An experiment on an ontology-based support approach for process modeling

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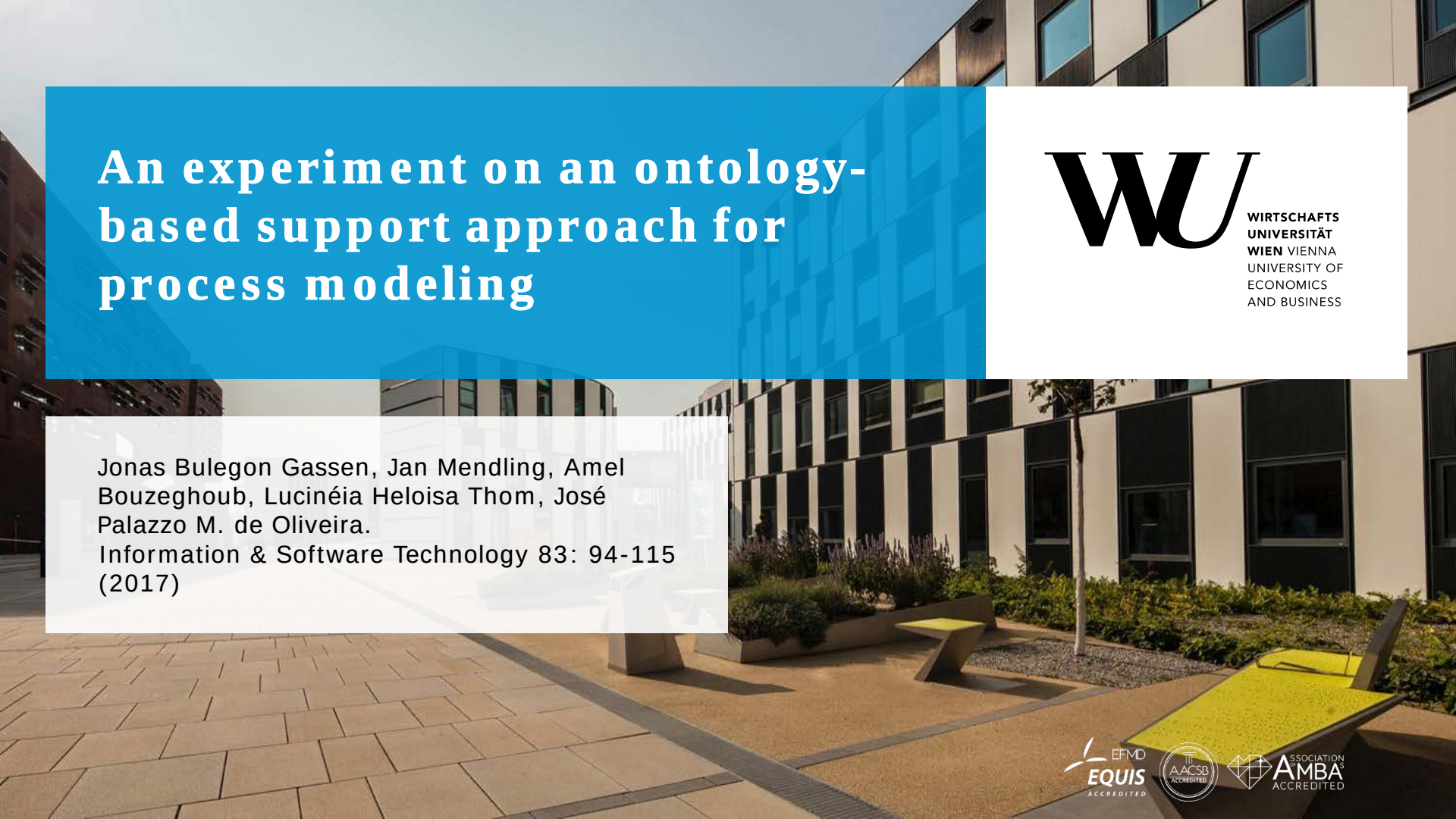
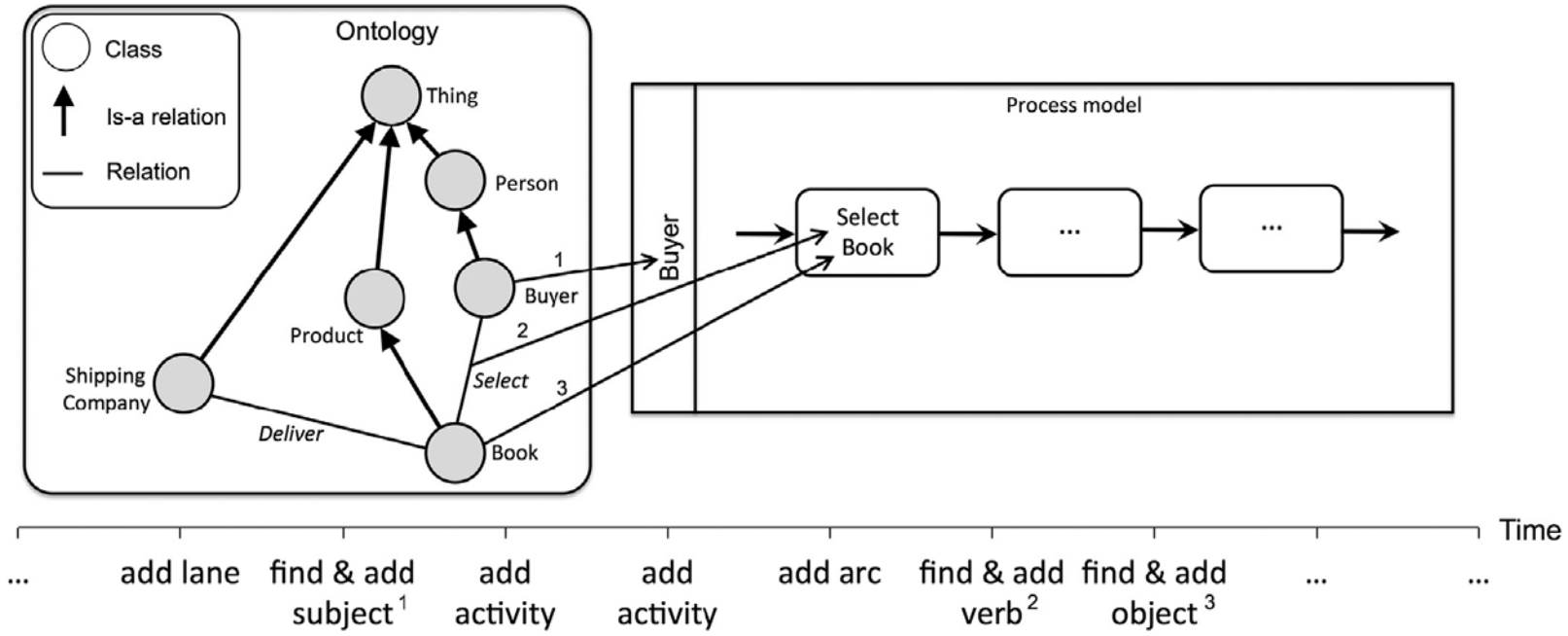


The Vocabulary Problem

Supporting the Process of Process Modeling



Ontology Support: Good or Bad?

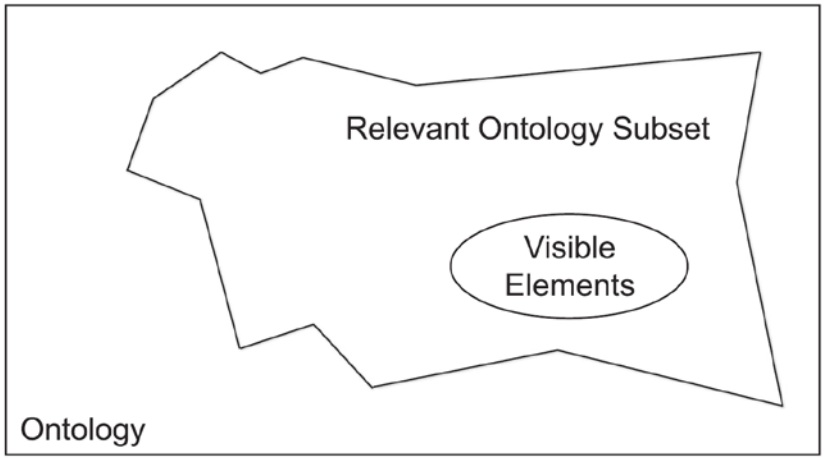
Benefits for

- Label Refactoring
- Verification and Validation
- Translation
- Annotation
- Model Matching
- Workflow Specification

Challenges in terms of

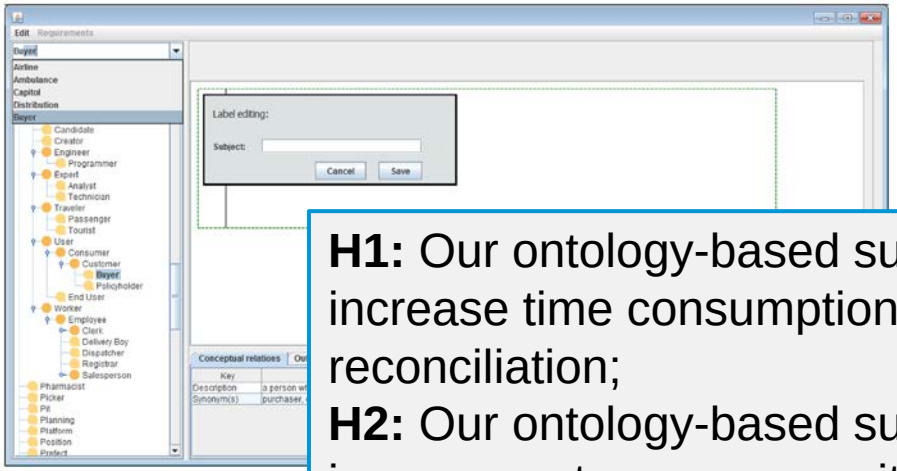
- Limited Working Memory
- Time Consumption
- Attention Economy
- Extraneous Cognitive Load
- Search Space

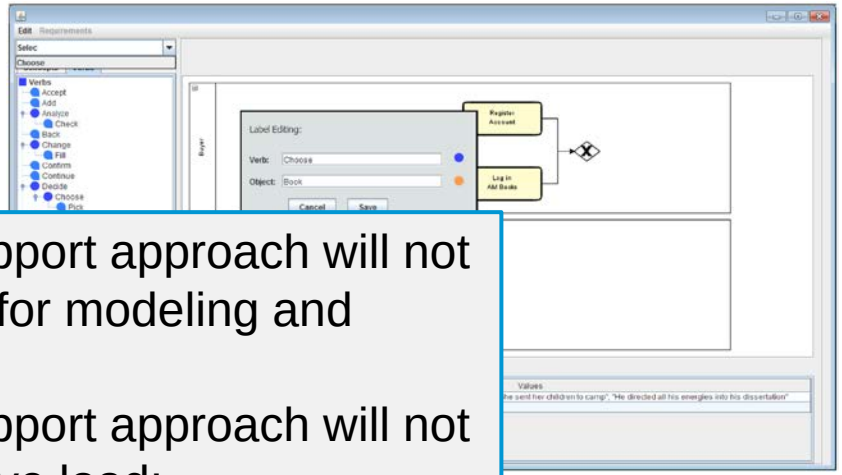
Principles of Ontology Support for Process Modeling



1. Effective Filtering
2. Efficient Search
3. Efficient Labeling Support

How to Implement this?

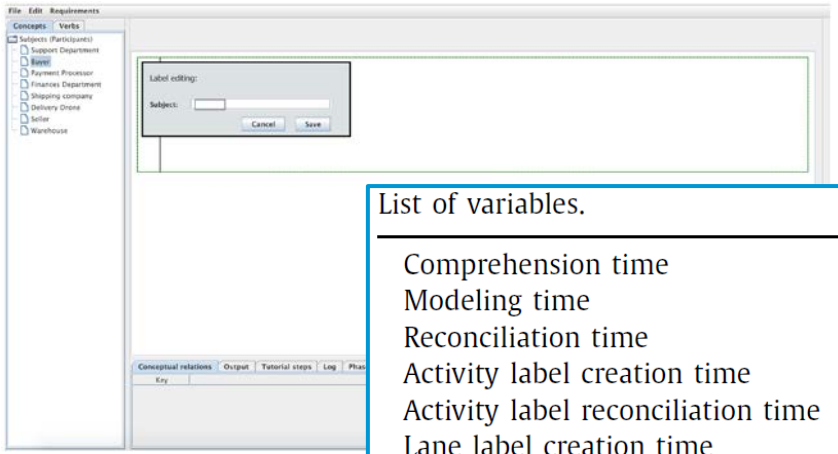




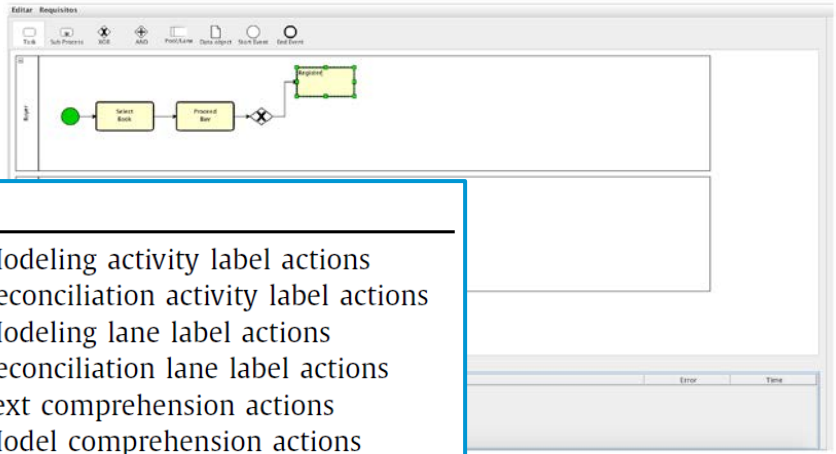
H1: Our ontology-based support approach will not increase time consumption for modeling and reconciliation;
H2: Our ontology-based support approach will not increase extraneous cognitive load;
H3: Our ontology-based support approach will improve the labeling of activities;
H4: Our ontology-based support approach will not increase mental effort for model creation.

Experimental Design

Group A with ontology



Group B without ontology

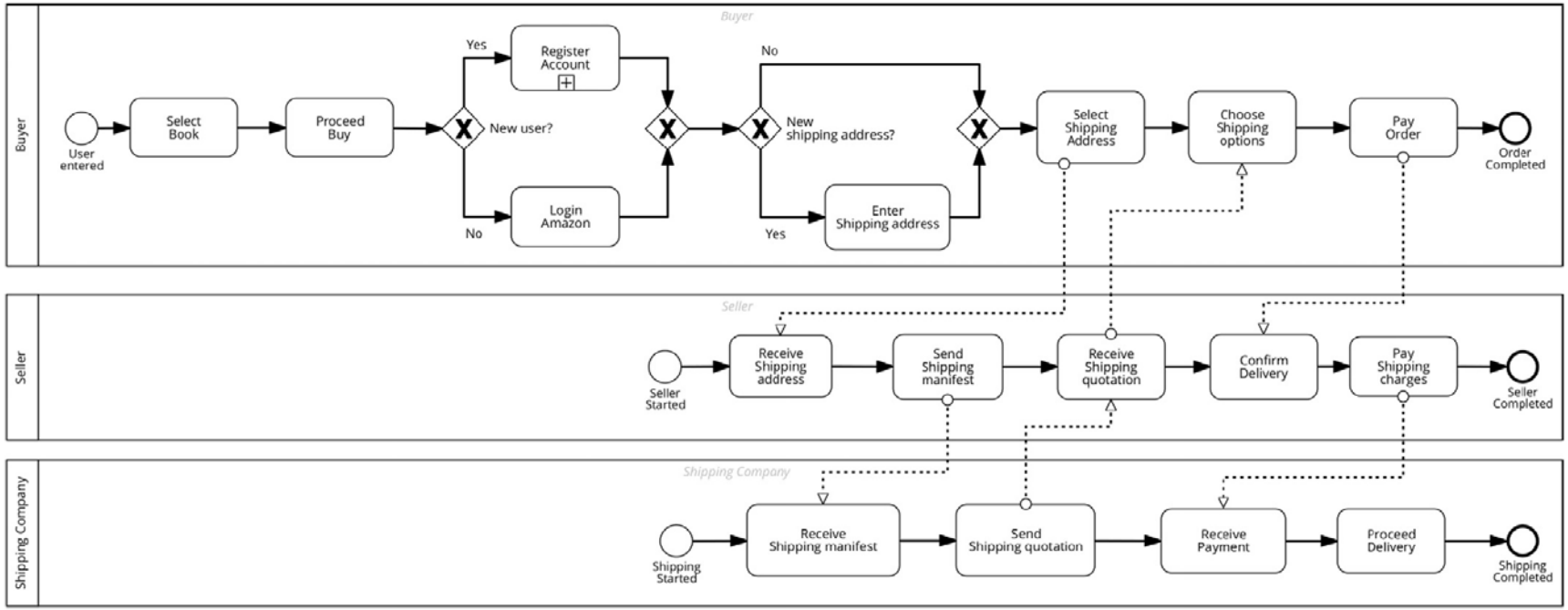


List of variables.

Comprehension time	Modeling activity label actions
Modeling time	Reconciliation activity label actions
Reconciliation time	Modeling lane label actions
Activity label creation time	Reconciliation lane label actions
Activity label reconciliation time	Text comprehension actions
Lane label creation time	Model comprehension actions
Lane label reconciliation time	Ontology comprehension actions
Textual comprehension time	Between comprehension actions
Model comprehension time	Ontology comprehension time
Between comprehension time	

Experimental Task

Textual Description of this Business Process



Experimental Ontology

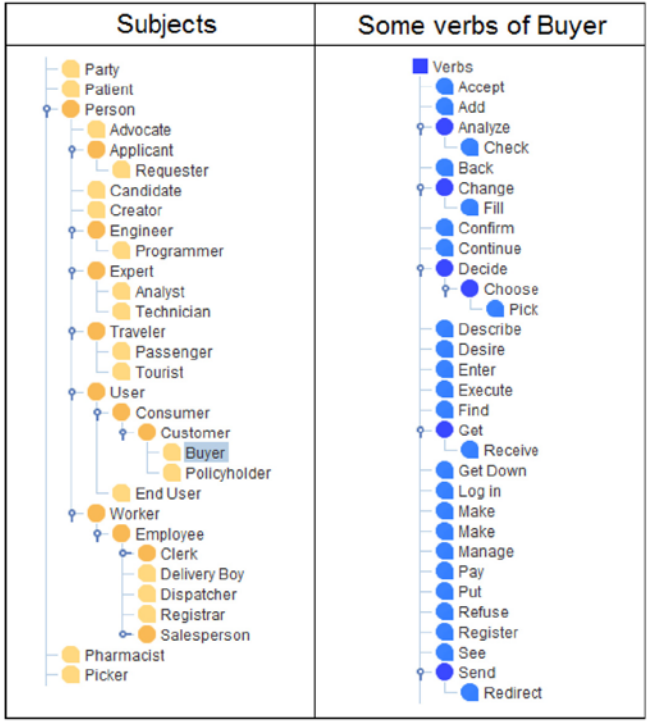


Table 18
Triples for experiment with Sample 1.

Count	Subject	Verb	Object
	Buyer	Pay	Order
	Buyer	Register	Account
	Buyer	Login	AMBooks
	Buyer	Enter	Shipping address
	Buyer	Proceed	Buy
	Buyer	Select	Book
	Buyer	Select	Shipping address
8	Buyer	Choose	Shipping options
	Seller	Pay	Shipping charges
	Seller	Confirm	Delivery
	Seller	Send	Shipping manifest
	Seller	Receive	Shipping address
5	Seller	Receive	Shipping quotation
	Shipping company	Proceed	Delivery
	Shipping company	Send	Shipping quotation
	Shipping company	Receive	Shipping manifest
4	Shipping company	Receive	Payment
Distinct terms	3	10	12
Ratio	-	10/3 = 3.333	12/10 = 1.2

Manipulation Check: Comparison of Activity Labels Created

	Mean A	Mean B	U	Z	*P*-value	abs(r)	N
Labels created (S1)	17.20	15.88	83.50	−1.676	0.097[a]	0.296	32
Labels created (S2)	20.19	20.04	248.50	−0.311	0.762[a]	0.046	46

Results Overview

	H1	H2	H3	H4
General phases (Time)	Supported	-	-	-
Aggregated actions (Time)	Partially	-	-	-
Aggregated actions (Count)	Partially	-	-	-
Between comprehension (Time)	-	Partially	-	-
Between comprehension (Count)	-	Partially	-	-
Labels renaming (Time)	-	-	Supported	-
Labels renaming (Count)	-	-	Supported	-
Overall effort (Self-evaluation)	-	-	-	Supported

H1: time for modeling and reconciliation

		Mean A	Mean B	U	Z	*P*-value	abs(r)	N
S1	Modeling	561.83	629.25	67.00	−1.346	0.189[a]	0.254	28
	Reconciliation	310.99	397.74	140.00	−1.578	0.121[a]	0.298	28
S2	Modeling	727.47	719.88	229.00	−0.480	0.643[a]	0.072	45
	Reconciliation	357.44	382.79	217.00	−0.754	0.462[a]	0.112	45

[a] Exact significance (2-tailed).

H2: extraneous cognitive load

		Mean A	Mean B	U	Z	*P*-value	abs(r)	N
S1	Time in seconds	30.39	35.86	77.00	−1.455	0.154[a]	0.266	30
	Counting	2.47	2.65	82.50	−1.227	0.224[a]	0.224	30
S2	Time in seconds	24.03	32.47	102.00	−3.081	*0.002*[a]	0.470	43
	Counting	1.84	2.48	97.00	−3.651	*0.000*[a]	0.481	46

[a] Exact significance (2-tailed).

H3: labeling

		Mean A	Mean B	U	Z	*P*-value	abs(r)	N
	Seconds	13.65	63.97	27.00	−3.204	*0.001*[a]	0.605	28
	Counting	3.07	6.88	63.00	−2.451	*0.013*[a]	0.433	32
S1	VO (%)	17.08 (100%)	10.41 (67%)	7.50	−4.558	*0.000*[a]	0.806	32
	Seconds	55.80	77.03	214.50	−0.811	0.417[a]	0.125	45
	Counting	7.19	7.72	246.50	−0.354	0.730[a]	0.052	46
S2	VO (%)	17.48 (99%)	8.28 (45%)	29.50	−5.152	*0.000*[a]	0.760	46

[a] Exact significance (2-tailed).

H4: mental effort

		Mean A	Mean B	U	Z	*P*-value	abs(r)	N
S1	Overall effort	4.43	3.75	77.00	−1.564	0.122[a]	0.286	30
S2	Overall effort	4.29	4.84	213.50	−1.174	0.240[a]	0.173	46

[a] Exact significance (2-tailed).

Related Work

Authors	Label	PPM	Cognition	Ontology	Experiment
Mendling et al. [9]	X	X	X	–	X
Koschmider et al. [70]	–	X	X	–	X
Leopold et al. [12]	X	–	–	–	–
Jan Claes et al. [78]	–	X	X	–	–
Pinggera et al. [79]	–	X	X	–	–
Di Francescomarino et al. [42]	–	X	–	X	X
Kolb et al. [80]	–	X	X	–	X
Jan Claes et al. [81]	–	X	X	–	–
This work	X	X	X	X	X

Take Away

Principles

1. Effective Filtering
2. Efficient Search
3. Efficient Labeling Support

Results

- H1: not increase time consumption for modeling and reconciliation; partial
- H2: not increase extraneous cognitive load; partial
- H3: improve the labeling of activities; supported
- H4: not increase mental effort for model supported