Automatic Resource Allocation in Business Process: A Systematic Literature Survey

Qichen Liu, 26.05.2023

Motivation

——why we need resource allocation

- Organizations need to run their business effectively and efficiently.
- A rich set of resources, such as human resources, machines, vechicles, materials etc. are required.
- Each business process has certain time, cost and quality goals.
- Thus, we need resource allocation approaches to ensure that each activity of a certain business task is executed at the right time and with the right resource.

Main research question:

“What is the state-of-the-art of automatic approaches supporting resource allocation in business processes?”

- Sub-question 1: “What are the targeted resource allocation goals and capabilities?”
- Sub-question 2: “What is the role of process models and process data (in form of event logs) in the resource allocation approach?”
- …

My research question

——what do we want to know

- Motivation: Human resource allocation are one of the most important concern in business process. It has consistenly posed a challenge for many organizations.
- RQs:
  - What are the recent trends in human resource allocation?
  - What approaches have been proposed and what techniques have been developed recently?
  - What improvements do these approaches offer? (in terms of cost, time, ...)

Review protocol

——how we conduct the review

- Inclusion/exclusion criteria:
  - IN1 The study describes an algorithm supporting human resource allocation in business process and was published within the last 2 years.
  - EX1 The study primarily focues on material/vehicle resource allocation
  - EX2 The study does not include any of the following aspects in human resource allocation strategy:
  - A real-life experiment of the appoach with detailed documentation
  - A artificial simulation of the approach with detailed documentation
  - Pseudo code of the allocation algorithm
  - Control flow graph

Review protocol

——how we conduct the review

- Search terms examples:
  - IEEE Xplore:
    - ((human resource OR task OR staff OR resource) AND (allocation OR assignment OR scheduling OR optimization OR planning) AND (“process mining” OR “business processes”))
    - with publish date filter (year) 2021-2023
  - ACM Digital Library:
    - Abstract:((human resource staff task) AND (allocation assignment scheduling optimization planning) AND ("business processes" "process mining”))
    - with publish date filter (year) 2021-2023

In total, around 40 relevant studies were found.

Review protocol

——how we conduct the review

- Data extraction and synthesis strategy :
  - Year, Country
  - Improvement: expressed in percentage or other statistical form
  - Approach type: generic vs. specific
  - (Applicable scenario type: governmental business vs. private business)

Validate review protocol

——is the review protocol good enough?

- Pilot run:
  - Gyunam Park, Minseok Song. 2023. Optimizing Resource Allocation Based on Predictive Process Monitoring. *IEEE Access*.
  - Assessment:
  - Year: 2023, Country: South Korea
  - Details: Pseudo code, artificial and real-life experiment at hospital (specific scenario)
  - Goal: Optimization of scheduling human resource at hospital
  - Improvement: overall 9.6% better in comparison to a baseline approach
  - Quality: high

Categorization

- Preliminary categorization based on paper titles and abstracts, as preparation for further results and data clustering and synthesis after the exlusion and reading phase:
- 1. Studies, which provide approaches for specific real life scenarios
- 2. Studies, which present generic human allocation approaches

Preliminary categorization

- Studies, which focus on specific real-life case:
  - Marielle A. Cantara, John Lhor C. Melendrez et al. 2022. Program for the Task Allocation Model: Integrating Workforce Planning for Manpower Utilization at City of Cabuyao Engineering Office. *TENCON 2022 - 2022 IEEE Region 10 Conference (TENCON)*.
  - Jianjun Miao; Jiexun Liu et al. 2023. Optimization of the Recruitment Quota Allocation in Intra-Organizational Networks. *IEEE Access*.
- ……

- Studies, which offer generic human resource allocation approaches
  - Na Feng. 2022. Human Resource Intelligent Scheduling Algorithm Based on Decision Tree Algorithm. *IEEE 2nd International Conference on Mobile Networks and Wireless Communications (ICMNWC)*
  - Omid Mahdi Ebadati et al. 2022. Human Resource Allocation to the Credit Requirement Process, A Process Mining Approach. *13th International Conference on Information and Knowledge Technology (IKT)*
  - ……