Improving the Digital Cartographic Reference Data of the Walloon Region, Belgium (PICC) : A Comprehensive Methodology for Documenting Updating and Quality Control Processes

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***Abstract*— The Service Public de Wallonie aims to set up an INSPIRE-compliant Georepository, using the "Projet Informatique de Cartographie Continue" (PICC) as a baseline. This dynamic geodatabase, initiated in 1992, covers the entire Walloon Region, in Belgium, with precision below 25 cm in x, y, and z coordinates, serving various sectors and undergoing continuous updates. As a major cartographic reference, it includes features, such as buildings, roads, and addresses, providing a comprehensive database for the entire region. Implementing the Business Process Model and Notation (BPMN) methodology, the study models the PICC update workflows and quality controls, resulting in 7 processes divided into 46 diagrams. This approach enhances the PICC management, streamlines processes, strengthens quality controls, and optimizes data architecture, ensuring its relevance and usefulness in a dynamic geospatial context.**

Keywords-geodata; process workflow; quality controls; BPMN.

I. INTRODUCTION

The Public Service of Wallonia (SPW) aims to set up a Georepository in accordance with the INSPIRE directive [1], guaranteeing the quality of geodata. The "Projet informatique de cartographie continue" (PICC) has been selected as a basis for its development. The PICC plays a key role as the tree-dimensional cartographic reference covering the entire Walloon Region in Belgium. It includes all the identifiable elements of the Walloon landscape, with a precision below 25 cm in their x, y, and z coordinates. Initiated in 1992, the PICC is a dynamic geodatabase that is continuously updated to reflect the constant evolution of the Walloon territory. Freely accessible through a Web Service via WalOnMap [2], it serves a wide range of sectors, including network operators and geometers, or is used for example as a basis for spatial analyses in combination with remote sensing technologies.

A first study [3] proposed a quality control methodology for three geodata features: buildings, road axes, and point addresses. The latter led to the definition of a theoretical basis for the validation of geodata quality. As a complement to this study, it was necessary to model the flows of the PICC update process, together with the existing quality analysis processes, to ensure their compliance with current standards, consolidate and improve them where necessary. To this end, the international standard methodology for business process modeling, "Business Process Model and Notation" (BPMN) [4], has been implemented.

The paper is organized into three sections: the BPMN, the BPMN application to the PICC and a conclusion.

II. BPMN

The BPMN approach provides a clear and intuitive graphical notation of activities that can be understood by all, while also being capable of representing complex processes. Several categories of elements in BPMN exist, the main ones being shown in Figure 1.

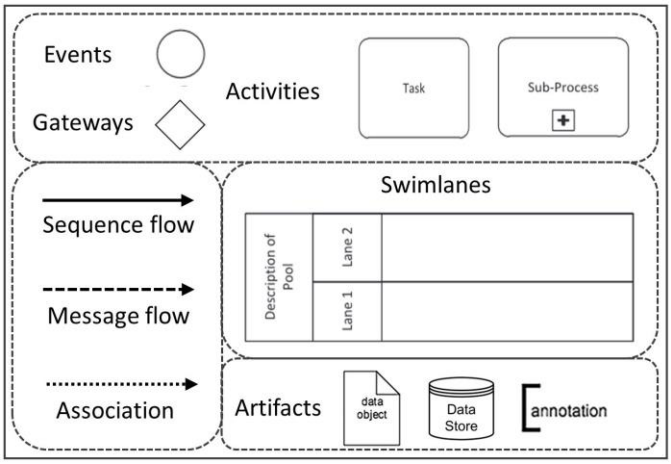

Figure 1. Basic elements in BPMN.

The methodology offers a number of advantages, particularly through the implementation of a collaborative approach in which diagrams are co-constructed by leveraging the experience of experts.

III. BPMN APPLICATION TO THE PICC

Our approach consists in modeling the update workflows and associated quality controls of the PICC geographic data.

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Figure 2 shows the PICC update workflows consisting of two separate branches, one per database. This arrangement stems from the coexistence of the PICC database with an official database specially designed for address management. The two branches are handled together at the final stage, for data distribution.

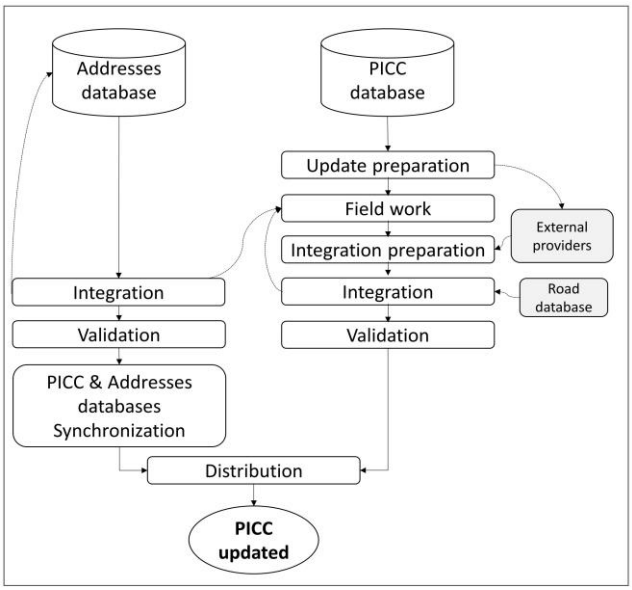

Figure 2. The PICC update workflow.

In this context, BPMN provides an opportunity to have an exhaustive vision, both globally and in-depth, in order to make further improvements where required. BPMN has seldom been used in the field of geographic information science. Reference [5] applies this methodology to formalize the conceptualization of spatio-temporal data and the management of business processes.

The outcome of the BPMN application to the PICC is a set of 7 processes divided in 46 diagrams which, when combined, offer a complete and detailed vision of the PICC update processes and sub-processes. Figure 3 presents an example of one of these diagrams, where external data is used as input for the integration of changes in the PICC. Specifically, it presents the integration of the Road database into the "Integration" process of the PICC database branch from the PICC update workflow shown in Figure 2.

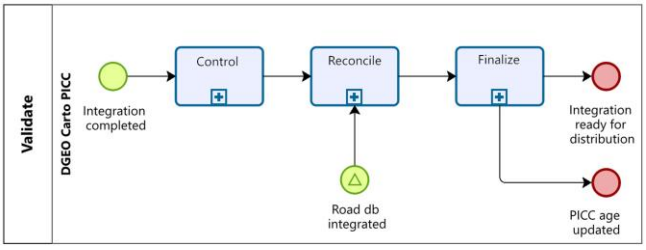

Figure 4. Diagram example: the PICC update "Validation" process.

Figure 4 shows a diagram of the "validation" process which is divided into three sub-processes. It illustrates the connections between the different diagrams, with the starting event, occurring during the second sub-process, corresponding to the end of the diagram in Figure 3.

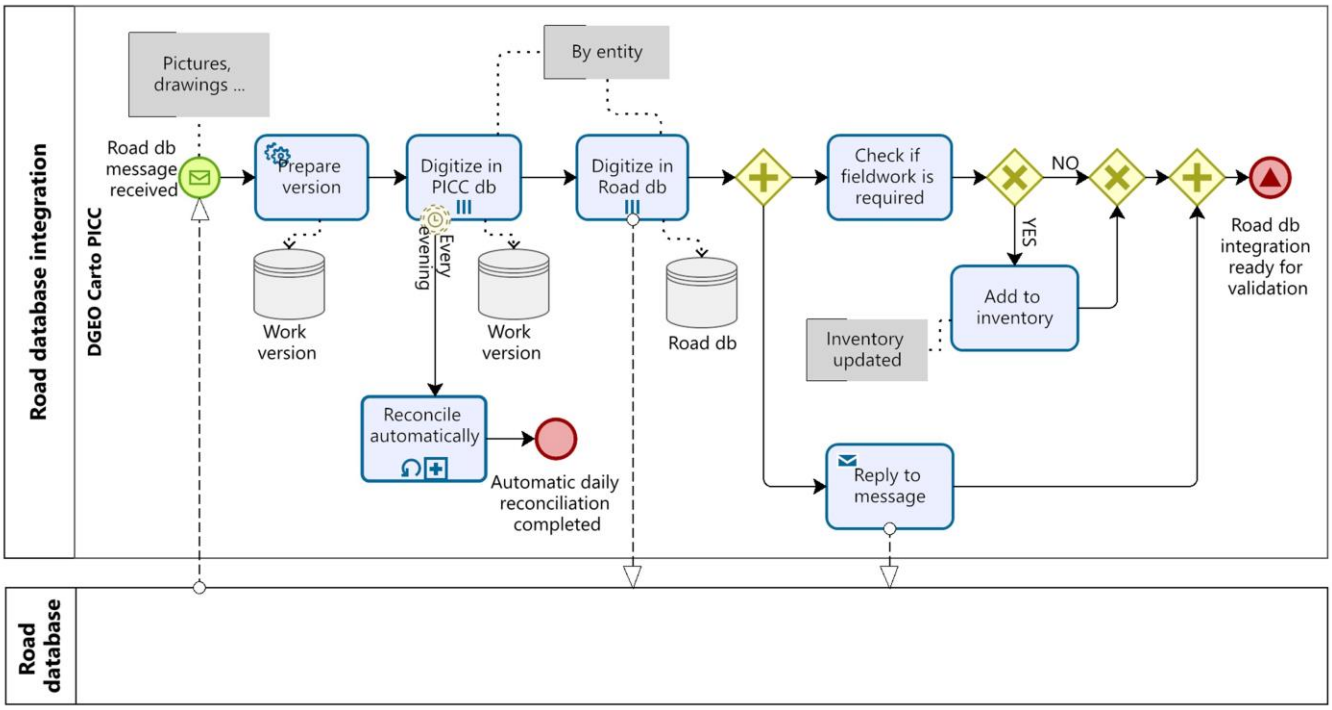

Figure 3. Diagram example: sub-processes of the PICC update "Integration" process.

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IV. CONCLUSION

The use of BPMN methodology in the context of geographic data has seldom been used. Its application to the PICC has shown its relevance by providing an exhaustive vision, both globally and in-depth, of updating processes and associated quality controls. This approach has contributed to the overall improvement of the PICC management, leading to an ongoing restructuring of processes and a strengthening of quality controls. In addition, an in-depth analysis of data architecture has been undertaken to simplify existing structures, while ensuring that the final quality of the PICC is enhanced. This methodological initiative has enabled the overall optimization of the PICC, while reinforcing its relevance and usefulness in a dynamic geospatial context.

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