Recommending Resource Allocation to Activities in Business Processes Combining Organizational and Temporal Process Mining Perspectives

MICHAEL ARIAS

ADVISORS: JORGE MUNOZ-GAMA, MARCOS SEPÚLVEDA

PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

1 INTRODUCTION

2 GENERAL SOLUTION

Research question :

Is it possible, based on historical information about past process executions, to build an appropriate resource profile in order to allocate suitable resources to perform activities within a business process?

Goals :

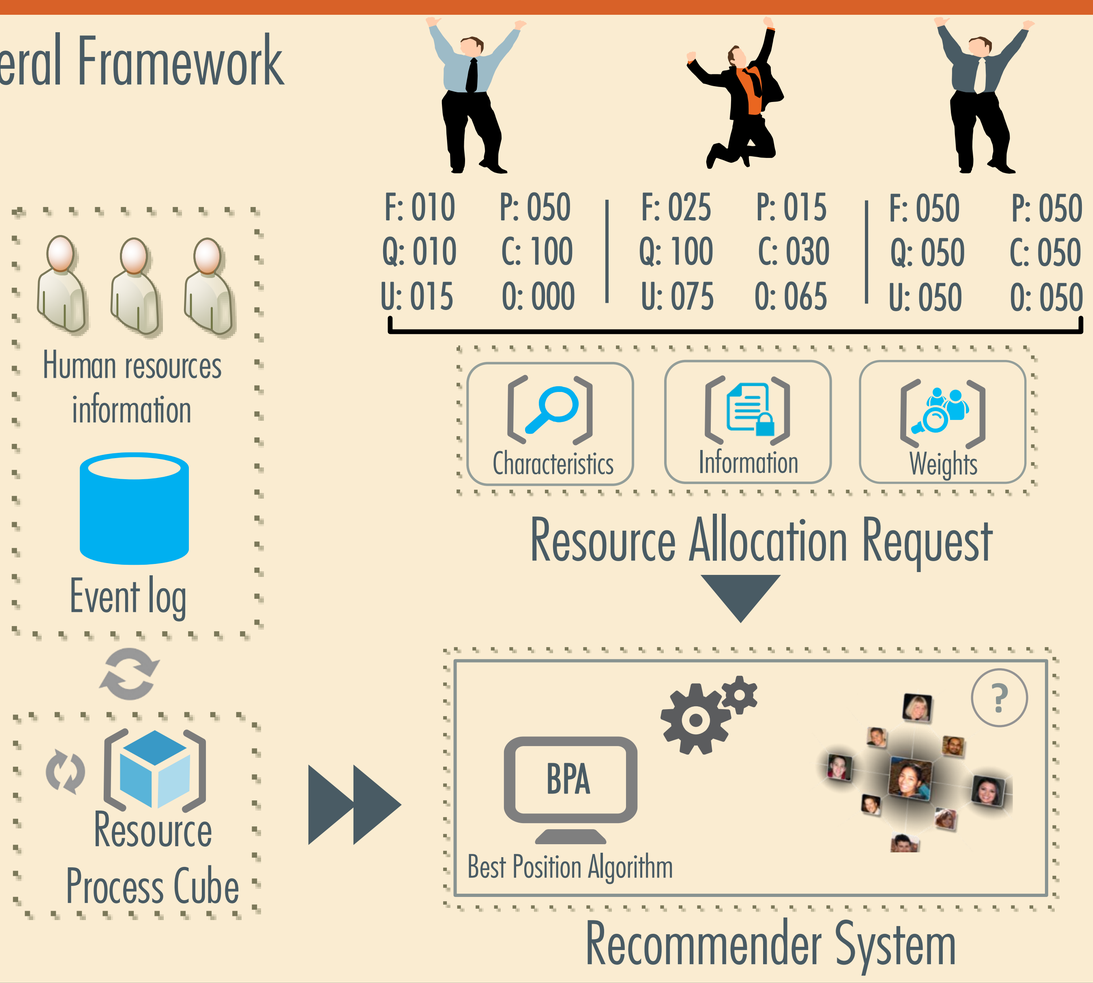
1. Characterize activities and resources using historical and contextual information
2. Build a new resource allocation technique
3. Verify and validate the technique

3 CURRENT PROGRESS

- Determine attributes of activities and resources
- Analyze different criteria used to allocate resources
- Design a resource process cube to abstract historical information
- Implement a new resource allocation technique
- Experimental evaluation using synthetic data with simulated scenarios

4 RESULTS

General Framework



Resource Allocation Request: characteristics, information, weights

Example: Help-Desk scenario

Characteristics	Information	Weights
Sub-process: Contact level 1 Typology: Printer problem	**Expertise**: competencies, skills and knowledge Required [2, 2, 2], Resource [2, 1, 0] **Dimensions:** **F**requency, **P**erformance, **Q**uality, **C**ost **U**nderQualification, **O**verQualification	**F**: 025 **P**: 015 **Q**: 100 **C**: 030 **U**: 075 **O**: 065

Resource Allocation Metrics

$$Workload\_Metric\,(r,c) = \frac{\mathbb{Q}[r][\,][w].top - \mathbb{Q}[r][\,][w].total}{\mathbb{Q}[r][\,][w].top - \mathbb{Q}[r][\,][w].bottom}$$

$$Performance\_Metric\,(r,c) = \frac{\mathbb{Q}[\,][c][p].max - \mathbb{Q}[r][c][p].avg}{\mathbb{Q}[\,][c][p].max - \mathbb{Q}[\,][c][p].min}$$

$$Frequency\_Metric\,(r,c) = \frac{\text{logarithm}\,(\mathbb{Q}[r][c][f].total) + 1}{\text{logarithm}\,(\mathbb{Q}[\,][c][f].total) + 1}$$

$$underQualification\_Metric = 1 - \frac{1}{n}\sqrt{\sum_{i=1}^{n}(\text{under}(i))^2} \qquad \text{under}(i) = \begin{cases} \frac{\mathbb{E}_c[i] - \mathbb{E}_r[i]}{\mathbb{E}_c[i] - \mathbb{1}_i} & \text{if } \mathbb{E}_c[i] >= \mathbb{E}_r[i] \\ 0 & \text{otherwise} \end{cases}$$

$$Cost\_Metric\,(r,c) = \frac{\mathbb{Q}[\,][c][co].max - \mathbb{Q}[r][c][co].avg}{\mathbb{Q}[\,][c][co].max - \mathbb{Q}[\,][c][co].min}$$

$$Quality\_Metric\,(r,c) = \frac{\mathbb{Q}[r][c][q].avg - \mathbb{Q}[\,][c][q].min}{\mathbb{Q}[\,][c][q].max - \mathbb{Q}[\,][c][q].min}$$

$$overQualification\_Metric = 1 - \frac{1}{n}\sqrt{\sum_{i=1}^{n}(\text{over}(i))^2} \qquad \text{over}(i) = \begin{cases} \frac{\mathbb{E}_r[i] - \mathbb{E}_c[i]}{T_i - \mathbb{E}_c[i]} & \text{if } \mathbb{E}_r[i] >= \mathbb{E}_c[i] \\ 0 & \text{otherwise} \end{cases}$$

5 CONCLUSIONS

1) A framework for recommending resource allocation based on multi-factor criteria.
2) The framework provides a fine-grained degree of customization, and it is designed to be generic and extensible.
3) Organizational, time and case perspectives.
4) Specific dimensions to assess different resource features.

6 FUTURE WORK

1) Case studies using real data.
2) Potential application domains are: help desk, consulting, software quality assurance, and healthcare processes.
3) Validate the approach incorporating final users feedback.
4) Explore new criteria to perform the allocation. E.g., new dimensions.

PAPER

[1] Arias, M., Rojas, E., Munoz-Gama, J., and Sepúlveda, M. (2015). A framework for recommending resource allocation based on process mining. DeMiMoP 2015.

RELATED WORK

[2] Huang, Z., van der Aalst, W. M. P., Lu, X., and Duan, H. (2011). Reinforcement learning based resource allocation in business process management. Data Knowledge Engineering.
[3] Zhao, W. and Zhao, X. (2014). Process mining from the organizational perspective. Foundations of Intelligent Systems.
[4] Russell, N., van der Aalst, W. M. P., ter Hofstede, A. H. M., and Edmond, D. (2005). Workflow Resource Patterns: Identification, Representation and Tool Support. CAiSE 2005.
[5] Cabanillas, C., García, J.M., Ruiz, D., Mendling, J., and Cortés A.R. (2013). Priority-based human resource allocation in business processes. ICSOC 2013.

ACKNOWLEDGMENTS

This work is partially supported by Comisión Nacional de Investigación Científica CONICYT – Ministry of Education, Chile, Ph.D. Student Fellowships.

CONTACT

Presenter: Michael Arias email: m.arias@uc.cl
Advisors:
Jorge Munoz-Gama email: jmun@ing.puc.cl
Marcos Sepúlveda email: marcos@ing.puc.cl
Web: www.uc.cl