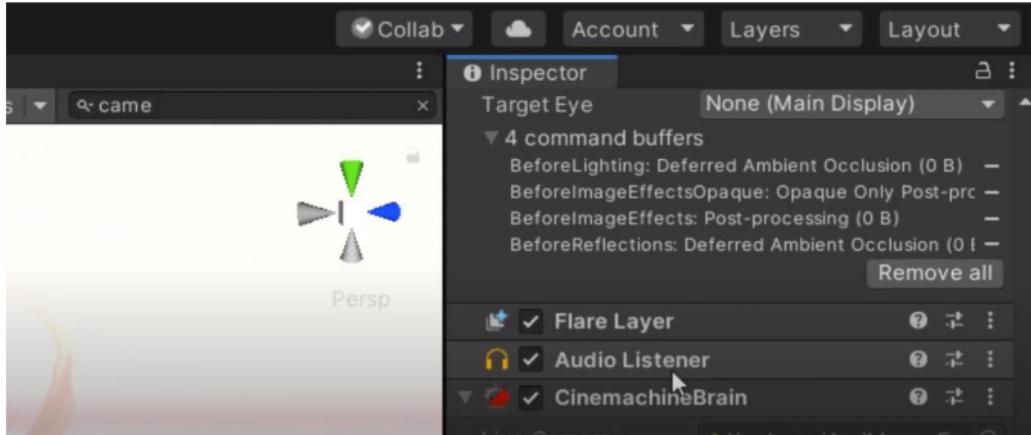
[Try it Yourself »](#)

https://www.w3schools.com/html/html5_audio.asp

Audio in Unity

Audio Listener: Think of an audio listener as an element of a game that listens to music. Basically, this is part of the world that captures the sounds created in the game. For example, as a character passes through a portal, the portal may emit a gentle “hum” or electrical noise. Something in the game needs to hear these sounds. In most cases, game developers add audio listeners to their cameras. This is because in most games the camera tracks the character, so the emitted sound is picked up and registered by a camera that shares the player's point of view.

Therefore, all game sounds appear to surround the character from the correct position in 3D space.

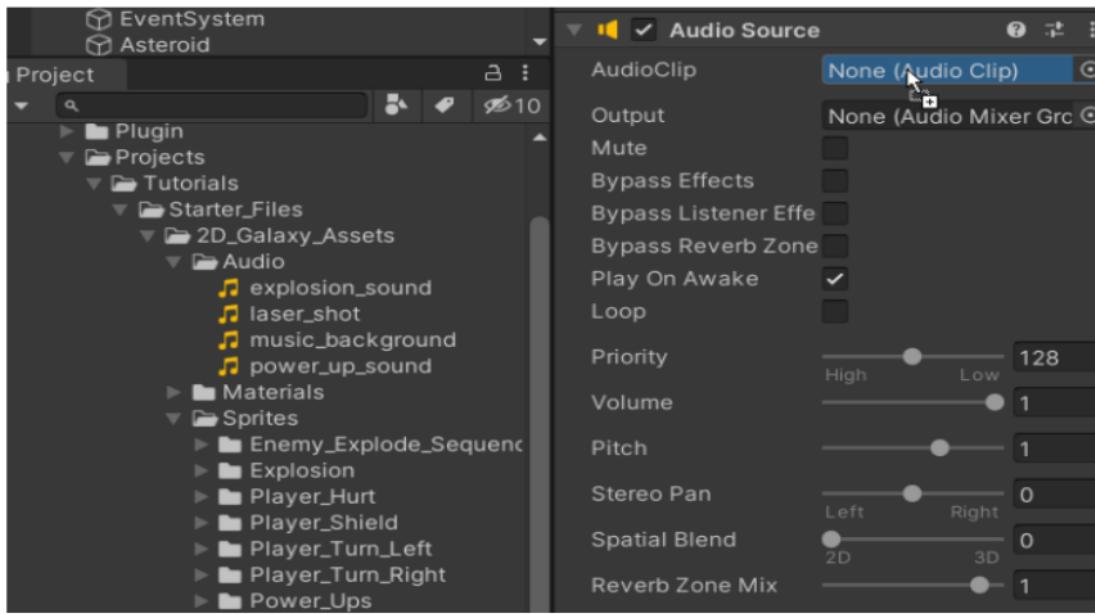


71

<https://www.sovereignmoon.studio/how-to-add-music-to-unity-3d-game-kit/>

Creating Audio Sources. The audio source is not going to work without the associated audio clip. Clips are the sound files that are actually performed. A source is like a controller that starts and stops playing that clip and changes other audio properties. To be able to create a new audio source: 1. Import the audio file into Unity project. These are now audio clips. 2. From the menu bar, choose GameObject > Create Empty. 3. With the new Game Object selected, select Components > Audio > Audio Sources. 4. By using Inspector panel on the right side, choose the Audio Clip property on the Audio Source Component and assign a clip, either by dragging one from the Project Window or by clicking the small circle icon to the right of the Inspector property, then selecting a clip from the list. Note: If you only want to create an audio source for just one audio clip in your Assets folder,

just drag that clip into the scene view.



A Game Object with an audio source component is automatically created. When you drag a clip onto an existing Game Object, the clip will be attached with a new audio source (if it doesn't already exist). If the object already has an audio source, the newly dragged clip will replace the clip currently in use by the source.

⁸¹

[https://docs.unity3d.com/2019.3/Documentation/Manual/class-
 AudioSource.html](https://docs.unity3d.com/2019.3/Documentation/Manual/class<AudioSource.html)

Audio Analysis

To determine the most suitable format, the table below was analysed with various bit rates and sample rate, the evaluation was carried out by an independent participant.

The analysis was done in the application GoldWave.

Format type	Sample Rate	Bit Rate	File Size	User rating
Original MP3	44.100Hz	256Kbps	502kb	Very good

MP3 (ACM)	8000Hz	8Kbps	16kb	Bad, like from the next room
MP3(LAME)	8000Hz	8Kbps	16Kb	Terrible
MP3(LAME)	44100Hz	32Kbps	64Kb	Bad
MP3(LAME)	44100Hz	64Kbps	126Kb	Bad
MP3(LAME)	44100Hz	128Kbps	252Kb	Very good
MP3(LAME)	44100Hz	256Kbps	252Kb	Very good
MP3	48.000Hz	320Kbps	628kb	Very good, the same as original
Wav -16 bit	44100Hz	1411Kbps	2775Kb	Average
FLAC-max compression	44100Hz	24bit	3249Kb	Good
FLAC-max compression	44100Hz	8bit	670Kb	Good
Ogg Vorbis	44100Hz	500Kbps	905Kb	Very good
Ogg Vorbis	44100Hz	320Kbps	639Kb	Very good
Ogg Vorbis	44100Hz	128Kbps	245Kb	Very good
Ogg Vorbis	44100Hz	64Kbps	127Kb	good
Ogg Vorbis	44100Hz	45Kbps	48Kb	bad
Ogg Vorbis	8000Hz	12Kbps	16Kb	Very bad

Summary

The highest marks were received by MP3 and Ogg formats, so it makes sense to choose between them. As bit rate was reducing – quality was reducing as well, but

it got noticed especially on MP3 format. Significant different in a quality of a sound appears when bit rate is lowered from 128 Kbps down to 64 Kbps on MP3 format, but there is no change in Ogg format quality. The best combination of format/bit rate / size are

MP3(LAME)	44100Hz	128Kbps	252Kb	Very good
-----------	---------	---------	-------	-----------

Ogg Vorbis	44100Hz	128Kbps	245Kb	Very good
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Flac format represented a high quality but has a very big size of a file – 3249 kb for a 15 second audio.

Text

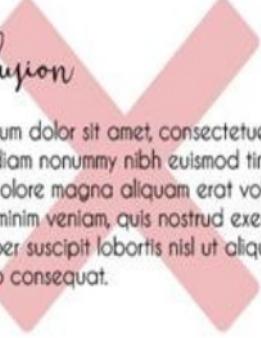
Set of rules to improve readability and legibility of text content.

Communication plays an important role in design. It's important to create a clear connection between your website and your users so they can reach their goals. When we talk about communication in the context of web design, we usually mean text. Typography plays an important role in this. Around 95% percent of all information on the web source is in the form of written language.

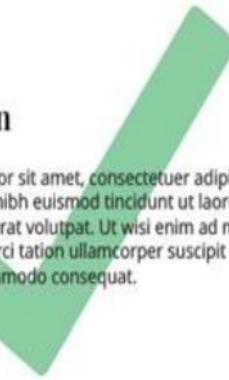
There are few rules that highly recommended to be followed to gain the best result in readability and legibility of text content.

1. Avoid using different types of fonts. Reduce them to a max 3 fonts per project.
2. Use a classic (typical) font that all web browsers are supports.

Conclusion

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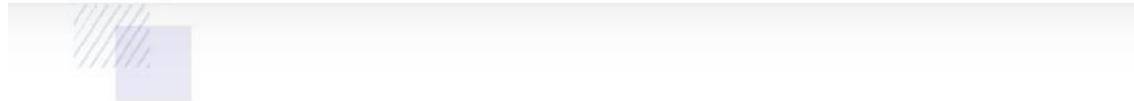
Conclusion

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat.

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<https://www.instantprint.co.uk/printspiration/print-design-tips/what-makes-a-bad-font-choice>

3. Keep a line length at right number for better readability. For example, limit for a mobile device is 30-40 characters per.
4. Use fonts with observable different in letters to avoid confusion (for example “i”s and “l”s).
5. Do not use CAPS ALL caps text —acceptable for a logo or game menu, for example.
6. Keep acceptable space between lines. If the space is too small, it will be hard to read.



Heading

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Vivamus sagittis odio metus, vitae lacinia ante lobortis sed. Suspendisse potenti. Integer ac odio nec velit viverra condimentum. Proin scelerisque gravida erat sed pellentesque. Praesent in viverra augue. Mauris volutpat neque sed erat vehicula finibus. Donec in rutrum sapien. Sed ac odio orci. Aenean in nisl ullamcorper, volutpat sapien vitae, imperdiet nisl. Mauris sagittis leo rhoncus, condimentum justo in, lobortis leo. Nam in sapien dolor. Nullam pellentesque massa eu placerat molestie. Phasellus pharetra dolor metus, quis tristique leo rhoncus id.



Heading

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<https://www.justinmind.com/blog/white-space-design/>

7. Make the text more visible by adding a sufficient color
8. Do not mix green and red colors in a text and background, because color blind people will not be able to read it.
9. Try not to use blinking text. Flashes and flickers can trigger seizures. Also, there is a chance that it will annoy an user.

²
<https://uxplanet.org/10-tips-on-typography-in-web-design-13a378f4aa0d>

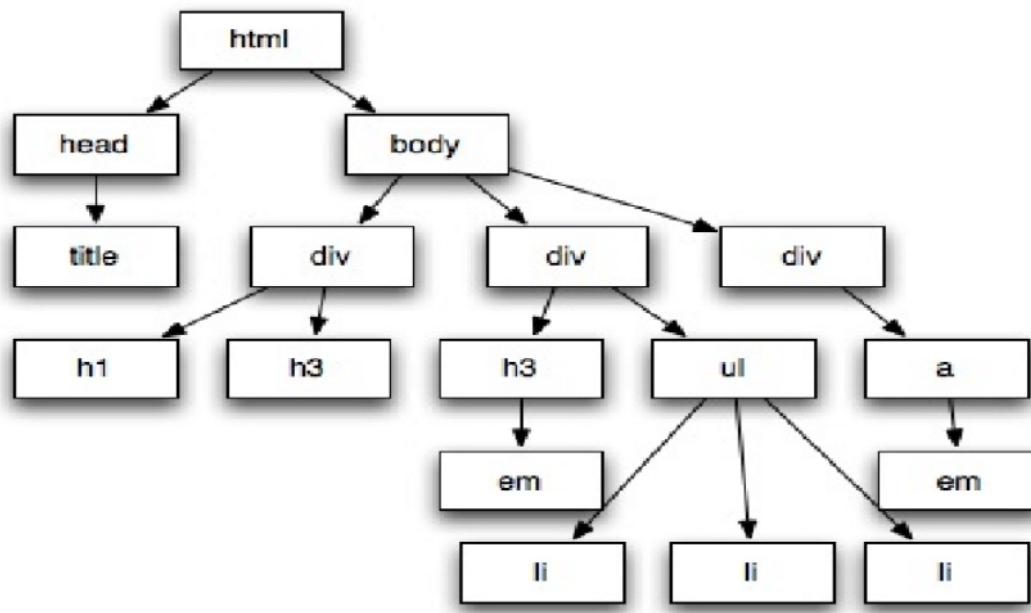
34

Text design from an HTML (the standard markup language for documents designed to be displayed in a web browser) perspective.

34

HTML is the standard markup language for documents designed to be displayed in a web browser.

In designing text for web page, app or game, it is necessary to consider text from the designer's point of view. All information must be readable and easy to read while well suited to website styles. However, it is necessary to consider and work with the content hierarchy. Creating hierarchies are "big pictures" in the website configuration. However, if typography is applied then hierarchy must be created in an association with a specific text on the page. This will create relationships with their headers and work creates relationships with their headers and visually separate content and text.



https://www.researchgate.net/figure/HTML-document-tree-representation_fig4_261313983

Headings and Spacing. Web content usually focuses on only several different text elements. Headlines are from H1-H6, but most websites use only H1-H4.

The space between texts is important to help you define page content itself. When the user finds a new header, it is checked if the content has been changed to a new theme or in an existing subject.

The negative storage space between text indicates how the contents of the page are relevant. Headers with many spaces are considered dominant, and headers are close to contextual paragraphs. The lower margin after the paragraph indicates the text line and the location where they belong to the hierarchy. Everything is related to the suppression of content hierarchies to visually distinguish the text on the page.²³

Heading relationship. Each heading reflects its own style, but style needs to be relevant to a whole style idea. Each internal block uses smaller sub header text. The amount of space between the header and the paragraph defines which paragraph belongs to which paragraph. Similarly, designer should apply enough space between smaller headers and larger headers. The negative space defines both visual design and typography hierarchies.²³

Rules for a successful heading style:

- The visual hierarchy should be evident by using space, size, color and/or text style. This should be visible even if you are standing 3-5 feet away from the monitor
- First child paragraph and each subheader should be close to each other's.
- Place meaningful headings in close meaning to the project or situation to get the point across faster and more clearly.

² <https://designshack.net/articles/layouts/web-design-best-practices-minimalism-typography/>

Game Text

Recommendation for a size of a text recommendation are a minimum of 28 pixels tall by three pixels wide when viewed on a 1080p screen. Might be a good idea to give the player the option to change the text size. Subtitles are probably the only text that should be an upper limit. Do not add captions that cover the entire screen.¹⁰

¹⁰
Players need to be able to resize text and subtitles. The default setting should be a large sans serif font.



<https://www.designbombs.com/best-gaming-fonts/>

Contrast note

¹⁰
The most recommended contrast ratio of 4.5: 1. This will provide enough contrast between the text and the background, making the text stand out and most likely to display the text in the player.

Deque Color Contrast Analyzer is highly recommended to check a contract between background color and text color (<https://dequeuniversity.com/color-contrast>)

Font suggestions: developers should use sans-serif fonts, that is, non-prosperous fonts at the end of each character, to maximize readability. These should be used not only for all menus, but also for all other forms of in-game communication so that players can analyze all the text they encounter. Most recommended fonts such as Arial, Helvetica, Verdana, and Comic Sans (suitable for dyslexics).

Using serif font for a game developing is a bad practice.

2

<https://www.gamesindustry.biz/articles/2020-08-05-a-quick-guide-to-readable-game-text>

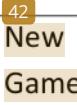
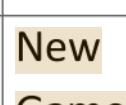
To provide the best user experience in any form of interactive media it is very important to choose right Topography, including font size, colors, and font-styles. Below is an analysis of some aspects of the topography

Analysis for a text design choice for a Menu

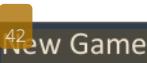
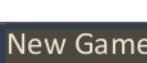
Font style

	Arial	Verdana	Curlz MT	Brush Script MT
sample	42 New Game	New Game	New Game	<i>New Game</i>
independent user rating	Good	Good	Too fancy, bad	Bad

Font size for a Menu

	6	14	20	72	
sample					
independent user rating	Too small. Bad	Might be too small. Bad	Might be ok. Ok	Probably good if compared to existing screen. Good	

Text color contrast for menu (dark background)

	Yellow	Blue	White	Red
sample				
independent user rating	Good	Ok	Good	Might be bad for Color blind people

White space

	Expanded 4pt	Normal	Condensed 1.2pt	Expanded 2pt
sample	New Game 33 Congratulations	New Game Congratulations	New Game Congratulations	New Game 33 Congratulations
independent user rating	Too big, almost the same size as a space between words	Ok	"To crowded"	Good

Conclusion:Font-style:

Animation and Video

Difference Between Animation and Video

Animation is kind of art of drawing sketches of objects and displaying them in sequence to make them look like moving things. However, video is a recording of stationary or moving objects. This is the difference between video and animation. However, main purpose for both is show viewers objects in a motion.

The animation is a video created by a person who creates many pictures that are displayed at high-speed using the camera, so it feels and looks like a video motion. The video is made by a person with a video camera.

When an animator or artist completes a painting, they are sent to a computer where some operations are performed to explain the story. Most of the work these days is done on computers. This makes it easier to create animated videos. After the animation is converted to video format, there is no difference between the animation and the video. Animations can be upload or download like regular videos on the internet.

<https://vspages.com/animation-vs-video-1508/>

Video format, container, codec.

⁷⁵ A format is basically a set of rules and parameters that define a video. Among other parameters, these are native resolution, color depth, and number of frames per second.

The video codec works as an interpreter for video formats or supported formats. Main purpose of code is compress and decompress video. Codec is used by the video player to set a rule how the video should be played correctly on the system.

Video containers intended to bundle multiple files. Some advanced containers can include video, audio track, metadata, and other data like menu. But usually, it is just video and audio track. The most popular container formats are MOV, MKV, AVI.

² <https://www.ghacks.net/2011/09/07/whats-the-difference-between-a-codec-container-and-video-format/>

Most common video formats

- MP4. Most devices and digital platforms support this format. This format can store audio and video files, images, text. Despite maintaining small file sizes, MP4 provides a high-quality video.
- MOV. This format is designed by Apple, extremely popular, was created to work along QuickTime player. This format contains video and audio, subtitles, timecode etc. This format due to very high quality takes a lot of space.
- WMV. Usually used in Windows media players, as was designed by Microsoft. This format has a better compression than MP4, provides small sizes. Extremely popular for an online video streaming, but it is not compatible with Apple devices.
- FLV. Supported by all browsers and video platform. This format used by Adobe Flash Player. This format is very good for online video streaming (YouTube), has a very small size, but not compatible with iPhones and some other devices.

- AVI. This format has an extremely large sizes, because of less compression. Can be created without any compression – lossless files, it means quality will not go down.
- ²⁶ AVCHD (Advanced Video Coding High Definition). This format was designed for professional high-definition video recording. By using the compression, high quality video can be stored with a usage of a small amount of space.
- WebM. Perfect for usage with HTML5. Can be used for online video streaming by any device.
- MKV. This format contain video, audio, subtitles in a single file. Very adaptive and easy to use container, support almost any audio and video format.

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<https://www.computer.org/publications/tech-news/trends/8-best-video-file-formats-for-2020/>

Animation

Different formats of animation

Different types of can be used depending on the purpose. There are few the most common formats:

49

- SVG. It is an open 2D XML - based standard vector graphic. This format is text-based, scalable, high quality and very easy to be changed.
- JPG. The best format so far for high quality photos, extremely popular for graphic purpose. Does not support transparency.
- GIF. Is very good for icons and logos with not many colors, supports transparency, very good for small animations.
- PNG. This format supports alpha channel transparency, it means that background can be changed. Very good level of built- in color gamma .

53

<https://www.whale-agency.com/stories/different-types-of-animation-formats-why-svg-is-the-best-one>

Different types of animation

There are five major categories of animation:

67

Traditional animation. Also known as a cell animation. The animator draws each frame by hand so that result is animation.

2D Animation. It is type of animation that based on vectors. The animator has the option to edit frame by frame. There is no need to redraw character every time, instead of that character's rigs can be created. Very flexible and popular for beginners in animation.

3D Animation. It is a computer animation and most popular form of animation nowadays. The process contain moving character in program, involves fewer drawing skills.

Motion Graphics. Main principle is ability to move text, shapes, and graphic elements. Examples of that graphic are animated logos, advertisement, tutorials.

Stop Motion. Contain of a still image that can be changed to show movement. That type is very similar to traditional animation, different is stop motion works with real object. Very good example of that animation is cartoon "The nightmare Before Christmas".

<https://affordableschools.net/lists/5-types-of-animation/>

Virtual Reality

VR (Virtual Reality) is it is no longer something that people imagine, it has been among us for a long time and is easily accessible. Now you can visit another country without leaving your home or get behind the wheel and go where your eyes look, perform heart surgery in the simulator. There are few different types of VR on a market right now.

- Virtual Reality. VR is fully immersive and tricks your senses and mind, while being in a real world your brain and body started to think otherwise.⁸⁹
- Augmented Reality. Concept of AR lays in applying digital information on real world. Pokémon Go – is a very good example.
- Mixed Reality. MR combines real and digital world, it means you can interact with virtual and physical world, items, and environment.

To experience virtual reality following equipment is required:

1. A VR headset
2. Standalone VR gear
3. VR headset for use with computer
4. smartphone
5. headset
6. joystick

VR is a technology that widely used in nowadays. For example, VR can be used in Healthcare, Virtual Adventure, Professional sports, gaming, entertainment, studying purposes.

2

<https://www.intel.com/content/www/us/en/tech-tips-and-tricks/virtual-reality-vs-augmented-reality.html>

В своем проекте для анимации будет использоваться классическая анимация. Для движения будут использоваться 4 картинки в разном положении чтобы создать иллюзию ходьбы. Для этого в юнити есть специальная фоторамка, нужные картинки нужно разместить в нужном порядке и сеть времени между соседними картинками – скоростью. Очень важно чтобы последняя картинка была добавлена еще раз, чтобы создалась полная иллюзия.

Формат для анимации – пиксельные картинки с расширением PNG, качество картинок стоит на последнем месте, так как это 2D пиксельная игра.

For storyboarding I am going to use Go-Pro with a stop motion feature to create animation by changing and move objects and background.

For recording my tutorial, I am going to use screen recorder, fortunately market full of them. For example, Filmora, Gimp, Game Bar – built-in Windows 10 screen recorder, Bandicam etc. GIMP provides a wide range of features, easy to use, change size of PC screen, moreover I am using it already as my photo editor.

Graphic and Image

Graphic

A graphic or graphic image is a digital representation of information other than text. B. Drawings, figures, or photographs. Many websites apply colourful graphic designs and images to convey their message. Two of the more common graphic formats that exist on the web are JPEG and GIF.

Computer graphics are either 2D or 3D. Early computers only supported monochrome 2D graphics. It was black and white (or black and white on some monitors). Eventually, computers began to support color images. Initial machines only supported 16 or 256 colors, but most computers today can display millions of colors of graphics.

<https://techterms.com/definition/graphics#:~:text=A%20graphic%20is%20an%20image,and%20letters%2C%20rather%20than%20images.>

Image

An image, also known as a still image, is a digital image that is a binary representation of all types of visual information, such as drawings, individual video frames, logos, images, and graphics

<https://anydifferencebetween.com/difference-between-graphics-and-images/>

An image is made up of a rectangular array of dots called pixels. Image dimensions are specified in width X height, in pixels. The physical size of the image, in centimetres or inches, it totally depends on the resolution of the screen on which the image is displayed. Resolution is often measured in Dots Per Inch (DPI). An image will be smaller on a higher resolution device than on a lower resolution device. For color images, to represent all colors of an image there should be enough bits per pixel. The number of bits per pixel is called the image depth.

https://www.tutorialspoint.com/multimedia/multimedia_images_graphics.htm

Codec

Codec is a technology for compression files, consists of two components encoder – to compress files and decoder to decompress.

There are different types of image codecs available, based on different algorithm of compression with a different specification, platform etc.

BMP. Shrink image by throwing away pixels, which might lead to the change of an image in an unacceptable manner. Bitmap files are limited to RGB-images but provide very good photo quality. It's not supported enough across multiple platforms.

GIF. Compresses by scanning horizontally across a row of pixels and finding solid areas of color with no loss of information for an image. Best choice for distributing color image on web. Allows to create animated graphics.

JPEG. Very low level of complexity, memory efficient, allows to reduce the file size. Provide a good quality picture. But codec has no lossless capability, provides only single quality and single resolution.

MJPEG. It is a lossy codec, often used as a storage format. Degradation of an image is minimal if image had 100% quality. Might be hard to work with a large image.

TIFF. An uncompressed TIFF codec retains the best quality of a photographic image, making it ideal for digital masters. It's also lossless, can be compressed or decompressed. But unfortunately produce large file size.

PNG. Lossless compression with no color information loss, is recognized and supported on all platforms. But does not support animation and has a low quality

<https://imagecodecs.wordpress.com/>

Image data types

To create an image a variety of techniques could be used for representing data - called data types, such as ⁵⁴ monochrome and color images. Monochrome images are created in a single color, and color images are created in multiple colors. Some data types of images are:

1-bit images. An image is a set of pixels. In 1-bit images, each pixel is stored as a single bit (0 or 1). A bit has only two states either on or off, white, or black, true, or false. Also known as a binary image.

³ A 1-bit image with resolution 640*480 needs a storage space of 640*480 bits or 37.5KB.

The quality or clarity of 1-bit image is extremely low.

8-bit gray level images. Each pixel of 8-bit grey level image is by a one byte, each pixel can hold ³ 2 in power of 8 = 256 values between 0 and 255. Every pixel shown as a brightness on a scale from 0 to 255, it means all pictures composed of gray shades only – monochromatic.

³ An 8-bit image with resolution 640 x 480 needs a storage space of 300KB.

24-bit color images - each pixel equal to 3 bytes often representing R-G-B (Red, Green, and Blue). Each true color represented by 256 shades of RGB – it means there are 16777216 color variations.

³ Often 24-bit color images are stored with an extra byte to store an alpha value for special effect information (32 bits in total).

Main disadvantages of this type that images require large storage space.

https://www.tutorialspoint.com/multimedia/multimedia_images_graphics.htm

Image file formats

Applying the right image formats can help to get the best performance for a particular need. For example, by using a correct format speed of loading a webpage can be increased, it is especially important with a low internet traffic.

There are 13 the most popular image formats that are widely used.

JPEG – very good for web images, printing, saving files to camera, picture sharing, great for projects on the web. But better not use it for text-focused images.

PNG – great for web images, text-focused images, logos, and high-resolution pictures. Can be edited with no loss of quality, saves an image with more colors on a transparent background when used on web. Not good for printing.

BMP – generally outdated format. It's supported by all biggest browsers and image viewers.

GIF – perfect for simple animations. Very good for demonstrating tutorial steps. However, not suitable for images with rich colors.

TIFF/TIF – good for printing and scanning documents. Not suitable for web pages, takes forever to load. Because of lossless compression original image data is maintained regardless of how often you might copy, re-save, or compress the original file.

HEIF – it's used for saving high-quality images on newer devices, providing better-optimized file sizes. It is not the best choice for accessing images on browsers and OS.

RAW – it is least-processed image type, recommended for high-quality photographs. RAW images are very important because they capture every element of a photo without processing and losing small visual details. Not suitable for web usage.

4
PSD – it is special **Adobe Photoshop's** format used for graphic design projects that can be edited. This type of file contains "layers" that make modifying the image much easier to handle. Not suitable for printing or web usage.

4
SVG – great for web images, images with simple shapes, 2D illustrations, and importing 2D images to 3D modelling software. Not suitable for displaying detailed images with high color depth, such as photographs.

4
EPS – file in vector format, should be used for printing, illustrations, graphic design. Bad for photographs.

PDF – great for printing, visual reports, infographics. Not suitable if some changes are required to the image.

4
INDD – used in Adobe InDesign for saving editable layouts or page designs. Not suitable for web usage.

6
AI – mainly used for saving vector graphics in Adobe Illustrator. Most reliable type of file format for using images in all types of projects from web to print.

<https://www.hostinger.com/tutorials/best-image-formats>

41 **Raster Image Files and Vector Image Files**

Raster image files

Raster images are constructed by a series of pixels, or individual blocks, to form an image. Every photo a raster image. Pixels have a defined proportion based on their resolution (high or low), and when the pixels are stretched to fill space, they were not originally supposed to fit, they become distorted, resulting in blurry or unclear images.

4 **Top 8 Raster Formats**

1. **JPEG and JPG**

2. PNG
3. BMP
4. GIF
5. TIFF
6. HEIF
7. RAW
8. PSD

6

Vector image files

Vector images are way more flexible. They are constructed using proportional formulas rather than pixels. EPS, AI and PDF are perfect for creating graphics that require frequent resizing. Provide ability for images to be sized as tiny as a postage stamp, or huge enough to fit on an 18-wheeler.

4

Top 5 Vector Formats:

1. SVG
2. EPS
3. PDF
4. INDD
5. AI

6

<https://blog.hubspot.com/insiders/different-types-of-image-files>

Different Types of Media

44

We use various media to get news, learn new things and have fun. With the development of technology, we can choose the type of media we want to use. The goal of media is to convey an advertising message to the audience through the most appropriate media channel for their product.

In general, media can be classified in three mains.

Print media. Previously, this type of media was the only way to convey information to the population. In the 80s and 90s print media was the only means of entertainment. People trusted and on magazines, newspapers – good source of vital information about a country or the world. Includes newspaper, magazines, books, banners, billboards, brochures, flyers etc.

Web media (internet media). The most popular type of media at the moment, moreover some young generations are using only that type of media. This media includes social networks or websites, online forums, podcasts

Online forums - an online place where we can comment, message, or discuss a particular topic. Forums allow us to share knowledge with other people with the same interest. That's why it's regarded as the best platform to seek support and assistance.

<https://whatagraph.com/blog/articles/different-types-of-media>

Pixelate

Most image files, such as JPG, PNG, and GIF, are bitmaps or they're maps of bits - essentially grids of pixels that blend smoothly together to form an image. Pixels are the smallest squares of hue, saturation, and lightness (HSL) that make up the grid of a digital image. Pixelation occurs when, instead of perfectly blending, pixels are visible to the naked eye. Image can be accidentally pixelate when change a scale of an image to a size too large for its resolution.

<https://www.adobe.com/nz/creativecloud/photography/discover/pixelate-image.html>

Free sources of images for games can be found on the internet, some examples of those website are below:

<https://www.freepik.com/free-photos-vectors/2d-game>

<https://craftpix.net/freebies/>

There is a very good tool that can be used for pixelating any images

PIXEL IT <https://giventofly.github.io/pixelit/>

Unity

5 Unity imports image files as textures. Unity supports most common image file types, such as BMP, TIF, TGA, JPG, and PSD. If you save your layered Photoshop (.psd) files in your Assets folder, Unity imports them as flattened images. (<https://docs.unity3d.com/Manual/AssetTypes.html#:~:text=Unity%20supports%20the%20FBX%20file,natively%20supports%20importing%20SketchUp%20files.>)

Analysis of the most common image extensions is below. Compressing and converting of the image was applied by using a GIMP. Image was taken from a free source. As a source for converting and compressing was taken the same original image every time.

Analysis of image formats

Image extension	Image compression	Dimensions	Image size	Review of an user
GIF	No compression applied	3000*2132	1832kb	Bad, blurry
TIFF	Not applicable	3000*2132	1875kb	Good
BMP	16bit	3000*2132	12493kb	Bad quality
BMP	24bit	3000*2132	18739kb	Ok
JPG	Low	3000*2132	3175kb	Perfect
JPG	Medium	3000*2132	550kb	Acceptable if no zooming is applied

JPG	High	3000*2132	118kb	Terrible, blurry
JPG	Original as downloaded	3000*2132	930kb	Good
PNG	Low	3000*2132	18785kb	Perfect
PNG	High	3000*2132	5559kb	Almost Perfect

Summary

After the analysis, the highest rating was shown by the formats PNG and JPG. Even with no compression applied, JPG-format provided extremely good quality despite small image size – only 3 MB. Despite after full zooming in 460% applied image is still showing good quality. PNG extension on the other hand have an extremely large size of an image – 18 MB, but after compression down to 5.5MB quality is almost the same as before.

Lowest rating received by JPG format after maximum compression down to 118KB, unfortunately this image is awful at this size.

Gif format is also terrible choice for an image, because with a size of 1832KB quality is terrible as JPG with 118KB size.

CONCLUSION

REFERENCES

Project

ORIGINALITY REPORT

28%

SIMILARITY INDEX

25%

INTERNET SOURCES

3%

PUBLICATIONS

15%

STUDENT PAPERS

PRIMARY SOURCES

- | | | | |
|--|----------|--|-----------|
| | 1 | blog.landr.com | 2% |
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| | 2 | Submitted to Christchurch Polytechnic Institute of Technology | 2% |
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| | 3 | www.tutorialspoint.com | 1% |
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| | 9 | www.visual-paradigm.com | 1% |
| | | Internet Source | |

10	www.gamesindustry.biz	1 %
Internet Source		
11	www.differencebetween.net	1 %
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12	www.maqe.com	1 %
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13	www.scienceworld.ca	1 %
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14	www.izotope.com	<1 %
Internet Source		
15	uxplanet.org	<1 %
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16	Submitted to Durban University of Technology	<1 %
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22	freshworks.io Internet Source	<1 %
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24	Submitted to International School of Paris Student Paper	<1 %
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26	www.computer.org Internet Source	<1 %
27	Submitted to Ocean County College Student Paper	<1 %
28	Submitted to SOS Hermann Gmainer International College Student Paper	<1 %
29	kieransapprenticeshipblog98236340.wordpress.com Internet Source	<1 %
30	www.omnicalculator.com Internet Source	<1 %
31	Submitted to American Public University System Student Paper	<1 %

32	netivei-reshet.org Internet Source	<1 %
33	mamasmercantile.blogspot.com Internet Source	<1 %
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35	Submitted to Central Washington UNiversity Student Paper	<1 %
36	Submitted to University of New South Wales Student Paper	<1 %
37	imagecodecs.wordpress.com Internet Source	<1 %
38	www.ghacks.net Internet Source	<1 %
39	Submitted to Asia Pacific University College of Technology and Innovation (UCTI) Student Paper	<1 %
40	answers.unity.com Internet Source	<1 %
41	codinghero.ai Internet Source	<1 %
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Internet Source

<1 %

44

Submitted to Ain Shams University

<1 %

Student Paper

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