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RE: *"Laboratórios Digitais de Ambientes e Interacções Humanas (HEI-Lab)"*

Dear Professor Gamito,

I have now reviewed the report and strategic response to the review of the HEI-Lab. Here below is my commentary on the requested topics. I wish you the best in your continued efforts in this research and development.

1. Tackle FCT's assessment negative points? Strongly agree.

The report to the Advisory Board logically and effectively addresses the major issues that were brought up in the evaluation. The team has reformulated the research agenda in a clear fashion addressing the key points in review. Their approach will support research in the <u>basic processes</u> that underlie the more integrated functioning that is addressed in the <u>applied</u> research and <u>application development</u> domains. Each area studied within this continuum, will necessarily rely on guidance from established theory. There is no way around acknowledging the value of established theories for providing guidance to a research and development agenda. The design and development of VR and associated technologies always requires a baseline theoretical perspective to provide guidance on the efficient creation of systems to be tested. Whether it is basic sensorimotor processes that enable higher level cognitive/affective processes or how these higher level cognitive/affective processes support more integrated function in everyday life, all of these areas provide a useful continuum of theoretically informed research opportunities for studying the value/dangers/impact of technology on humans. Thus, I believe the reformulation of the research agenda you have provided is sound and I believe it will effectively drive research across these levels of science, while at the same time testing theoretically informed hypotheses that are relevant in a world society that is becoming ever more reliant on technology for work, play, learning, communication and social interaction.

The added discussion of research on human-technology interaction to inform understanding of the relationship between the digital world and human behavior will leverage and extend the work of the basic and applied efforts and likely generate new hypotheses that will reciprocally drive the basic and applied

work. Thus, I see your team as taking a logical approach that requires interdisciplinary collaboration to truly do work that generates knowledge in this important area. Whether it's at the level of studying a basic perceptual process in a controlled VR simulation or at the level of how those perceptual processes guide human behavior in everyday life with and without technology--these are not problems that can be solved without interdisciplinary collaboration and your team/approach certainly exemplifies that strategy.

I also believe the plan for reducing fragmentation of the staff's efforts and for enhancing international recognition of the team's work, to be sound. In various research centers that I have worked with, I have seen the beginning stages of a center's effort to suffer from lack of integration. However, this often sorts itself out as researchers begin to learn about each other's expertise and research, and new ideas are stimulated, leading to novel and important opportunities. But that process takes time to evolve in addition to having leadership that recognizes the value of an interdisciplinary model for advancing science and practice. I see your team as having both of those ingredients and am excited to see your program continue to grow and evolve. The process is also supported by having a few core full-time members of a team, who are not distracted from the vision by other pursuits. I see that the response presented in this report as endorsing these views—you and your team have built into the budget the hiring of 3 full time staff and have allocated specific budget lines to international presentation of research findings via open access journals and international conferences. A bonus here is seen in the resources provided by the university to fund these new hires in addition to the student and post-grad hires. I would advise that the hiring of the new 3 full time members give consideration to applicants with a track record of previous interdisciplinary effort.

2. Will help placing HEI-Lab on the track for a better assessment in 4 years' time. Strongly agree.

I believe that what is proposed here will have a significant impact on the state of the center in 4 years' time. You already have a lot of solid pieces in place now and now have put forth a logical plan for addressing the critiques in the evaluation.

3. Is up to date with what is expected from an international outlook? Strongly agree.

The team has a history of work in this area that is on par with the research and development seen internationally. The R&D thus far addresses important topics in cognitive/affective factors for tech development and usage in this area. I expect your group will be seen as a leading center in this domain as it continues to evolve.

4. Additional comments:
The work with virtual humans (avatars and agents) will present great opportunities to advance both basic and applied knowledge that will likely have significant societal impact. Many clinical applications could become possible or would be enhanced with the credible introduction of autonomous/interactive Virtual Human agents that could promote natural user engagement with VR content. Such VH capabilities could provide instruction/guidance to users to support usability and could be used for direct application of a clinical strategy as in role play training to improve social skills or for training clinicians to learn or improve

therapeutic skill via practice with virtual patients. Similarly, as AI evolves, the merger of AI with VR content will drive analytic strategies that leverage the massive amount of performance data that is captured within a VR simulation. This could provide clinicians and researcher with decision-support tools relevant to assessment, treatment planning/implementation, pacing of stimulus presentation, measurement of change, and for "near-time" updating of treatment strategies. I believe the team has all the pieces in place to address these topics and make a substantial contribution to knowledge in this domain.

With that said, thank you for inviting me to advise your team and review your strategy in response to the previous review. I am excited to see the research and development that will continue to emerge from your efforts and stand ready to provide any input or support for advancing your center's mission.

Sincerely,

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