1 Tables and Figures

Entity type	Property	Count	Entity type	Property	Count
Painting	Name Description Image Date Height Width Sitelink URI	2990	Person	Name Description Image Sex Date_of_birth Date_of_death Sitelink URI	25
Collection	Name Description Image Date Website Collection_size Visitor_per_year Sitelink URI	334	Exhibition	Name Description Date Website Sitelink URI	127
Genre	Name Description Sitelink URI	29	Movement	Name Description Start_time End_time Sitelink URI	29
Material	Name Description Sitelink URI	46	Keyword	Name Description Sitelink URI	1919
Country	Name Description Sitelink URI	39	City	Name Description Sitelink URI	251

Table 1: A summary of entities and their properties.

Relation Type	Head Entity	Target Entity	Count
has_CREATOR	Painting	Person	6010
belongsto_GENRE	Painting	Genre	5474
belongsto_MOVEMENT	Painting	Movement	2106
in_COLLECTION	Painting	Collection	4944
in_EXHIBITION	Painting	Exhibition	632
on_MATERIAL	Painting	Material	5064
has_KEYWORD	Painting	Keyword	7742
in_CITY	Painting Collection Exhibition Person	City	
in_COUNTRY	Painting Collection Exhibition Person	Country	412

Table 2: A summary of relationships.

Intent Name	Training Phrase
Exhibit.display	I would like to know about *King Caspar*. Tell me about *Two moors*.
Question.have	I want to ask questions. How should I ask questions?
Question.answer	Who is the creator of *The Night Watch*? What key elements are in *The Night Watch*?
Recommendation	Show me similar exhibits like this one. I want to know some similar exhibits.
Recommendation.attribute	Another one related to *oil paint*. Tell me another entity related to *Rembrandt House Museum*.
Recommendation.nomore	Stop the recommendation, please. That's enough, thanks.
Recommendation.new	Do you have another one? Could you show me one more suggestion?
Recommendation.connection	Why this one? What's the connection between them?
Visit.finish	Finish the visiting. I want to stop the visiting now.
Universal.yes	Yes. Why not. Sure.
Universal.no	No, thank you. I am good. It's enough.

Table 3: The intents list and samples of their training phrases. The italic name in training phrases indicates that it is an instance of an entity type, for example, *King Caspar* is an instance of **Painting** and *oil paint* is an instance of **Material**.

Question type	Utterance	Cypher query
	Which {museum} owns <The Night Watch>?	
paintings_collection	Which {Collection} owns <Painting>?	(p:Painting)-[r:in_COLLECTION]->(?)
	Who is the {creator} of <The Night Watch>?	
paintings_creator	Who is the {Creator} of <Painting>?	(p:Painting)-[r:has_CRREATOR]->(?)
	What is the {material} of <The Night Watch>?	
paintings_material	What is the {Material} of <Painting>?	(p:Painting)-[r:on_CRREATOR]->(?)
	What is the {genre} of <The Night Watch>?	
paintings_genre	What is the {Genre} of <Painting>?	(p:Painting)-[r:belongsto_GENRE]->(?)
	What is the {key element} in <The Night Watch>?	
paintings_depicts	What is the {Depicts} in <Painting>?	(p:Painting)-[r:has_KEYWORD]->(?)
	What {movement} does <The Night Watch>belongs to?	
paintings_movement	What {Movement} does <Painting>belongs to?	(p:Painting)-[r:belongsto_MOVEMENT]->(?)
	{When} was <The Night Watch>created?	
paintings_date	{Date} was <Painting>created?	(p:Painting) return p.date
	Show me the {picture} of <The Night Watch>.	
paintings_image	Show me the {image} of <Painting>	(p:Painting) return p.image
	Which {country} is <The Night Watch>in?	
paintings_country	Which {Country} is <Painting>in?	(p:Painting)-[r:in_COUNTRY]->(?)
	Show me {paintings} in <Rijksmuseum>.	
collection_paintings	Show me {Painting} in <Collection>	(?)-[r:in_COUNTRY]->(c:Collection)

Table 4: List of the implemented question types for KBQA with examples, question type names, examples with question keywords in curly braces and entity names in angle brackets, and corresponding Cypher queries.
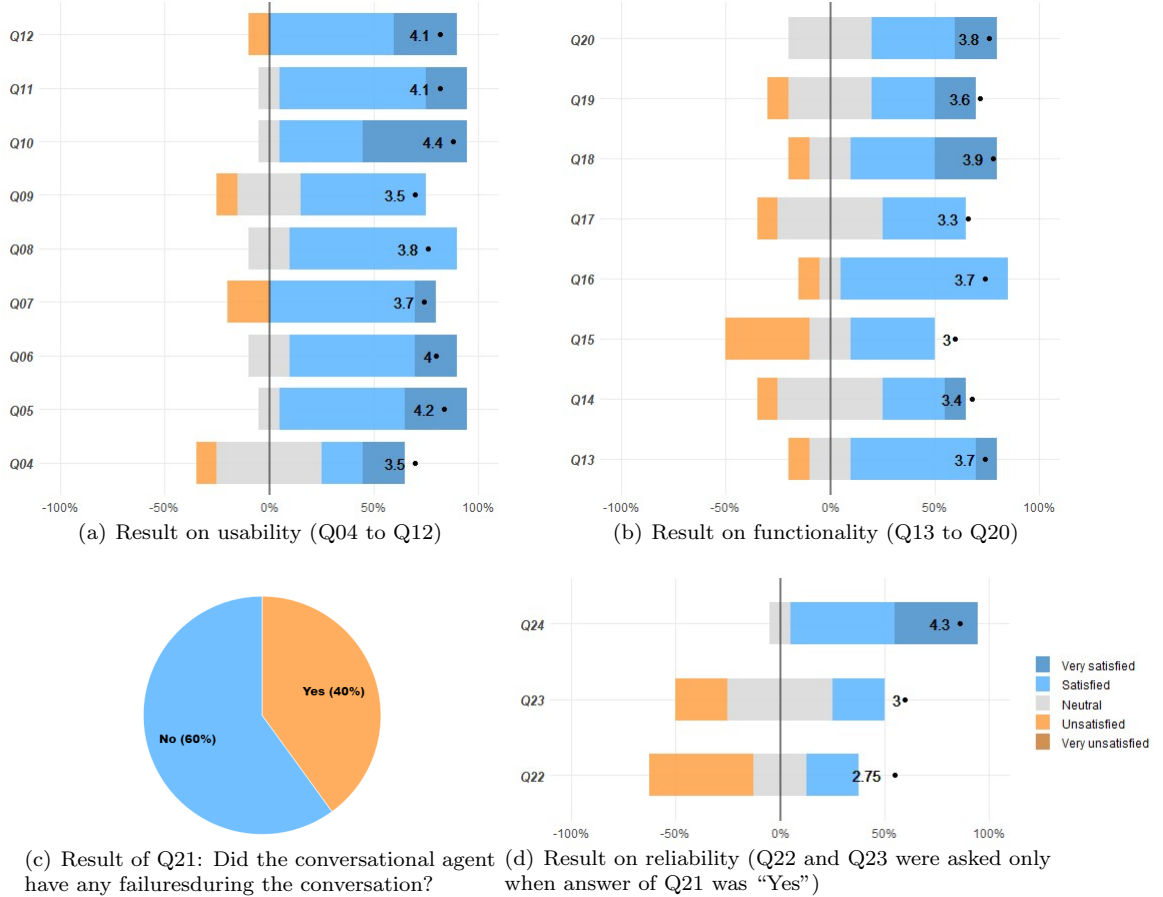

(a) Result on usability (Q04 to Q12)

(b) Result on functionality (Q13 to Q20)

(c) Result of Q21: Did the conversational agent have any failuresduring the conversation?

(d) Result on reliability (Q22 and Q23 were asked only when answer of Q21 was "Yes")

Figure 1: Results of user evaluation on usability, functionality and reliability

Category	Sub-category	Number	Questionnaire Item
Overall Evaluation		Q1	Have you used a chatbot or a conversational agent as a museum guide before?
		Q2	Do you think your visit experience was improved by having the conversation with the virtual guide?
		Q3	Do you think the guide was annoying and spoiled your visit experience?
Usability	Ease to start conversation	Q4	I think it was easy and clear to start a conversation with the agent.
		Q5	I would imagine that most people would learn to start the conversation quickly.
		Q6	I quickly realized what information the chatbot could give me.
	Maxim of quantity	Q7	The amount of received information was neither too much nor too less.
		Q8	The amount of recommendation from agent is appropriate.
		Q9	The agent gives me only the information I need.
	Understandability	Q10	The agent's responses were easy to understand.
		Q11	I felt comfortable with the conversational interface, i.e. the chat box.
	Speed of answer	Q12	My wait time is short for the response from the agent.
Functionality	Ability to maintain a conversation	Q13	I felt that the conversation is coherent and ongoing.
	Recognition of the user's intent	Q14	I felt my intentions were understood by the agent.
		Q15	I had to rephrase my input multiple times for the agent to be able to understand me.
	Relevance of information	Q16	During the whole conversation, the agent offers relevant information about what I asked.
		Q17	The agent's recommendations are always interesting to me.
	Satisfaction to functions	Q18	I liked to see the connections between exhibits through the knowledge graph.
		Q19	I felt asking questions to the agent was not troublesome or unnecessary to me.
		Q20	My experience of visiting improved due to the recommendation from the agent.
Reliability	Resilience to failure	Q21	Did the conversational agent have any failures during the conversation?
		Q22	The agent response appropriately when it encountered a problem.
		Q23	The agent helped me back to the normal conversation when a failure happened.
	Security	Q24	I felt my personal information is secured during the whole conversation.

Table 5: Question types and examples in questionnaire.