



Final Presentation

KLM: Adaptive AI for Enhanced Employee Training

JIP Team

1.4.1

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The Interdisciplinary Team



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Introduction

AIRFRANCE 


KLM



- KLM: Implements VR in cabin crew training.
- Ineffective existing training methods.
- JIP: Feasibility of increasing training effectiveness through Adaptive AI.

Problem Statement



Exploring the use of Adaptive AI for sales department employee training at KLM



Constraints:

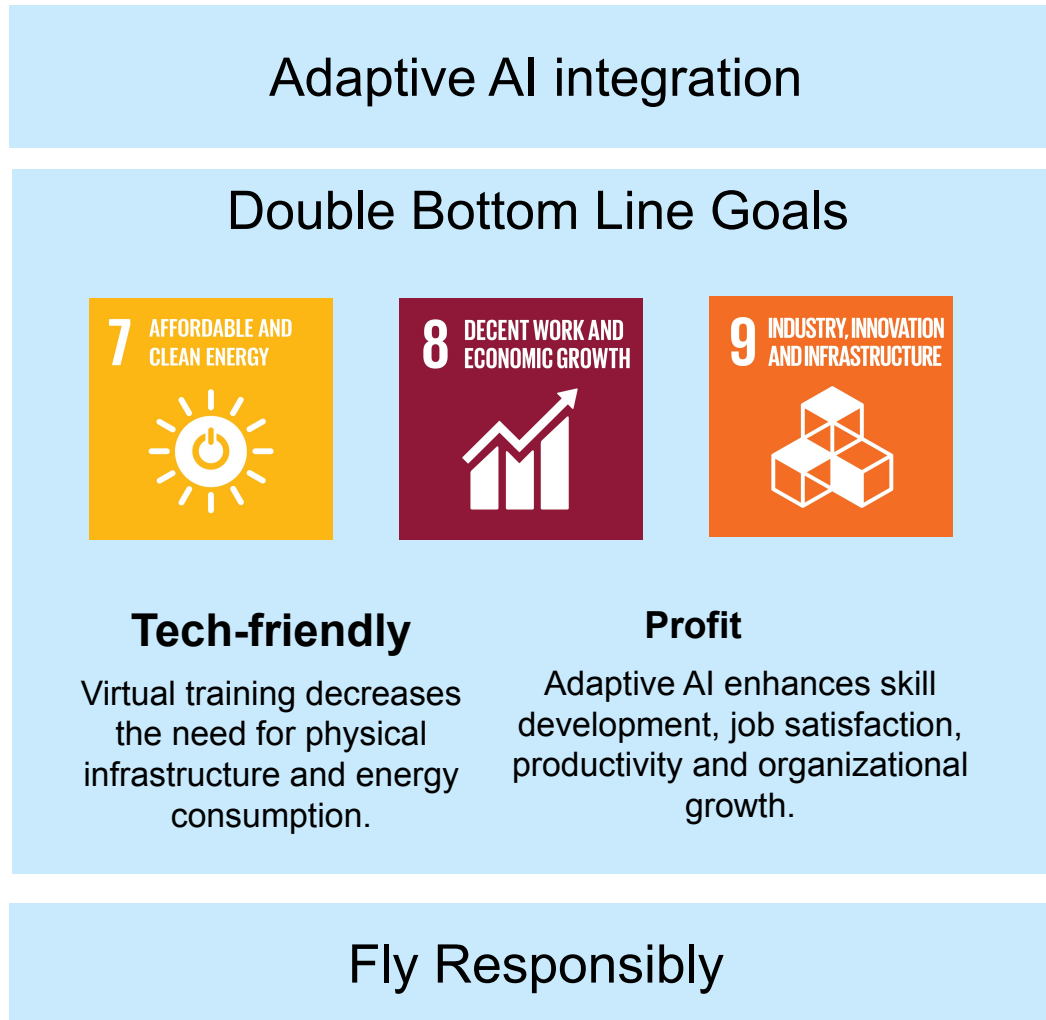
Latency in response generation, quantitative testing analysis to provide initial feasibility result in 10 weeks.



Method should be:

Scalable, ethically acceptable, culturally adaptable, technically and organizationally feasible, financially viable and desirable to the employees.

Problem Rational



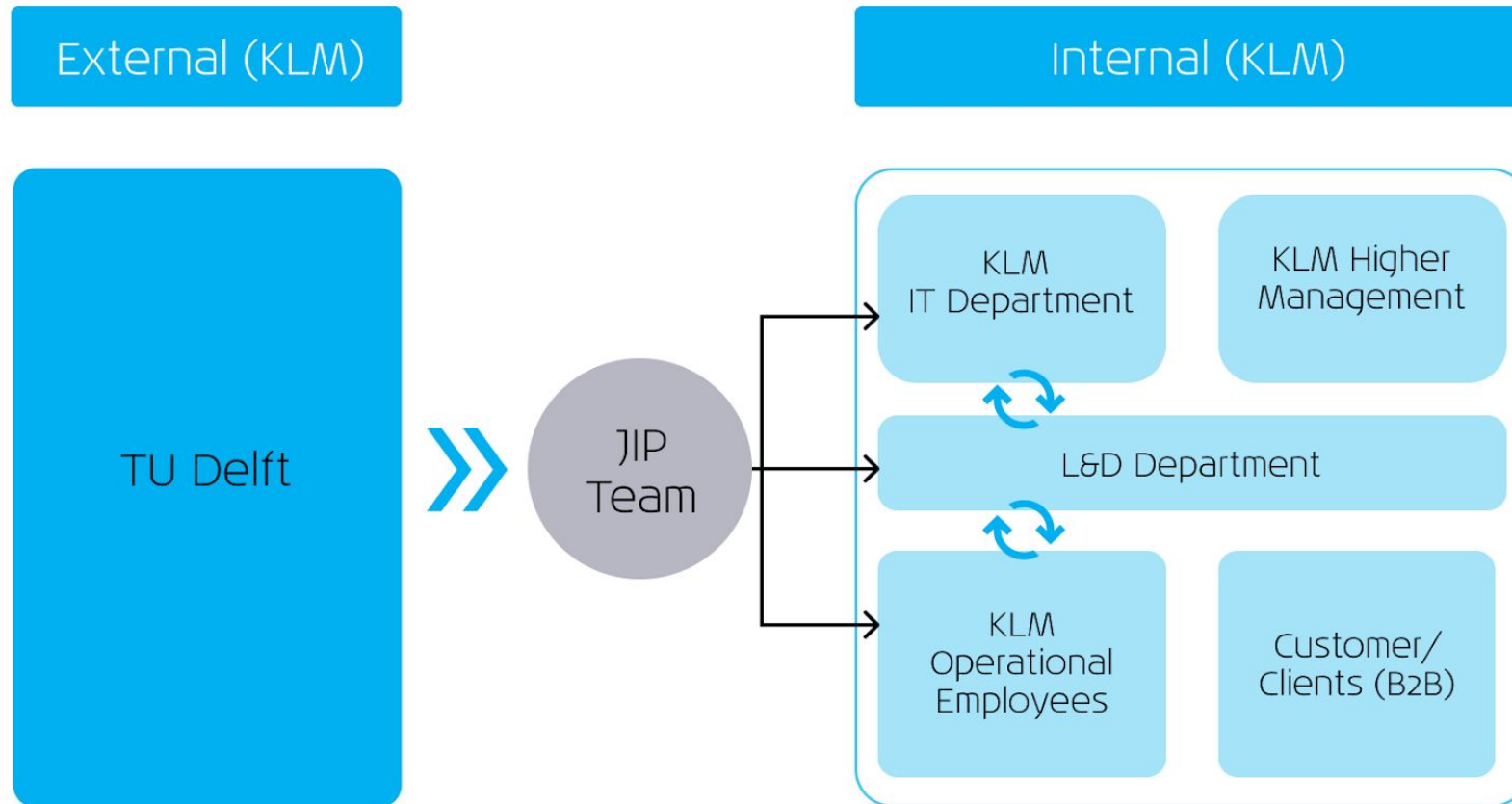
Opportunities

Use of Adaptive AI integration in the existing training programs





Achieve Sustainability Development Goals

Foster Responsible Innovation

Stakeholder Analysis



Risk Assessment

	Category	Risk	Solution
	Technology	Technical glitches	Rigorous testing phase and regular updates
	Organisation	Inconsistencies in collaboration hinder progress	Foster inter-departmental collaboration with regular synchronized sessions
	Privacy	Sensitive employee and customer data	Strong encryption and data controls centres
	Social	Resistance from staff towards new technology	Conduct practical workshops and encourage an open dialogue

Literature Review

Virtual Reality (VR) Defined

- VR encompasses various forms of mixed reality, such as augmented reality (AR), Mixed reality (MR), augmented virtuality (AV), and VR itself. These technologies offer different user experiences, often combining real-world and virtual elements (*Zhang, 2014*)*.
- In virtual reality, sight is key, but additional senses such as touch, **speech and sound**, among others, can also be used to improve the user experience. (*Friego and Barbosa, 2016*)*.

Impacts of VR technologies

- Medical
- Design, Manufacturing, and Maintenance
- Mining
- **Aerospace**
- Military
- Entertainment

****Ref:** Zhang, W. (2014). On college oral english teaching in the base of virtual reality technology. 10.4028/www.scientific.net/AMM.687-691.2427

Friego, E., Mauricio & Silva, & Barbosa, G. (2016). Augmented reality in aerospace manufacturing: A review. *Journal of Industrial and Intelligent Information*. <https://doi.org/10.18178/jiii.4.2.125-130>

Literature Review

Training challenges in the Airline Industry

- Applications in the airline industry, such as passenger recognition using augmented reality, have the potential to improve passenger services and crew efficiency (*Bellamy, 2017*).
- AI-powered adaptive training will make it more efficient and affordable as this technology will pay off in the long run, since training demands will be **cut by 30-50%**. (*Klassen, 2021*).

Integration of Adaptive AI in VR Training

- Technology's role in individualized training and cost savings and the potential benefits of AI-driven instruction systems in aviation.
- Current challenges faced are due to maintaining efficient end to end conversation and delays in AI integrated training.

****Ref:** Bellamy, W. (2017). 9 companies using augmented reality and virtual reality in aviation. <http://www.aviationtoday.com/2017/08/24/9-companies-using-augmentedvirtual-reality-aviation/>
Klassen, M. (2021). How using ai for pilot training makes aviation safer | paladin ai.medium. <https://medium.com/paladin-ai/adaptive-pilot-training-makes-aviationsafer-and-cheaper-a8ce7d67f626>

Literature Review

Why Adaptive AI ?

- Generative AI models can make new things like text, pictures, or music all on its own, without much help from inputs thus making the generated data different in every instance.
- The gap in Generative AI depends on the quality of the initial training data, errors or biases in data can affect the model's output. (Su & Yang, 2023)
- Adaptive algorithms changes its behaviour based on data and tasks, improving over time and adapting to different conditions, which allows to improve its performance over time as per conditions. (Meskó et al, 2023)

****Ref:** Meskó, B., Topol, E.J. The imperative for regulatory oversight of large language models (or generative AI) in healthcare. *npj Digit. Med.* 6, 120(2023). <https://doi-org.tudelft.idm.oclc.org/10.1038/s41746-023-00873-0>

Su, J., & Yang, W. (2023). Unlocking the power of ChatGPT: A framework for applying generative AI in education. *ECNU Review of Education*, 1–12. <https://doi-org.tudelft.idm.oclc.org/10.1177/2096531>

Ethics

Responsible Engineering criteria

- Privacy and Data Security
- Ethical Use case
- Diversity Inclusion

Ethics

3 P's (People, Profit, Planet)

- Improved Performance
- Enhanced Retention through increased immersion.(Granito et al, 2012)
- Reduce training costs: from €58.000.000/year to €40.600.000/year - (KLM, Financial Statement, 2022).
- Faster and more effective model for training which pushes people into the workforce faster.
- Industry Leadership

****Ref:** Granito, Mark & Chernobilsky, Ellina. (2012). The Effect of Technology on a Student's Motivation and Knowledge Retention.

KLM Financial Statement, 2022, https://www.klmanualreport.com/wp-content/uploads/2023/04/KLM-Financial-statements_2022.pdf (after consulting with KLM personnel)

Concept Selection Criteria

Adaptive AI-Enhanced Existing Training Programs

- Custom, real-life practice scenarios.

Arguments for the selection

- Aligns perfectly with sustainability goals.
- Seamlessly integrates multiple departments and expertise (AI Development, L&D, Sales).
- Technically feasible

Concept Selection Criteria



Description of current product

- Personalised, realistic scenarios for sales representatives.
- Adaptive AI that provides curated personas.

Functional Architecture

Systems engineering approach

- Usage Scenario
- Main Phases:
 - Deployment Phase
 - Operational Phase
- Extracting Needs and Requirements
- Functional Hierarchy Tree
- Activity Diagram

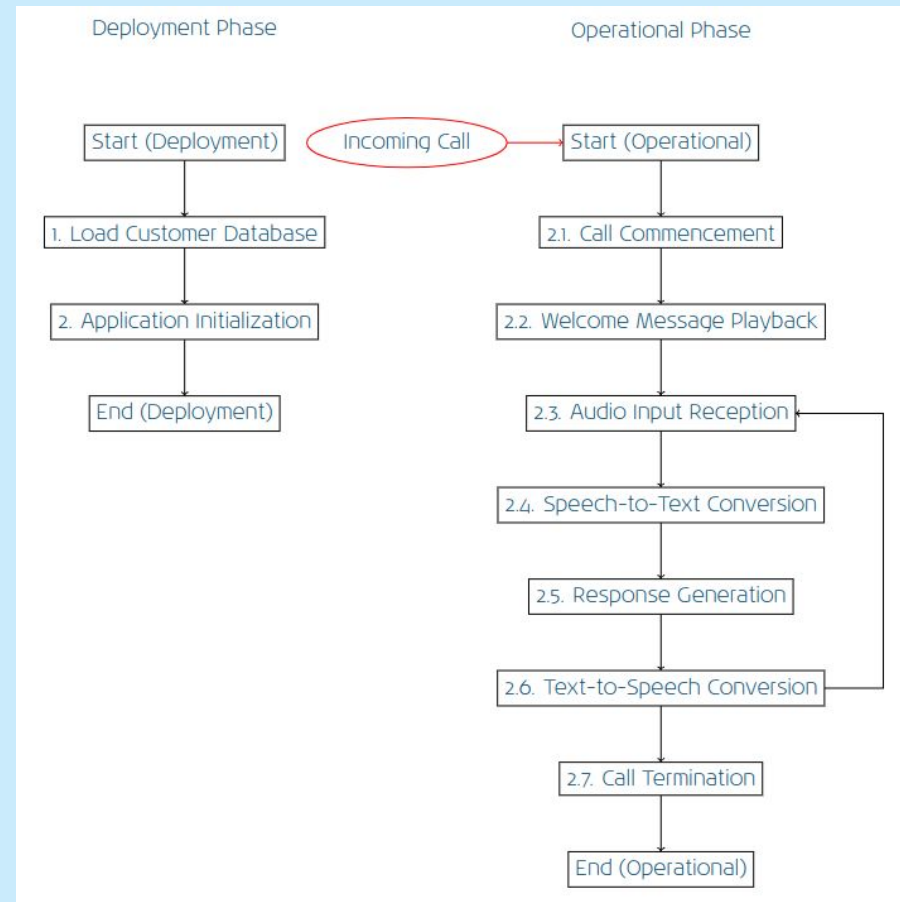
Functional Architecture

Usage scenario



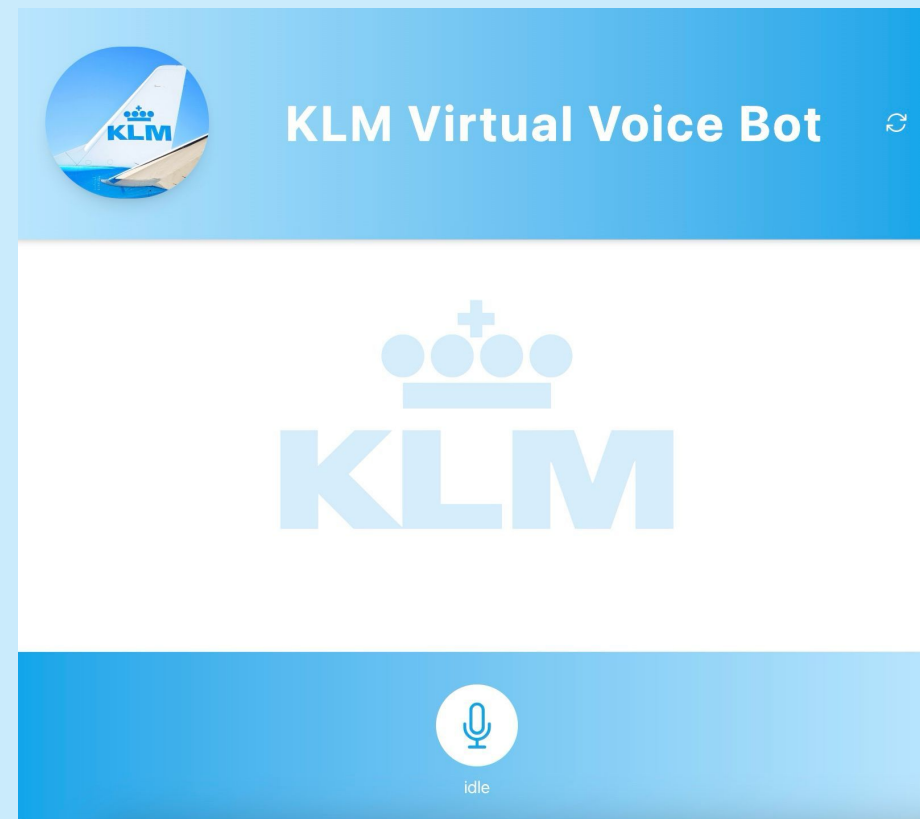
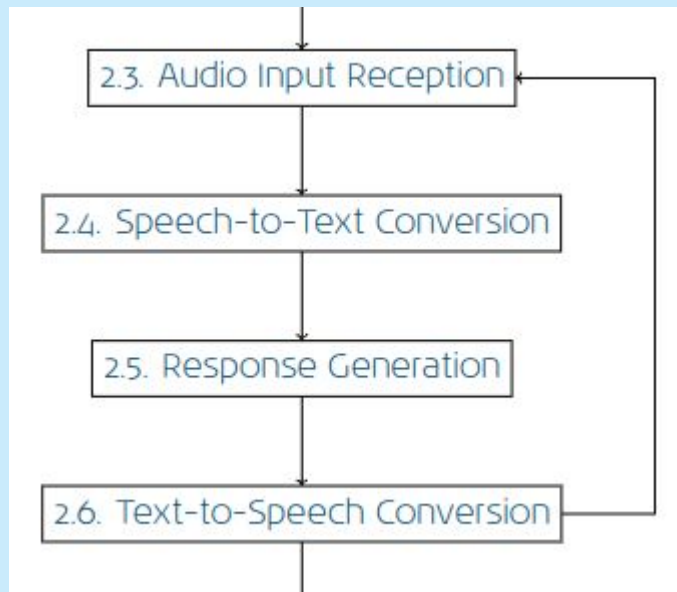
Functional Architecture

Activity Diagram



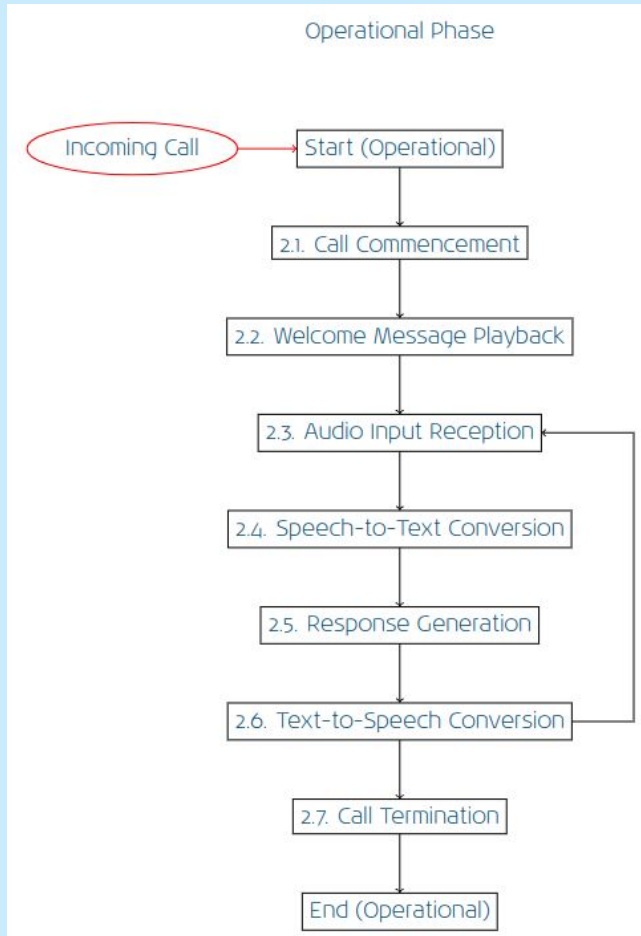
Development Iterations

Iteration 1

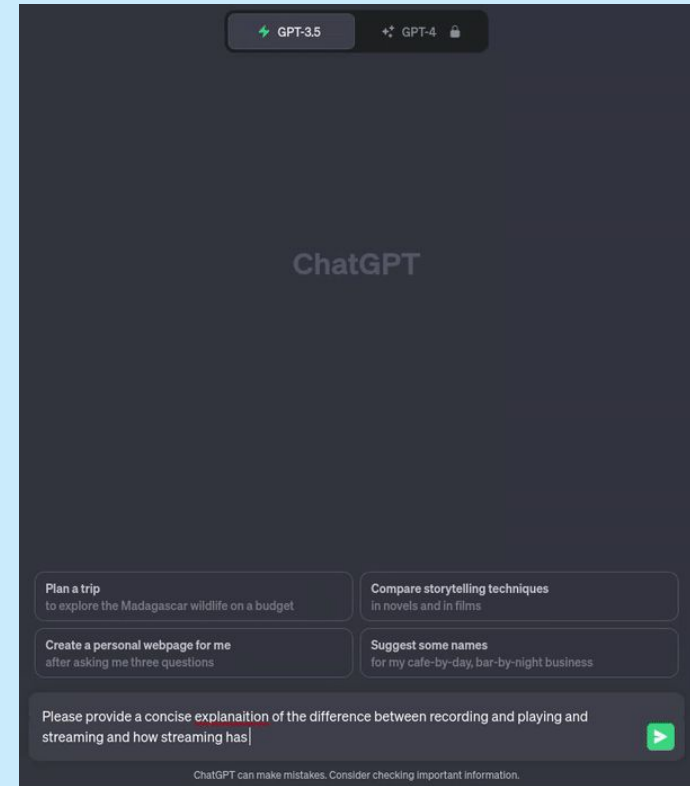


Development Iterations

Iteration 2



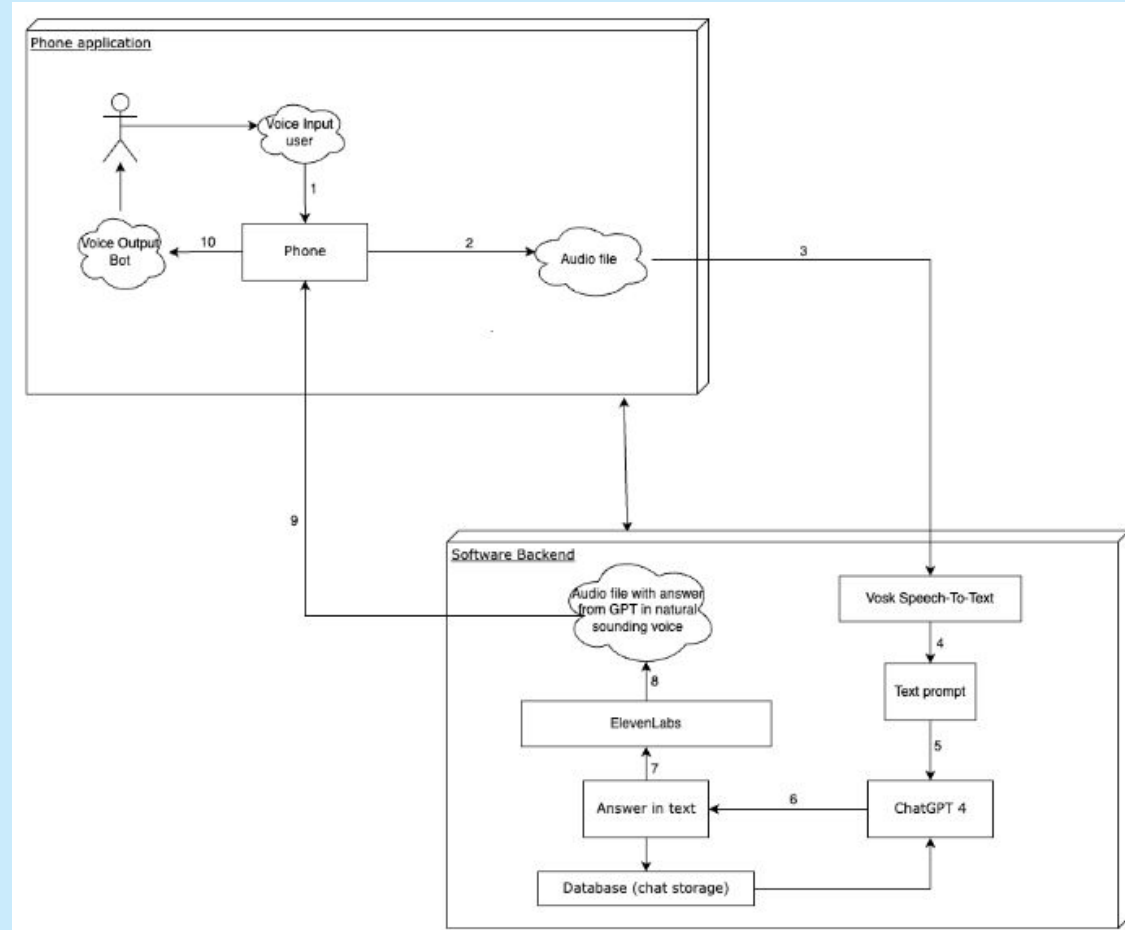
Iteration 3



Development Iterations

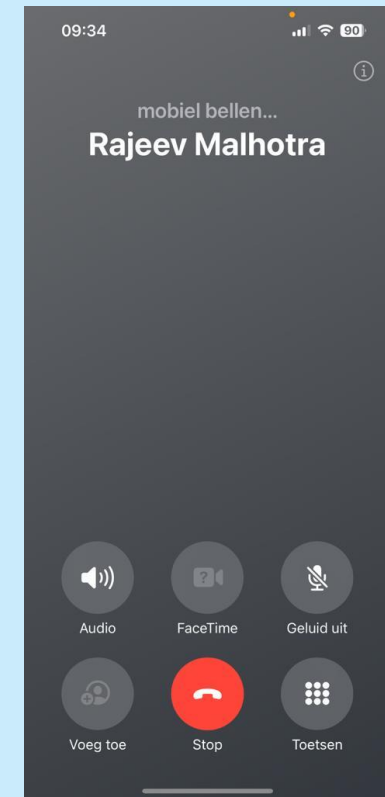
- **Python**
- **Javascript**
- **Disfluencies**

Final Software Architecture



Product Demo

- **Demo:**
 - Customer: Rajeev Malhotra, the virtual CEO
 - Objectives: price, culture and sustainability
- **Instructions:**
 - Could you please remain quiet?

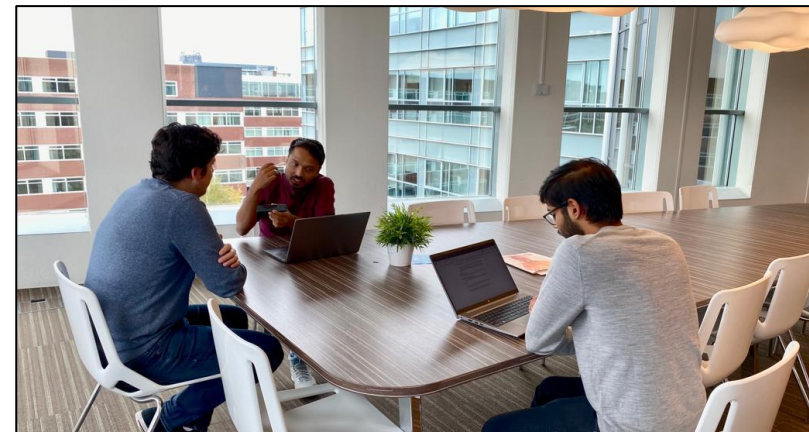
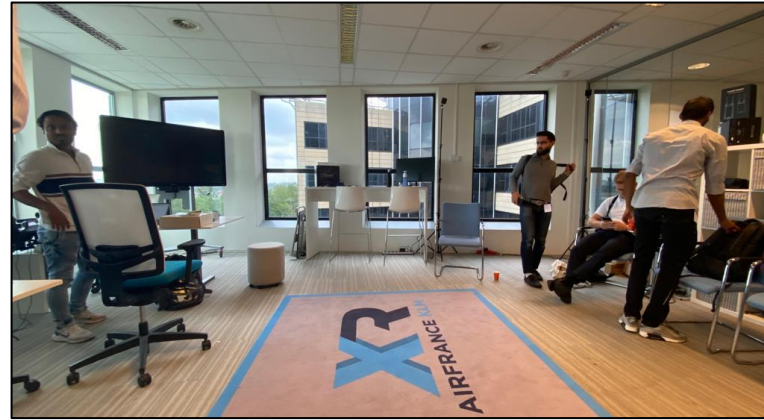


Product Demo



Experiment

XR Lab, Team Discussion & Interaction with Participants



Product Analysis

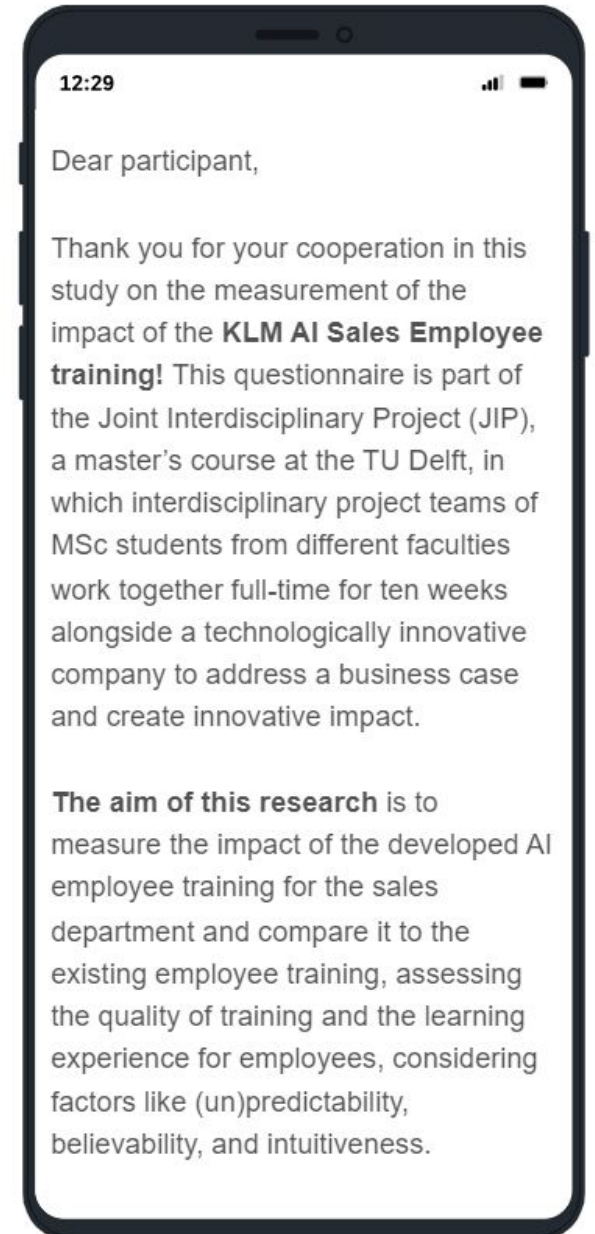
Quantitative Analysis

Three Surveys

- **Survey 1:** Quality assessment existing employee training programs
- **Survey 2:** Quality assessment new AI training program
- **Survey 3:** Quality assessment new AI training program one day after training to control for enthusiasm bias

Participants

Participant ID	Department and Role	Familiarity with AI
P1	XR Lab - Lead Developer	High
P2	VR Gaussian splitting KLM Intern	Low
P3	XR Lab - Intern	Moderate
P4	Innovation track team - External VR Developer	Low
P5	XR Centre of Excellence - External Developer	Low
P6	XR Technical Specialist	Moderate
P7	Visual Designer at KLM	Low
P8	Senior Researcher for new technologies	High
P9	Programmer	High
P10	Programmer	High



Product Analysis

Quantitative Analysis

Results

- Higher scores for **overall quality**, **intuitiveness**, **unpredictability**, and **believability**
- No significant difference in the **difficulty**
- Improved **confidence**, **motivation**, and **cross-cultural communication skills**
- No enthusiasm bias.

AI Bot Assessment

- Realistic voice
- Sufficient depth in conversations
- Feasible to implement in departments
- Mildly effective in incorporating unpredictable scenarios
- Long response time

	Rating Current Training	Rating New AI Training
Overall quality	4,3	7,1
Intuitiveness	4,9	7,6
Unpredictability	2,0	6,5
Difficulty	4,2	3,9
Believability	3,2	7,1

How would you rate the **level of difficulty** of the training?

Very easy

Very difficult

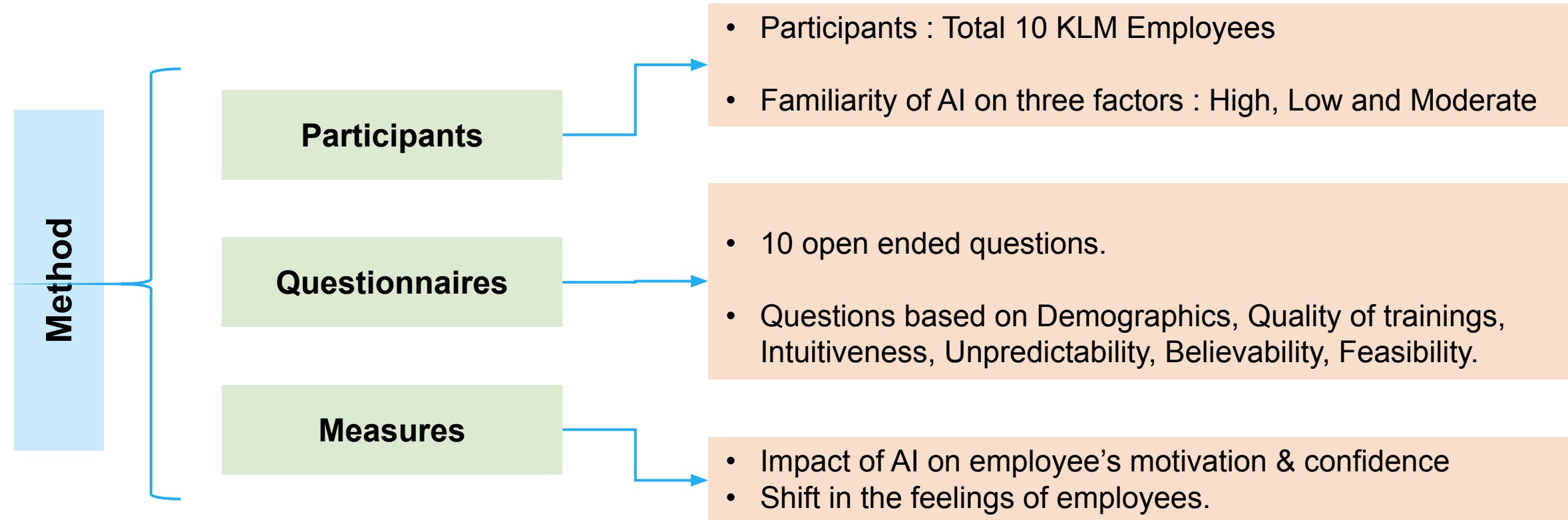
Difficulty

4



Product Analysis

Qualitative analysis



Results

Themes

Unpredictability

- “ when you say like you can predict that what he’s going to say next or how is the conversation going to I can’t predict that Okay, I Have no idea what he’s gonna react” p1
- “ it’s fun because you can ask the bot anything you want and you can again answer back. And you have also control, which is, and again, going back to the unpredictability, you can anticipate any way you want, then you’re not restricted by a script” p8

Believability

- “ I think is very nice is answering in time, but he has behaves pretty human to say it like that, which I think was very nice p5
- “ so if you should test this for instance by oh I’ve got a person on the line could you maybe try this call and not saying that it is a training bot how differently the conversation would be p1

Natural Conversation

- “ Yeah, they could because they could really answer true and they could ask more. And it was more feasible because they didn’t have to feel that there was an actor. They had to feel eventually that they were talking to something p10
- “ Even though you kind of you stayed within his what he wanted, but you asked him something about he just gave a natural answer p3

Motivation

- “ Yeah, there’s just no script. So it becomes fully unpredictable and that’s a motivating factor to look upto in a conversation. p7
- “ Yeah, I think it was very predictable, very intuitive actually. So people could learn a trick instead of learning a skill p10

Intuitiveness

- “ I can say that I was giving the goals of Rajeeb. I was giving his goals beforehand so I knew a little bit about what he was going to tell me so that felt a little bit too intuitive for me because I knew what was going to happen p4
- “ very intuitive because I could just Even if it didn’t went the way I wanted it or that I expected you could always sidetrack and be like oh, okay Let’s ask something else.” p7

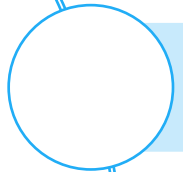
Quality of response.

- “ was a realistic conversation but still in my mind I had I’m talking to a bot. Okay, so that was a bit that the combination of realistic and bots.” p1
- “ Yeah, I chose good potential because I think this is a really interesting way of like having these conversations and it did feel pretty natural, so I do think there’s a there’s a like a big potential in these kinds of technologies. p2

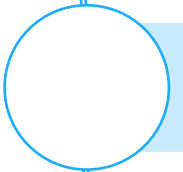
Conclusions



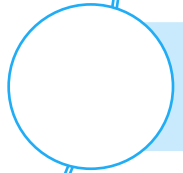
Adaptive AI offers **personalized** and **cost-effective** learning



A **boost** in sales crew **motivation** compared to traditional methods.



Has an impact on the **communication confidence** in the sales crew.



Improves customer relationships and services through **personalized training**



AI-driven voice communication ensures **seamless** and **human-like interactions**

Recommendations and future implementation



- **Emotional Intelligence:** AI chatbots recognizing emotions for empathetic, personalized interactions.
- **Enhanced Conversation Flow:** Enhancing chatbots for better long conversations and smoother topic switches.
- **Increased Learning and Adaptation:** Enabling chatbots to learn and adapt from every conversation.
- **Multi-Turn Conversations:** Empowering chatbots for extended, complex natural conversations.



- **Digital Twin:** Adaptive AI bot can be embedded into a 3D tablet that can serve as an assistant, easing the corporate workflow.
- **Integration with VR for cabin crew training:** Offers stewardesses hands-on training to boost confidence in handling different cabin situations.

References

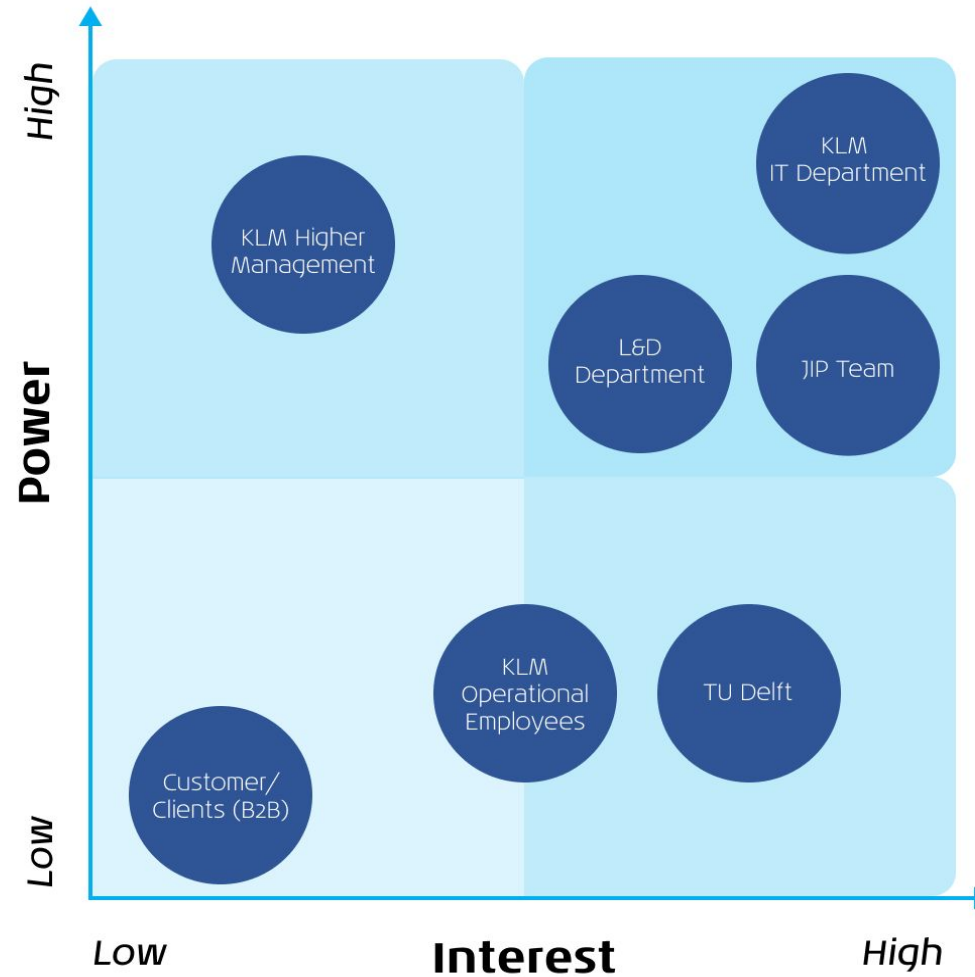
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Questions?

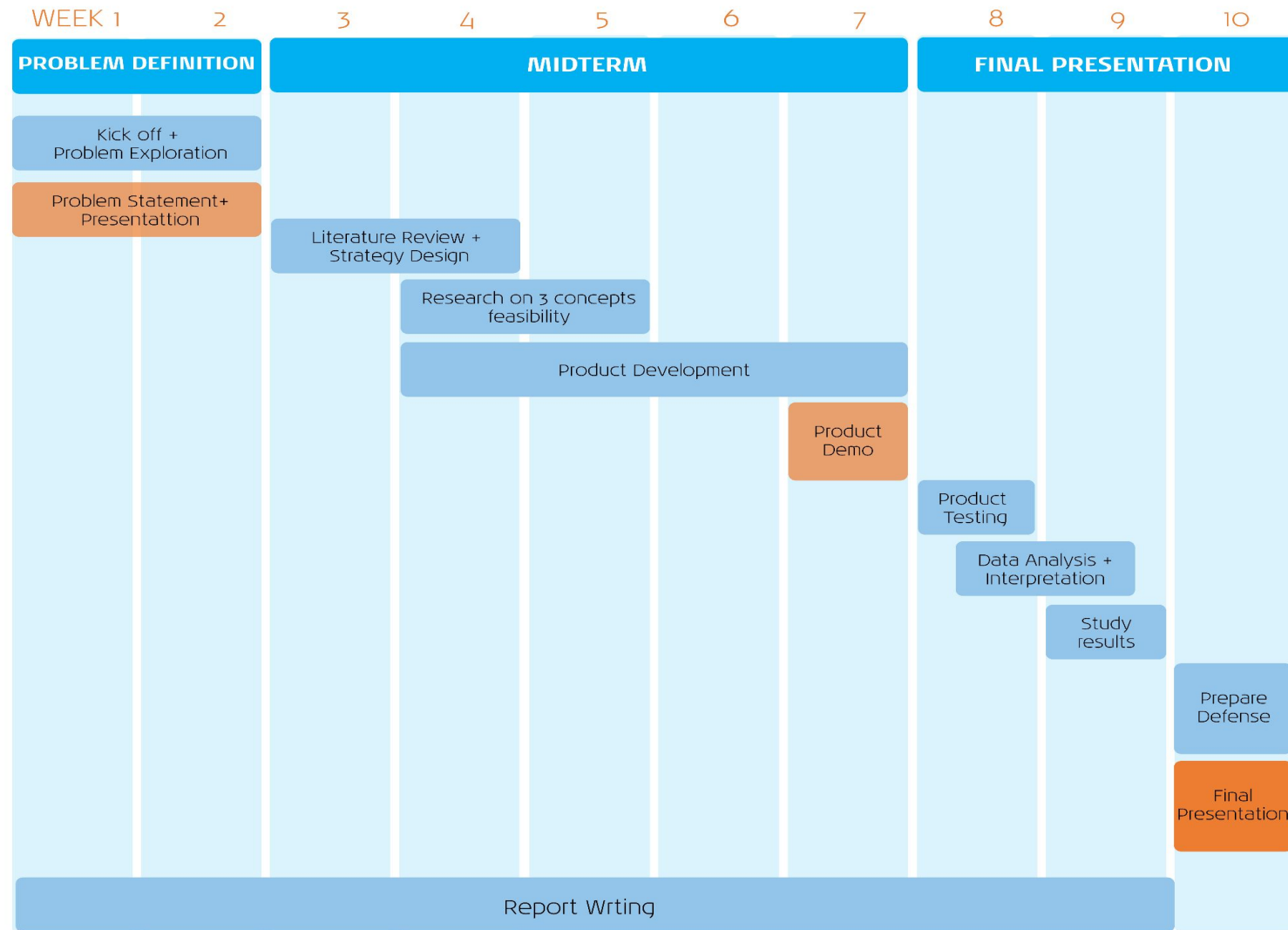
Thank you for your attention!



Power Interest Grid



Project Plan



Responsible Innovation

- Adaptive AI into sales training, enhances personalized customer service
- Prioritizing data privacy in-line with GDPR guidelines
- KLM prioritizes inclusivity, transparency, accessibility and ethical innovation
- Standards of safety and security with Informed consent forms backed by customer feedback.

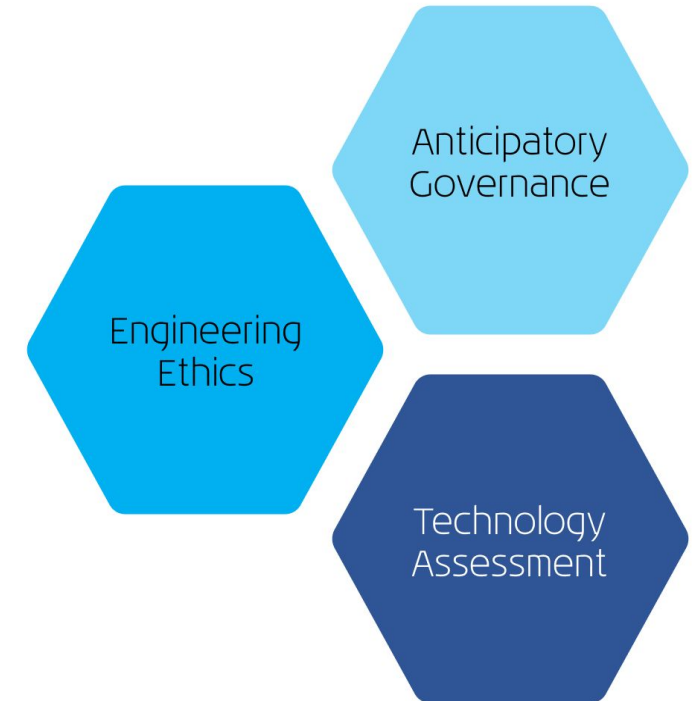


Table 5.47: All Statements

Statement	Description
Statement 1	The training adequately prepares me and provides enough confidence for communicating with sales customers
Statement 2	The training adequately prepares and motivates me for communicating with sales customers
Statement 3	The training incorporates unpredictable scenarios that simulate real-world unpredictability
Statement 4	The training enhances cross-cultural communication skills, deepens understanding of cultural differences, and enables us to better meet the diverse customer needs
Statement 5	The AI bot's response time in a typical conversation feels realistic
Statement 6	The AI bot has a realistic voice
Statement 7	The conversation with the AI bot had sufficient depth regarding the content
Statement 8	The introduction of the AI bot would be feasible in our department
Statement 9	The introduction of the AI bot would enhance the effectiveness of our current employee training programs

Table 5.50: Paired Samples Test

Pair	Paired Differences	Mean	95% Confidence Interval		Two-Sided p
			Lower	Upper	
1	Overall quality (1) - Overall quality (2)	-2.7455	-4.5696	-0.9213	0.007
2	Intuitiveness (1) - Intuitiveness (2)	-2.7636	-4.4098	-1.1174	0.004
3	Unpredictability (1) - Unpredictability (2)	-4.5273	-6.8389	-2.2156	0.001
4	Difficulty (1) - Difficulty (2)	0.2364	-1.4611	1.9339	0.763
5	Believability (1) - Believability (2)	-3.8545	-6.0495	-1.6596	0.003

Table 5.51: Wilcoxon Signed Rank Test

Null Hypothesis	P-value
The median of differences between the assessment of Statement 1 in Surveys 1 and 2 equals 0. Related-Samples Wilcoxon Signed Rank Test	,031
The median of differences between the assessment of Statement 2 in Surveys 1 and 2 equals 0. Related-Samples Wilcoxon Signed Rank Test	,098
The median of differences between the assessment of Statement 3 in Surveys 1 and 2 equals 0. Related-Samples Wilcoxon Signed Rank Test	,032
The median of differences between the assessment of Statement 4 in Surveys 1 and 2 equals 0. Related-Samples Wilcoxon Signed Rank Test	,018

Table 5.52: Mean Analysis

Pair		Mean	Standard Deviation
Statement 1	Survey (1)	2.55	1.214
	Survey (2)	4.00	0.894
Statement 2	Survey (1)	3.00	1.183
	Survey (2)	4.00	1.000
Statement 3	Survey (1)	2.27	1.009
	Survey (2)	3.64	1.027
Statement 4	Survey (1)	2.73	1.009
	Survey (2)	3.91	0.701

Table 5.53: Paired Sample Statistics

Pair		Mean	Standard Deviation
Pair 1	Overall quality (2)	7.060	2.0850
	Overall quality (3)	7.020	2.1170
Pair 2	Intuitiveness (2)	7.710	1.5051
	Intuitiveness (3)	7.710	1.0418
Pair 3	Unpredictability (2)	6.360	2.4500
	Unpredictability (3)	6.080	2.5728
Pair 4	Difficulty (2)	3.990	2.2487
	Difficulty (3)	4.720	1.9263
Pair 5	Believability (2)	7.130	1.7969
	Believability (3)	6.980	2.0826

Table 5.55: Mean analysis

Statement	Mean
Statement 5	2.50
Statement 6	4.00
Statement 7	4.00
Statement 8	4.50
Statement 9	4.20