**COURSEWORK SUBMISSION FORM**

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| Module Name | Fundamentals of Information Technology | First Marker’s  (acts as signature) |  |
| Module Code | 4BUISO12C | Second Marker’s  (acts as signature) |  |
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| UoW Student IDs |  | **For Registrar’s office use only (hard copy submission)** | |
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| **MARKERS FEEDBACK (Continued on the next page)** |
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Contents

[1. Introduction 3](file:///C:\Users\user\Downloads\Telegram%20Desktop\FIT.CW1.00008699.00007717%20(3).docx#_Toc35342104)

[2. Review of computers/solutions/tools 4](file:///C:\Users\user\Downloads\Telegram%20Desktop\FIT.CW1.00008699.00007717%20(3).docx#_Toc35342105)

[2.1. Cloud-based infrastructure: 4](file:///C:\Users\user\Downloads\Telegram%20Desktop\FIT.CW1.00008699.00007717%20(3).docx#_Toc35342106)

[2.3. Hybrid solution based on above-mentioned software solutions: 8](file:///C:\Users\user\Downloads\Telegram%20Desktop\FIT.CW1.00008699.00007717%20(3).docx#_Toc35342107)

[3. Justification and recommendations 9](file:///C:\Users\user\Downloads\Telegram%20Desktop\FIT.CW1.00008699.00007717%20(3).docx#_Toc35342108)

[4. Conclusion 11](file:///C:\Users\user\Downloads\Telegram%20Desktop\FIT.CW1.00008699.00007717%20(3).docx#_Toc35342109)

[Reference: 11](file:///C:\Users\user\Downloads\Telegram%20Desktop\FIT.CW1.00008699.00007717%20(3).docx#_Toc35342110)

## 1. Introduction

Following report is meant to guide the established company into very competitive however, very profitable and on demand industry, mobile application development. Because the industry makes it very hard to settle on the perfect approach, this paper adopts Time, Cost Quality approach as the base determiner. The first focus of the paper is introducing the relevant software and hardware analysis in reference to the various environmental set-ups like on-premise architecture or cloud computing.  
The mobile development is developing at a really fast pace because it is now expanded to over 20 different categories like education, utilities and entertainment. The startup companies are highly recommended to specialize in game development by means of following reasons:

* Switching from gaming to the other category are going to be fairly simple as relevant software and hardware can easily build any sort of application.
* With modern cross-platform engines like Unity and Unreal Engine, games are deployed to not just iOS and Android platforms but to the other mobile platforms, PC, PlayStation and more.
* Gaming is that the hottest category and liable for 0.25 of all downloads.  
  In short, the first focus of following report is mobile game development and therefore the recommendations are given to the game industry.

In short, following report assumes the sport development because the primary focus of your company and provides recommendations associated with mobile game development. so as to simply refer in later chapters, report divides app development into 3 user categories:

* Development and testing
* Design
* Project management

Assuming that company starts with relatively simple projects, recommended team member is 8 people. Estimated expenditure for starting is around $25.000, which only covers hardware expenses and initial licenses for software:

## 2. Review of computers/solutions/tools

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Computer Type | CPU (Central Processing Unit) | GPU (Graphics Processing Unit) | RAM (Random Access Memory) | Extra |
| Development | Personal Desktop (better to build own)  Price: 1450$ - 1550$ | Intel Core i7-7700K, 4-cores or above (520$) | NVIDIA GeForce RTX 1660 TI (275$) | Minimum 8GB (29$) | 1. 256 GB SSD (40$) 2. At least 2 monitors - Dell UltraSharp U2415 (each 210 $) 3. Other accessories (250 $) |
| Designing | Personal Desktop (better to build own)  Price: 2500$ - 2700$ | Intel i9 9900K, 8-Cores (606$) | NVIDIA GeForce RTX 2080 (830$) | Minimum 16GB (66$) | 1. 512 GB SSD (82$) 2. At least 2 monitors - Samsung LU28E570DS/ZA (each 350 $) 3. Other accessories (250 $) |
| Project  Management | Laptop  Recommended Model: Dell XPS 13 (1129$)  Price: 1150$ | Minimum Intel Core i5 | Intel UHD Graphics 620 | Minimum 4GB | 1. 128 GB SSD (25$) |

### 2.1. Cloud-based infrastructure:

Due to the high influence on information technologies there are variety of software and programs for development, designing, project management, testing and for other processes of creating applications. It may be difficult to choose appropriate and cost-efficient software for the team or company. Therefore, in the following tables the most suitable software are recommended based on three categories: cloud based, on-premise based and hybrid infrastructure. For taking the best of two categories the hybrid infrastructure is found to be most appropriate and affordable for a small start-up company.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Name and Price | OS/Browser support | Short Description | Benefits | Limitations |
| Development | GitHub Price: free | macOS X, Windows, Linux | Service for hosting IT projects and their joint development. | 1. Good documentation  2. Collaboration | 1. Security |
| AWS Cloud Price: Free for the first year. Then starts from 10$/month Offers both PaaS and SaaS | macOS X, Windows, Linux | Amazon’s cloud  based platform offers  reliable, scalable, and  inexpensive cloud  computing services | 1. Easy to use  2. Reliable and secure 3. No capacity limits | 1. Security limitations 2. Technical support fee |
| Azure Price: After free trial starting from 13$/month Offers both PaaS and SaaS | macOS X, Windows, Linux | Microsoft cloud  platform. Provides  the ability to  develop, execute  applications and  store data on servers. | 1. Data security 2. Scalability  3. Cost effective | 1. Requires management 2. Requires platform expertise |
| Google Cloud  Price: 300$ free credit for starting. 15GB of free storage monthly. Unlimited storage for 100$/month | macOS X, Windows, Linux | Google’s cloud  platform for running apps, hosting sites and data storage. | 1. Good documentation  2. High durability  3. Easy to integrate with other Google Cloud Services | 1. High pricing  2. Complex pricing schema 3. Support fee is quite high |
| Testing | CloudTest Price: free for 30 days. | macOS X, Windows, Linux | Cloud-based load and performance testing | 1. Flexible integration 2. Good level of support 3. Stable solutions | 1. Test clip is less user friendly |
| LoadStorm Price: from 99$/month | macOS X, Windows, Linux | Cloud-load testing for web & mobile apps |  |  |
| AppPerfect Price: starter pack – 399$ | macOS X, Windows, Linux | Cloud load testing, cloud hosted testing & cloud security testing |  |  |
|  | Figma  Price: Free (12$/month for team) SaaS | macOS X, Windows, Linux | The collaborative interface design tool | 1. Real-time collaboration  2. Quick and easy file sharing  3. All in one tool 4. Provides a free plan 5.Many useful plugins | 1. Problem with browser cache  2. Does not work offline |
| Adobe Creative Cloud Price: 79.99$/month (for team) | macOS X, Windows, Linux | The collection of tools for creating graphic design, editing photo & video, 2d & 3d modelling and more | 1. **Access your plan virtually anywhere.**  2. **No need to keep paying for the upgrades.**  **3.** **There are still per device licenses available.** | 1. **Not every app is upgraded at the same rate.**  **2.** **No guarantee of consistent pricing.** |
| Gravit Designer  Price: free | macOS, Windows, Linux, Chrome OS, iPad, Android and browser | Cross-platform editor for vector graphics | 1. Free  2. Customizable interface 3. Advanced editing tools | 1. Limited save formats |
| Project Management | Smartsheet  Price: 25$/month (per user) | macOS X, Windows, Linux | Service offering collaboration and work management | 1. Easy interface  2. Clean and professional design | 1. Price is higher compared to competitors |
| Wrike  Price: $9.80/user/month. | macOS X, Windows, Linux | Offers project management service | 1. **Real-time project and team reporting**  2. **Enterprise-class security and IT controls**  3. **One work hub to complete your projects** | 1. Pretty expensive per user  2. Hard to master and use |
| Work zone  Price: starts from 20$/user/month | macOS X, Windows, Linux | cloud-hosted project management and document collaboration app | 1. Easy to use | 1. Expensive price |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Name and Price | OS/Browser support | Short description | Benefits | Limitations |
| Develospment | Unity  Price: Free | mac OS X, Windows, Linux | Game engine for developing cross-platform games | 1. The best app for game development.  2. Excellent for cross-platform development.  3. Easy to use compared to the same type technologies. 4. Good for 2d and 3d rendering 5. Updated continuously.  6. Free. | 1.Due to version 5.0 documentation is quite outdated. |
| Visual Studio  Price: Free (Community edition) | Windows, mac OS X, Linux | Integrated development environment (IDE) | 1. Team collaboration.  2. Quick debugging and strict testing  3. Variety of extensions.  4. Wide and expending community. | 1. High hardware consumption  2. Community edition is limited in some areas |
| Unreal engine  Price: 5% of the profit | Windows, mac OS X, Linux | Platform for creating mobile applications for both iOS and Android | 1. Open-source app. 2. Better and faster rendering.  3. Best for optimization. | 1. Price depends on your profit. 2. Not good for small apps/games. |
| Testing | Zaptest  Price: by requesting a quote | Windows, mac OS X, Linux, iOS, Android | Cross-platform testing tool | 1. Cross-platform execution. | 1. Not good documentation |
| Design | Modo  Price: 399$/month after free trial | mac OS X, Windows | Program for 3d modelling, animation and rendering | 1. Has its own native renderer.  2. Customizability | 1. Expensive pricing compared to other same type software. |
| Blender  Price: Free | mac OS X,  Windows, Linux | Open source, graphics design software used to 3d modelling, animation and visual effects. | 1. Constantly improving.  2. Includes shading, sculpting, rigging, tracking, features | 1. Not beginner friendly |
| SketchUp  Price: starting at 299$/user/year | Windows. mac OS X | Program used for a wide range of 3D modeling projects like game design | 1. Has free version  2. Ease of use  3. Powerful engine | 1. Less modern tools compared to other same software |
| Project Management | Office Suite 2019  Price: 249$ (lifetime access) | Windows. mac OS X | Collection of office programs like MS Word, MS Excel, MS Power Point and etc | 1. 17 language packs  2. Text to speech service | 1. There will be no updates |
| VivifyScrum  Price: starts at 10$/month | Windows. mac OS X | VivifyScrum is a flexible cloud-based project management solution for team management, customer management and time management | 1. Easy to use  2. Great to use with the development of software products | 1. Lack of integrations |
| Paymo  Price: starts at 9.56$/user/month | Windows. mac OS X | Paymo is a modern job management application primarily for small and medium-sized businesses. | 1. Has free version  2. Makes time management really simple and intuitive | 1. Lack of integrations |

### 2.3. Hybrid solution based on above-mentioned software solutions:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Software name and price | Cloud based | On-premise based |
| Development | Unity  Price: Free | - | + |
| Visual Studio  Price: Free (Community edition) | - | + |
| Design | Figma  Price: Free (12$/month for team) SaaS | + | - |
| Blender  Price: Free | - | + |
| Gravit Designer  Price: free | + | - |
| Project Management | Office Suite 2019  Price: 249$ (lifetime access) | - | + |
| Wrike  Price: $9.80/user/month. | + | - |

## 3. Justification and recommendations

For the development branch, it is recommended to have a medium type of computer that satisfies the needs of developers and testers at the same time. As it can be seen from the table above that recommended CPU is Intel i7 and above. Because developers will need a reasonable CPU while running the game in the coding process to test. The programmers usually rely on their CPUs while testing the game in the coding process instead of deploying the game each time when it needs to test. When it comes to the power of GPUs for the development branch, it does not make a big effort. However, it is suggested to have NVIDIA GeForce 1660 in order to process the game graphics easily while testing. Besides that, developers need minimum 8 GB of RAM so as to run several software like Unity, Figma or Photoshop, Visual Studio and Google chrome simultaneously without crashing none of the programs. Because when the capacity of the RAM is not enough some of the programs might crash or stop running which causes to disappear unsaved works. For the additional hardware, it includes 256 GB SSD, 2 monitors and other accessories to make the desktop work much faster and outstanding than any other laptops or personal computers that cost an equal amount of money to buy.

In modern games, graphics make characters more realistic which has the effect of drawing players into the game and keeping their interest for a longer time (1). It can be seen from the table above that the design branch needs much more powerful hardware systems than others. Having i7CPU, minimum 16 GB of RAM, 512 GB SSD and other mentioned accessories in the table, make the desktop render easily when the graphic designer works with large programs like 3D Max, Adobe Effects, Photoshop, Blender, Gravity Designer and so on. Computers with more powerful CPU and GPU, the faster it renders the animation or the graphics (Intel.com, (2)). That is why it is recommended to have Intel i9 CPU, NVIDIA GeForce 2080 and minimum 16 GB of RAM though it costs much money. However, investing for better equipment makes the quality of the games much better as well as takes less time to finish the game.

There is no need for recommendations or limitations in terms of hardware systems for the production branch. But the recommendation for the types of the computer would be a laptop. Because it is transportable as project managers might need laptops for business meetings or special events. Moreover, the recommended version that can be seen from the table, has enough capacity to run many programs such as MS Office, Chrome, Photoshop and many others. It is highly recommended to buy the Dell XPS 13 model of the laptop with extra 128 GB of SSD.

The most effective way of selecting the most appropriate software to the company is referring to the types of computing services. Currently, cloud computing is one of the most operative infrastructures among many organizations with its various cloud-based software, although it does not have a powerful and integrated software for the game development industry or mobile application development. Taking as an example, cloud-based infrastructure has no software which can create games or complex animations. On the other hand, cloud-based software or infrastructure itself cannot be ignored because of absences of powerful software. In this case, the recommended method will be to use hybrid infrastructure which is a combination of on-premises and cloud-based infrastructure. Amazon Web Service (AWS) or Microsoft Azure can be best examples for hybrid infrastructure (NetApp.com (3)).

For the development branch two on-premise based software has been selected which are Unity and Visual Studio 2019. It was only a dream to think about creating 3D video games with realistic graphics in 1980 and 1990s (Mirko Humbert (4)). However, with the help of cross-platform game engines developed by Unity Technologies made it easy to create not only mobile but video games for computers without any complexity. Unity only requires knowledge of C# programming language, and developers are getting huge benefits from Unity with its extensions that helps to deploy the game easily, Unity Asset Store that has hundreds and thousands of ready designs for 2D and 3D games with the different levels, and Unity Community which helps developers to find a solution for their any raised problems.

As for testing the game, it does not require a separate job position when Unity provides an opportunity to live testing the games by connecting the phone to the computer via USB connection with the help of Unity Remote 5. It is offered by Unity for developers as free of charge which currently has been utilized by many mobile game developers. Furthermore, there are many reasons to choose Visual Studio which are it supports C# programming language and Git. Besides that, it has a powerful tool called debugging which is loved by many developers. Lastly, Visual Studio also improved the live streaming extension for developers to work in a team at the same time with one project.

Three Cloud-based software Figma, Blender and Gravit Design has been selected for the Designing branch which helps graphic designers to make their projects outstanding and accurate. These three cloud-based software are completely free of charge, and have innumerous luxuries for the designers. Blender helps to create a user-friendly interface, piercing workbench as well as it has EEVEE that renders in real-time (Blender.org, (5)). As for Figma, it is one of the best cloud-based software to edit and design anything in a short period of time.

For the last branch which is the project management branch, it is recommended to work with cloud-based Wrike and on-premise MS Office software. Wrike is a project management tool that offers simplicity and reliability to its users (wrike.com (6)). As Project managers might not always have internet connection, it is advised to use an on-premise based MS Office package while it has cloud-based version as well. Besides that, the on-premises version of MS Office is much faster than cloud-based one.

## 4. Conclusion

Taking aforementioned factors into consideration, start-up company has to rely on all recommendations in order to build a successful company in the future. Firstly, appropriate hardware and software for all branches need to be considered wisely. Hybrid infrastructure has to be applied to the company which is a mixture of on-premise and cloud-based software as well as hardware facilities can be bought from one of the most trusted company Amazon.com.

Link to Google Docs and GitHub:

<https://docs.google.com/document/d/164IQ10Og8uSJmvU2-4lNyxaUwyRttwUwApZpgAAdhDU/edit#heading=h.76j0glz60i0a>

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