Influence of System Development Methodologies on Process Centric Development to User Centric Tool (PcD.UcT)

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Abstract— *The evolution of System development methodologies has taken place since decades and many approaches that concern on a defined procedure in developing systems have emerged. Furthermore, the concern in system development methodologies has been shifted from processes to users. Among the system development methodologies, waterfall, prototype, agile, iterative, and spiral model are more prominent. This study aims to identify the influence of the existing process models to the Process Centric Development to User Centric Tool (PcD.UcT). The PcD.UcT development methodology has been proposed as a systems development methodology for HydroGIS tool development and the developed HydroGIS tool is named as GIS2MUSCLE. PcD.UcT development methodology can be The findings from this study suggests that three main system development methodologies have influenced the proposed PcD.UcT methodology, namely, waterfall, prototype, and iterative and incremental development models. Nevertheless, since this PcD.UcT methodology has shown a process accuracy of 100% and user-friendliness of 92% with a proven capability of employing the developer's time effectively, this can also be used as a software project management tool.*

Keywords— **PcD.UcT, process models, influence**

I. INTRODUCTION

The history of system development methodologies date back to 1960s (Wirth, 2008) and since the introduction of waterfall model, multiple attempts have been taken by researchers in improving the procedure of system development. With the emergence of computing, and higher utilization of software in the industry, the significance of employing a system development methodology to software engineering tasks has gained much attention. Among the vast amount of system development methodologies that have taken positon, waterfall, prototype, agile, incremental and iterative, spiral, RAD, scrum (Despa, 2014) are much significant.

Literally, the term System Development Methodology can be defined as the approach taken to implement the phases of the System Development Lifecycle (SDLC) in the software development. These development methodologies can be classified as plan-driven and agile, predictive and adaptive, and process centered and data centered perspectives. The proposed PcD.UcT development methodology is based on the predictive and adaptive perspective.

The researchers (Pradeep & Wijesekara, 2017) have worked on combining and evaluating appropriate methodologies to develop a Hydrological Geographic Information System (HydroGIS) tool that is aimed on automating the complex hydrology process in GIS environment. The ultimate aim of these researchers is to carry out two parallel developments, namely, automating the engineering process, and achieving user-friendliness. The researchers have finally developed a HydroGIS tool named GIS2MUSCLE using PcD.UcT system development methodology.

The HydroGIS tool proposed by the researchers (Pradeep & Wijesekara, 2017) is concerned with the application of hydrological engineering in the urban decision making. The idea behind this strategy is to automate the hydrological calculations that are essential in predicting the urban flood occurrence due to the modifications done by the public on urban lands. Further, the authors seek to automate the selection of a preventive step that must be taken if the calculated hydrological values predict that there is an affect to the flood occurrence due to the urban land modification.

Therefore, to achieve the above said requirements, the authors have attempted to select the most suitable system development methodology by analysing the ease of automating the process and also the user requirements. 24 system development methodologies have been analysed by identifying whether the focus is on user, process, or developer. Further, Pradeep & Wijesekara, (2017) have also assessed the suitability of each an every system development methodology for the HydroGIS tool.

According to the results obtained from the literature survey done to determine the suitable system development methodology to develop the HydroGIS tool, waterfall development has been identified as best suited for process requirements while the protype development has been identified as the most suited for user friendly development. Further, it has been found out that the waterfall model focuses on Process while the focus of the prototype model is on the User.

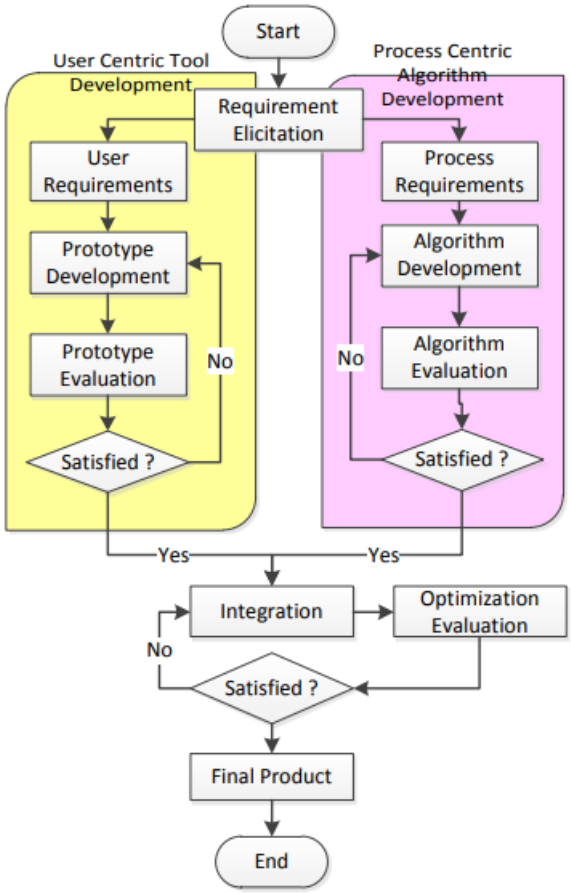

Figure 1. PcD.UcT Development Model
Source: (Pradeep & Wijesekara, 2017)

Therefore, the authors (Pradeep & Wijesekara, 2017) have employed the waterfall development and the prototype development for the implementation of the proposed PcD.UcT development model.

Pradeep & Wijesekara, (2017) were able to achieve process accuracy of 100%, and a user-friendliness of 92% in the proposed and practised system development methodology in developing the HydroGIS tool named GIS2MUSCLE. Figure 1 illustrates the PcD.UcT tool that has been proposed and utilized by the authors in developing the HydroGIS tool.

This study aims to determine the influence of the system development methodologies to the proposed and practised PcD.UcT system development methodology.

II. SYSTEM DEVELOPMENT METHODOLOGIES

As shown in Figure 1, the PcD.UcT methodology is a combination of User Centric Tool Development of Process Centric Algorithm Development. This section deals with the system development methodologies that influence the PcD.UcT methodology introduced by Pradeep & Wijesekara, (2017). As stated by the authors, the proposed and practised PcD.UcT methodology is a hybrid development of prototype model and waterfall model. But, according to my point of view the system methodology is also influenced by the Iterative and Incremental model.

A. Waterfall Development

Automation of the engineering phase has been performed using the waterfall development. In the process development, first the required hydrology models and calculation sequences were identified and Rational Method has been used to automate the dynamic calculation modules. Further, the detention storage size is determined using the inflow hydrograph attenuation concept. Both the results from the intermediate calculations and GIS manipulation outcomes has become the inputs and the whole process runs manually and the intermediate and final results are recorded in the excel sheet.

Therefore, it can be stated that the Process Centric Algorithm Development employs the Waterfall Development methodology since the existing manual system has been studied and the drawbacks of the existing system were identified which is a strategy in the waterfall development.

B. Prototype Development

Development of the user interfaces is done using the Prototype development. It is much apparent that the Protype Development has greatly influenced the user centric tool development in the PcD.UcT.

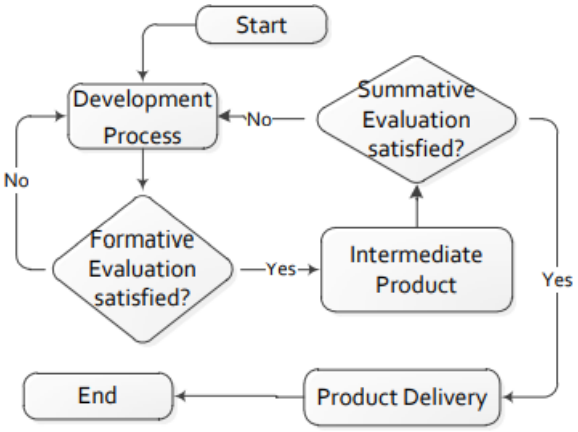

Figure 2. Prototype Development Process
Source: (Pradeep & Wijesekara, 2017)

As shown in Figure 2, user evaluations are of three types, namely, software adequacy, formative and summative evaluations. A protoype is developed followed by the requirement analysis with the fundamental functionalities. After going through the software adequacy evaluation, the second prototype was developed and it was again tested two times until the prototype satisfies the users.

Modifications were done to the prototype each time the view of usability of users deviates.

C. Iterative and Incremental Development

Nevertheless, according to my point of view, the PcD.UcT development methodology has also been influenced by the iterative and incremental development. This is evident from the fact that after the Integration stage of the user centric tool development and the Process Centric Algorithm Development as shown in Figure 1, if the Optimization Evaluation is not satisfied, the flow again transfer to the Integration stage.

Furthermore, both in the User Centric Tool Development and the Process Centric Algorithm Development, the Iterative and Incremental Development is identified. As shown in Fgure 1 that depicts the proposed PcD.UcT model, the User Centric Tool Development checks if the prototype evaluation is satisfied and if not again the flow is transferred to the Prototype evaluation. Likewise, in the Process Centric Algorithm Development, if the Algorithm Evaluation is not satisfied, the flow is transferred to the Algorithm Development.

Therefore, it can be stated that the Iterative and Incremental Development is also found in the PcD.UcT system development model that is proposed and practised by Pradeep & Wijesekara, (2017).

III. CONCLUSION

Through the conduct of this study, it can be concluded that the system development methodology that is proposed by the researchers (Pradeep & Wijesekara, 2017) has been able to address a major issue that is faced by the engineers and researchers. The issue that is solved by the proposed methodology is that through the proposed two parallel phased development, both the user interface and the engineering process are taken in to consideration. Therefore, through the proposed PcD.UcT model, the concern towards both the frontend and backend development has been emphasized. Although the authors Pradeep & Wijesekara, (2017) state that two software development methodologies namely, prototype and waterfall developments have been combined in proposing the PcD.UcD, from the study done in this review, it is quite apparent that Iterative and Incremental development model has also indirectly influenced the proposed model.

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