wOIS-paan – Discovering Performer-Activity Affiliation Networking Knowledge from XPDL-based Workflow Models

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Abstract. In this demo-paper, we implement a workflow-supported organizational intelligence system, which is named as wOIS-paan. The major functionality of the current version of the system is to explore "*workflow performer-activity affiliation networking knowledge*" from an XPDL-based workflow model, and to visualize the knowledge in a graphical form of the force-directed-layout of the Prefuse toolkit. The implemented system operates under a series of algorithms discovering, analyzing, measuring, and visualizing workflow performer-activity affiliation networking knowledge from an XPDL-based workflow package[3], which represents involvement and participation relationships, after all, between a group of performers and a group of activities. The eventual goal of the system is to measure and visualize the human resource allotments and contributions in enacting a workflow procedure (or a group of workflow procedures) at a glance. Also, in terms of the scalability of the system, it can be extensible to show the organization-wide workflow procedures. Conclusively, the wOIS-paan system ought to be a very valuable tool for the BPM and workflow design and operational performance analyzers and consultants.

Keywords: workflow-supported social networking knowledge, workflow affiliation networking knowledge, organizational knowledge discovery, workflow intelligence

1 Maturity

In general, a workflow management system consists of two components, the modeling component and the enacting component. The modeling component allows

[3] A group of workflow models is defined as a workflow package in the WfMC's standardization terminology.

a modeler to define, analyze and maintain workflow models by using all of the workflow entities that are necessary to describe work procedures, and the enacting component supports users to play essential roles of invoking, executing and monitoring instances of the workflow model defined by the modeling component. Especially, from the organizational intelligence point of view, the modeling component deals with the *planned* (or workflow build-time aspect) knowledge of organizational resources allocations for workflow-supported operations, while on the other the enacting component concerns about the *executed* (or workflow run-time aspect) knowledge of organizational resources allotments for the workflow-supported operations. With being connected to these view-points, there might be two issues, such as discovery issue[3] and rediscovery issues[4], in terms of the organizational knowledge discovery activities. In other words, the workflow knowledge discovery issue has something to do with exploring the planned knowledge from workflow models defined by the modeling component, and the workflow knowledge rediscovery issue is to explore the executed knowledge from the execution logs of the workflow models. Conclusively, the demo-system, wOIS-paan, is able to discover, analyze, and visualize the *planned knowledge* of workflow performer-activity affiliations and allotments on a workflow model or a group of workflow models.

Availability of the System. The system's development environments are listed as followings. Particularly, we suppose that the XPDL workflow package's release version is XPDL 1.0. So, it is necessary to be refurbished to support the recently released version of XPDL 2.0 or more, which reflects the BPMN[4] graphical constructs.

- Operating System: Windows 7 Ultimate 64bit
- Programming Language: Java Development Toolkit v.6.0
- XPDL Version: XPDL 1.0
- Development Tool: Eclipse Indigo Release 2
- Libraries: Awt/Swing, Prefuse, Xpdl

However, the system's execution environments are any types of operating systems, and the executable system is available on the website of the authors' research group, the collaboration technology research lab, at the department of computer science, Kyonggi University, https://ctrl.kyonggi.ac.kr/wois.html, and anyone can download the executable system and its demo workflow models in XPDL after registering as a member of the wOIS-paan's user group.

Use Cases and Features. The workflow performer-activity affiliation networking knowledge can be not only discovered from a workflow model defined by the modeling component, but also rediscovered from its execution event logs stored by the enacting component. In this demo-paper, we focus on the discovering issue

[4] BPMN stands for Business Process Modeling Notations, and it is released by OMG's BMI (Business Modeling & Integration) Domain Task Force.

of the workflow performer-activity affiliation networking knowledge from a workflow model. That is, the system's use cases are related with the discovering, analyzing, and visualizing features of the planned knowledge of performer-activity affiliations and allotments. The major use cases and their crucial features are listed as the followings:

- Discovery Use Case : Import XPDL-based workflow models or packages, Discover the wOIS-paan knowledge, and Generate the bipartite matrix from the discovered knowledge
- Analysis Use Case : Calculate the degree centrality of each performer and each activity, and Measure the group-degree centrality of the corresponding workflow models (or packages)
- Visualization Use Case : Visualize the graph nodes and edges between performer and activity in a graphical form of the force-directed-layout of the Prefuse toolkit

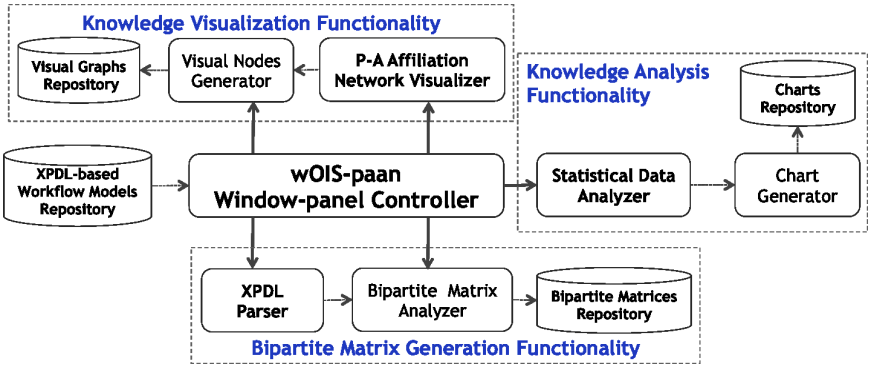

Fig. 1. Architectural Components of the wOIS-paan Knowledge Discovery System

The essential functional components being comprised of the system are bipartite matrix generation functionality[2], knowledge visualization functionality, and knowledge analysis functionality, and these components also can be systematically implemented by using the Java programming language. Fig. 1 illustrates a system architecture of the implemented wOIS-paan knowledge discovery system, which is made up of four groups of architectural components—wOIS-paan Window-control, knowledge visualization, bipartite matrix generation, and knowledge analysis components. Particularly, the XPDL parser of the analysis components group takes charge of generating a performer-activity bipartite matrix from an XPDL-based workflow package[5], and the social graph visualizer of

[5] The system is able to handle a group of XPDL-based workflow models as well as individuals of the workflow models.

the visualization components group depicts the wOIS-paan knowledge as a bipartite graph transformed from the bipartite matrix. In terms of the wOIS-paan knowledge analysis aspect, the system is theoretically backed up by the extended versions of the workload-centrality analysis equations[1], such as actor-degree centrality analysis equations and group-degree centrality analysis equations, so as to mathematically analyze a workflow performer-activity affiliation network model discovered from an XPDL-based workflow package.

2 Significance to the BPM field with a Case Study

As an operational example, we try to discover wOIS-paan knowledge from the XPDL-based pseudo-workflow packages arranged in Table 1. We suppose that there are two pseudo-workflow packages, each of which has two workflow models and three workflow models, respectively, and all fifty activities have been conducted by all of the sixteen performers. Consequently, the system is able to successfully discover a wOIS-paan knowledge from the pseudo-workflow packages, and visualize the discovered knowledge as shown in the captured-screen of Fig. 2. In the visualized wOIS-paan knowledge as colored bipartite graph, boxes and circles imply performers and activities, respectively, and the bold-colored box and its linked circles represent the performer, Alan, and his affiliated 11 activities, such as $\alpha_1, \alpha_9, \alpha_{10}, \alpha_{16}, \alpha_{21}, \alpha_{26}, \alpha_{33}, \alpha_{36}, \alpha_{39}, \alpha_{43}, \alpha_{50}$.

Table 1. Specifications of the XPDL-based Pseudo-workflow Packages

Workflow Package	Workflow Model	Workflow Activity	Workflow Performer
HR-Dept-Workflow-Package1	Hiring-Workflow-Model	$\alpha_1 \sim \alpha_{16}$ (16 Activities)	Jeff, Ed, Christiaan, Emily, Adam, Cynthia,
	Performance-Management-Workflow-Model	$\alpha_{17} \sim \alpha_{25}$ (9 Activities)	Joylette, Amanda, Nathaniel, Bryan, Tamara, Ashley, Ryan, Alan, Chris, Holly
HR-Dept-Workflow-Package2	Employee-Training-Workflow-Model	$\alpha_{26} \sim \alpha_{36}$ (11 Activities)	
	Department-Management-Workflow-Model	$\alpha_{37} \sim \alpha_{44}$ (8 Activities)	The same performers in the Package1
	Salary-Negotiation-Workflow-Model	$\alpha_{45} \sim \alpha_{50}$ (6 Activities)	

3 Conclusion

In this demo-paper, we suggested a possible way of projecting a special affiliation knowledge of the workflow-supported affiliation relations (involvement and participation behaviors) between workflow-based people and workflow-based activities by converging the social network techniques and the workflow discovering techniques. As a consequence of this suggestion, we have newly defined

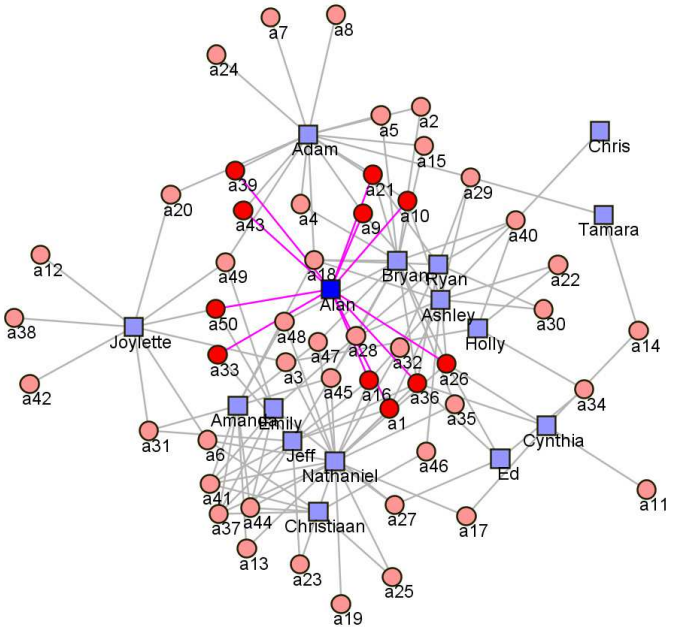

Fig. 2. Visualization of the Discovered wOIS-paan Knowledge by the System

an organizational intelligence of workflow performer-activity affiliation networking knowledge, and implemented a knowledge discovery system to explore the performer-activity affiliation networking knowledge from an XPDL-based workflow package. Conclusively, we have successfully verified the implemented system through applying to two pseudo-workflow packages and visualizing the discovered wOIS-paan knowledge from them.

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