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INTEGRATION OF TEAMCENTER WITH PERL IN WOO-COMMERCE

A smart business with E-commerce platform

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ABSTRACT

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The thesis was written with the main purpose of explaining how E-commerce business is playing a big role on people's lives. Besides, it described a simple way to create a website based on online commercial platform.

The thesis includes two major parts: The first one was to review knowledge about programming aspects and to discuss the importance of E-commerce in the world nowadays. Many E-commerce platforms have been introduced to help people in making their own E-business. And WooCommerce is a great platform, which is easy to use and friendly for both developers and non-developers, run by Wordpress, the most powerful tool for creating websites. The second part was about building a commercial website. This website was written by Perl using data from Teamcenter, connecting to webpage by REST API.

The thesis is the process of creating a website on WooCommerce platform, which was captured from a project from Ideal Product Data Oy.

Key words
WooCommerce, Teamcenter, API, E-Commerce, Wordpress, Perl

ABSTRACT

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1 INTRODUCTION

With business generally, people were familiar with direct purchasing, oral marketing. These days, however, there is another option for making the business is with E-commerce – everything is online. There are some facts of the E-commerce that every entrepreneur needs to know: It is easy, almost no border when buyers only need a computer with internet connection or simply just a smartphone. Moreover, it is fast, customers will be super convenient when they are able to shop 24 hours a day, 7 days a week without any restrictions. And it helps the companies, while in the internet, everyone is closer to each other. There is always an opportunity for the companies to expand their businesses when tons of marketing techniques can apply for the websites: social media, email advertisement. (Discoverydesign 2016.)

There are dozens of ways to create a commercial website, the owner can make it themselves, design and create their own features, however, this method costs much in time and needs the experiment in web developer. Another option is using the E-commerce platforms to help in designing the website. At the moment, many platforms in this concept have been developed and made the market vivid. According to ecommerceCEO, BigCommerce, Shopify, Wix and WooCommerce are some of the strongest platforms in this particular field. And the prices for these supports are not so high, depending on how technical the company needs and some of the features even cost zero, each of the platform gives a different performance, protocols, designing, themes, methods and integrations in using. In order to meet the requirements, users need to find and choose the proper solution carefully. (Dematas 2020.) Through many options, WooCommerce came out as the best choice for the project as it is an open source software, low price, running in WordPress, and can be integrated almost unlimitedly.

Ideal PLM is a Finnish company that cooperates with Siemens PLM software in providing full-service Product Lifecycle Management (PLM) solution with all efforts to boost the Digitalization with PLM. With 25 years of experience in the industry and an enthusiastic team including around 100 experts from Finland and Russia, Ideal Product Data Oy confidently runs many offices along Finland in Vantaa, Tampere, Turku, Vaasa. (IDEAL PLM 2017.) They want to own an E-commerce website with real products like chain saw, helmet. The strengths of Ideal are familiar in managing Teamcenter, a modern, platform for Product Lifecycle Management, where users are allowed to edit products data and processes such as embedded software, 3D designs and bill of materials. (Softwareadvice 2019.) Integrated in

Teamcenter, CPM (Commercial Product Management) is one of the most important applications to run the project.

This thesis strongly aims the process of building E-commerce website with WooCommerce plugins through Teamcenter in Perl programming language. Along with bringing the knowledge from this particular field, the thesis has 3 significant parts sharing all the steps in making the business website. The commissioner of the thesis work was Ideal Product Data Oy.

2 THEORETICAL FRAMEWORK

A theory works as a reason for the everything runs in a proper way. It is important as creating the meaning for any research work. Framework is a building of theory, it settles the main parts in a good order as improving the investigations to reach at a specific stand. Theoretical framework overall is similar to the skeleton of a human body. It describes an awareness of theories and concept definition of the topic. (PhD Assistance 2019.) To go deeply in understanding the project as its knowledge areas and how it works, the theoretical framework will be explained through seven sections below.

2.1 E-commerce

Electronic commerce, which is well known for E-commerce, was a new kind of business when the transactions were conducted online. Whenever an individual or a company are selling or purchasing goods via the internet, they are joining the E-commerce. It also includes the other types of activities, such as online auctions, internet banking, payment gateways, and online tickets. (Ecommerceguide 2020.) With the growth of Internet nowadays, E-commerce grows 23% each year and becomes one of the fastest developing industries in the global economy. It is evaluated that the retail E-commerce can reach up to 27 trillion dollars by 2020. (Toppr 2020.)

2.1.1 History of E-commerce

In 1972, a transaction was made between Stanford students and MIT students via the Arpanet account in their lab making the first online purchasing in the world. After that, in 1979, the first online shopping was created by a British man named Michael Aldrich. This, however, just a domestic invention via telephone line and computer. In the next year, 1980, this system was advertised, became popular in United Kingdom and exported to some neighbors such as Ireland and Spain. (Miva 2011.)

Until 1994, when a transaction was made using a Mastercard to buy "Sting's Ten Summoner' Tales" via the internet. It turned into the first shopping transaction. Because in this moment, an encryption software designed for privacy was first used for an online purchase. This led the globe to a new chapter, changed everything people knew about businesses and made the history for the economics. Starting with the

success, in the mid of 1990s, Amazon and Alibaba grew rapidly in the retail industry, evolved the way people used to sell and buy products. (Ecommerceguide 2020.)

2.1.2 Most common E-commerce business models

There are many kinds of business models, however, the most popular among those are Business to Consumer (B2C), Business to Business (B2B), and Consumer to Consumer (C2C). The first and the most common, Business to Consumer, describes a transaction between businesses and individuals when the consumers buy a minor part of the product, both physical and online. Supermarkets would be a representative example for B2C, or some famous companies like Nike, IKEA and Netflix also engage in this business model. (Ecommerceguide 2020.)

Secondly, the bulk business, B2B or Business to Business is the type when both companies participate together. One provides for the other office equipment in bulk, and it is normally with a discounted rate to motivate the buying capacity. This business model is not popular for everyone since it is the wholesale, and normally happens among companies. Slack (communication platform) and Xero (cloud-based accounting software) would be an example of B2B model. (Markus 2019.)

The last and the newest, C2C or Consumer to Consumer, however, this kind of business model just recently became popular when many secondhand-market platforms like eBay and Craigslist play an important role in social businesses. People are easily selling products, it could be anything in their house, from the remote control to the television. This model was developed when both involved parties are the consumers trading items with each other, and typically a used product. This kind of business also helps to reduce the waste of non-using items. (Ecommerceguide 2020.)

2.1.3 Benefits of E-commerce

The trend of world businesses has changed quickly, online business has replaced the original one. And there are many reasons for it. Firstly, E-commerce sets no boundary for the globe, changes it to a global market that anyone can be a part while old stores are limited by geographical area. Building the business from ground and expanding it not only in the local but all over the world at almost zero cost. The next big achievement E-commerce brings is online store available around the clock. This unstoppable

working time causes online business serve customers 24/7, every single day of the year. "Shopping every minute" became a slogan which stimulates customers to buy more at no restriction time which a normal shop cannot arrange. It is a two-side win when businesses can grow dramatically in sales while buyers have a convenient time and quick options to be completed. (Markus 2019.)

The price makes it the third benefit. Running an E-commerce business requires a lower cost because there is no need in hiring sales staffs or managing physical store. From that point, company can offer coupons for customers or discount directly in the products, then it will be an advantage in the market. While the business is purchasing online, companies could access and collect a big amount of data from customers. Therefore, targeted consumers and clients' buying habit can be tracked for marketing purpose. Companies can easily reach their customer's desire and advertise products through many popular social platforms such as Facebook, YouTube or Instagram. Not only online shopping is a excellent way for companies and customers, but the working men also get benefits from online business. E-commerce platforms do not require employees to stay at office every single day while they can simply manage their work at home or anywhere else has good internet connection. (Markus 2019.)

2.1.4 WooCommerce

E-commerce appeared and brought a novelty for the economics, encouraged entrepreneurs in running their businesses. And many platforms support companies in building an E-commerce site, help them to be more successful in their career. Standing out of those, WooCommerce is one of the best options and perfect platform for this project. WooCommerce is a plugin of Wordpress, the most powerful tool to create website in the world. Wordpress used to be known as a primary tool for making blogs, but it is no longer true. Nowadays, with the changing in core code and the new ecosystem, people are able to create any kind of website with Wordpress. About the number, Wordpress owns over 35,2% of all websites throughout the internet, it is 100% free and an open source content management system that everyone can use and edit the software with zero cost. The power of Wordpress is that it is suitable for anyone even though the person is familiar with coding or not, they can still access to this software freely. (Kinsta 2020.)

WooCommerce has become a successful E-commerce platform of Wordpress in making business websites. It was created in 2011 and hit 2 million downloads in just 2 years. As its compensation, WooCommerce is free and an open source, it is also owning 25% of all E-commerce shops, and the

number just keeps growing. Inheriting Wordpress's achievements, WooCommerce is a user-friendly platform. This plugin of Wordpress also does not require users are master at programming field, even though it still has many areas for developers to build up their creativity. WooCommerce is flexible when it can run on all devices from laptop, tablet to smartphone. With the diverse of themes, users can modify their store's interface better. Above all, WooCommerce is completely save, it is secured by a hosting company approving the best security. With WooCommerce, businessman can sell their products in both physical or digital way, control their stockpiles, choose shipping options, payment methods and sale taxes. (COLIN 2019.)

2.2 Teamcenter

Teamcenter is a Product Lifecycle Management platform which belongs to Siemens PLM software, firmly created for supporting the design and managing the development of products. As a platform, Teamcenter contains many apps in a single piece of software. It can be run through log-in interface with username and password to access all the capabilities of Teamcenter functions. Users can also store data on Teamcenter because it is based on database. Teamcenter is divided into 3 main parts: Start - the initial deployment, Extend - the increase functionality and Transform - the advanced capabilities. From 2000s, Teamcenter not only stores and maintains the digital data received from product development period but also has extensive capabilities. Some of the most popular applications are Bill of Material Management, Service Lifecycle Management, Manufacturing, Product Cost Management, Commercial Product Management. With Teamcenter, business can control their products efficiently. (Power 2016.)

2.2.1 Active Workspace

Teamcenter, one of the most popular Product Lifecycle management software, however, it is complicated for people who avoid using new software, specially people who are not good at programming field. Because Teamcenter seems difficult and bulky, Teamcenter Active Workspace was built to be simple and convenient in controlling, slight and fast in speed and it could be run in any device. Technically, Active Workspace is a Web based client that provides access to Teamcenter, it does not require to install the application. Not only computer can access Teamcenter Active Workspace, but now even from a tablet or a smartphone, users can review product details, or join the PLM workflow through it (Siemens 2020.). Besides, in Figure 1, its User Interface is designed smartly with intelligent, dynamic

charts, smart filter options and result ranking. Active Workspace helps users' access in searching information easily, save time when finding data, and support modifying data in Teamcenter. (BCT 2017.)
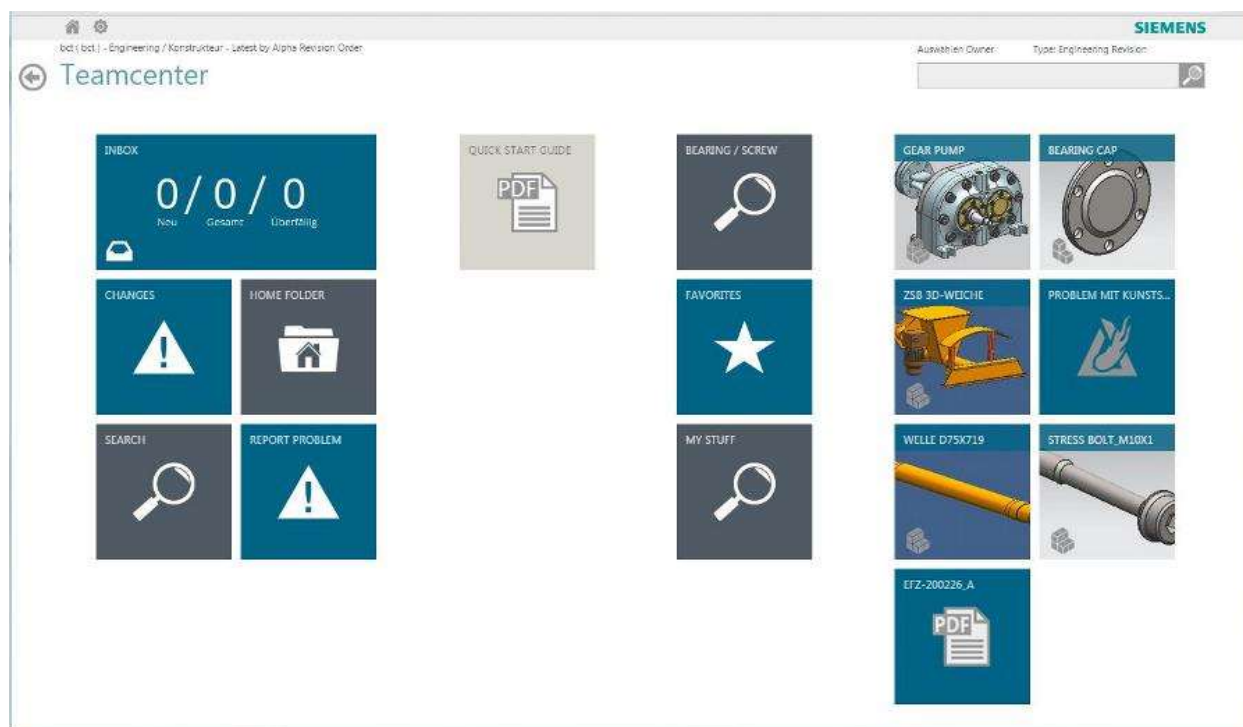

Figure 1. Teamcenter Active Workspace UI (Siemens 2020.)

2.2.2 IDEAL Commercial Product Management

Commercial Product Management (CPM) is an application launched by IDEAL PLM to help Teamcenter software capacity expand in business area. The CPM ensures unified brand and product story across all customer touchpoints, creates savings with improved data quality. It also supports in finding product related content easier and faster, maximize the portfolio value and improve the efficiency. The benefits CPM brings back for management team is reducing the number of software solution, unifying product experience across sales channels and making the products faster to the market. (IDEAL-PLM 2017.)

2.3 Perl script

Perl is a group of programming languages, which includes Perl 5 and Perl 6. In this thesis, only Perl 5 is mentioned since Perl 6 (known as Raku) is not an upgrade of Perl 5, but a separate part and has no relevant effect on the rest of Perl development. Within 30 years of development, Perl is an open source, highly capable, general-purpose programming language. Perl is also a cross-platform programming language which runs on over 100 platforms. This language was mainly built for text manipulation, but now it plays an important part in web development, network coding and Graphics User Interface design. With Perl, user can work with HTML, XML and embed its interpreter into other systems. Nowadays, most of used Perl is as web programming language. It can help to speed up the process of web servers to 2000%. Perl also can be a security for E-commerce platforms while encrypting the Web data transactions. (Rouse 2017.) In this project, version of Perl 5.30.1 by Larry Wall was used.

2.4 HTML

HTML is short for Hyper Text Markup Language, which is the fundamental and most crucial language of web development. HTML is not considered as a programming language, since it cannot create dynamic functions. It is a computer language that allows users to create static website, mostly create the structure of a web page such as making sections, headings, paragraphs and links. And with HTML, all the works are finished by code structures (attributes and tags). Websites that are written by HTML can be viewed by everyone using the Internet. The HTML files are saved with a .html or .htm extension, and it can run on any web browser. Developers create HTML files that browser can read then renders the content as a web page that anyone using internet can access. (Domantas 2019.)

2.5 PHP

PHP or Hypertext Preprocessor is a server-side scripting language that goes along with web development and can be embedded inside HTML. This language can only be run on server in which PHP has been installed. PHP is considered as a back-end programming language, which means that instead of decorating for the static website, PHP mostly supports the dynamics of a website, causes it more friendly to users. (Guru99 2020.) Moreover, PHP is a cross-platform script, and users can run PHP on any operating system and web server. Output of PHP is not limited to HTML, and developers can print out

any text including XHTML or XML files. With PHP, programmers do not need to worry about database when this script supports a wide range of databases. (PHP.net 2020.) In Wordpress and WooCommerce, PHP is used as coding language which is set on a server level. With PHP, Wordpress is able to interact with the database and to get data. After that, Wordpress can output data as HTML because of the various PHP tags and functions. (McCollin 2018.)

2.6 REST API

Application Programming Interface, API, is a software intermediary that allows the communication between two applications without knowing each other. APIs can be considered as a menu in a restaurant, customers write down what they want to order. The menu will be sent to the kitchen, then food will be brought back to customers exactly what they desire. Moreover, APIs help the developers create functionality to an application, while they do not require programmer to write down all the codes themselves. With API, users can also approach data from other services (Hoffman 2018.). There are 4 main forms of APIs: Open APIs, Partner APIs, Internal APIs and Composite APIs. While the first one is the public APIs that everyone can access, the others need a license or a private network to connect. Only Composite APIs are used for boosting up and increasing the operation of execution in the web interfaces. (Rapidapi 2020.)

To decide how the API looks like, there are four main web services about APIs: SOAP, XML-RPC, JSON-RPC and REST. REST stands for Representational State Transfer, a most-used web service technology around the world and the only one that will be described in this section. REST can be considered as an architectural style of how developers create APIs. It is a set of principal rules which allow coders to follow when making their own APIs. It shows that whenever a user accesses a specific URL, then that one will get back an amount of data, and this process is called request and response (Liew 2018.).

2.7 JSON

JSON is an acronym for JavaScript Object Notation, it is a logical way to store and transport data. JSON is a lightweight format that is made for developers to read and write data easily and for machines to parse and generate efficiently. There are two structures in building a JSON, they are objects (a set of

names or values) and arrays (an ordered group of values). JSON is friendly with many programming languages such as C, C++, C#, Python, Perl, Java, JavaScript and became the most used data-interchange language in the world. (Json.org.)

3 INTEGRATION OF TEAMCENTER PERL WITH WOOCOMMERCE

In this section, step by step of the process will be discussed. All the significant parts will be shown including images to explain the whole project. The main focus of this section is on the knowledge of Wordpress and WooCommerce, along with programming in Perl. Teamcenter and Active Workspace are considered as an initial part and already installed. The integration started with Wordpress and WooCommerce installation in WampServer. After that, API was created then it was used as the keys for Perl to write the codes.

3.1 Installing Wordpress and WooCommerce

The aim of the project is building an E-commerce website through WooCommerce. Installing Wordpress is the initial part needed to be completed. However, for the study purpose, there is no budget in purchasing a paid server, users need to download a free version of web server. In this project, WampServer was chosen. In reality, to own a website, developers have to buy a domain to manage it, then it can be found in the Internet by everyone.

3.1.1 Download server: WampServer

WAMP is an acronym which stands for Windows, Apache, MySQL and PHP. This is a software package that includes everything developers need to make a web application, in this case is Wordpress. With WampServer, users will have installed PHP, the scripting language which was explained above, MySQL, a database management system where all the website's content, users' cookies are stored, and Apache, the server software that allows users grant request over HTTP. Apart from LAMP (a web server sibling of WAMP) which is used for Linux, WampServer is based on Windows operating systems. Furthermore, WAMP is mostly designed for creating Wordpress, it allows users to try all the Wordpress features freely and speed up the network process. In this project, only private version of WAMP was used for study purpose, therefore, it cannot connect to the Internet. (Barisauskas 2019.)

To install WampServer, firstly go to its website: http://www.wampserver.com/en/. There is an alternative option for downloading this software is link to https://sourceforge.net/projects/wampserver/. Choosing the proper version then downloading it. After having this software in download folder, easily

developers can install it by double clicking the application, then follow the default options. When the process was finished, WampServer can be found in the toolbars with a pink icon as in Figure 2. The version which was used in this project was 3.2.0.
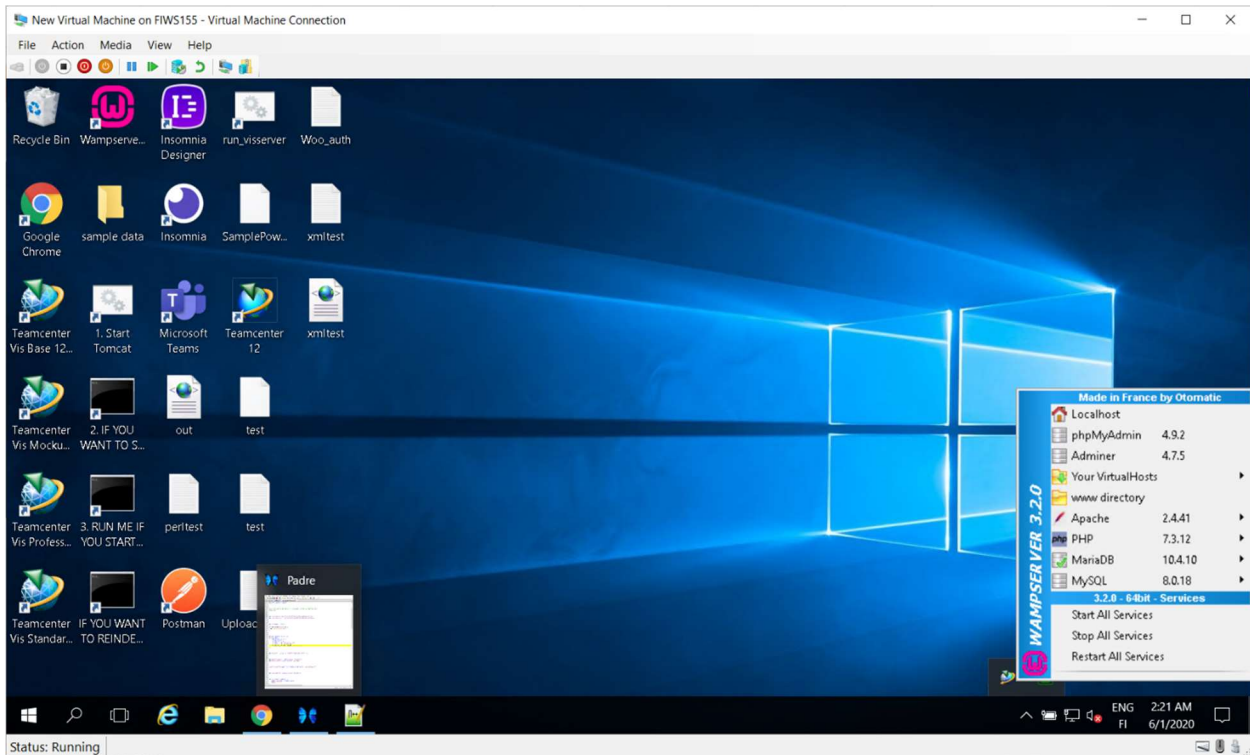

Figure 2. WampServer installed

Moving to the next step, running WAMP by double clicking the WampServer icon which is automatically created on the desktop. When WAMP is running, user can access the localhost through any web browser, then it can be viewed as in Figure 3. From here, developers can watch their projects, access the tools, see the aliases and the virtual Host. This side also provides all the information of everything that was installed together with it such as PHP, MariaDB and MySQL. Then the installing WAMP server is completed.
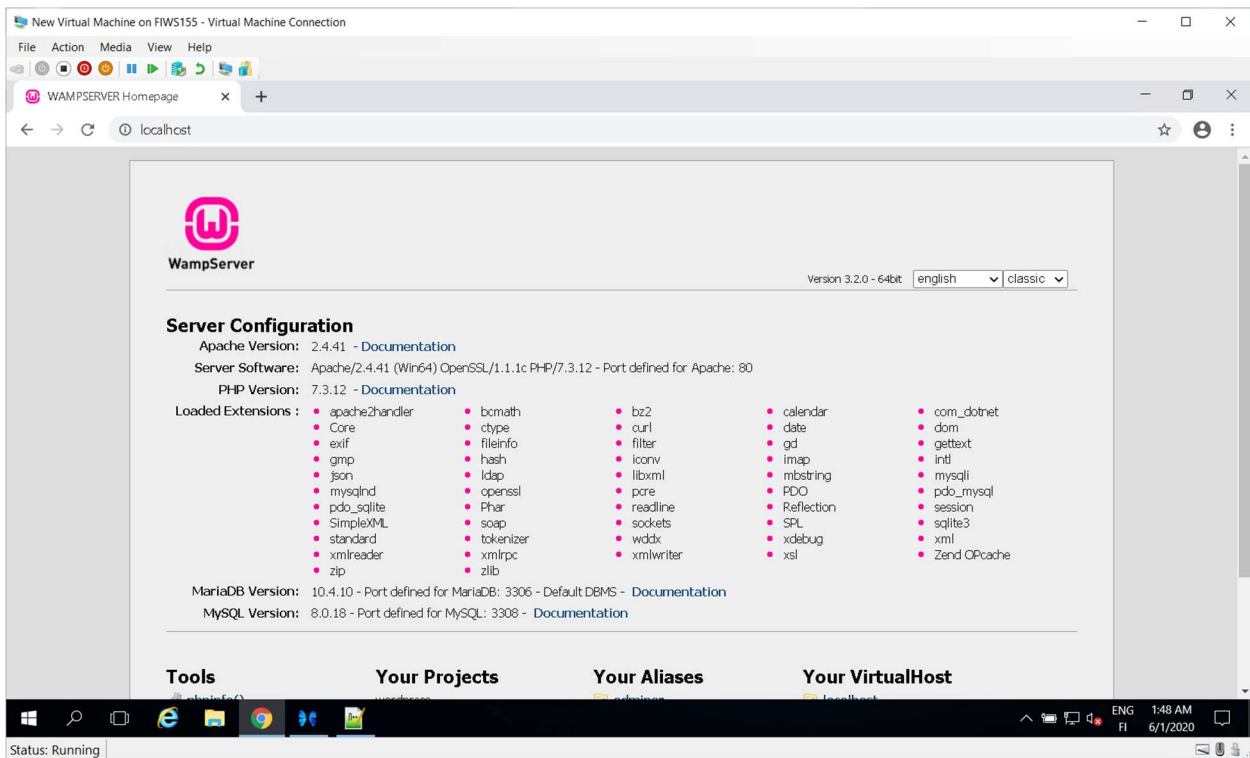
Figure 3. localhost of Wampserver

3.1.2 Install Wordpress

The next step and also the most important part of the project, installing Wordpress. Simply go to https://wordpress.org/download/ and download the Wordpress application. Unzip the package, then follow the instruction, and remember to create a database for Wordpress on web server. Then Wordpress is able to create by running http://localhost/wordpress/wp-admin/install.php on web browser. If everything was setting up properly, languages window will appear as in Figure 4. There are many options for choosing, from English, Turkish, Finnish to Vietnamese. However, in this project, English was chosen to this Wordpress. (Wordpress.org.)
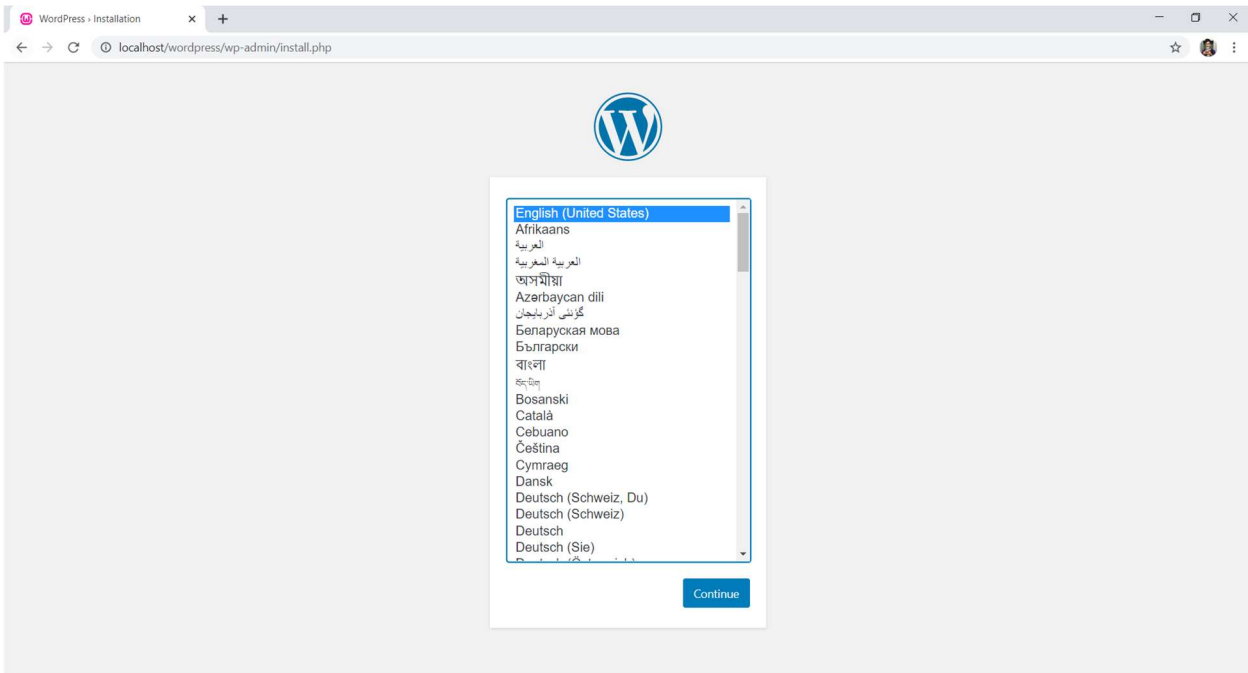
Figure 4. Wordpress language setting

After choosing the language, users need to set up their own data such as site name, username, password and email address as in Figure 5. This is the mandatory part, and it is especially important for security. Site name will appear in the web shop while username and password will be used when the owner logs in Wordpress. When setting the real web shop, email will play an essential part of protection, but in this project, only an unreal email was added. (Wordpress.org.)
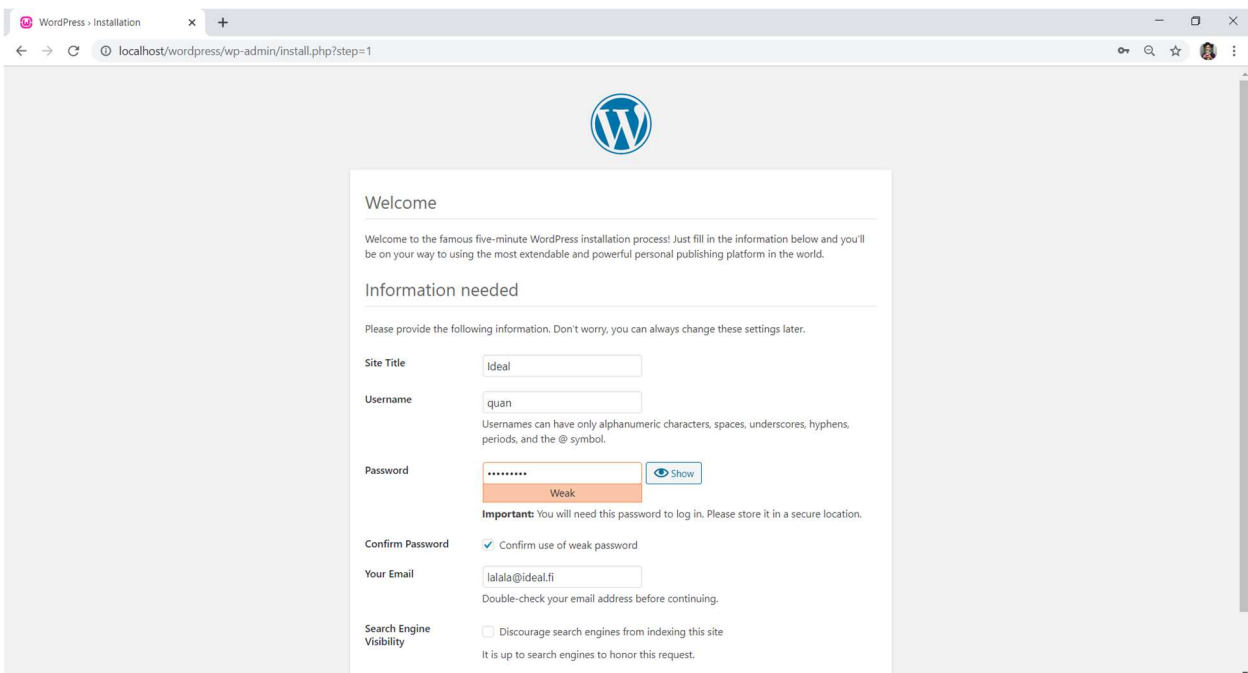

Figure 5. Setting personal information for Wordpress

When all the steps were finished, then Wordpress is ready to use. Figure 6 is showing the User Interface of Wordpress. Since Wordpress's appearance is similar to a blog, there are many functions of blogs such as Posts, Media, Pages and Comments. Moreover, Wordpress has many options to edit, for examples, Appearance is to change the theme, Users, Tools and Settings are for personal information, and Plugins are the place for installing other applications. (Wordpress.org.)
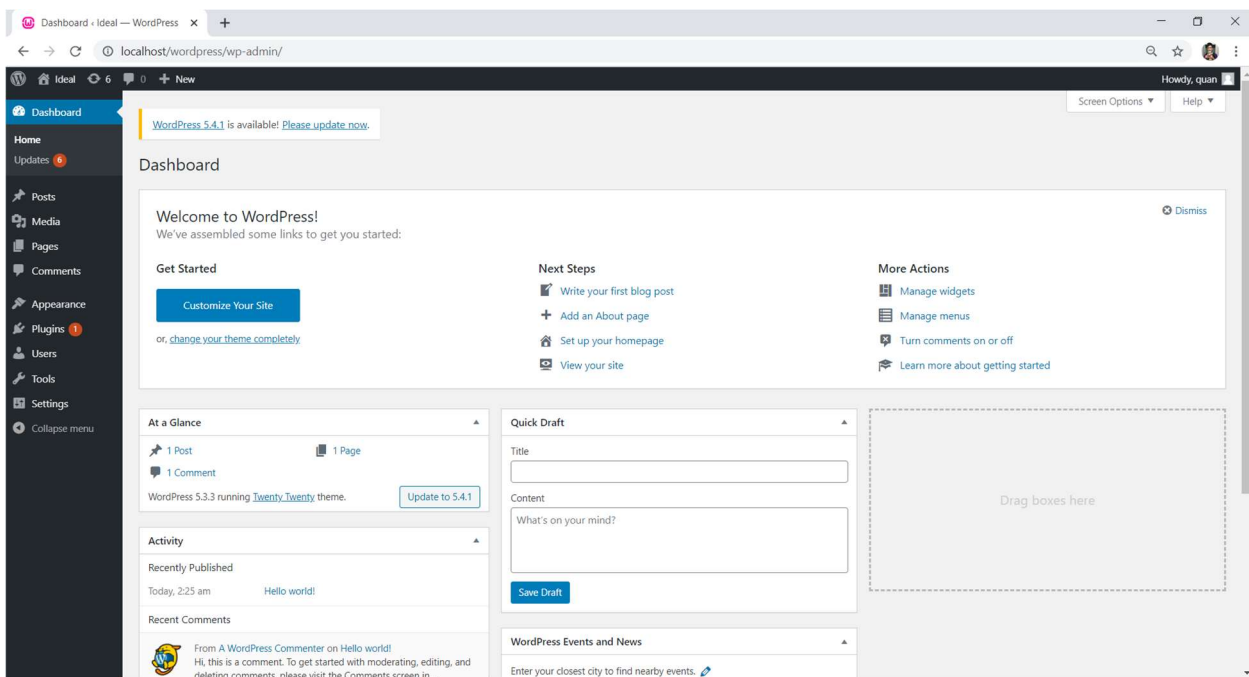

Figure 6. Wordpress UI

3.1.3 Install WooCommerce

WooCommerce is an E-commerce platform of Wordpress that can be found in the plug-in of Wordpress site. Moving to the search engine, and users can find WooCommerce by typing "WooCommerce" in the search area. As in Figure 7, the first result appearing in the Search Result is the plugin that developers need to install. Simply installing it by clicking the button "Install now". After that, let everything as default then WooCommerce was installed in Wordpress. (Khan 2020.)
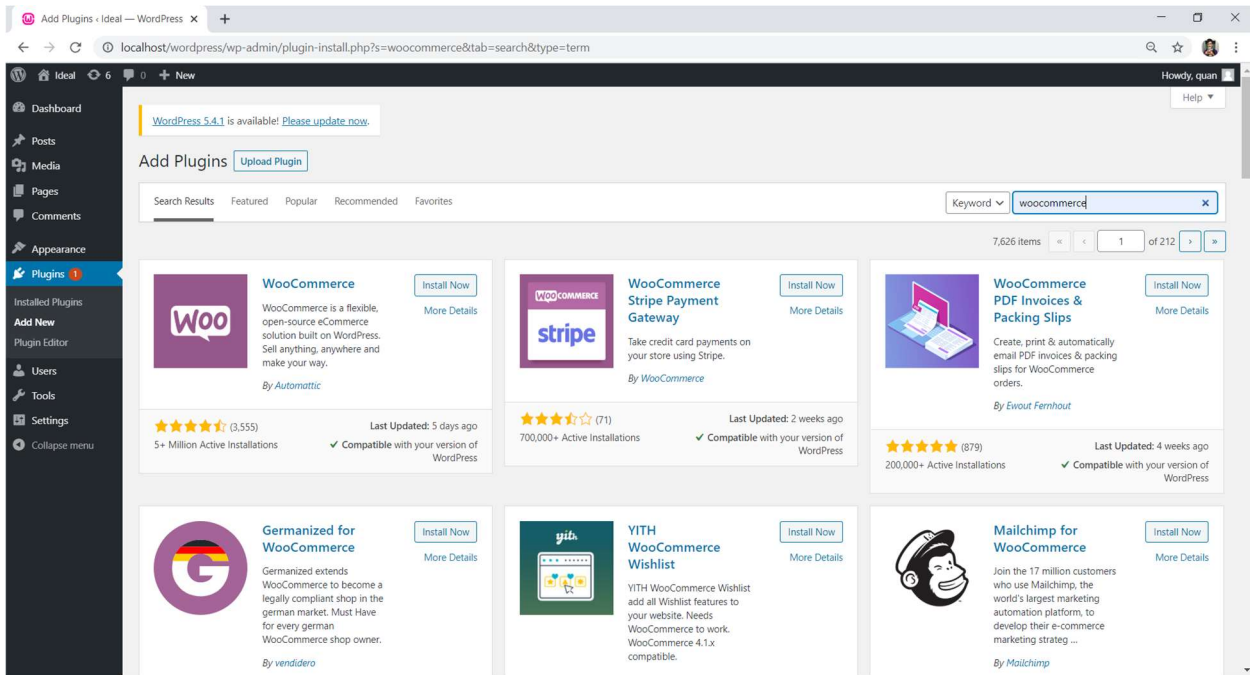
Figure 7. Plug-ins of Wordpress

After installing WooCommerce, developers need to declare again for WooCommerce, user details and information about the website such as address, industry, products type, business details and themes. Figure 8 shows all the steps owner needs to complete in order to create WooCommerce store. These steps are important as authenticating users' information. When shopping, customers will recognize and follow the products easily. (Khan 2020.)
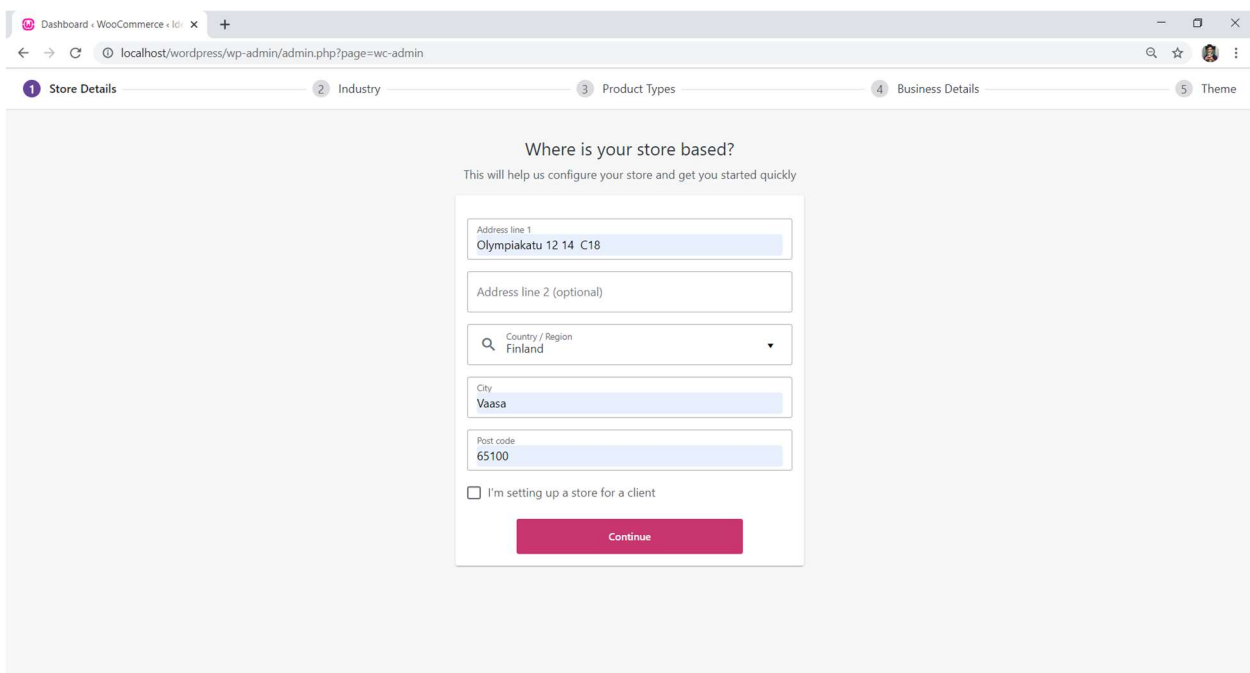

Figure 8. Installing WooCommerce process

When the setting up was finished, users will have an UI of WooCommerce on Wordpress. Figure 9 describes a part of WooCommerce site which includes brief information of how the shop is working. Users can choose data range to show on the screen. Following that is the performance of website sale from total sales, net sales to orders and items sold. Moreover, charts of each factor are illustrated below the performance. (Khan 2020.)
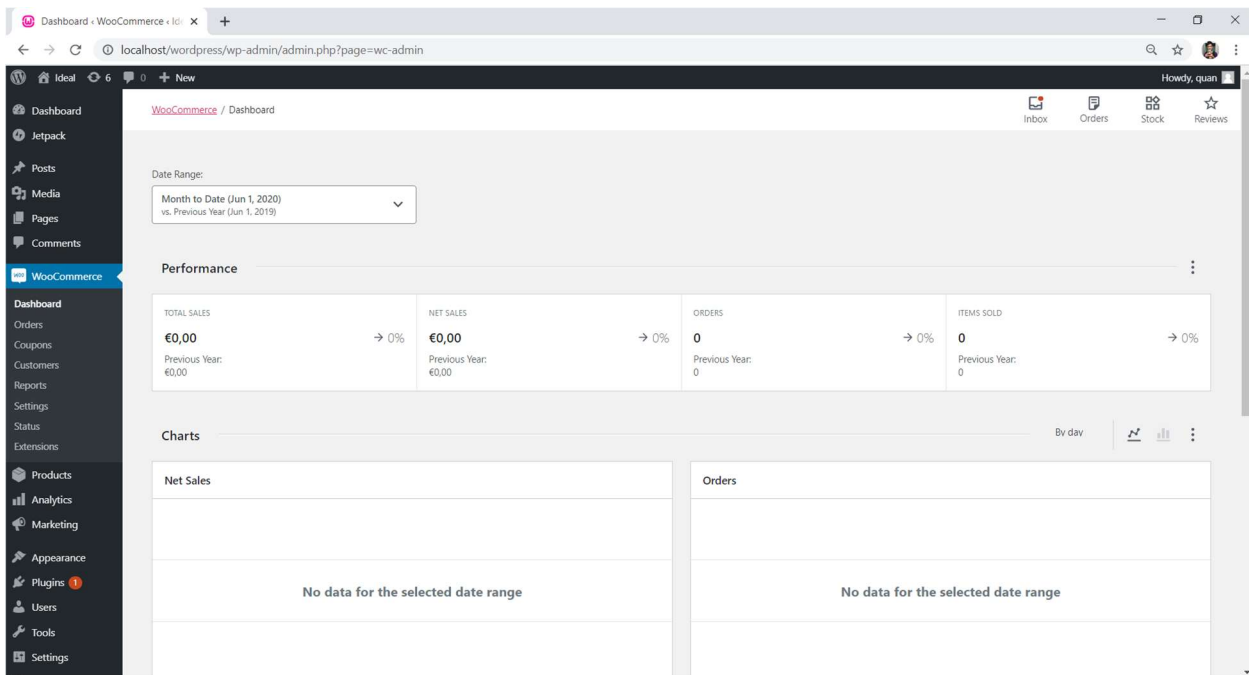

Figure 9. WooCommerce UI in Wordpress

When WooCommerce was fully created, then users can also access the shop interface. Either users choose button in the up-right corner from Wordpress interface or users can go to the link bar and type "localhost/wordpress/shop" to directly access the web shop as in Figure 10. Appearing in the middle of the web is the name that developers created in the beginning. There are many options as home, cart, checkout, my account, sample page and shop in the toolbar. All these functions can be edited as what users want to their pages. (Khan 2020.)
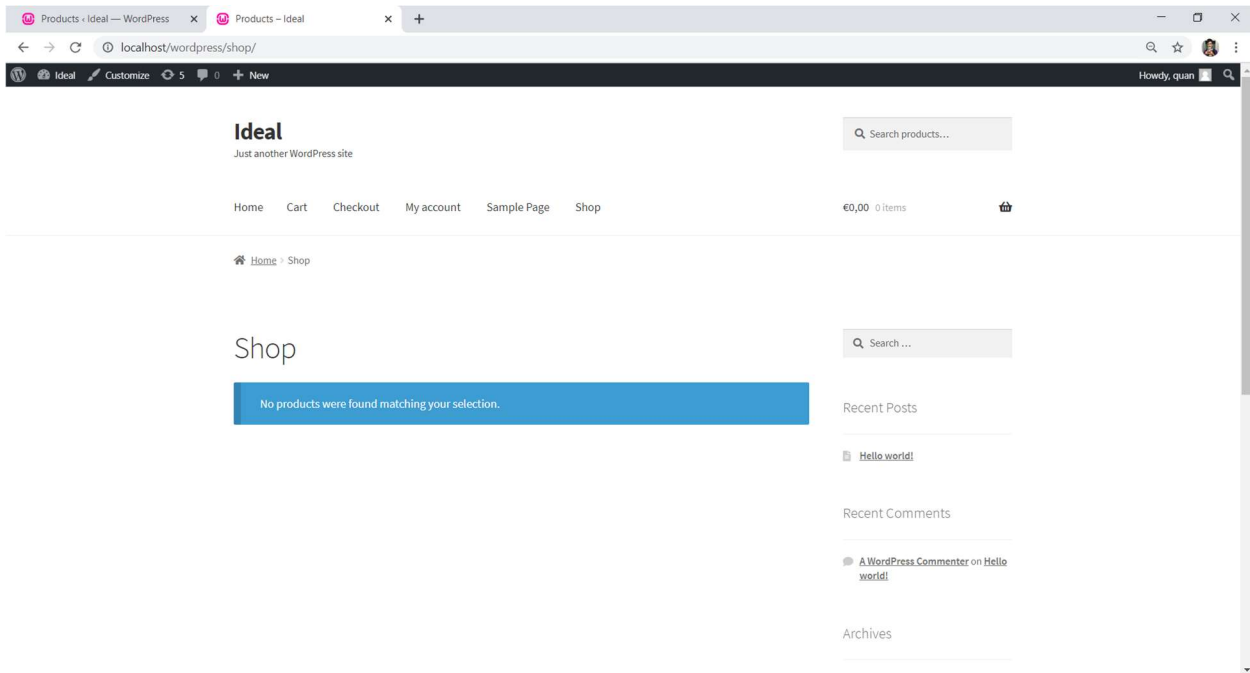
Figure 10. WooCommerce web shop UI

WooCommerce can help developers to create products and edit functions in their website manually. However, in this project, Perl programming language will be used to create anything without the help of WooCommerce. Furthermore, using Perl also supports developers when connecting to Teamcenter better. All the products will be automatically updated through Teamcenter.

3.2 Integration with WooCommerce

After installing Wordpress and WooCommerce, there are some categories on the main page such as Home, Cart, Check-out. In the next step, the products need to be created then be exported to the WooCommerce site. However, the authentication is the first job users need to finish. Authentication needed to be done to claim the accesses for users to enter the web's entrance. This also helps users' clients in the future for easy accesses. (Gandhi 2020.)

3.2.1 Authentication WooCommerce

Authentication is the process that verifies the legitimate users. Sometimes, applications require people who want to access their services a verified identity. This allows website owners control the interacting

users by positions and privileges. By providing a unique key, normally a username and password, owners can share it to their customers with different levels of using. There are many methods to authenticate a website, such as OAuth, OpenID, Basic Auth. (Gandhi 2020.) In this project, it will be Basic Auth.

Although authenticating sounds like an easy step, it is the most difficult part. Because it is similar to a big gate which prevents users to occupy the website. To authenticate WooCommerce, Basic Auth with SSL are using in this thesis work. In WAMP, the localhost is connected to HTTP site: http://localhost. However, this is a non-secure method that causes difficult to authenticate the website. Therefore, a SSL (Secure Socket Layer) is required to be set into WampServer to create the website more secure by HTTPS. (Green 2020.)

By going to https://slproweb.com/products/Win32OpenSSL.html, users can download the software OpenSSL. Following the instruction of OpenSSL, developers can setup the HTTPS that is able to use. After setting up the SSL, WooCommerce site will have an appearance as in Figure 11. The http now is replaced by https in the link bar.
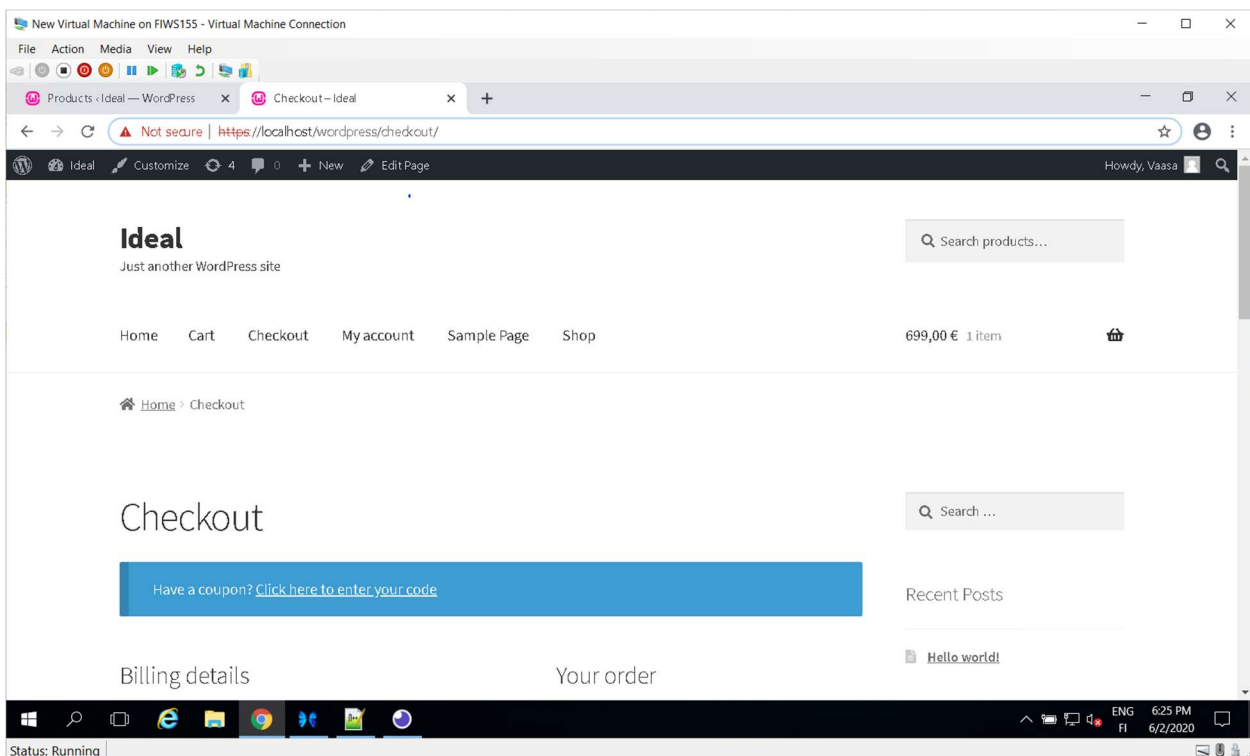

Figure 11. Change from HTTP to HTTPS

Next step, a unique key needs to be generated for users with different levels of using. Going to WooCommerce Settings in Wordpress site, then navigating to "Advanced" button, "REST API" option

will be shown under "Advanced". Click on that one, there will be a button to create new key. Choose "Add key" to generate a new key. In Figure 12, under "Add key", there is a list of keys that were generated and some brief information of each key. They are Description, Consumer key ending in, User, Permissions and Last access. These details help developers to control their keys in order and effectively. (Woocommerce.)
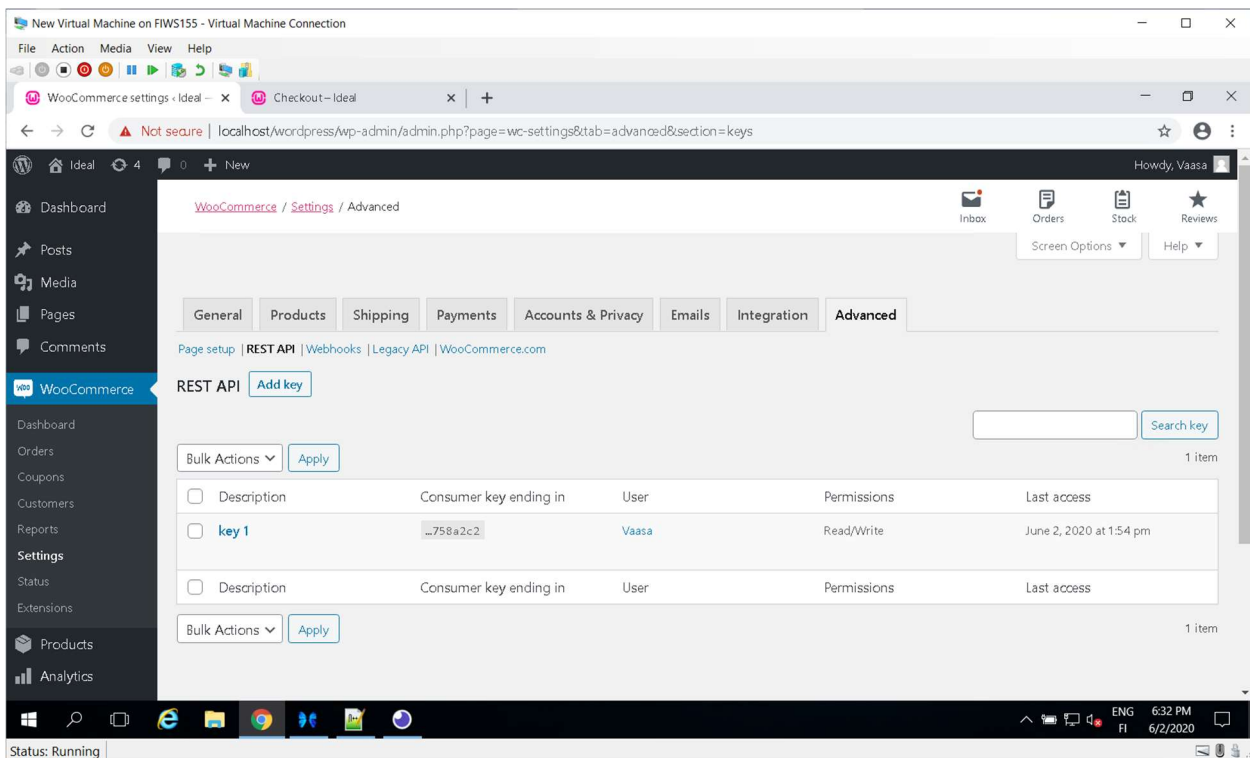

Figure 12. REST API key

Figure 13 shows the details in creating an API key. Owner can choose which permission can the clients access with. There are three options: Read, Write and Read/Write. In Description box, owner chooses a name for new key, it should be relevant to the client that will use the key. When the key's information was completed, click "Generate API key" to finish. A new key was created with, in this case, unique Consumer Key and Consumer Secret. (Woocommerce.)
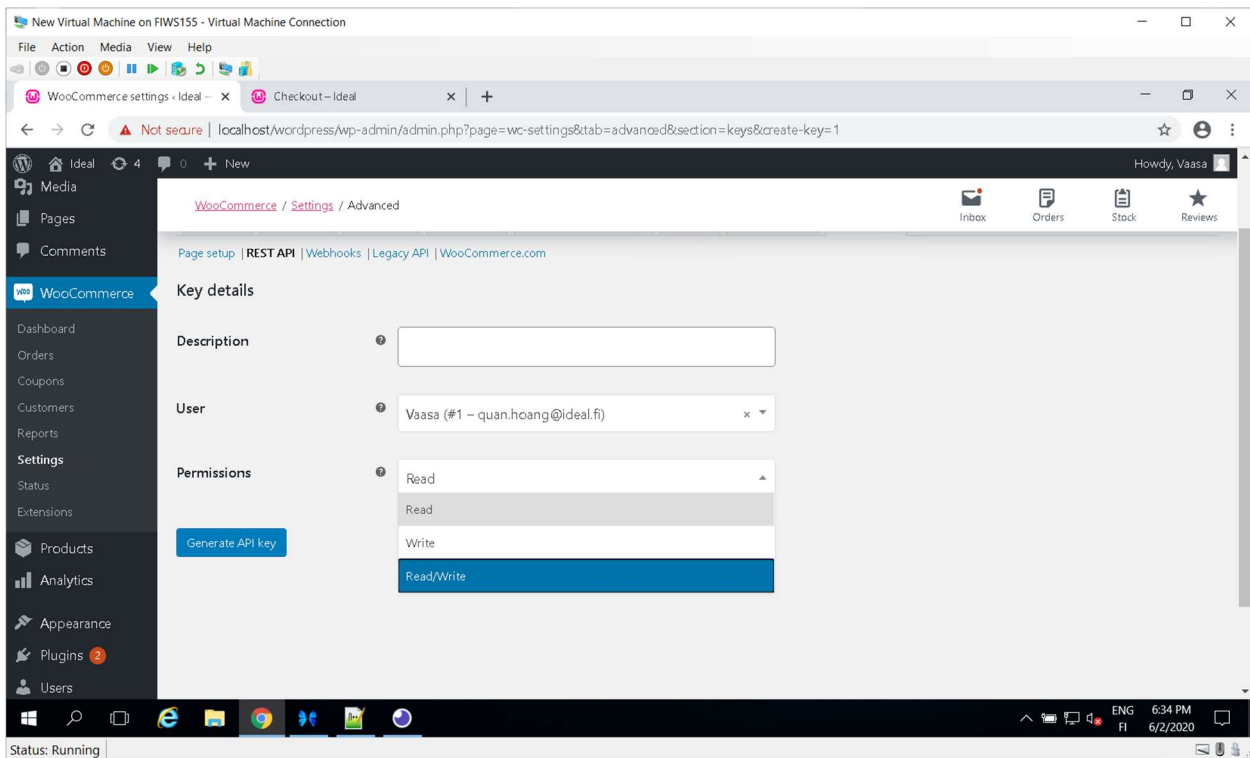
Figure 13. Information to create a REST API key

Moving forward, Perl script was written and will be run on Command Prompt (cmd) to authenticate WooCommerce website. Firstly, a set of libraries will be declared as illustrated in Figure 14. The first 3 lines are rules and concepts in writing in Perl, the strict pragma will verify all unsafe programming constructs, it obliges coder to declare all variables and code properly. While warnings pragma helps compiler to check and detect potential coding errors, it will then send a notification to developers for finding mistakes easier. (Gutschmidt 2002.) The 5 following libraries are for reading XML file, accessing SSL network, requesting website, reading JSON strings. All these will be explained deeply later in its own section.
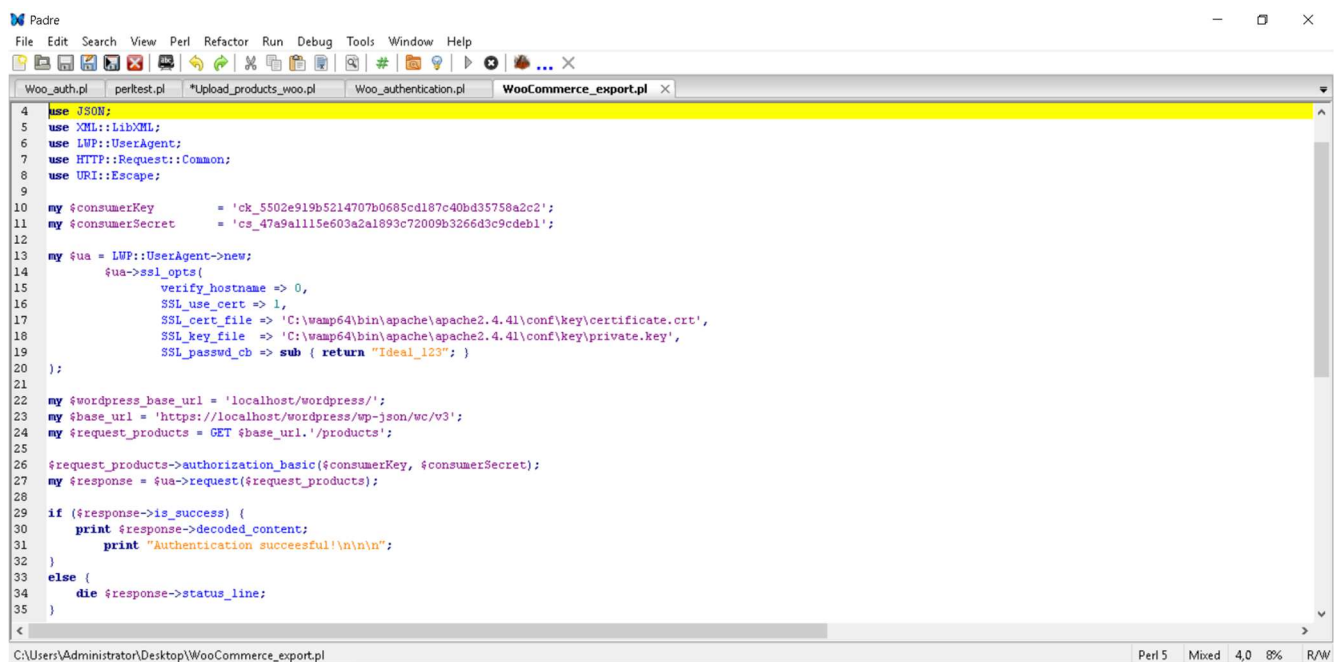
```perl
3    use 5.010;
4    use strict;
5    use warnings;
6
7    use XML::LibXML;
8    use LWP::UserAgent;
9    use HTTP::Request::Common;
10   use URI::Escape;
11   use JSON;
```

Figure 14. Perl used libraries

To authenticate WooCommerce site, declaring consumer key and consumer secret is the compulsory part. They will be then read by $request_products which is a request GET of REST API. All the API of products will be listed through GET request. The URL function "https://localhost/wordpress/wp-json/wc/v3" of $base_url is provided by WooCommerce REST API website (https://woocommerce.github.io/woocommerce-rest-api-docs/?javascript#products). Along with this, SSL is enabled through a certificate and a private key which were gotten when developers set up the SSL connection above. All the variables in Figure 15 are declared as "my" due to strict pragma. Figure 15 is the script for authentication, it shows all the setup for authenticating to WooCommerce.
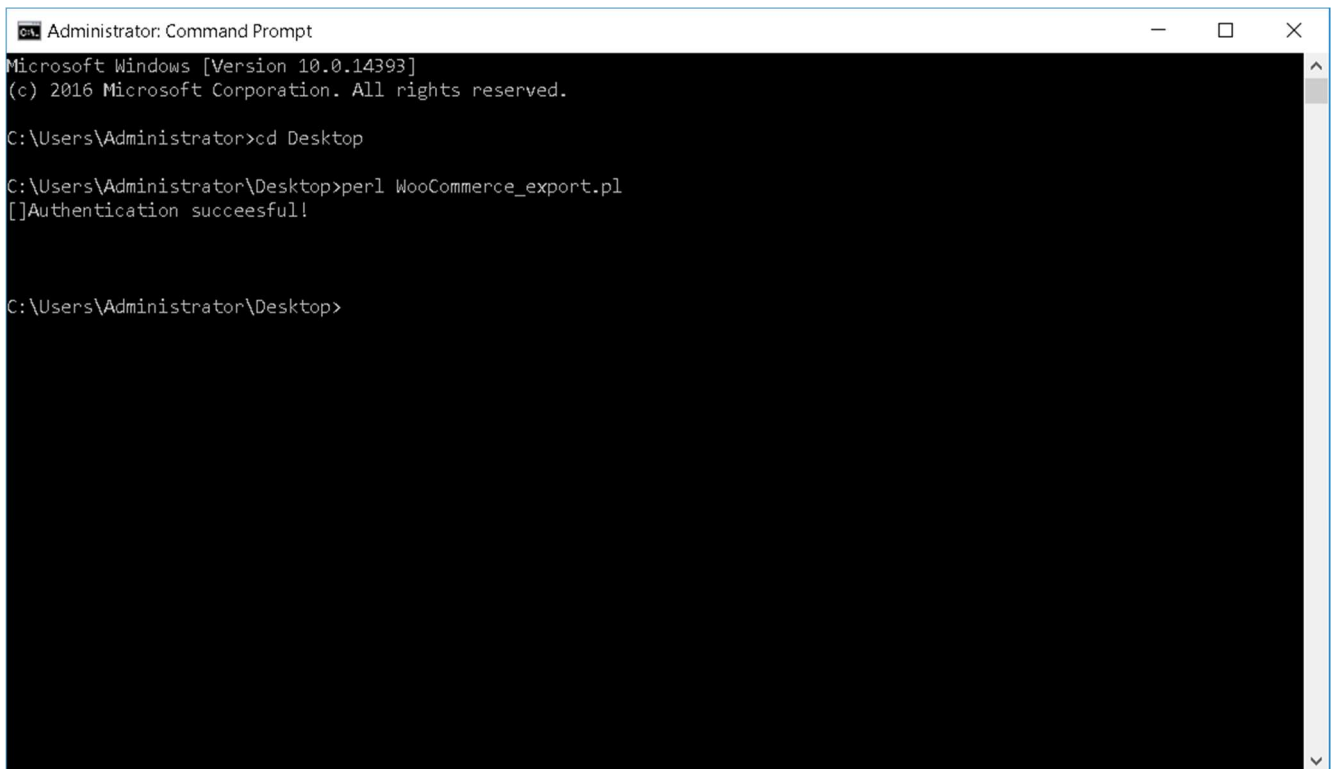

Figure 15. Authenticate script

If the $response is successful, then compiler will print a congratulation sentence on the command prompt as in Figure 16. After running a code "perl WooCommerce_export.pl" in Desktop, a sentence "Authentication successful" was printed out, this shows that the authentication was completed.

Figure 16. Successful authentication out-put in cmd

3.2.2 Export XML file from Teamcenter

After successful in authenticating WooCommerce, the next step is testing the XML file reading function. Teamcenter will export an XML file containing all the product data and developers have to send those data to online platform. But first, this file needs to be read through Perl script. Now the XML::LibXML library is used to read the file, in this case is XML file. It will read the file through a loop by each "Instances => Instance" (each "Instance" includes a single product, because it is based on the structure of XML file). Figure 17 shows the script of reading XML file by Perl.
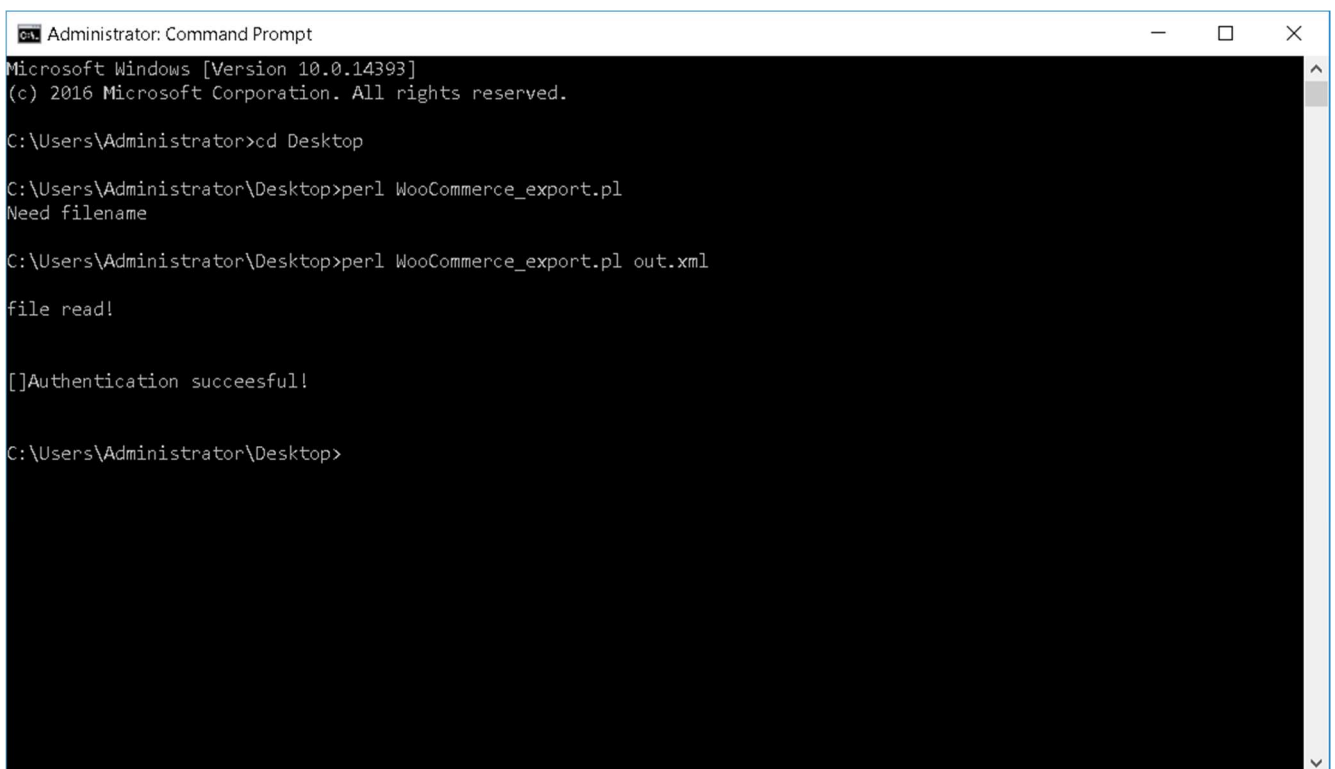
```
22   my ($filename) = @ARGV;
23
24   if (defined $filename) {
25           print "\nfile read!\n\n\n";
26   }
27   else    {
28           die "Need filename\n";
29   }
30
31   my $dom = XML::LibXML->load_xml(location => $filename);
32   for my $instance ($dom->findnodes('/Instances/Instance[@TcType = "Ipd3_ProductRevision"]')) {
33       traverseChildren($instance);
34   }
35
36   sub traverseChildren
37   {
38       my $node = $_[0];
39           #postToWooCommerce($node);
40       for my $refs ($node->findnodes('./RelatedInstances')) {}
41   }
```

Figure 17. XML file read script

If the file is found by the compiler after the code "perl WooCommerce_export.pl out.xml", there will be a sentence appearing with a content of "file read" in the cmd. Otherwise, "Need filename" will show up since the compiler could not find the XML file as in Figure 18.

Figure 18. Successful XML file read out-put in cmd

3.2.3 Create Products

When the file is possible to read, developers will create a form for each product including "name", "slug", "sku", "regular price" and "image". The first four elements are found in the XML file through "Properties => Property" (based on the structure of XML). But the last element "image" is read in a different way (this will be discussed later). Figure 19 describes a script for creating a data form for products. However, developers can add more factors for their products such as sale prices, color or sources.

```perl
59    sub createJSONdata
60    {
61        my $node = $_[0];
62
63            if($node->exists('Properties/Property[@dbName = "object_name"]'))
64            {
65                    my $JSON = JSON->new->utf8;
66                    $JSON->convert_blessed(1);
67                    $JSON->allow_blessed(1);
68
69                    print $node->find('Properties/Property[@dbName = "object_name"]') ."\n\n\n";
70
71                    my $perlData = {
72                            name => $node->find('Properties/Property[@dbName = "object_name"]')->shift->textContent,
73                            slug => $node->find('Properties/Property[@dbName = "item_id"]').'/'.
74                                    $node->find('Properties/Property[@dbName = "item_revision_id"]'),
75                            sku => $node->{UID},
76                            regular_price => $node->find('Properties/Property[@dbName = "ipd3_Global_Reference_Price"]')->shift->textContent,
77                            images => createImagesJSONData($node),
78                    };
79
80                    my $jsonData = $JSON->encode($perlData);
81                    return $jsonData;
82            }
83    }
```

Figure 19. Create data script

3.2.4 Posting products to WooCommerce

After creating the JSON for product's structure, the last thing developers need to do is upload all the data to WooCommerce platform. It is similar when coders authenticate by a GET function, now it requires another REST API function, the POST function. Because whenever users want to communicate with website, they need API. By function POST ($base_url.'/products'), the compiler will understand users want to connect to "products" category. It will need the consumer key and consumer secret to verify the identity to access WooCommerce as in Figure 20.

```
85   sub postToWooCommerce
86   {
87       my $node = $_[0];
88           my $encoded_data = createJSONdata($node);
89           if(defined $encoded_data)
90           {
91                   print "$encoded_data\n";
92                   my $post_products = POST($base_url.'/products');
93                   $post_products->content_type('application/json');
94                   $post_products->authorization_basic($consumerKey, $consumerSecret);
95                   $post_products->content($encoded_data);
96
97                   my $response = $ua->request($post_products);
98
99                   if ($response->is_success) {
100                          print $response->decoded_content;
101                          print "\n";
102                  }
103                  else {
104                          die $response->status_line;
105                  }
106          }
107  }
```

Figure 20. REST API POST

If the code ran successfully, cmd will print out all the string data because of the code "print '$encoded_data'". However, there is no need to see the cmd after this step, instead of that, the interface with products of WooCommerce is shown in Figure 21. Now the products are added into WooCommerce store. This is the main purpose of the thesis, showing how to create and export products to WooCommerce from the beginning. Nevertheless, to finalize the appearance of the store, last section will be for images of products.
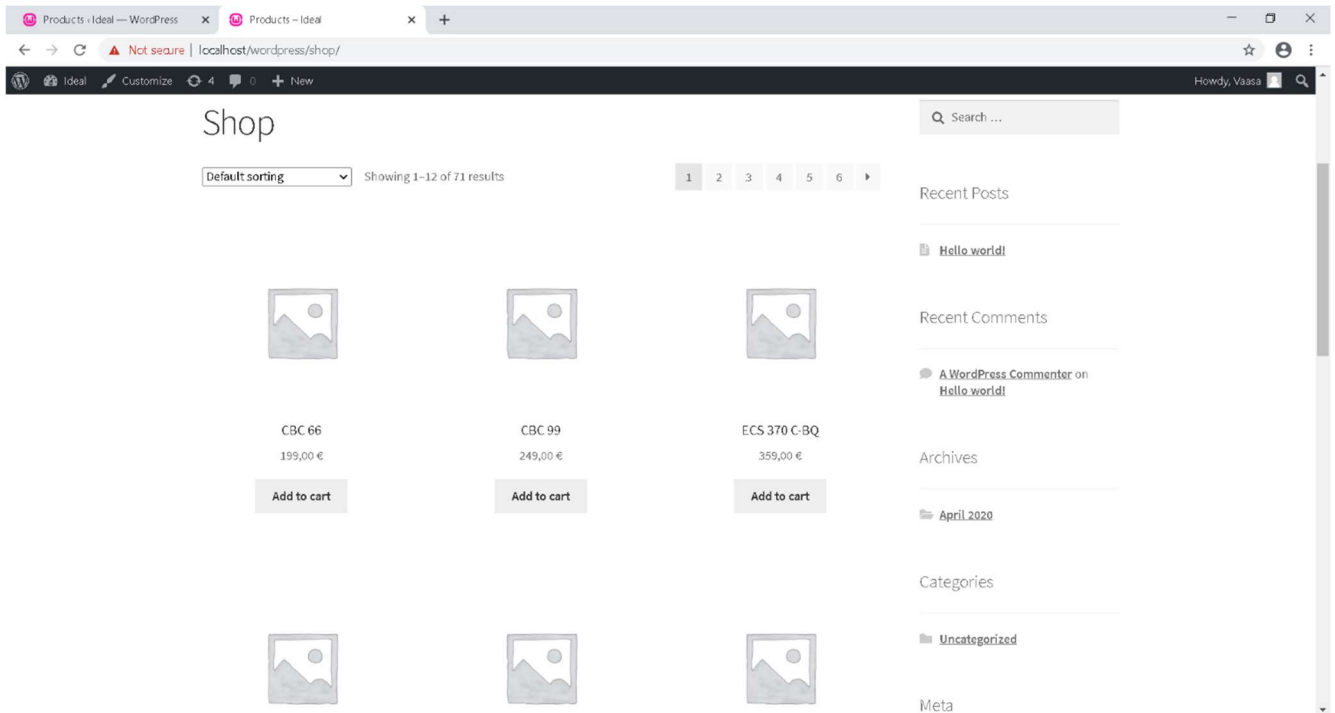
Figure 21. WooCommerce webshop UI

3.2.5 Adding images for the products

The last step can be considered as a final stage, a complete structure of a commercial website based on WooCommerce. However, to finish it with a better and friendly graphics interface, images will be added into the platform. By creating one more "sub" for images, this subroutine will be then included in the structure of a product as it had been mentioned above. An images file was exported from Teamcenter then be moved to a "$wordpress_base_url.'wp-content/uploads/product_images/'" folder. Figure 22 shows the script for adding images for products.

```
65  sub createImagesJSONData
66  {
67      my @arr;
68  my $node = $_[0];
69      my $references = $node->find('RelatedInstances')->shift->{relatedInstances};
70      #print $references;
71      for my $foundNode ($dom->findnodes('/Instances/Instance[@TcType = "JPEG" and contains(\''.$references.'\', @UID)]')) {
72          if(defined $foundNode) {
73              my $imageFileName = $foundNode->find('NamedReferences/NamedReference').'';
74              if($imageFileName =~ m/([^\\]+)$/)
75              {
76                  push(@arr, {
77                      src => $wordpress_base_url.'wp-content/uploads/product_images/'.$1,
78                      name => uri_escape($imageFileName),
79                      alt => 'empty'
80                  });
81              }
82          }
83      }
84      return \@arr;
85  }
```

Figure 22. Adding images script

After reading the images file, all the pictures will be added to the products content. Refreshing the shop page then as appearing in Figure 23, each product has itself an image. The web shop now looks much better than the last time with images.
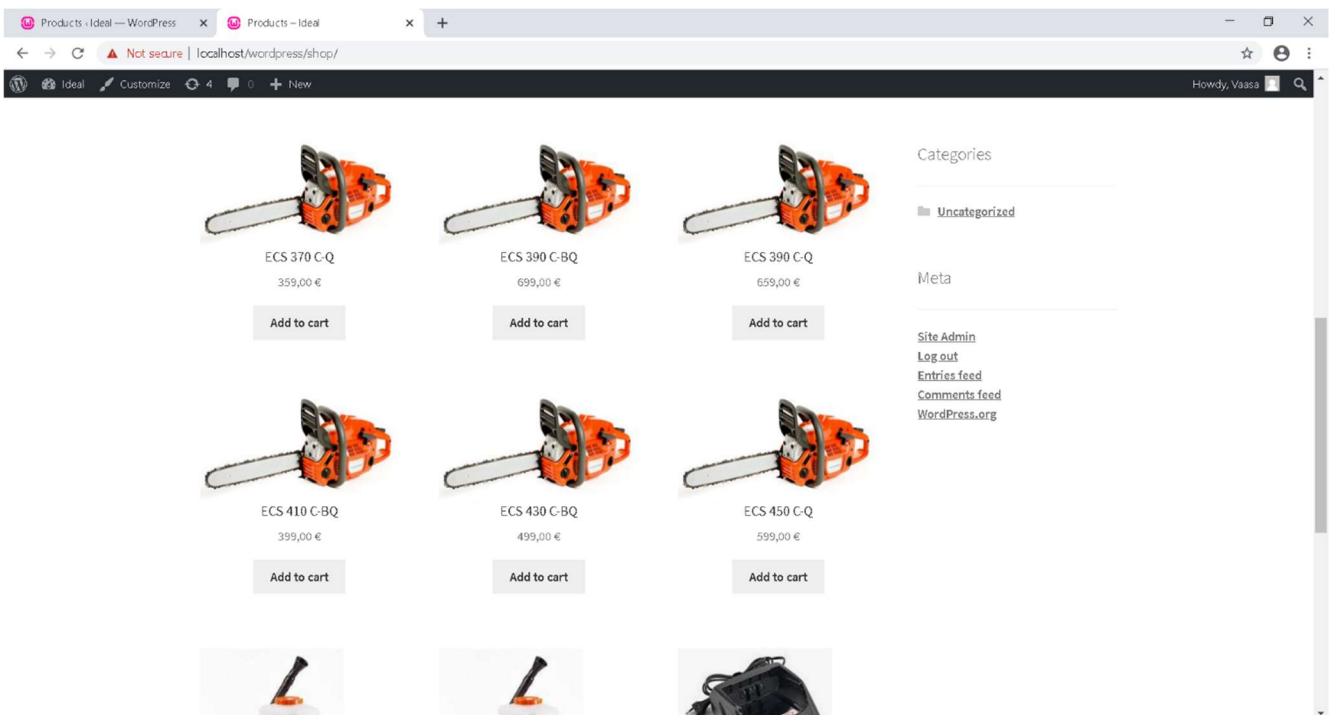

Figure 23. WooCommerce web shop UI with images

3.3 Testing of the integration

After finalizing the WooCommerce web page, developers need to test all the functions as if they work properly. From Figure 24 to Figure 26 is a process of buying 1 item. Firstly, going to the WooCommerce site by entering the link https://locallhost/wordpress/shop in web browser. There are several ways to sort items, in Figure 24, sort by average rating was used.
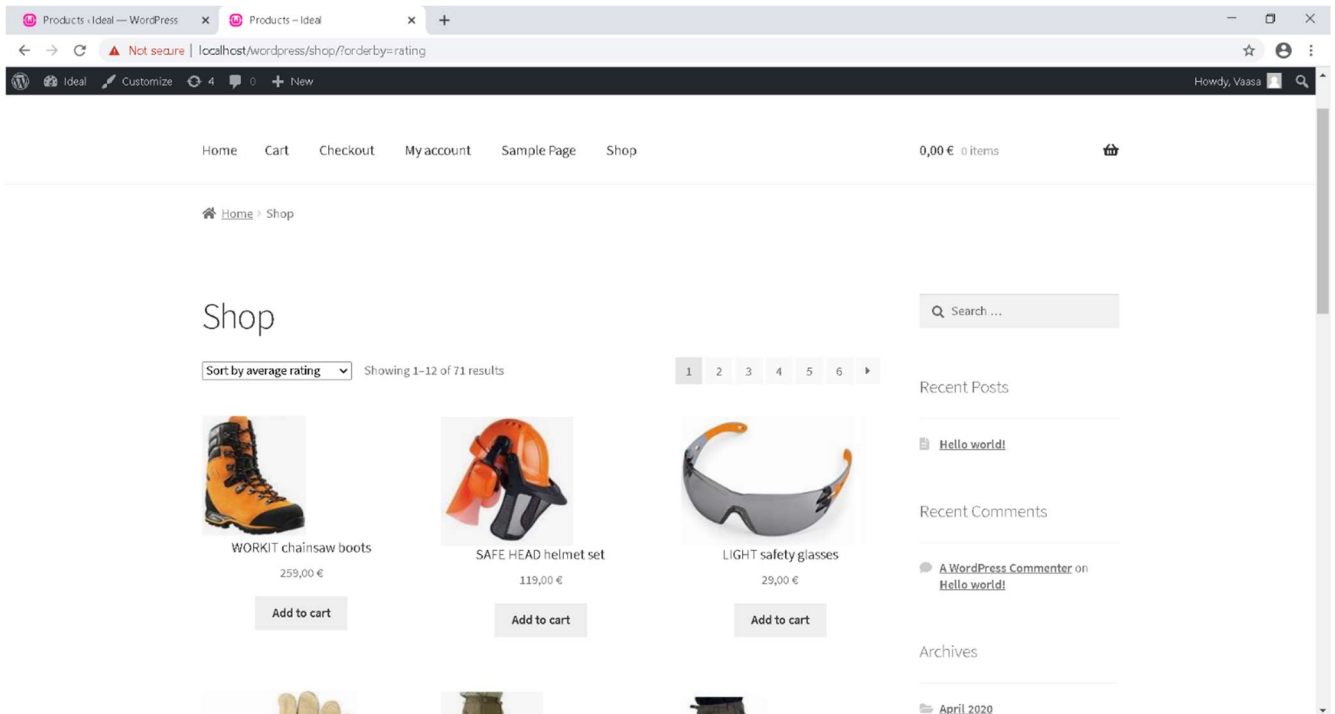

Figure 24. Final WooCommerce web shop UI

After that, a safe head helmet was chosen to the cart. In the cart section as in Figure 25, all the brief information was listed and an option to increase number of chosen products as well as a place for coupon code. Customer can review the products by checking product name, price of each item, quantity and the total price. If the customers choose products by multiple windows, then they can click "Update cart" to refresh the page. When everything is correct, then customers can choose "proceed to checkout".

Figure 25. Cart section

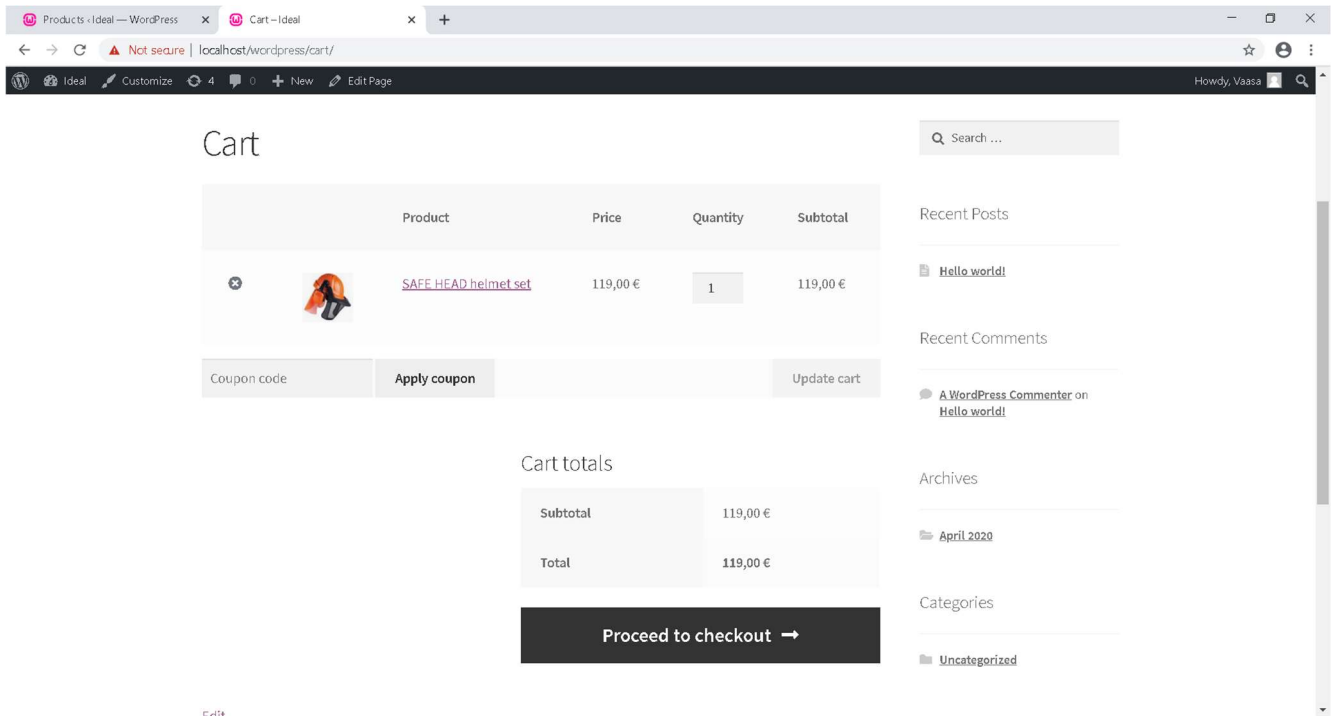In checkout site, customers need to fill all the personal information such as name, address, and also buyers can check again the information of their picked items. When all the steps are completed, customers can pay for the chosen products. However, this site was not set up for commercial but study, it does not have paid function since it is not connected to the internet yet.
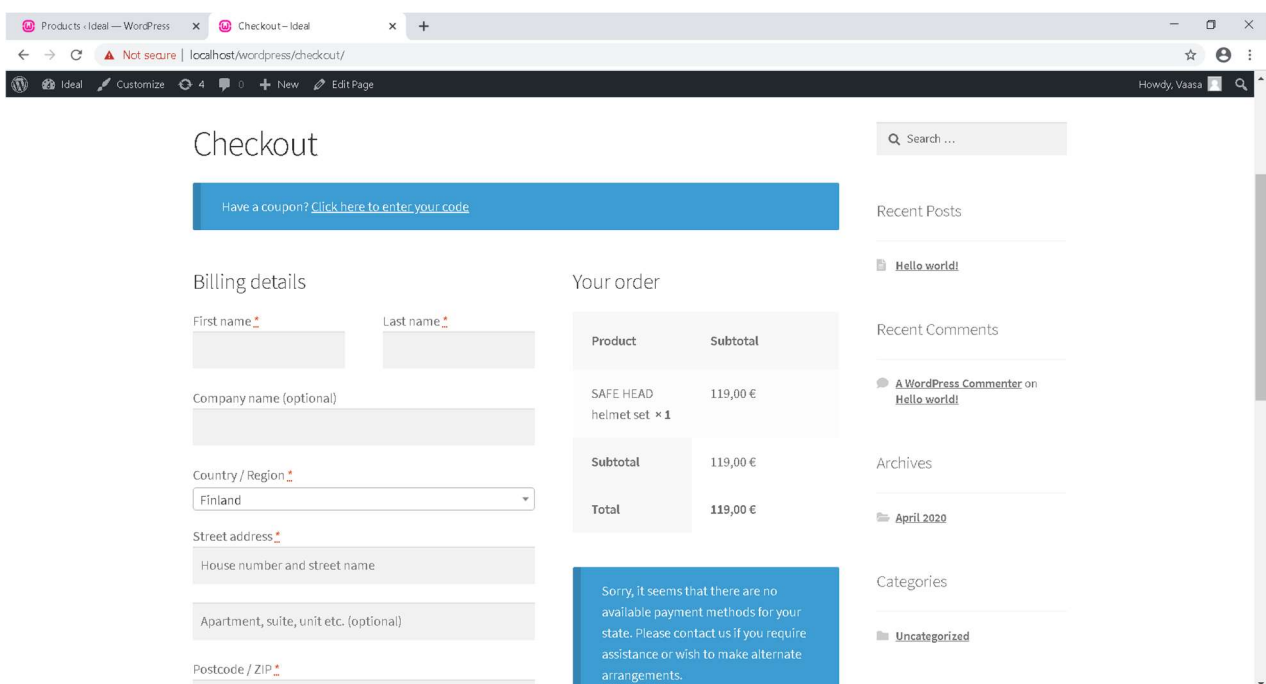
Figure 26. Check-out section

This is an entire structure for building a commercial website based on WooCommerce by Perl using data from Teamcenter. The main purpose of this thesis was to create a fully functioning web shop that can be run in real life. Developers can not only create products but also delete or update them. Nevertheless, there are many other steps to create the shop more effective by creating categories, coupons, setting up theme, designing font. All these steps are similar to those that have been explained above.

4 CONCLUSIONS

The primary goal of this thesis was to explain how to build a commercial web on WooCommerce platform by Perl from Teamcenter, and to discuss the importance of E-commerce on the modern people nowadays. The world has changed rapidly since technology entered human's lives, therefore, business has to grow up to adapt with that changing. Markets and stores now not only just stay on the ground but they are open also in the internet. E-platform appeared and ruled the business kingdom by all its convenient and effective sides. Modern businessman needs to change and adapt for the new markets. Running a business with E-commerce at the moment is an advantage, combining it with traditional store is a perfect combination. Businessmen, specially entrepreneurs need to know the best way to connect to the world, the internet, and a commercial website is a gate leading to every customer.

WooCommerce, one of the most common E-commerce platforms for web shop, was chosen for this project. Developers can create their own WooCommerce website by themselves. It is easy as it can be done manually through web interface, however, developers can also make a program for it especially when working with a heavy data. This thesis is to help developers create a website in WooCommerce by Perl using REST API with data taken from Teamcenter. However, the thesis is just a sample mostly for study, not for running a real business. To run a business website as well as a company requires much more efforts and resources. This thesis itself is a part of a project to open an E-commerce website for Ideal Product Data Oy.

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