Agile-based Low-code Software Development for Nuclear Big Data Processing System

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2021.10.21

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01 Introduction

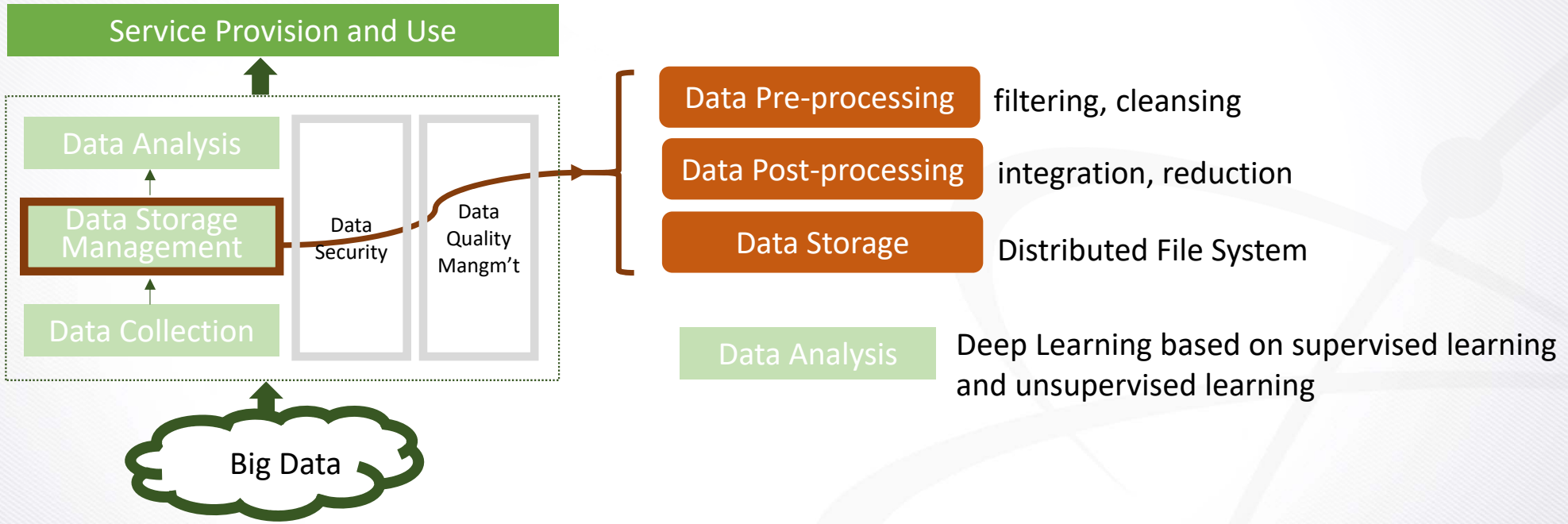

Fig.1 Big data process for Korean nuclear power plant

01 Introduction

Emerging Issue of Big Data Application Development

- **No-code and low-code** are emerging as the mainstream of big data application development methods.
- The reason why low code is attracting attention is **because it generally uses a visual programming interface. So, the entry barrier is low and the realization speed is fast. In addition, it is advantageous in terms of safety because only functions that have been verified in advance are used.**
- **VPL(Visual Programming Language)** is a method that implements functions using graphic symbols rather than characters, so that modules can be easily installed and used, and intuitive results can be checked through node manipulation.
- Unlike a general nuclear power plant system in which design requirements are determined at the beginning of development, **nuclear big data processing systems needs to gradually expand their requirements through short and repetitive implementation and verification processes according to the characteristics of various nuclear data.** Therefore, the nuclear big data processing system requires a different software development method rather than the existing waterfall development model.

02 Agile-based Low-code Development Method

Machine Learning Language

	Programming Language C/C++,JAVA,C#	Script Language Python, R, Lua, LISP	Visual Programming Language(VPL) KNIME, Orange, MS Azure
Form	Compile Required	Interpreting	Graph based
Module Dependency	Low		High
Development speed	Slow		Fast
Learning Difficult	Difficult		Easy

Fig.2 The type of machine learning language

Features of each VPL Type

KNIME	Enterprise-grade open source data analysis platform • Using Java and Eclipse platform • Modular workflow • Designed for teaching
Orange	Data visualization and analysis platform for experts and beginners • Python Based • Intuitive user interaction • High and simple extensibility
MS Azure	Cloud-based data predictive and analysis service • Web based • Service deployment support

Fig.3 The Features of each VPL type

02 Agile-based Low-code Development Method

Application of Data Mining Technology

- **Data mining** analyzes data from various perspectives and combines the results into useful information. Data mining identifies patterns and correlations hidden in massive data with statistical methods and gives them value.

- **VPL,** which is one of the machine learning implementation languages, is a tool that is usually **based on data mining techniques.** If you use VPL based on data mining technology like Orange, you **can implement the intended functional requirements without actually coding and check the results, saving cost and time.**

- **Data mining technology can be used for the filtering, cleansing, integration, transformation, reduction, and predication function of nuclear big data for the nuclear big data processing system .**

- If we use the VPL tool based on this, **we can check the function without a hardware-based prototype in the system concept and requirements design stage before the detailed design of the big data processing system. In addition, the result can be efficiently verified through comparison with the detailed design result later.**

02 Agile-based Low-code Development Method

Comparison between Waterfall and Agile

- **The waterfall model** is a traditional linear development model that collects all requirements, creates a plan, and progresses the project step by step.
- **Agile model** is a development model that improves quality by repeating execution and results in small units for given requirements.

	Waterfall Model	Agile Model
Scope	The scope is set in advanced, conditions are fixed	The scope is not fixed, can be changed within the schedule and budget
Features	Large projects with clear procedures and hierarchies	Small and medium-sized projects that frequently try new things to minimize risk
Requirements	Requirements can be added or changed only within the milestone because it goes through the stages of collecting and comprehensively analyzing all requirements	It is possible to reflect changing requirements during the entire project period
Realization Method	A linear way of planning according to the requirements and putting in and developing the necessary resources	Requirements cannot be predicted in advance, so iterating execution and results from minimal discussion of what to build and how to develop to results
Development Method	Creating software step by step	Iteratively confirms the process of developing prototypes and reflecting feedback according to function priorities
Integration Method	The final result is integrated at the end	Iterating releases for each version to find, solve, and fix problems
Test	Final testing and defect fixes prior to release	Integrate from the beginning and always find and improve potential flaws and problems

02 Agile-based Low-code Development Method

Agile based Low-code Software Development Nuclear Big Data Processing System

- we propose to implement the actual waterfall model **after applying the VPL-based agile model in the Rx data driven system concept and system requirement analysis stage for nuclear big data processing system** as shown in Fig. 4.

- The result of applying the VPL based agile model is used as an input for the requirement analysis stage of the waterfall model. In addition, **the results of each detailed design stages can be verified by comparing it with the results of the VPL-based agile model.** The detailed verification method is shown in Fig.4.

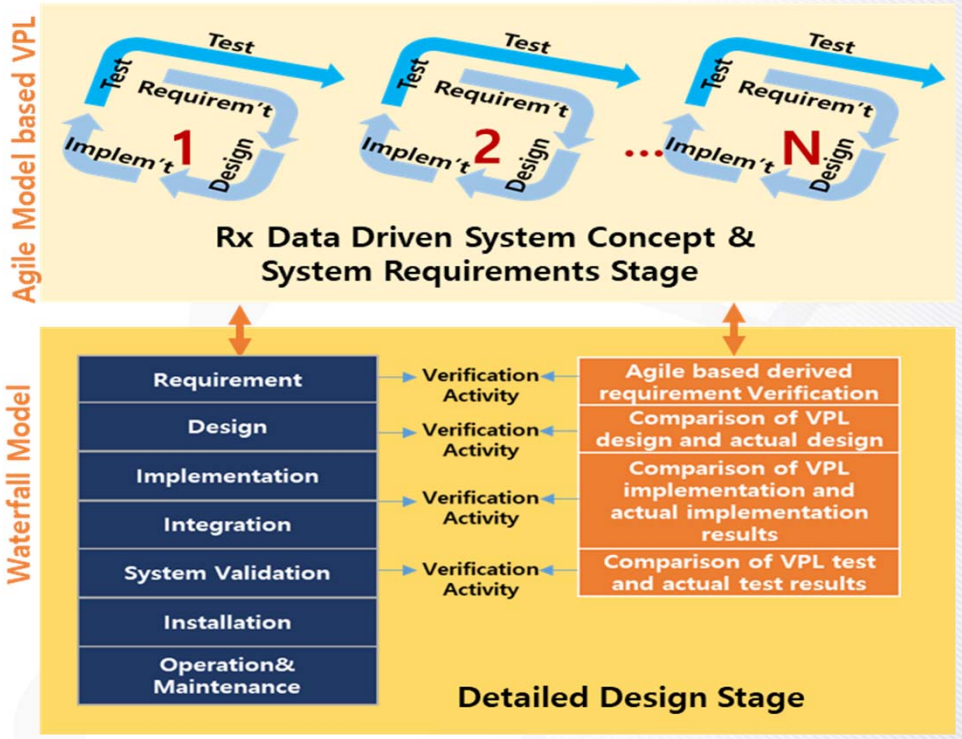

Fig.4 Agile-based low-code software development for nuclear big data processing system

03 Application Results

- Fig. 5 shows **the results of applying the agile-based low-code method using the data mining tool Orange** according to Fig. 4.

- Fig.5 shows an application example of agile model that starts with a small function of a nuclear big data processing system and checks the result by gradually adding functions. In addition, **it shows that the detailed design results can be compared with the functional results using Orange tool.**

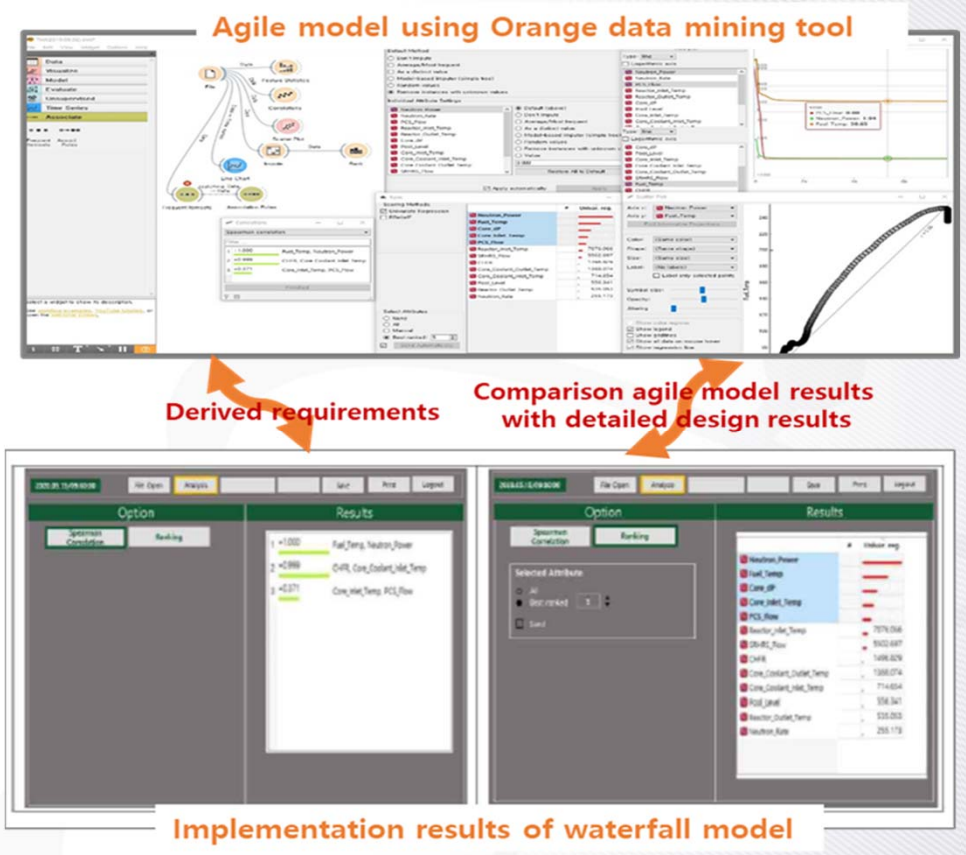

Fig.5 Application results of agile-based low-code software development for nuclear big data processing system

04 Conclusion

- In this study, **agile-based low-code software development method** was proposed for a nuclear big data processing system.
- This proposed method applies the **VPL-based agile model to the nuclear data-driven conceptual design and requirements analysis stage, which is the previous stage of the waterfall model applied to the detailed design of a big data processing system.**
- In addition, the results of each software life cycle can be verified by comparing them with the results of the agile model. In this study, **the possibility was confirmed by using the Orange data mining tool based on VPL.**

THANK YOU