

# A NEW PROJECT MANAGEMENT TOOL BASED ON DEVSECOPS

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**Abstract**— Cyber Security has become an important and crucial part of our society. Software are many times developed with little to no guidelines and security components, costing the quality and security of the software. We investigated on different agile development life-cycle models including: Behavioral Driven Development, Scaled Agile Framework and DevOps and DevSecOps. Eventually, we decided to focus on the DevSecOps development life-cycle model. Different types of DevSecOps models were found and analyzed. The characteristics of each were gathered to develop criteria for a new and effective DevSecOps model. Our results show that the DevSecOps models were more reliable than the previous models. Hence we adapted this model to develop our website to allow more security. All the selected criteria are highlighted and discussed in this study along with the website.

**Keywords**— Cyber Security, development models, scalability, DevOps, DevSecOps

## I. INTRODUCTION

In our current economy technology is the steering wheel. Undoubtedly, technology is the most booming field compared to all the existing industries. The reason is usability and ease in our daily lives. We are surrounded by IoT (Internet of Things). Most of the electronic devices around us are connected in the network. Soon, all the devices will be in the network and then we have to deal with new challenges to cope up with the maintenance, security and efficiency. Security is one of the concerns in technology, such as websites, software and applications, even hardware and mechanical machineries. The IoT devices are usually connected to a single point of network, hence if one device is somehow compromised then the whole network is vulnerable and subjected to the compromise of the rest of the connected devices in the network. We conducted this research study, because cyber security is becoming more and more prevalent. In this study we wanted to consider security before the delivery of a product. We wanted to append security to the website before the delivery to the customer,

so that customers don not have to deal with trivial security issues in phase 1 of the product launch. Our current test bed is a project management website implemented by us.

This paper is divided in following segments. The section II highlights the goal and methodology. Then section III highlights a little bit on the previous research related to this study, followed by section IV, describing the chosen criteria for the software development models. Based on these criteria the DevSecOps model was chosen to be implemented on the website. Then section V, talks about the website, which is a project management tool, implemented based on the DevSecOps model. We also highlighted some of the limitations of this project in section VI and finally discussed and highlighted the future directions and conclusions in Section VII.

## II. GOALS & METHODOLOGY

The Goal of this project is to develop a new DevSecOps model that would improve the security and quality of products alongside development phase before product delivery. DevSecOps is an agile based software development process which integrates continuous security into the original DevOps development process. After the development of this model, we digitally incorporated it into a website.

Our Methodology is first to switch to agile development. The agile development process is the process of continuous development where a product and requirements continue to evolve until developers and users are completely satisfied. Developers are able to return to the software and change any defects or modify parts of the software. This is why agile development process is seen as a loop or cycle because it is continuous. Then we analyzed different agile development models. Once we found a specific agile model, we focused on that one. After finalizing the specific model, we analyzed

the different components of the website on that one specific model. We analyzed several of the models that were based on DevSecOps. We found similar characteristics of those DevSecOps based models and used them to develop our criteria.

### III. RESEARCH BACKGROUND

There are numerous software development models in the market. In the beginning the relation between the developers and clients was not as transparent as it is now. Hence Waterfall model were serving the purpose of software development before. In Waterfall model, the requirement analysis, design, implementation, testing all were accomplished separately and predominantly. Hence there is not much room to fix an issue after the product was delivered to the client. But now in Agile models there are different strategy model to fit the clients in between the phases of software development. Such one model is Scrum, where the client can take part during the requirement analysis, design and implementation phase. Certainly the transparency can produce a healthy and efficient product before the final delivery. The development process goes in a loop fashion to revisit the previous stages if necessary.

Investigation was completed on four different agile models. The first model we researched was Behavioral Driven Development (*BDD*). *BDD* is an agile software development process designed to focus on the system behavior rather than its current state. *BDD* focuses on the software behaviors by using scenarios and features that users come up with to enhance its usability and adaptability. This model was not effective due to our research agenda to fit our website in a model for safety. The next model that was researched was the Scaled Agile Framework (*SAFe*). *SAFe* is a software development process that incorporates Lean-Agile Development, principles and practices that are used to develop software quickly, with high quality and on time. But then again *SAFe* is not the best fit since there was no focus on security aspects of software development and also the type of website we intend to build. The last model that was researched was *DevOps*. *DevOps* incorporates continuous development and continuous operation throughout the development lifecycle. This model is more prevalent and developed to the point where we can analyze different types of models and come up with criteria. Finally, we chose a slightly modified version of *DevOps*, known as *DevSecOps* which incorporates continuous security.

are graphically presented to elaborate our findings after launching DoS attacks.

### IV. CRITERIA

In the tables below, are the sets of criteria and their measurements that were developed, mentioned. There are three categories: Structure of model, Security components, and Efficiency of model. In figure 1, 2 and 3 the criteria and the measurements for them are listed. A decision can also be influenced by the perception that users have about online shopping in general and the time constraints which could be a stressor [9].

Criteria: structure of model	Measurement
How much overhead (extra tasks/phases)	Impact on necessity: high, moderate low
Structure deformation	How much change: major, moderate minor

Figure 1: Structure of Model Category

Figure 1 is a representation of the first group of criteria. The first group of criteria focuses on the structure of the model and its measurements. The first criterion talks about the amount of overhead (which means the amount of tasks added into the phases). One of the measurements of this criterion is “*impact of necessity*,” which determines the priority of the added tasks, either low, moderate or high. The second criterion focuses on structure deformation. Not all DevSecOps models are the same structure. The structure sometimes has an inner meaning. The measurement for this criterion focuses on the amount of modification to be considered on the model, either major, moderate, or minor.

Criteria: Security Components	Measurements
Use of Security tools	Identify tool & determine the impact of the security tool
Incorporate continuous security	Go through each phase and each iteration, must continue through deployment and monitoring. yes/no
security plan, identify security requirements	Level of impact the security plans and requirements have on the model and team High efficiency Medium efficiency Low efficiency
Security education/training enforced	Impact of security training/education. High Medium Low

Figure 2: Security Components Category

Figure 2 displays the second group of criteria which focuses on the security components to the model. The first criterion focuses on the use of security tools during the software development process. During the development process we should also identify the security tools and their impact on the software development. Incorporating continuous security is the second criterion. Throughout the

phases from the planning phase to the monitoring phase, security should be incorporated and continuous. Identifying Security requirements and creating a security plan is the third criterion. During the development process we should also determine the generation of level of impact due to the creation of a security plan on the project as well as the development team. The level of impact and efficiency could be high, medium or low. The fourth Criterion is incorporating security education/training. Security education is important during a project development project. Providing knowledge and proper training to team members with different aspects of security will enable them to better understand and incorporate the use of security components during the development. When the security education/training is incorporated, it is equally important to determine its impact. For example, what will be the impact for two days of training or for a whole week? If they are high, medium, or low.

Criteria: Efficiency of model	Measurements
Must be limitless and scalable to fit the needs of different sectors/user in computing	High scalability Medium scalability Low scalability
Impact of structural deformation on model	Increase efficiency Decrease efficiency

Figure 3: Efficiency of Model Category

Figure 3 displays the third group of criteria which focuses on the efficiency of the model. The first criterion says that the model created should be limitless and scalable for different sectors/users. This means that the model should be universal and able to be used by the majority of the IT industry. When the model is being created, we should evaluate its scalability. Is the Scalability high, medium, or low? The second criterion focuses on the impact of the structural deformation on model. We should also focus on the impact of structural deformation on the model and if it increases or decreases the overall efficiency.

## V. THE PROJECT MANAGEMENT TOOL

For the web application tool, I used HTML5 for the content, CSS for styling, and JavaScript for the interactions between the user and the website, and PHP to connect to the database and to allow forms to be submitted.

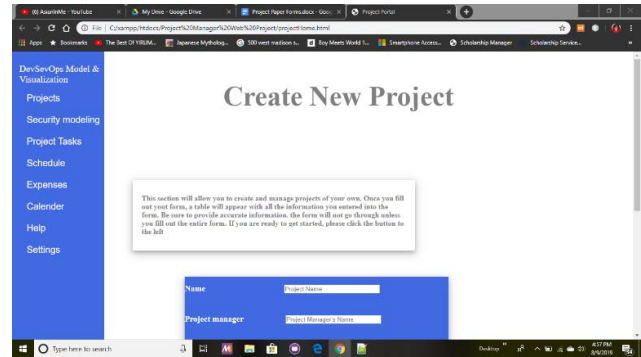


Figure 4: Create New Project page

Figure 4 shows the actual project management tool where users can manage their projects. The navigation bar begins with the “DevSecOps model and Visualization.” this page displays the new DevSecOps model that will be developed. The “Project” page (Current page in the picture above) is where the user can create and manage their projects. The “Security modeling” section is where all the security components will be added. Users can create a security plan, use security tools, assign security roles, conduct security tests and create a threat model. “Project Tasks” is where users can create and manage their tasks. “Schedule is where users can create and schedule tasks and activities. A google calendar was embedded into the web application in order to save time. In the “Expenses” tab, users can calculate the cost of their project, and enter records of invoices, and payments and expenses in general. In the “Calendar” tab, users can use this as another way to track meetings, tasks and other events. the Google Calendar was also embedded into this web page. The “Help” page consists of frequently asked questions, a way to contact and a search bar to search for the help users need. The “Settings” page consists of all the settings you may want in your project management tool.

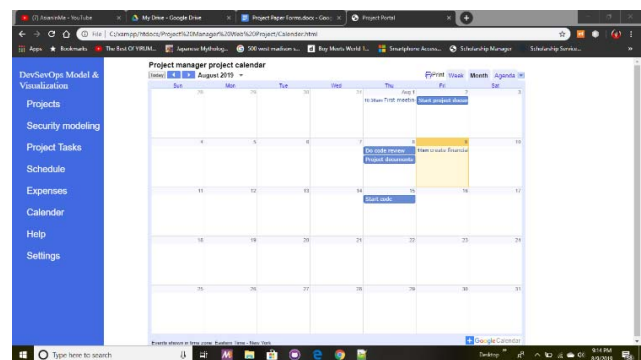


Figure 5: Calendar Page

Figure 5 displays an embedded google calendar in the Calendar page. I went to google calendar and received the piece of code that would allow me to view the calendar on

my website. I would have to modify the calendar on google calendar. Once I refresh the page on my website, the modification appears as you can see in Figure A. there are different tasks and events set up as shown in the picture.

Figure 6: New Project Form

Figure 6 displays one of the forms that were created. This form is used to create a new project. Once the form is complete, the data submitted will be entered into the database server. Once the data is successfully entered, a table will be created in the website displaying the information entered.



Figure 7: General Website Layout; Navigation menu, search bar, and login/registration

In Figure 7, the general layout of the website is displayed. We first see the home page, a search bar to search the website and the login and register buttons. We have the about page that talks about the website and its creators, the features page that talks about the features of the project management tool, the Contact page for contact and feedback, the Help page which displays a help search bar and a Frequently Asked Question section, and the Getting started page which is the gateway to the project management portal.

## VI. LIMITATIONS OF PROJECT

Several limitations of the web application were the difficulties with entering information from the form to a server database. Another limitation was the time. Although this project is a work in progress and will continue after the research program, it proved more of a challenge to accomplish more with the website.

## VII. FUTURE WORK & CONCLUSION

The purpose of this research and the development of the web application was to see how we can incorporate more security into the development life-cycle process. To build our criteria for our new model, we focused on preexisting DevSecOps models. The security of users on the internet and other technical platforms is very important. To prevent cyber-attacks such as DDoS, malware, and ransomware, we should incorporate security into the process of development. This means whether you are in the planning, designing, implementing, testing, and deploying phases, and security should be incorporated. We were successful at starting the website; however, it is still a work in progress and will be continued throughout the year.

On the cart page (Figure 6), users can view what they have ordered. Like peapod items in the cart would be categorized by type such as protein, dairy, etc. On the right is the payment method where users can select how they would like to pay and enter their information. On the bottom is the total including delivery fee and a section where users can input a coupon code.

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