## **Overall Chatbot Performance Suammry**

	Production Parts			
	Adjusting Nut RERANKER_TOP_K=5 RETRIEVER_TOP_K=15		RERANKE	ug R_TOP_K=5 R_TOP_K=15
Questions	Rating	Generation Time (sec)	Rating	Generation Time (sec)
Activity-based questions (AQ)				
What are the most and least executed activities?		6		9
How many activities does the model have?		3	SS	4
What are the possible start and end activities in my log?		7		11
Which activity is the happened before and after activity X?		5		9
Which activities have instances of rework?		7		9
Process-based questions (PQ)				
What transitions take the highest average time and its frequency?		9		11
What are the main bottlenecks in the process?		12		13
What cases contain self-loops?		7		8
Where am I wasting the most time in the process?		7		11
Which are the highest and lowest transitions on average time and how frequent are they?		15		16
Variant-based questions (VQ)				
How many variants are there in the process?		2		5
Which cases followed the shortest path?		6		3
What is the longest trace regarding the number of activities? How many cases follow this trace?		6		9
How many distinct activities are there in the shortest path?		10		15
I would like to see statistics comparing longest and shortest variants.		15		13

## Full QnA Summary

Part Name		Adjusting Nut		Plug		
Answer	Ground truth	LLM generated result	Time generated	Ground truth	LLM generated result	Time generated
Activity-based conto	ext					
What are the most and least executed activities?	Turning & Milling - Machine 8: 10 executions Flat Grinding - Machine 11: 1 executions	- **Most executed activity**: Turning & Milling - Machine 8 (10 times) - **Least executed activity**: Flat Grinding - Machine 11 (1 time)	0 min 6 sec	Turning & Milling - Machine 5: 18 executions Grinding Rework - Machine 12: 1 executions Round Grinding - Machine 23: 1 executions	- **Most executed activity**: Turning & Milling - Machine 5 (18 executions). - **Least executed activities**: Grinding Rework - Machine 12 (1 execution), Round Grinding - Machine 23 (1 execution).	0 min 9 sec
How many activities does the model have?	Total number of activities: 7	- The model has 7 activities.	0 min 3 sec	Total number of activities: 18	- The model has **18 activities**.	0 min 4 sec
What are the possible start and end activities in my log?	=== Start Activities === Turning & Milling - Machine 8: 1 cases start here Round Grinding - Manual: 1 cases start here === End Activities === Packing: 2 cases end here	- **Start activities**: - Turning & Milling - Machine 8 (1 case starts here) - Round Grinding - Manual (1 case starts here) - **End activity**: - Packing (2 cases end here)	0 min 7 sec	=== Start Activities === Turning & Milling - Machine 5: 4 cases start here Turning - Machine 5: 1 cases start here Turning & Milling - Machine 4: 1 cases start here  === End Activities === Packing: 3 cases end here Final Inspection Q.C.: 2 cases end here Round Grinding - Machine 3: 1 cases end here	- **Start activities**: - Turning - Machine 5 (1 case starts here) - Turning & Milling - Machine 5 (4 cases start here) - Turning & Milling - Machine 4 (1 case starts here) - **End activities**: - Packing (3 cases end here) - Final Inspection Q.C. (2 cases end here)	0 min 11 sec
Which activity is the happened before and after activity X?	- Turning & Milling Q.C> Laser Marking - Machine 7 - Final Inspection Q.C> Laser Marking - Machine 7 - Laser Marking - Machine 7 -> Flat Grinding - Machine 11 - Laser Marking - Machine 7 -> Packing	- **Before**: Turning & Milling Q.C., Final Inspection Q.C **After**: Flat Grinding - Machine 11, Packing.	0 min 5 sec	Turning - Machine 5 -> Turning & Milling - Machine 5 Turning Q.C> Turning & Milling - Machine 5 Turning & Milling Q.C> Turning & Milling - Machine 5 Turning - Machine 5 -> Turning & Milling - Machine 5  Turning & Milling - Machine 5 -> Turning & Milling - Machine 5 Turning & Milling - Machine 5 -> Turning & Milling - Machine 4 Turning & Milling - Machine 5 -> Turning & Milling Q.C.	**Before**: Turning Q.C., Turning & Milling - Machine 5, Turning & Milling Q.C., Turning - Machine 5  - **After**: Turning Q.C., Turning & Milling - Machine 4, Turning & Milling - Machine 5, Turning & Milling Q.C., Laser Marking - Machine 7	0 min 9 sec

				Turning & Milling - Machine 5 -> Turning Q.C. Turning & Milling - Machine 5 -> Laser Marking - Machine 7		
Which activities have instances of rework?	=== Rework Cases Per Activity === Turning & Milling - Machine 8: 1 cases with rework Turning & Milling Q.C.: 1 cases with rework Final Inspection Q.C.: 1 cases with rework Round Grinding - Manual: 1 cases with rework	- Turning & Milling Q.C Final Inspection Q.C Round Grinding - Manual - Turning & Milling - Machine 8	0 min 7 sec	=== Rework Cases Per Activity === Lapping - Machine 1: 6 cases with rework Turning & Milling - Machine 5: 5 cases with rework Round Grinding - Machine 3: 5 cases with rework Final Inspection Q.C.: 3 cases with rework Turning & Milling - Machine 4: 2 cases with rework Round Grinding - Q.C.: 2 cases with rework Round Grinding - Machine 12: 2 cases with rework Turning Q.C.: 1 cases with rework Turning & Milling Q.C.: 1 cases with rework Turning & Milling Q.C.: 1 cases with rework Laser Marking - Machine 7: 1 cases with rework Round Grinding - Machine 2: 1 cases with rework Round Grinding - Machine 5: 1 cases with rework Turning - Machine 5: 1 cases with rework Round Grinding - Manual: 1 cases with rework	- Grinding Rework - Machine 12 - Round Grinding - Machine 2 - Turning Q.C Round Grinding - Manual - Turning - Machine 5	0 min 9 sec
Process-based conte	ext		T	T		Γ
What transitions take the highest average time and its frequency?	Round Grinding - Manual - > Final Inspection Q.C. (frequency = 1, performance = 637140.00 seconds = 7 days 8 hrs 59 mins)	**Highest average time**: "Round Grinding - Manual → Final Inspection Q.C." (7 days 8 hrs 59 mins) **Frequency**: 1.	0 min 9 sec	Round Grinding - Q.C> Round Grinding - Machine 3 (frequency = 1, performance = 2337840.00 seconds = 27 days 1 hrs 24 mins)	- **Highest average time**: "Round Grinding - Q.C. → Round Grinding - Machine 3" (27 days 1 hrs 24 mins). Frequency: 1 (lowest among 43 transitions).	0 min 11 sec
What are the main bottlenecks in the process?	Round Grinding - Manual - > Final Inspection Q.C. (frequency = 1, performance = 637140.00 seconds = 7 days 8 hrs 59 mins)	- **Main bottleneck**: "Round Grinding - Manual → Final Inspection Q.C." - Average execution time: 7 days 8 hrs 59 mins (longest in the process). - Frequency: 1 (lowest among 13 transitions). - Note: Slowest transition, likely causing delays in overall process flow.	0 min 12 sec	Round Grinding - Q.C> Round Grinding - Machine 3 (frequency = 1, performance = 2337840.00 seconds = 27 days 1 hrs 24 mins)	- **Main bottleneck**: "Round Grinding - Q.C. → Round Grinding - Machine 3" - Average execution time: 27 days 1 hr 24 mins (longest) - Frequency: 1 (lowest among 43 transitions	0 min 13 sec

Which transition contain self-loops?	=== Self-loop Transitions (A -> A) === Total number of unique self-loop transitions: 4 Turning & Milling - Machine 8 -> Turning & Milling - Machine 8: 8 times Turning & Milling Q.C> Turning & Milling Q.C.: 1 times Final Inspection Q.C> Final Inspection Q.C.: 2 times Round Grinding - Manual -> Round Grinding - Manual: 3 times	- **Final Inspection Q.C. → Final Inspection Q.C.** (self- loop, 2 times) - **Round Grinding - Manual → Round Grinding - Manual** (self-loop, 3 times) - **Turning & Milling - Machine 8 → Turning & Milling - Machine 8** (self- loop, 8 times) - **Turning & Milling Q.C. → Turning & Milling Q.C. * Turning & Milling Q.C. * (self- loop, 1 time)	0 min 7 sec	=== Self-loop Transitions (A -> A) === Total number of unique self-loop transitions: 10 Turning & Milling - Machine 4 -> Turning & Milling - Machine 4 -> Turning & Milling - Machine 3 -> Round Grinding - Machine 3 -> Round Grinding - Machine 3 -> Turning & Milling - Machine 5 -> Turning & Milling - Machine 5 -> Turning & Milling - Machine 5 -> Turning & Milling - Machine 2 -> Round Grinding - Machine 2 -> Round Grinding - Machine 2 -> Round Grinding - Q.C> Round Grinding - Q.C.: 3 times Lapping - Machine 1 -> Lapping - Machine 1: 5 times Final Inspection Q.C> Final Inspection Q.C.: 5 times	- Turning - Machine 5 → Turning - Machine 5 - Round Grinding - Machine 2 → Round Grinding - Machine 2 - Lapping - Machine 1 → Lapping - Machine 1 - Round Grinding - Machine 3 → Round Grinding - Machine 3 - Round Grinding - Manual → Round Grinding - Manual	0 min 8 sec
				Inspection Q.C.: 5 times Turning - Machine 5 -> Turning - Machine 5: 1 times Round Grinding - Machine 12 -> Round Grinding - Machine 12: 4 times Round Grinding - Manual -> Round Grinding - Manual: 5 times	- **Waste in "Round Grinding - Q.C. → Round Grinding - Machine 3"**:	
Where am I wasting the most time in the process?	Round Grinding - Manual - > Final Inspection Q.C. (frequency = 1, performance = 637140.00 seconds = 7 days 8 hrs 59 mins)	- The slowest transition is  **"Round Grinding - Manual → Final Inspection Q.C."** with an average execution time of  **7 days 8 hrs 59 mins**, making it the primary time- waster.  - This transition has the  **lowest frequency** (1 occurrence) among 13 transitions, indicating it is a bottleneck.	0 min 7 sec	Round Grinding - Q.C> Round Grinding - Machine 3 (frequency = 1, performance = 2337840.00 seconds = 27 days 1 hrs 24 mins)	- **Average execution time**: 27 days 1 hrs 24 mins (longest in the process) **Frequency**: 1 (lowest among 43 transitions) **Bottleneck**: Longest duration, causing significant time waste despite low frequency.  **Key Insight**: The most time wasted is in "Round Grinding - Q.C. — Round Grinding - Machine 3" due to its extreme execution time, even though it occurs infrequently.	0 min 11 sec
Which are the highest and lowest transitions on	Round Grinding - Manual - > Final Inspection Q.C. (frequency = 1, performance	- **Highest average time**: Round Grinding - Manual →	0 min 15 sec	Round Grinding - Q.C> Round Grinding - Machine 3 (frequency = 1, performance	- **Highest average time**: "Round Grinding - Q.C. → Round Grinding - Machine 3"	0 min 16 sec

average time and how frequent are they?	= 637140.00 seconds = 7 days 8 hrs 59 mins)  Final Inspection Q.C> Laser Marking - Machine 7 (frequency = 1, performance = 4380.00 seconds = 1 hrs 13 mins)	Final Inspection Q.C. (7 days 8 hrs 59 mins), frequency: 1 **Lowest average time**: Final Inspection Q.C. → Laser Marking - Machine 7 (1 hr 13 mins), frequency: 1 All listed transitions have a frequency of 1, which is the lowest among 13 transitions.		= 2337840.00 seconds = 27 days 1 hrs 24 mins)  Lapping - Machine 1 -> Round Grinding - Manual (frequency = 1, performance = 960.00 seconds = 16 mins)	(27 days 1 hrs 24 mins). Frequency: 1 **Lowest average time**: "Turning & Milling Q.C. → Turning Q.C." (26 mins). Frequency: 1.  - **Highest average time**: - **Round Grinding - Q.C. → Round Grinding - Machine 3** (27 days 1 hr 24 mins) - **Frequency**: 1 - **Lowest average time**: - **Lapping - Machine 1 → Round Grinding - Manual** (16 mins) - **Frequency*: 1 All listed transitions have the lowest frequency (1) out of 43.	
Variant-based conte	ext					
How many variants are there in the process?	Total number of variants: 2	There are 2 variants in the process.	0 min 2 sec	Total number of variants: 6	- 6 variants.	0 min 5 sec
Which cases followed the shortest path?	Variant 1: Round Grinding - Manual → Round Grinding - Manual → Round Grinding - Manual → Final Inspection Q.C. → Laser Marking - Machine 7 → Packing Number of activities in path: 7 Cases: 1 Case IDs: Case 58	- Case 58 followed the shortest path (7 activities).	0 min 6 sec	Variant 2: Turning & Milling - Machine 5 → Turning & Milling - Machine 5 → Turning & Milling Q.C. → Laser Marking - Machine 1 → Round Grinding - Machine 1 → Round Grinding - Machine 23 → Round Grinding - Q.C. → Round Grinding - Machine 1 → Lapping - Machine 1 → Round Grinding - Machine 3 → Final Inspection Q.C. → Final Inspection Q.C. → Final Inspection Q.C. → Case ID Scase: 1 Case IDs: Case 24 Distinct activities: Final Inspection Q.C., Lapping - Machine 1, Laser Marking - Machine 7, Packing, Round Grinding - Machine 23, Round Grinding - Machine 3, Round Grinding - Q.C.,	- Case 24	0 min 9 sec

				Turning & Milling - Machine 5, Turning & Milling Q.C. Avg duration: 3634560.00 seconds (1 months 12 days 1 hrs 36 mins) Min duration: 3634560.00 seconds (1 months 12 days 1 hrs 36 mins) Max duration: 3634560.00 seconds (1 months 12 days 1 hrs 36 mins)		
What is the longest trace regarding the number of activities? How many cases follow this trace?	Variant 2: Turning & Milling - Machine 8 → Turning & Milling Q.C. → Turning & Milling Q.C. → Turning & Milling - Machine 8 → Turning & Milling Q.C. → Laser Marking - Machine 7 → Flat Grinding - Machine 11 → Final Inspection Q.C. → Facking Cases: 1 Case IDs: Case 103	- Longest trace: 19 activities - Cases following this trace: 1 (Case 103)	0 min 10 sec	Variant 5: Turning & Milling - Machine 5 → Turning & Milling - Machine 5 → Turning & Milling - Machine 5 → Turning & Milling Q.C. → Laser Marking - Machine 7 → Deburring - Mandine 1 → Lapping - Machine 11 → Lapping - Machine 1 → Round Grinding - Machine 2 → Round Grinding - Machine 2 → Round Grinding - Q.C. → Round Grinding - Q.C. → Lapping - Machine 1 → Lapping - Machine 1 → Lapping - Machine 1 → Round Grinding - Machine 2 → Round Grinding - Machine 2 → Final Inspection Q.C. → Final Inspection Q.C. → Final Inspection Q.C. → Laser Marking - Machine 7 → Grinding Rework - Machine 12 → Final Inspection Q.C. → Final Inspection Q.C. → Final Inspection Q.C. → Packing Number of activities in path: 26 Cases: 1 Case IDs: Case 122 Distinct activities: Deburring - Manual, Final Inspection Q.C., Flat Grinding - Machine 11, Grinding Rework - Machine 12, Lapping - Machine 1, Laser Marking - Machine 1, Laser Marking - Machine 1, Packing, Round Grinding - Machine 2, Round Grinding - Machine 2, Round Grinding - Machine 2, Round Grinding - Q.C., Turning & Milling -	- **Longest trace (activities):** 26 activities - **Cases following this trace:** 1 case (Case 122)	0 min 15 sec

				Machine 5, Turning & Milling Q.C. Avg duration: 2030580.00 seconds (23 days 12 hrs 3 mins)	- **Distinct activities in the shortest path**: 9	0 min 13 sec
How many distinct activities are there in the shortest path?	Distinct activities: Final Inspection Q.C., Laser Marking - Machine 7, Packing, Round Grinding - Manual	- **Distinct activities**: 4 (Round Grinding - Manual, Final Inspection Q.C., Laser Marking - Machine 7, Packing)	0 min 15 sec	Distinct activities: Final Inspection Q.C., Lapping - Machine 1, Laser Marking - Machine 7, Packing, Round Grinding - Machine 23, Round Grinding - Machine 3, Round Grinding - Q.C., Turning & Milling - Machine 5, Turning & Milling Q.C.	- Turning & Milling - Machine 5  - Turning & Milling Q.C.  - Laser Marking - Machine 7  - Lapping - Machine 1  - Round Grinding - Machine 23  - Round Grinding - Q.C.  - Round Grinding - Machine 3  - Final Inspection Q.C.  - Packing	
I would like to see statistics comparing longest and shortest variants.	Variant 1: Round Grinding - Manual → Final Inspection Q.C. → Laser Marking - Machine 7 → Packing Number of activities in path: 7 Cases: 1 Case IDs: Case 58 Avg duration: 913440.00 seconds (10 days 13 hrs 44 mins)  Variant 2: Turning & Milling - Machine 8 → Turning & Milling Q.C. → Turning & Milling - Machine 8 → Turning & Milling Q.C. → Laser	- **Longest variant (activities):**  - **Variant:** "Turning & Milling - Machine 8 → → Packing" (19 activities)  - **Time:** 8 days 14 hrs 42 mins (fastest, shortest time)  - **Shortest variant (activities):**  - **Variant:** "Round Grinding - Manual → → Packing" (7 activities)  - **Time:** 10 days 13 hrs 44 mins (slowest, longest time)  - **Key difference:**  - Longest variant has more activities (19 vs. 7) but shorter duration.  - Shortest variant has fewer activities but longer duration.	0 min 18 sec	Variant 2: Turning & Milling - Machine 5 → Turning & Milling - Machine 5 → Turning & Milling Q.C. → Laser Marking - Machine 7 → Lapping - Machine 1 → Round Grinding - Machine 23 → Round Grinding - Q.C. → Round Grinding - Machine 3 → Lapping - Machine 1 → Lapping - Machine 1 → Lapping - Machine 1 → Round Grinding - Machine 3 → Final Inspection Q.C. → Final Inspection Q.C. → Final Inspection Q.C. → Packing Number of activities in path: 15 Cases: 1 Case IDs: Case 24 Distinct activities: Final Inspection Q.C., Lapping - Machine 1, Laser Marking - Machine 1, Laser Marking - Machine 7, Packing, Round Grinding - Machine 23, Round Grinding - Machine 3, Round Grinding - Q.C., Turning & Milling - Machine 5, Turning & Milling Q.C. Avg duration: 3634560.00 seconds (1 months 12 days 1 hrs 36 mins)	- **Shortest variant**: - Activities: 15 - Duration: 1 month 12 days 1 hr 36 mins - Case ID: Case 24 - Unique activity: Round Grinding - Machine 23 - **Longest variant**: - Activities: 26 - Duration: 23 days 12 hrs 3 mins - Case ID: Case 122 - Unique activities: Round Grinding - Machine 2, Grinding Rework - Machine 12 - **All variants**: Same execution count **Both variants**: Start with "Turning & Milling - Machine 5" and end with "Packing".	0 min 13 sec

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Marking - Machine 7 →	Variant 5: Turning & Milling
Flat Grinding - Machine 11	- Machine 5 → Turning &
→ Final Inspection Q.C. →	Milling - Machine 5 →
Final Inspection Q.C. →	Turning & Milling - Machine
Final Inspection Q.C. →	5 → Turning & Milling Q.C.
Packing	→ Turning & Milling -
Number of activities in	Machine 5 → Turning &
path: 19	Milling Q.C. → Laser
Cases: 1	Marking - Machine 7 →
Case IDs: Case 103	Deburring - Manual → Flat
Avg duration: 744120.00	Grinding - Machine 11 →
seconds (8 days 14 hrs 42	Lapping - Machine 1 →
mins)	Round Grinding - Machine 2
illilis)	→ Round Grinding -
	Machine 2 → Round
	Grinding - Q.C. → Round
	Grinding - Q.C. → Lapping -
	Machine 1 → Lapping -
	Machine 1 → Round
	Grinding - Machine 2 →
	Round Grinding - Machine 2
	→ Round Grinding - Wachine 2
	Machine 2 → Final
	Inspection Q.C. → Final
	Inspection Q.C. → Laser
	Marking - Machine 7 →
	Grinding Rework - Machine
	12 → Final Inspection Q.C.
	→ Final Inspection Q.C. →
	Packing
	Number of activities in path:
	26
	Cases: 1
	Case IDs: Case 122
	Distinct activities:
	Deburring - Manual, Final
	Inspection Q.C., Flat
	Grinding - Machine 11,
	Grinding Rework - Machine
	12, Lapping - Machine 1,
	Laser Marking - Machine 7,
	Packing, Round Grinding -
	Machine 2, Round Grinding -
	Q.C., Turning & Milling - Machine 5, Turning &
	Milling Q.C.
	Avg duration: 2030580.00
	seconds (23 days 12 hrs 3 mins)
	illilis)