**COURSEWORK SUBMISSION FORM**

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## 1. Introduction

The report is about to consult one of the existing companies of the most competitive as well as the most profitable and on demand market which is game development. As in the competitive markets it is hard to settle and even after lucky settlement keeping own position from top places is also difficult. This report mainly focuses on adopting perfect approach based on Time, Cost Quality. Firstly, this report introduces applicable software and hardware solutions based on various practical modern computer set-ups as well as cloud computing. Game development is growing at a high speed and now it one of the main sources of where people get entertained in and so on. Below extremely useful reasons will be provided for a start-up company for specializing in game development:

* Changing company’s sphere from game development to any other sphere it will be the way easier as the same hardware and software solutions can be powerful enough for building any sort of application
* With the help of the most modern cross platforms, namely, Unity and Unreal Engine company can deploy games not only in any operation systems such as Android, iOS, Windows, PlayStation, etc.
* Games market is so popular that up-to-the-minute it accounts 0.25 of whole downloads. Shortly, this report mainly gives attention to the mobile gaming applications.

Briefly, this report takes action category game development as an assumption for building recommended solutions and provides as much useful recommendations as possible and in later parts it divides game development into 3 user categories and these are:

* Development and testing
* Design
* Project management

According to the assumptions start-up company begin working with quite simple project and it is recommended to gather a team with 8 members. Projected outflow will for beginning will be at about 24000-27000 US Dollars, that covers hardware and basic licenses for software use:

## 2. Review of computers/solutions/tools

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Computer Type | CPU (Central Processing Unit) | GPU (Graphics Processing Unit) | RAM (Random Access Memory) | Extra |
| Development | Personal Desktop (recommended to build rather than buying)  Price: 1400$ - 1500$ | Intel Core i7-7700K, 4-cores or above (410$) | NVIDIA GeForce RTX 1660 TI (352$) | Minimum 8GB (30$) | 1. 256 GB SSD (39$) 2. At least 2 monitors - HP VH240a 23.8-inch Full HD (each 172 $) 3. Other accessories (280-300$) |
| Design | Personal Desktop (recommended to build rather than buying)  Price: 2550$ - 2750$ | Intel i9 9900K, 8-Cores (512$) | NVIDIA GeForce RTX 2080 (830$) | Minimum 16GB (66$) | 1. 512 GB SSD (82$) 2. At least 2 monitors - HP 27er 27-Inch Full HD (each 219 $) 3. Other accessories (280-300 $) |
| Project  Management | Laptop  Recommended Model: Dell XPS 13 (1129$)  Price: 1150$ | Minimum Intel Core i5 | Intel UHD Graphics 620 | Minimum 4GB | 1. 128 GB SSD (28$) |

### 2.1. Cloud-based infrastructure:

There are various options of softwares for development for development, design, project management as well as testing and much more for building application because of the growth of Information Technologies. It became so hard to choose most suitable and cost-efficient application for business or the team. Therefore, recommended applications will be highlighted in the next table and three classes will be taken as a base: cloud-based, on-premise as well as hybrid structure. Out of best categories the hybrid one can be the most applicable and affordable for new start-up company.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Name and Price | OS/Browser support | Short Description | Benefits | Limitations |
| Development | GitHub Price: free | macOS X, Windows, Linux, | IT projects and their joint development hosting service | 1. Good documentation  2. Collaboration | 1. Weak Security |
| AWS Cloud Price: 1 Year free, then starts from 10$ per month Available in both PaaS and SaaS | macOS X, Windows, Linux, | Cloud  based platform by Amazon. Reliable, scalable, and  inexpensive cloud  computing offered | 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$ per month. Available in both PaaS and SaaS | macOS X, Windows, Linux | Cloud  Platform by Microsoft.  Ability for  development, execution of  applications and  data storage 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$/month | macOS X, Windows, Linux | Cloud  Platform by Google. mainly for hosting sites and data storage. | 1. Good documentation  2. High durability  3. Easy to integrate with other Google Cloud Services | 1. High pricing  2. Complex pricing schema 3. Support fee is quite high |
| Testing | CloudTest Price: free for 30 days. | macOS X, Windows, Linux | Cloud-based performance testing | 1. Flexible integration 2. Good level of support 3. Stable solutions | 1. Test clip is less user friendly |
| LoadStorm Price: from 99$/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 and cloud security testing |  |  |
|  | Figma  Price: Free (12$/month) for team) SaaS | macOS X, Windows, Linux | Good interface design tool for collaboration | 1. Real-time collaboration  2. Quick and easy file sharing  3. All in one tool 4. Provides a free plan 5.Many useful plugins | 1. Problem with browser cache  2. Does not work offline |
| Adobe Creative Cloud Package Price: 79.99$/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 anywhere.**  2. **No need to pay for upgrades.**  **3.** **There are still per device licenses available.** | 1. Upgrading**.**  **2. consistent pricing.** |
| 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 & document collaboration app | 1. Easy to use | 1. Price |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Name and Price | OS/Browser support | Short description | Benefits | Limitations |
| Development | 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.Because of 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.  3. Variety of extensions.  4. Wide & expanding 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 | 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$/user/year | Windows. mac OS X | Program used for a wide range of 3D modeling projects like game design | 1. Has free version  2. Ease of use  3. Powerful engine | 1. Less modern tools compared to other same software |
| Office Suite 2019  Price: 249$ (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 |
| Project Management | 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

The recommendation to the development department to have a middle-class computer that meets the requirements of developers as well as testers. It is highlighted that the recommended CPU can be Intel i-7 or above. Developers usually need to run the game in the process of coding so that they can test it and it requires having a powerful CPU. Developers mainly prefer to test their codes in the process rather than deploying every time that they edit. The GPU doesn’t make computers that much effective but it is suggested to install GeForce 1660 or higher so that PC can process the graphics smoothly. When it comes to RAM management the minimum requirement for developers is 8GB of RAM because developers run various applications such as Unity, Adobe Photoshop, Visual Studio Code, etc. while using multiple applications with lower RAM, the computer might crash and it has a direct impact on overall performance and unsaved files also might disappear. For increasing the speed, it is also recommended to use 256 GB Solid State Memory and 2 monitors and also other accessories to use computer work with outstanding performance.

It is obvious that graphics represent game character more realistically in modern games and it keeps customers’ interest for a longer period. In the table, it is highlighted that the Design department should be provided with powerful computer set-ups than another department. The minimum requirement for this department Intel Core i-7 CPU with minimum 16GB RAM, and as mentioned 512 GB SSD or higher and other accessories to make their work easy and make working process smooth. The rendering process takes much time with heavy applications such as Autodesk 3DMax, Blender, and Adobe After Effects and Photoshop, etc. Powerful Graphics card with powerful CPU makes the rendering process (2). That was the reason why it is required to have Intel i-9 and Nvidia GeForce 2080. To some extent, the more investment in the Graphics department, the higher quality games will be in a short period.

The production branch is a very important one in the company but it is recommended for them to use laptops. The reason is laptops are portable and project managers usually need them in business meetings. Furthermore, the recommended options are that it has enough specifications to run and work with Microsoft Office applications, Chrome, Photoshop, etc. The highly suggested option was the laptop model XPS 13 produced by Dell with an extra 128 GB SSD.

The best way to choose the most suitable software for a company is to refer to these types of computing services. Nowadays, Cloud-computing is one of the most operational infrastructures amongst other analogs with its variety of cloud-based software, even though it doesn’t offer a powerful and integrated application for game development nor ordinary application development. Despite the absence of a great application of this cloud-based infrastructure, it should not be taken for granted. In our situation, it is suggested to use a hybrid infrastructure method that is the mix of on-premises and cloud-based infrastructure. The classic example of this could be Amazon’s Web Service or Azure by Microsoft

Department of development was consulted to use 2 on-premise applications: Unity and Visual Studio latest edition. It was said that building a realistic 3D game could be dreamt of back in the 80s and 90s (Mirko Humbert). The assistance of the cross-platform gaming engine developed by Unity took the industry to the next level and make it possible to build video games with no complexity at all. Unity has a very simple user interface and programmers are required to know about working with C# language and with extensions, programmers can easily deploy their game. Unity has its Asset store where is the home of tons of completed designs of 2D and 3D games at any level programmer wants as well as Unity Community gives programmers their helping hand on finding the solution on any problem raised.

Testing the game should not allow opening a new job position because with the help of Unity it is possible to test new games created just by connecting the smartphone to a PC via USB and the application Unity Remote 5 gives the privilege to test it in life. The application is totally free and now, it is being used mainstream by game developers. Turning to the Visual studio it has more privileges for choosing over others and it supports not only C# but Git, etc. the most powerful trick of VS is debugging and it is always appreciated by developers all around the world. Last but not the least, VS has many extensions for users and improved live stream so that developers can work on one project at the same time

Three main cloud-based software has been chosen: Figma, Blender, and Gravit Design for designing department, and it will help graphic designers to build wonderful designs. All the mentioned three applications are free and have tons of benefits for designers. Figma is the most popular cloud-based application in editing and designing very short of the time. Blender has a function to create a user-friendly interface.

The last department which is project management is suggested to use cloud-based Wrike as well as on-premise MS Office applications because they usually may not have a connection to the internet and it works much faster.

conclusion things considered; new start-ups should rely on recommendations to become one of the most successful companies in the future. First of all, all software and hardware solutions for each department should be considered wisely. The mixture of both on-premise and cloud-based applications must be applied and at this point, it should be mentioned that all hardware can be purchased by amazon.comLink to Google Docs and GitHub:

<https://docs.google.com/document/d/1HmLdU1hGpEdAA-8Eglt6LOTRJXMOoVCiPAd5ZhXn31g/edit?usp=sharing>

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