CONTROL-FLOW COMPLEXITY ANALYSIS OF BUSINESS PROCESS MODELS CREATED DURING BPMN TRAINING SESSIONS

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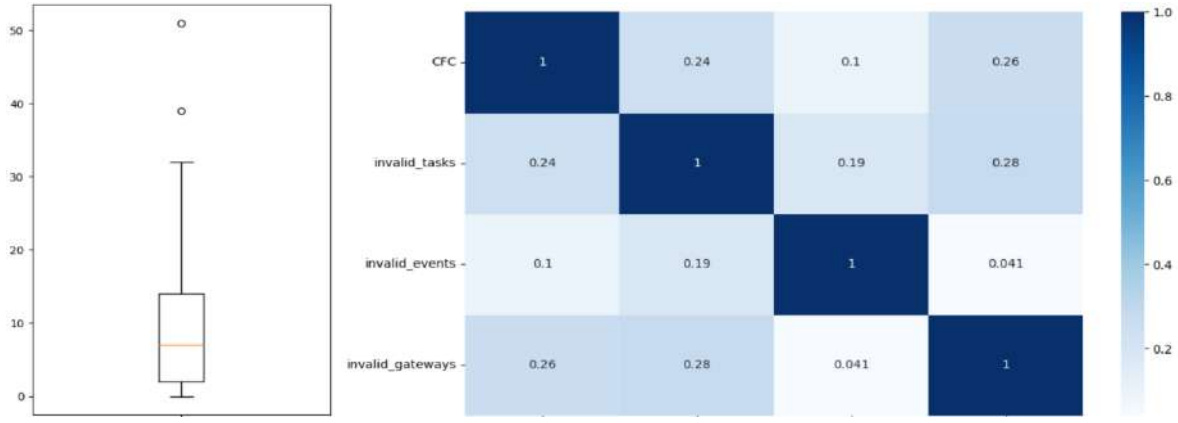
In this paper, we study the Control-Flow Complexity (CFC) [1] of business process models, created during BPMN (Business Process Model and Notation) training done by Master's Students of the "Information Systems Software" program within the course "Information Systems Strategy". It is well-known that business process models are valuable enterprise assets. In the field of information systems design and development, BPMN models are widely used for business process analysis and capturing requirements for further automation of the improved process. Therefore, it is crucial to design understandable process models free of errors to avoid further time and cost expenses [2]. One of the BPMN complexity metrics that reflects the understandability of business process models, is CFC [1]:

$$CFC = \sum_{s \in S} fan-out(s) + \sum_{s \in S} \left(2^{fan-out(s)} - 1\right) + \sum_{s \in S} 1,$$

where $s \in S$ is the gateway from the set of gateways; $fan-out(s)$ is the number of outgoing sequence flows from the gateway.

We analyzed 132 BPMN models, among which 25% have CFC below 2, 50% have CFC between 2 and 14, and the rest 25% have CFC above 14. The highest CFC is 51, the mean CFC is 9.14, while the lowest CFC is 0 (see Fig. 1a). No significant correlation between CFC and invalid BPMN elements is found (see Fig. 1b), which lets us suggest that CFC does not significantly affect BPMN process model quality.



(a) (b)

Fig. 1. – CFC box-plot (a); CFC and invalid BPMN elements correlation heatmap (b)

References:

1. Fotoglou C. et al. Complexity clustering of BPMN models: initial experiments with the K-means algorithm. *Lecture Notes in Business Information Processing*. 2020. Vol.384. P. 57–69.

2. Kopp A., Orlovskyi D. Towards Intelligent Technology for Error Detection and Quality Evaluation of Business Process Models. *CEUR Workshop Proceedings (CEUR-WS.org)*. 2023. Vol. 3373. P. 1–14.