



Virtual Reality Personality Assessment

Using immersive technologies to facilitate recruitment processes

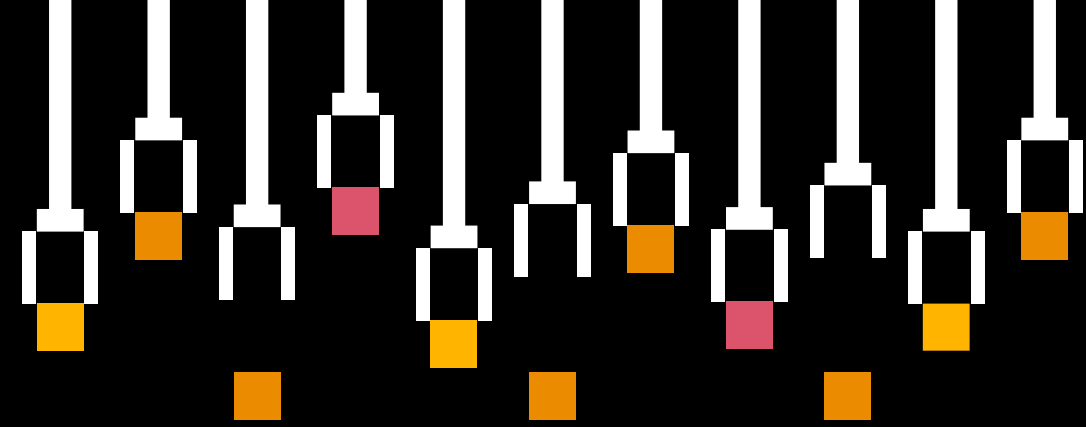

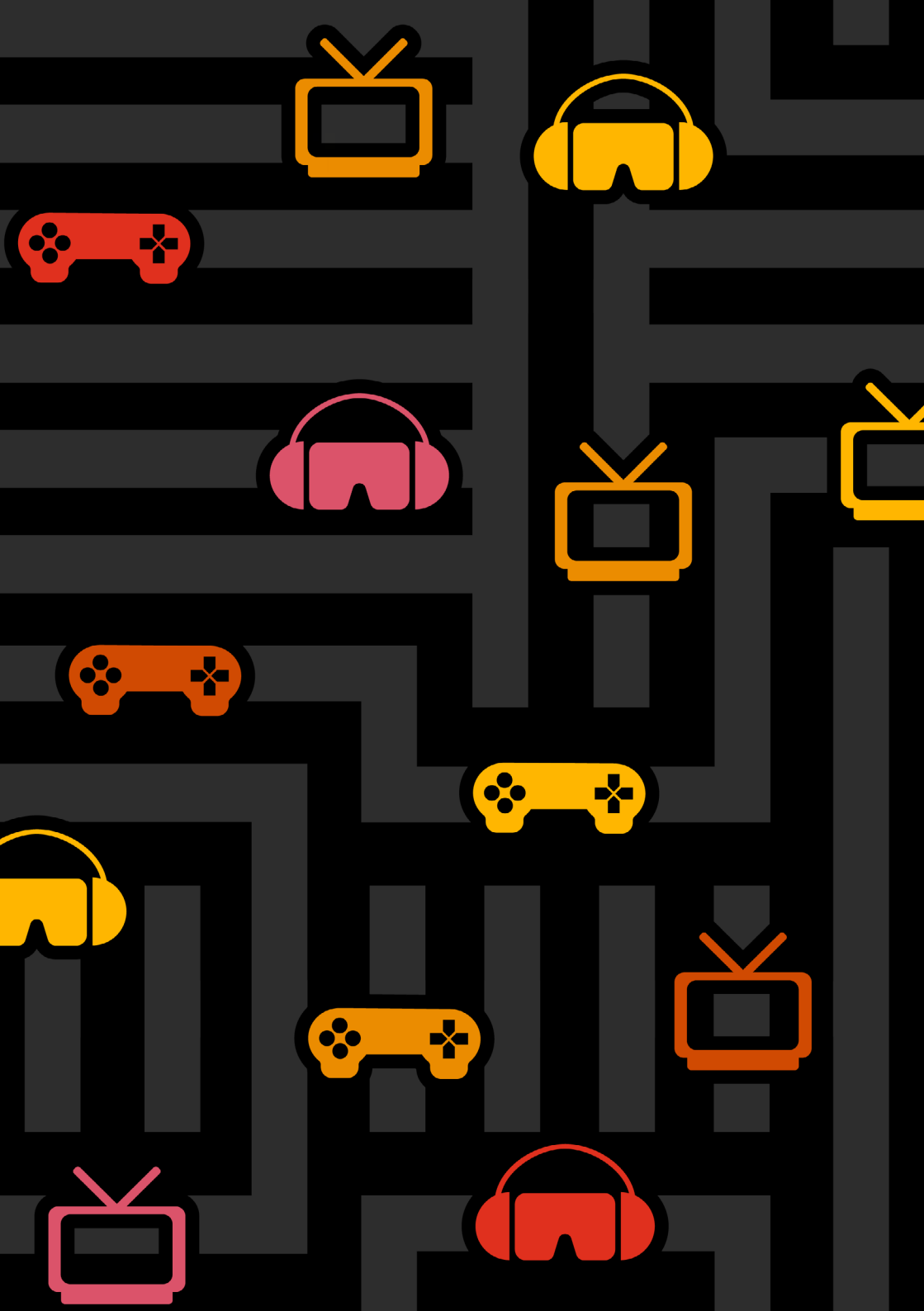


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 This project was done in collaboration with the Austrian Institute of Technology and their team of researchers, developers and UX/UI experts.

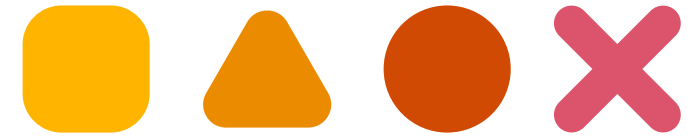


✕ Transforming recruiting processes

The aim behind this project was to further digitalize the recruitment process in PwC Austria. By introducing immersive technologies, we wanted to change the traditional way of recruiting employees by enriching it with a fully immersive VR experience.

KOIA offers the possibility to make assessment centers and conventional paper pencil tests come alive to a unique experience in VR. It gives the candidates the special opportunity to learn more about the company's values and offers both, candidate and PwC, a better understanding of their mutual fit with regards to their values. KOIA provides a supportive - not replacing - report to contribute to the quality of the application process.

Intro



Why have a VR personality assessment?

Assessing different skills and personality facets has become increasingly important for organizations in recruitment processes. Assessment Centers add an objective component to application processes that make the latter more transparent and can be a solid basis for following discussions.

Personality assessments usually consist of self- or other-assessments that are designed as paper-pencil tests. These psychometric measures are known to be objective, reliable and valid, but they might be subject to biases that enhance the self-worth of the concerning person or provide an inaccurate picture of the person's personality. This so-called impression management takes place not only, but especially during application processes. Applicants want to make a good first impression and not let their possible future employers see their imperfections. The more employers "hire for attitude,

not for skills", the more important the applicants' personality gets. This potentially leads to socially desired answers (let's be honest, who wouldn't agree on being altruistic and compromising when you're supposed to be working in a team?).

How does VR help the process of recruiting?

In order to avoid this sort of distortion in assessing personality, the newly developed method does not rely on self-disclosure. Instead, applicants are asked to take part in a fully immersive VR-Experience, allowing them to experience a new way of job recruitment based on behavioral measurements. The tool measures personality traits according to the HEXACO-framework by tracking decisions and the fulfillment of tasks.

This immersive and gamified climate reduces the chance of collecting socially desired answers as participants might forget they are being observed.

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What is the added value for the recruiter?

The PwC Austria recruitment process is complemented by this VR-Experience that assesses applicants' personality and matches them to the organizational values ("Global Values"). It also contrib-

utes positively to the Employer Branding of PwC, especially for the applicants who might have never been in VR before and are keen on experiencing it.

The tool was developed in collaboration with usability experts of the Austrian Institute of Technology.

Study Concept Development

Study Design - The Psychological aspect

The developed VR-Experience is based on state-of-the-art psychological theories.

A variety of psychological personality models and instruments used in common Assessment Centers for recruiting were identified and cross-checked with the requirements of the PwC Global Values and possible future employees, respectively.

In the end, the pool of instruments was reduced in order to operationalize measured concepts properly. The remaining collection of psychometric instruments was matched to

the PwC Global Values before being translated into possible tasks and decisions that could be carried out in VR.

The main part of the following experience is based on the psychological HEXACO-framework that defines human personality in 6 so-called facets, namely Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness & Openness to Experience¹. Additionally, some concepts that are not included in this framework but are still considered relevant for the PwC Global Values were chosen to be measured (e.g. Resistance to Change²).

A storyline integrating these tasks was developed and drafted before the actual development process of the VR game started.

Some content, especially textual elements, were pretested in terms of validity, readability and understanding. Also, usability was assessed and subject to feedback loops conducted by usability-experts before validating the prototype itself.

In order to validate the tool, a validation study within PwC Austria was conducted. Over 30 employees from all service lines and different positions participated in the study.

The study consisted of the VR experience, the original instrument (HEXACO, among others) and a short interview. Qualitative and quantitative data were collected and analyzed.

¹ Lee, K., & Ashton, M. C. (2018). Psychometric properties of the HEXACO-100. *Assessment*, 25, 543-556.
² Oreg, S. (2003). Resistance to Change: Developing an Individual Difference Measure. *Journal of Applied Psychology*, 88 (4), 680-693.



Designing the Experience

The tool was designed with an interdisciplinary approach, combining psychology, usability, UX design and software engineering. In brainstorming-sessions ideas for the storyline and VR activities were collected and compared to the psychometric items of validated personality tests. Iterative feedback loops with HR were established in order to guarantee the tool is suitable for the needs of recruiters.

How were the VR game tasks created?

The task development started with imagining the behavior of low- and high-scorers in the original HEXACO-test. The goal was to differentiate efficiently between people who would for example rate themselves as very creative and those who don't see themselves as creative at all. The list of defined vr tasks was further refined by choosing the ones

that are easily quantifiable and result in a precise measurement.

For example, the statement "I would enjoy creating a work of art, such as a novel, a song, or a painting." (HEXACO-questionnaire; Scale: Openness to Experience; Subscale: Creativity) was turned into the task of furnishing an office space. Participants were asked to choose from a selection of furniture choices and design the room according to their wishes. The selectable items have different characteristics, which make them appealing in terms of Creativity, Unconventionality or Aesthetic Appreciation.

The tasks were then combined into a unique storyline that was built to enhance immersion: By playing a certain character within the story, applicants get to express their preferences and opinions without explicitly stating them.

What is the VR game structure?

The experience consists of four phases which all measure different aspects of the HEXACO model.

During the first phase, participants start their first day at work in a marketing firm called KOIA. They get to furnish a room called Greenfield, which is a room designed by employees for employees. The participants are invited to decorate everything the way they want to - they may choose from 16 different categories with each 4 models available. Each model has 3 color options and a short description that can be read.

During the second phase, the virtual supervisor Paula Schneider sets up a chat forum for the virtual team that can then send their suggestions and wishes to the applicant. There are different ways to react to different kinds of messages, e.g. by accepting or declining wishes, re-

plying with emojis or predefined text options.

Final feedback on the design of the room is given in phase three, where colleagues share their opinion and give a rating of up to five stars. The feedback text is intended to trigger emotions in the participant (e.g. by stating in a non-constructive way that the Greenfield does not look good or that they feel like no wishes have been integrated etc.). Participants then have to react to this feedback by choosing one of four different answer options.

During the last phase, the applicant has to order lunch for their colleagues. While every order has the usually preferred spiciness-level displayed, applicants can choose to deviate from the suggestion and select a lower or higher spiciness, granting the opportunity to punish disliked colleagues.

VR Game Overview



Designing the Experience



Measurement

Measures in the original questionnaire are obtained by rating the given statements (e.g. “I would enjoy creating a work of art, such as a novel, a song, or a painting.”) on a 5-point Likert scale regarding the participant’s agreement. The VR tasks have a wider range of possible scores. For Creativity, the collected VR-scores includes the applicants behaviour in the first phase, e.g. the number of items chosen and their assigned creativity-score. In this case, the calculation of the score works the same as for the original scales, by calculating the mean.

All decisions and actions in virtual reality are tracked and turned into quantified values. These are used for determining the personality traits, as shown below.


After developing the prototype, usability was tested by an experienced researcher as a pretester and our validation study participants. Feedback was collected and, if possible regarding the standardized study conditions, implemented right away.

The validation study was conducted from February to March 2021 and included the VR-Experience, a short interview and the original psychometric questionnaire that was the basis of our tool. All in all, participation in the study took 1,5 hours maximum.

The data collected was analyzed using statistical methods; results obtained from the questionnaires were correlated with predefined behavioral parameters, calculated through the tracked values in VR.

All decisions and actions in virtual reality are tracked and turned into quantified values. These are used for determining the personality traits.

Personality Assessment: Measuring HEXACO...in VR?

Facet & Subfacet	Item	VR-Task
 Creativity	“I would enjoy creating a work of art, such as a novel, a song or a painting.”	Furnishing the room: Behaviour during furnishing Characteristics of furniture

Technology and Operations Considerations

The VR prototype was developed in Unity 2019.4.8f1, which is the latest long-term-support version. During testing the Oculus Rift was used. It can be played using a 6DoF headset such as the Oculus Rift, Oculus

Quest 2 (with a link cable) or the HTC Vive.

An important design principle was to reduce negative implications that VR can bring such as cybersickness. Our prototype was designed to be beginner friendly and easy to use.

The Results



Data Collection

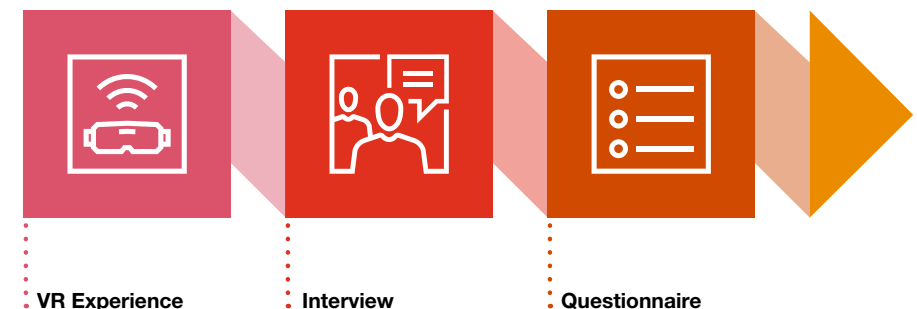
The VRPA project has a scientific base from the very beginning, starting at the requirement analysis and design phase, where ideas and suggestions were evaluated based on their suitability to reflect the chosen psychometric tests and the ability to be quantifiable and measurable at a later stage.

In the course of the validation study, not only the gameplay data was collected, but additional questionnaires and interviews were conducted. Each of the 30+ participants received an anonymized ID, connecting the gameplay data, questionnaire results and interview answers to one identity, without revealing it. The questionnaire included both

psychometric instruments HEXACO and RC (Resistance to Change) alongside some questions in relation to the Global PwC Values.

The interview consisted of 6 questions:

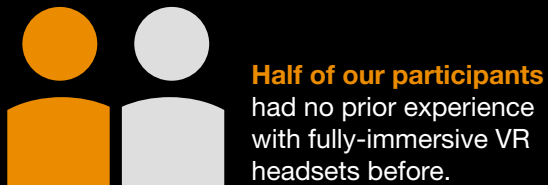
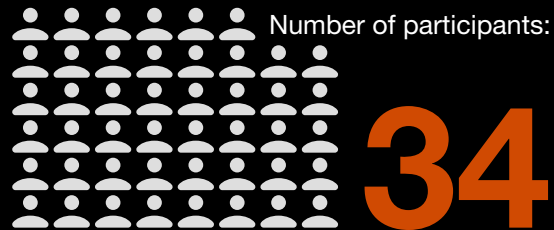
- How would people from your private/personal environment describe you?
- Please describe a situation in which you felt very creative.
- When was the last time you compromised with someone? How did it make you feel?
- How often do you argue with others? How do you feel afterwards?
- What do you usually do with other people's advice?
- What are your hobbies and interests?



Data Sources

The interpretation of the qualitative data generated from the interview was done with a qualitative content analysis tool, based on the so-called "Qualitative Inhaltsanalyse" of Philipp Mayring. Categories were formulated and independently assigned to the answer texts by two coders. Afterwards, the results were discussed and compared through an inter-coder agreement and finally merged, creating quantitative data sets.

Facts and Figures



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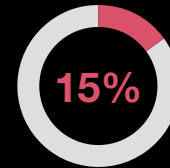
Average duration of the VR experience:

32:00

59% of the participants chose at least one unconventional furniture item

The majority of participants changed their furniture choices between 20-30% during P2

Only 27% of the participants



of participants reread feedback messages 20 times or more.

The majority of participants have a reaction time of under

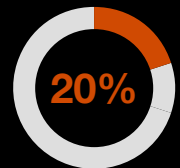
00:06 seconds

7 Participants have altered some spiciness level than preferred while ordering the food (less or more spicy)



The participants chose friendlier answers in the feedback phase.

The average tendency to compromise in P2 is slightly higher than



35% of people never muted any of their colleagues, despite irrelevant messages

Only 15% of the participants turned off the background music



Gameplay - HEXACO comparison



How does our game compare to HEXACO?

To understand how our VR game performs in comparison with HEXACO, we ran an analysis comparing the HEXACO-personality paper-pencil results with the participants' results during the gameplay. The analysis was focused on the Agreeableness & Openness to Experience facets of HEXACO (being the facets translated in the game) and also Resistance to Change.

Agreeableness & Openness to Experience

- **Forgiveness** in HEXACO is correlated with the muting of particularly philosophical and irrelevant messages.
- **Gentleness** is correlated with the amount of additional spice for two personas in the game.
- **Flexibility** is correlated with the number of actions in the feedback phase, as well as the friendliness and last minute changes during this phase and total number of actions during the game.
- **Patience** is correlated with muting and unmuting colleagues. Patience is also correlated with the amount of additional spice for one particularly rude persona in the game.
- **Aesthetic Appreciation** is correlated with muting and the amount of additional spice for one persona in the game who spams colleagues with philosophical messages.
- **Inquisitiveness** is correlated with the number of minutes in the messages phase and positively with the muting of irrelevant and philosophical messages, as well as the number of selected items throughout the game.
- **Creativity** is correlated with the amount of additional spice for two rude personas in the game and the total steps.
- **Unconventionality** correlates with the average reaction time.

Another aspect of the comparison we considered and analysed using Bayesian Conditional Probabilities was: *How likely are participants to behave in a certain way, given they have already shown a certain behavior?*

The results showed certain connections between the participant's paper pen results and some particular behaviours of the participants during gameplay:

- People who are more creative (HEXACO), choose more objects in the game.
- People who are creative (HEXACO) change their minds more often while furnishing the room.
- People who are unconventional (HEXACO) choose objects with higher unconventionality-levels.
- People who are unconventional (HEXACO) react in a certain way to philosophical messages.
- People who are more cognitively rigid (HEXACO) change less after finishing the first part (e.g. they don't accept others' wishes or redesign the room themselves).

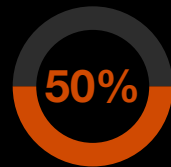
Interview Findings

The interview phase consisted of 6 general questions (EN/DE) related to the participant's personality. The participant's answers were noted down to be used in qualitative analysis. The results revealed interesting patterns. In the following section you may find the most relevant ones.



of the participants described themselves with mostly positive attributes. The most commonly mentioned attributes were in a social context.

The majority of the interviewed participants said they **rarely argue**.



of participants said they generally felt negative after an argument.



There were more mentions of situations, where the participant felt creative by doing something technical or crafty.

The overwhelming majority of participants **agree to compromises**. However, approximately one third did not give a concrete example and instead generalized.

Some participants mentioned examples where advice was not taken, integrated in their own views or partially implemented advice. Only a part of participants mentioned that it matters who gives them advice.

The hobby categories mentioned the most were **physical exercise, nature, social and entertainment**.



Sharing personal / private information

- Participants who tended to share private information during the interview (e.g. regarding creative situations or compromises accepted) used more emojis during the messaging part of the game and also gave significantly gentler feedback at the end of the game. They also accepted more wishes than people who did not share as much private information.

Feeling bad after arguing

- Participants stating they would feel rather negative after arguing / fighting showed specific behavioral patterns within the game.
- They accepted significantly more wishes and compromises than participants who did not mention they would experience negative feelings after arguing.
- During the last part of the game, these participants were significantly less inclined to punish their colleagues.

Creative activities

- Participants who deliberately shared more “crafty” creative actions, conducted more clicks during the first two phases of the game, meaning they looked at different models and colors of furniture and took more time to find the fitting answer to colleagues. They also gave gentler feedback during the third phase of the game emphasizing again their friendly spirit in collaborating with others.

Advice

- Participants who mentioned integrating advice in their value system or reflecting upon it before using it, also accepted significantly more wishes and compromises than others.
- Participants who said they would usually not use advice also behaved badly towards their colleagues in the game, e.g. punishing them for the bad feedback received.

Conclusions

The VR-experience was perceived in a solely positive manner by all participants, no matter whether they had experienced VR before or not. In terms of usability, we observed that both the storyline and the handling of the interactive elements worked really intuitively.

The analysis results between HEXACO and game results suggest a relatively good translation for the Agreeableness & Openness to Experience (A&O facets)

and Resistance to Change (RC). This is important taking into account the HEXACO - Game translation is not done in a one by one subfacet basis.

Moreover, the game showed evidence for our initial hypotheses, suggesting a consistent line of thought in the gameplay actions.

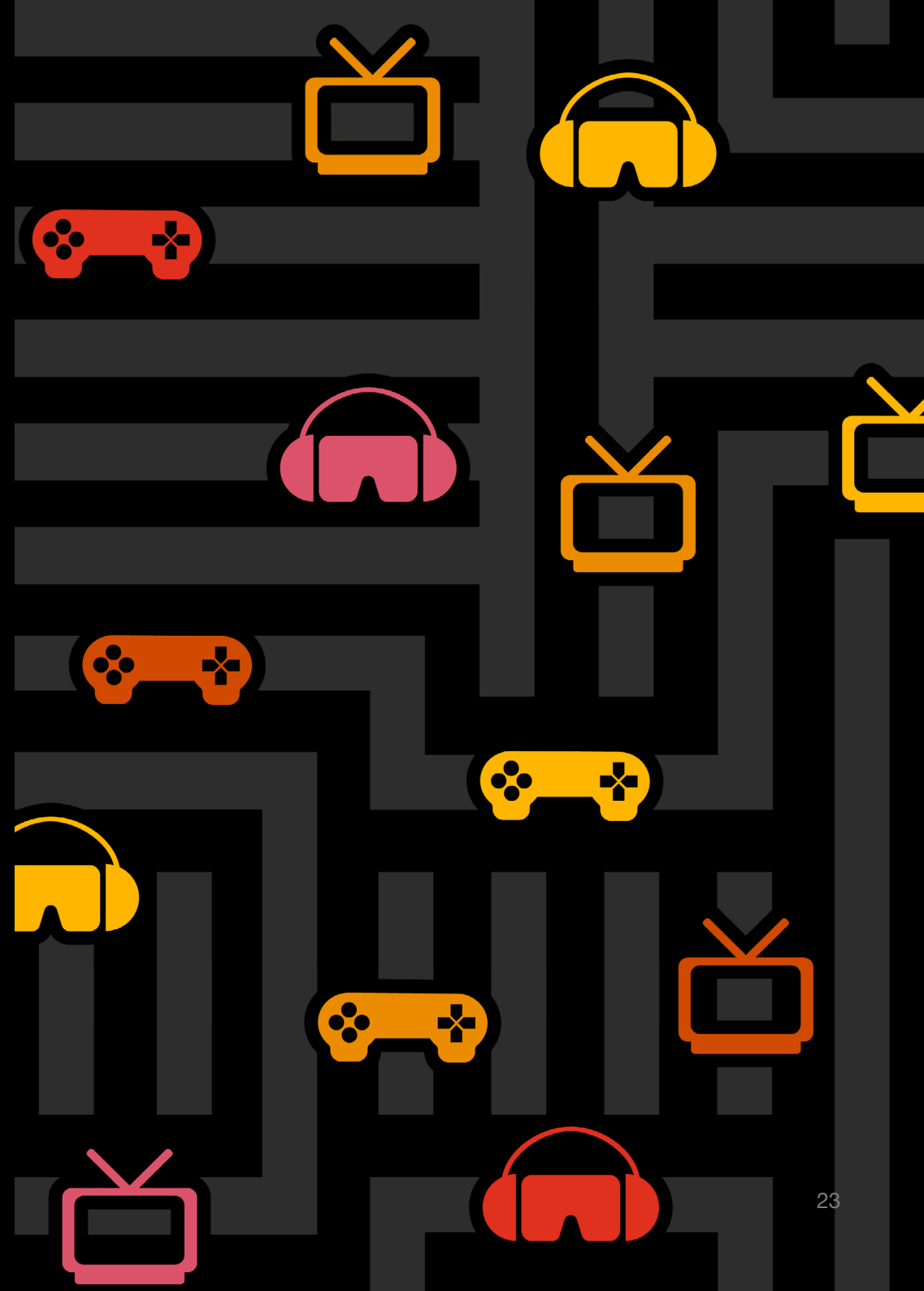
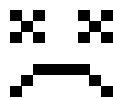
Additionally, the answers given during the interview are reflected in an explainable manner in the game.

Limitations

Due to the sample size of our study, findings might only be interpreted cautiously. In order to conclude more robust implications, we suggest reconsidering and increasing both the sample size and population diversity.

The insufficient sample size also impacted the conduction of a

factor analysis that was meant to reproduce the HEXACO facet structure within our data. Exploratory factor analysis revealed a five-factor solution for the HEXACO data, indicating that the validation of our gameplay data on the basis of HEXACO might be interpreted only cautiously as well.



Contacts



Gerald Dipplinger

Partner | Tax Technology & Digital Lead
PwC Austria
+43 676 8337 73648
gerald.dipplinger@pwc.com



Gersa Tome

Associate | VR/AR Consultant
PwC Austria
+43 699 1630 5034
gersa.tome@pwc.com



Natalie Cosima Juliane Alexandra Straub

Manager | Leadership & Development
PwC Austria
+43 699 1630 5954
natalie.straub@pwc.com