



Co-funded by the
Erasmus+ Programme
of the European Union



HERA Evaluation Questionnaire

Draft. This document will be formatted when approved.

Foreword

For the assessment of the product, please fill out the following questionnaire. It consists of 3 parts. All parts will have a 7 option answer, but the first part will be presented differently:

Example part 1:

attractive	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	unattractive
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Example part 2:

		totally disagree	totally agree
n.	The game is addictive	<input type="checkbox"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="checkbox"/>

Please decide spontaneously and don't think too long about your decision. There is no wrong or right answer, just your honest personal opinion. If you are not completely sure about a particular attribute, please select a value anyway. Just tell us about your experience with the game!

Engagement

		totally disagree	totally agree	
E1	I lost track of time	□ ○ ○ ○ ○ ○ ○ ○ □		E-F25 N1
E2	I enjoyed playing the game	□ ○ ○ ○ ○ ○ ○ ○ □		E-P20
E3	I felt skillful / competent	□ ○ ○ ○ ○ ○ ○ ○ □		E-C02/10
E4	I was deeply concentrated in the game	□ ○ ○ ○ ○ ○ ○ ○ □		E-F28
E5	I felt that I could explore things	□ ○ ○ ○ ○ ○ ○ ○ □		E-I19
E6	Gameplay is challenging	□ ○ ○ ○ ○ ○ ○ ○ □		E-H26
E7	I was fast at reaching the game's targets	□ ○ ○ ○ ○ ○ ○ ○ □		E-C21
E8	It felt like a rich experience	□ ○ ○ ○ ○ ○ ○ ○ □		E-I30

Learning and pedagogical aspects

E1	I learnt something	□ ○ ○ ○ ○ ○ ○ ○ □	L2
E2	Teamwork is key to get good results	□ ○ ○ ○ ○ ○ ○ ○ □	-
E3	The game represents well real life situations	□ ○ ○ ○ ○ ○ ○ ○ □	L4
E4	The game improved my problem solving skills	□ ○ ○ ○ ○ ○ ○ ○ □	L5
E5	The game encompasses different learning subjects into one	□ ○ ○ ○ ○ ○ ○ ○ □	PA2
E6	I feel motivated to learn other disciplines	□ ○ ○ ○ ○ ○ ○ ○ □	PA4
E7	The game helped me to understand how to define problems and find solutions	□ ○ ○ ○ ○ ○ ○ ○ □	PA1
E8	The game allowed me to work with my teammates	□ ○ ○ ○ ○ ○ ○ ○ □	-

Free comments (open question)

1. What I liked more in the game was...
2. What I liked less in the game was...
3. The game would be better if...
4. If I could add a scenario it would be...

Development of the questionnaire

Concept and requirements

This questionnaire should focus on the evaluation of the experience and usefulness of HERA's serious game. For that, **user experience** (UX), **game experience** (GX) and **game engagement** (GE) are key elements. Besides these, we need to measure the **perceived usefulness** of the experience. The maximum time to complete the evaluation should be less than 5 minutes.

Existing evaluation methods

We've found in recent literature several questionnaires to evaluate most of the items listed above:

- UX: User Experience Questionnaire (UEQ) and its shortest version UEQ-S [1]
- GX/GE:
 - Game Experience Questionnaire (GEQ-R) [2] [3]
 - Player Experience of Need Satisfaction (PENS) [3]
 - Game Engagement Questionnaire (GEngQ) [3], [4]

UEQ

The UEQ contains 6 scales with 26 items in total:

- *Attractiveness*: Overall impression of the product. Do users like or dislike the product?
- *Perspiciuity*: Is it easy to get familiar with the product? Is it easy to learn how to use the product?
- *Efficiency*: Can users solve their tasks without unnecessary effort?
- *Dependability*: Does the user feel in control of the interaction?
- *Stimulation*: Is it exciting and motivating to use the product?
- *Novelty*: Is the product innovative and creative? Does the product catch the interest of users?

The questionnaire consists of pairs of contrasting attributes that may apply to the product. The circles between the attributes represent gradations between the opposites. You can express your agreement with the attributes by ticking the circle that most closely reflects your impression.

The standard version of the UEQ is:

	1	2	3	4	5	6	7		
annoying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	enjoyable	1
not understandable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	understandable	2
creative	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	dull	3
easy to learn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	difficult to learn	4
valuable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	inferior	5
boring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	exciting	6
not interesting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	interesting	7
unpredictable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	predictable	8
fast	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	slow	9
inventive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	conventional	10
obstructive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	supportive	11
good	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	bad	12
complicated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	easy	13
unlikable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	pleasing	14
usual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	leading edge	15
unpleasant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	pleasant	16
secure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	not secure	17
motivating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	demotivating	18
meets expectations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	does not meet expectations	19
inefficient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	efficient	20
clear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	confusing	21
impractical	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	practical	22
organized	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	cluttered	23
attractive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	unattractive	24
friendly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	unfriendly	25
conservative	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	innovative	26

The short UEQ-S version has 8 items:

obstructive	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	supportive
complicated	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	easy
inefficient	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	efficient
confusing	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	clear
boring	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	exciting
not interesting	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	interesting
conventional	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	inventive
usual	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	leading edge

GEQ-R

The GEQ started as a 33 item questionnaire based on a 5-point Likert scale to measure the experience of the player [2]. It was refined to 25 items in [3].

N	PREMISE	not at all	slightly	moderately	fairly	extremely
P01	I felt content	0	1	2	3	4
C02	I felt skilful	0	1	2	3	4
I03	I was interested in the game's story	0	1	2	3	4
P04	I thought it was fun	0	1	2	3	4
F05	I was fully occupied with the game	0	1	2	3	4
P06	I felt happy	0	1	2	3	4
N07	It gave me a bad mood	0	1	2	3	4
x08	I thought about other things	0	1	2	3	4
x09	I found it tiresome	0	1	2	3	4
C10	I felt competent	0	1	2	3	4
x11	I thought it was hard	0	1	2	3	4
x12	It was aesthetically pleasing	0	1	2	3	4
F13	I forgot everything around me	0	1	2	3	4
P14	I felt good	0	1	2	3	4
C15	I was good at it	0	1	2	3	4
x16	I felt bored	0	1	2	3	4
x17	I felt successful	0	1	2	3	4
I18	I felt imaginative	0	1	2	3	4
I19	I felt that I could explore things	0	1	2	3	4
P20	I enjoyed it	0	1	2	3	4
C21	I was fast at reaching the game's targets	0	1	2	3	4
T22	I felt annoyed	0	1	2	3	4
H23	I felt pressured	0	1	2	3	4
T24	I felt irritable	0	1	2	3	4
F25	I lost track of time	0	1	2	3	4
x26	I felt challenged	0	1	2	3	4
x27	I found it impressive	0	1	2	3	4
F28	I was deeply concentrated in the game	0	1	2	3	4
T29	I felt frustrated	0	1	2	3	4
I30	It felt like a rich experience	0	1	2	3	4
F31	I lost connection with the outside world	0	1	2	3	4
H32	I felt time pressure	0	1	2	3	4
H33	I had to put a lot of effort into it	0	1	2	3	4

Originally, it contained 7 subscales:

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- Immersion (I): 03, 12, 18, 19, 27, 30
 - Flow (F): 05, 13, 25, 28, 31
 - Competence (C): 02, 10, 15, 17, 21
 - Tension (T): 22, 23, 24, 29
 - Challenge (H): 11, 26, 32, 33
 - Positive affect (P): 01, 04, 06, 14, 20
 - Negative affect (N): 07, 08, 09, 16

Improvements proposed in [2] removed items 05, 23, 28, 32, tension and negative were merged as one subscale. Its validation proved that not all the subscales were reliable. GEQ-R was created from the original using 5 subscales (negative affect, tension and challenge were merged).

PENS

The questionnaire contains 19 items. It reviews the experience in terms of 5 components:

- Competence
- Autonomy
- Relatedness
- Immersion/presence
- Intuitive controls

All are measured using 3-item scales but immersion, which is a 9-item scale. It is ranked on a 7-point Likert scale. It has been statistically validated. The questionnaire is copyrighted and therefore is not available to researchers.

GEngQ

It's questionnaire to measure the level of engagement in video game-playing [3], [4]. Although its original acronym was GEQ, as it's found in the original literature available, It has been renamed to avoid confusion with the game experience questionnaire (GEQ). It's made of 19 items.

It was developed for commercial games, so it includes some items that do not fit in the study we are conducting, like "I feel scared". However, some items like "I lose track of time" are relevant for our subject. Since we need to measure other items, specific for the HERA game in particular, the engagement part of the HERA project will be tailored specifically and may include some of the most relevant items from the GEngQ.

The GEngQ is as follows:

		strongly disagree					strongly agree				
e1	I lose track of time	0	1	2	3	4					
?2	Things seem to happen automatically	0	1	2	3	4					
x3	I feel different	0	1	2	3	4					
x4	I feel scared	0	1	2	3	4					
?5	The game feels real	0	1	2	3	4					
x6	If someone talks to me, I don't hear them	0	1	2	3	4					
?7	I get wound up (annoyed)	0	1	2	3	4					
x8	Time seems to kind of stand still or stop	0	1	2	3	4					
9	I feel spaced out	0	1	2	3	4					
10	I don't answer when someone talks to me	0	1	2	3	4					
11	I can't tell that I'm getting tired	0	1	2	3	4					
12	Playing seems automatic	0	1	2	3	4					
13	My thoughts go fast	0	1	2	3	4					
14	I lose track of where I am	0	1	2	3	4					
15	I play without thinking about how to play	0	1	2	3	4					
16	Playing makes me feel calm	0	1	2	3	4					
17	I play longer than I meant to	0	1	2	3	4					
e18	I really get into the game	0	1	2	3	4					
19	I feel like I just can't stop playing	0	1	2	3	4					

System Usability Scale (SUS)

The System Usability Scale (SUS) [5] is a tool for measuring the usability. It consists of a 10 item questionnaire with five Likert scale response option. Originally created by John Brooke in 1986, it was designed to enable the evaluation of a wide variety of products and services, including hardware, software, mobile devices, websites and applications, being a general questionnaire. It has been referenced in over 1300 articles and publications, becoming an industry standard. It is easy to complete, reliable on small samples and valid, according to all previous research.

However, the scoring system is somewhat complex. The results are not percentages and should be normalized to produce a percentile ranking.

When a SUS is used, participants are asked to score the following 10 items with one of five responses that range from Strongly Agree to Strongly disagree:

strongly disagree

strongly agree

1	I think that I would like to use this system frequently	0	1	2	3	4
2	I found the system unnecessarily complex	0	1	2	3	4
3	I thought the system was easy to use	0	1	2	3	4
4	I think that I would need the support of a technical person to be able to use this system	0	1	2	3	4
5	I found the various functions in this system were well integrated	0	1	2	3	4
6	I thought there was too much inconsistency in this system	0	1	2	3	4
7	I would imagine that most people would learn to use this system very quickly	0	1	2	3	4
8	I found the system very cumbersome to use	0	1	2	3	4
9	I felt very confident using the system	0	1	2	3	4
10	I needed to learn a lot of things before I could get going with this system	0	1	2	3	4

Interpreting scoring can be complex. The participant's scores for each question are converted to a new number, added together and then multiplied by 2.5 to convert the original scores of 0-40 to 0-100. Though the scores are 0-100, these are not percentages and should be considered only in terms of their percentile ranking.

Based on research, a SUS score above a 68 would be considered above average and anything below 68 is below average, however the best way to interpret your results involves "normalizing" the scores to produce a percentile ranking [6].

References

- [1] “User Experience Questionnaire (UEQ).” <https://www.ueq-online.org/> (accessed Jul. 20, 2020).
- [2] E. L.-C. Law, E. L. -C. Law, F. Brühlmann, and E. D. Mekler, “Systematic Review and Validation of the Game Experience Questionnaire (GEQ) – Implications for Citation and Reporting Practice.” doi: 10.31234/osf.io/u94qt.
- [3] D. Johnson, M. John Gardner, and R. Perry, “Validation of two game experience scales: The Player Experience of Need Satisfaction (PENS) and Game Experience Questionnaire (GEQ),” *International Journal of Human-Computer Studies*, vol. 118. pp. 38–46, 2018, doi: 10.1016/j.ijhcs.2018.05.003.
- [4] C. M. Fox and J. H. Brockmyer, “The Development of the Game Engagement Questionnaire: A Measure of Engagement in Video Game Playing: Response to Reviews,” *Interacting with Computers*, vol. 25, no. 4. pp. 290–293, 2013, doi: 10.1093/iwc/iwt003.
- [5] Assistant Secretary for Public Affairs, “System Usability Scale (SUS),” Sep. 2013, Accessed: Aug. 06, 2020. [Online]. Available: <https://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html>.
- [6] “MeasuringU: Measuring Usability with the System Usability Scale (SUS).” <https://measuringu.com/sus/> (accessed Aug. 06, 2020).