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Abstract

The applications software interface builds take too much time to complete. Lean tools were used to analyze the process and determine the major areas for improvement. It was found that automation tools bring great benefits to the process. Working documentation tasks in parallel to the build process and sending them to review before the build is complete also contributed to the time reduction of the whole process. It was also desired to reduce the amount of turnbacks found in the Software Quality Assurance review. By using the SQA review tool employees can make a self-check of the work before sending it for review, this way documents need less or no rework. Builds process time was reduced by 50 hours.

Introduction

In the embedded systems department of Infotech Aerospace Services, there are many projects that cover a variety of work products, for military and commercial engines. These work products cover various phases of the software development life cycle. This life cycle consists of the stages shown in Figure 1. The company deems Design, including Implementation, and Verification as critical to business (CTB) processes for the company.

After changes are implemented to the software system of commercial engines in the Design and Implementation Phases, the software goes through an applications interface build process.

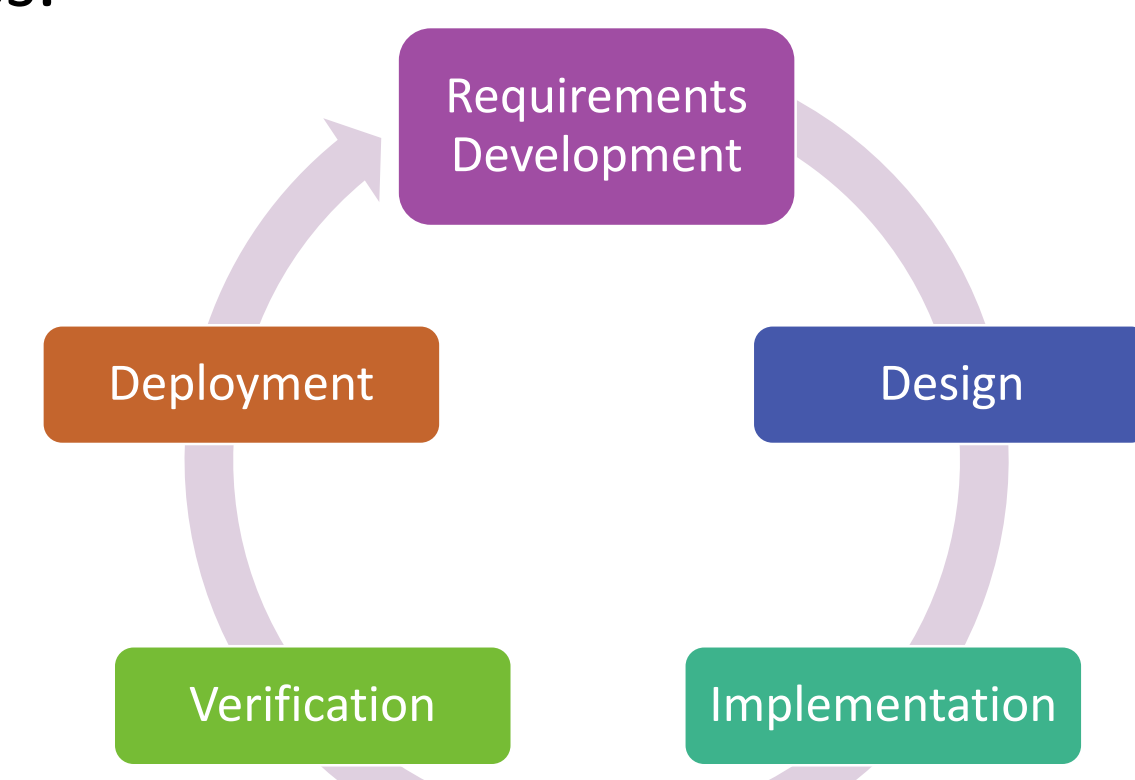


Figure 1
Software Development Life Cycle

Problem

Currently, the applications software interface (ASI) build process takes too long to complete and to be finally delivered to the client. The generation time of the documentation associated to the process is extensive also. With the time pressure to complete the work on time, sometimes internal “turnbacks” emerge during the Software Quality Assurance Phase, which require rework in order to deliver a 100% compliant product. Turnbacks are found during internal inspection when the product does not meet all specified criteria.

The objectives of this project are:

- Improve builds documents generation time.
- Reduce software quality assurance turnbacks, and reduce rework.
- Improve on time delivery.

Methodology

The need to improve the process of applications software interface builds was evaluated using different six sigma tools. A process mapping and a value stream mapping (VSM) were used to identify the major offenders in the process, and determine where waste time could be eliminated. It was determined that automation tools and process changes had to be implemented in order to reduce the build delivery time. One of the first steps taken to improve the build process was to implement better ways of communication between the department, SQA and the clients. A status email is sent daily to get awareness of status and build priorities. Additionally, documentation is sent to SQA as it is completed, before the build is finished, to advance this part of the process. To reduce the amount of turnbacks found in the SQA Review employees of the builds’ team use the SQA Metric review tool to verify their work and the metric file before sending it to SQA.

In addition, now IAS Local Build Machines are used to make test builds, this way errors can be detected before running official builds. It was proposed that they can also be used for official build processes when client’s machines are unavailable.

In order to improve the generation time of the metric file a Macro file was developed to automate this step of the process. Another automation implemented was the creation of a script that completes the bench checkout step and reduces bench time usage. The existing database of compiler warnings’ database was modified and enhanced to reduce the analysis of new warnings.

A plan was developed in order to monitor action items and tasks, and take time measurements. Lastly, the accomplishments of the objectives was verified with the customer’s and employees’ feedback.

- 1 • Process Mapping and Value Stream Mapping (VSM)
- 2 • Improve communication
- 3 • Automation of Metric File
- 4 • Automation of bench checkout
- 5 • Use IAS Local Build Machines more
- 6 • Enhancement of compiler warnings’ database
- 7 • Use the SQA Metric Review Tool
- 8 • Work documentation and send to review in parallel to other tasks
- 9 • Monitor action items and tasks
- 10 • Gather customer’s and employees’ feedback

Figure 2
Summary of the methodology

Results and Discussion

All the improvements in the process contributed to a great reduction in the time it takes to complete the build process. Table 2 presents a summary of the improvements along with the time it used to take to complete each step and the time it takes now. It can be observed that before improvements these steps of the build process took a total average time of 70 hours. Now the steps mentioned in the table take a total average time of 20 hours. The metric file now has 0 findings during Software Quality Assurance, since the team uses their revision tool. Therefore, SQA turnbacks were reduced from an average of 8 turnbacks per build, to an average of 5 turnbacks. The rest of the turnbacks are found in other documents, but the team is working to continue reducing them.

Table 1
Time it takes to complete a step in the build process before improvement vs after improvement

Step	Improvement	Before improvement	After improvement
Metric Tool	Automation (Macro)	5 hours	0.5 hours
Bench Checkout	Automation (Script)	2 hours	0.7 hours
Compiler warnings’ analysis	Modify database of warnings	13 hours	0.8 hours
Build Documentation (Generation, Internal Review, SQA Review, Fixes)	Better communication, use SQA review tool, send documents to SQA as they are completed (parallel to build)	50 hours	18 hours
Total time		70 hours	20 hours

Table 2
Number of turnbacks found during SQA before improvement vs after improvement

Document	Improvement	Average number of turnbacks per build	
		Before improvement	After improvement
Metric Tool	Use SQA review tool	3	0
Other Build Documentation	None	5	5
Total turnbacks		8	5

Conclusions

The purpose of this project was to improve the applications software interface build process. The main objectives were to: improve builds documents generation time, reduce software quality assurance turnbacks and reduce rework (cut down waste time), and improve on time delivery. The activities that contributed the most to the accomplishments of the objectives were the automation of the creation of the metric tool and the modifications to the warning database. Working tasks in parallel to other steps, such as sending documentation to Software Quality Assurance review and generating the parameters database in parallel, also proved to be very efficient. This contributed to meeting the first objective of improving builds documents generation time.

Software Quality Assurance turnbacks were also reduced. This was accomplished by using the SQA Metric Review file before sending the documents for review. Therefore, rework has also had a marked reduction.

The build process was practically reduced by 50 hours, this improvement obviously contributes to the accomplishment the objective to improve on time delivery. Clients and employees are happy with the results. Even though all the objectives were met, it is important to remember that the Lean Philosophy teaches us to continue improving and always be aware to identify areas of opportunity.

Future Work

There still are opportunities for improvement in this process, like continue working towards less or zero turnbacks. For example, SQA can provide training of their review process. Then, the builds’ team can implement points of inspections for all documentation. It is important to promote continuous improvement for this process in IAS since it impacts CTB processes for the company.

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