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HEALINT4ALL Digital Interactive Platform for European and National Placements Audit for Medicine and Allied Health Professions Following a User-Centered Design

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Abstract. To ensure optimal clinical learning environments for students in the medical and allied health professions, it is essential to establish robust quality processes. Within the HEALINT4ALL ERASMUS+ project an evidence-based protocol to assess the quality of placements for Medicine and Allied Health Professions (AHPs) in clinical environments created. While the existence of a protocol itself is useful, its application can be proved difficult, as relevant forms and audit processes should be established. Audit of clinical placements is time demanding process in an already busy healthcare setting, while exchange of audits between higher education institutions (HEI) and HEI and clinical placements may be lengthy due to internal forms and processes. Thus, a digital interactive platform for European and national placements audit following a user-centered design created. Stakeholders' workshops and an iterative evaluation process ensured the usability and acceptability of the platform, complemented by Nielsen's heuristic evaluation within a group of experts in education technology or quality assurance of placement. The proposed platform supports a globally prepared medical and AHPs international workforce able to transfer skills and practice and offer best interventions to enhance patient treatment, by providing a more effective process and faster appraisal of clinical environments.
Keywords: Elective placements, Quality assurance, UCD, Appraisal of Healthcare Placements, User-Centred Design.

1 Introduction

Health professionals with communication and cultural sensitivity skills are crucial for inclusive care across settings [1, 2]. Student mobility fosters cultural awareness, knowledge, and sensitivity, contributing to core values of cultural competence [3]. In order to ensure optimal clinical learning environments for students in the medical and allied health professions, it is essential to establish robust quality processes [4, 5]. These processes necessitate innovative approaches to guarantee that audit materials and resources are suitable for their intended purpose.

HEALINT4ALL ERASMUS+ Strategic partnership provides medical education and allied health professionals with an audit system to facilitate quality assurance of EU clinical learning environments by mapping and innovatively adapting a newly established audit protocol and support tools to suit the Higher Education needs for wider application to medicine and professionals allied to medicine[6, 7]. The project initiated a literature scoping review, followed by interviews and focus group discussions involving clinicians, students, and educators from six European partners. This comprehensive approach aimed to identify service needs and best practices, mapping the standards and requirements for clinical learning environments. This process led to a much-needed protocol to assess the quality of placements for Medicine and Allied Health Professions in clinical environments. While the existence of a protocol itself is useful, its application by higher education institutions (HEIs), and clinical placements can be proved difficult, as relevant forms and audit processes should be established. Furthermore, audit of clinical placements can be a time demanding process in an already busy healthcare setting, while exchange of audits between higher education institutions and higher education institutions and clinical placements may be lengthy due to internal forms and processes. Moreover, user-centered design (UCD) has long proved its usefulness [8, 9] positioning the user at the center of the development process, enabling systems that are tailored to stakeholders needs.

Thus, in this paper we propose a digital interactive platform, created following a user-centered design, for European and national placements audit to allow the collaboration between HEIs, and HEIs and placements. The remainder of the papers structured as follows. Initially we describe the UCD protocol that we used, followed by its application and complemented by theoretical underpinned evaluations. In the last section we discuss our findings and limitations concluding to the value of the HEALINT4ALL Digital Interactive Platform.

2 Methods

A user-centered design (UCD) was followed to ensure that the digital platform will be tailored to stakeholders needs [8]. An initial UCD protocol was formed based on literature of previous research outcomes. Stakeholders representing academics, healthcare professionals, technologists, quality assurance experts and administrators participated in UCD.

Initially a participatory workshop organized with stakeholders from 6 countries to form the system requirements. Then, an iterative process of stakeholders' participatory workshops to give input on the system functionality, based on mockups and alpha versions of the system followed. The last 2 rounds included evaluation of the acceptance and the usability of the system. Once the development of the system was finalized, remote evaluation followed based on Nielsen heuristic evaluation principles. Suggestions implemented and translation into 5 languages followed.

The online participatory workshops utilized MS TEAMS and organized around the system's functionality following a focus group discussion approach, while the evaluation assumed a quantitative approach located in the post-positivist paradigm. The questionnaires administered online and based on the UTAUT2[10, 11] and SUS questionnaire[12] extended with questions on Satisfaction[13-15] and Perceived Value[16]. A modified Nielsen's heuristic evaluation [17] performed through an online survey across all 10 heuristics. The evaluation employed a descriptive research design to analyse data on factors influencing the acceptance and usability of the platform.

Participants were recruited from HEALINT4ALL partner institutions, while inclusion criteria were defined as follows: i) be a member of staff (academic, administrator or technical) or student to a medical school, or a school relevant to allied health professionals; ii) or be a healthcare professional or administrative personnel engaged in students placements; iii) or be a quality assurance expert with at least 1 year of experience; iv) or conduct research in medical or health education area.

3 Results

Firstly, a stakeholder workshop from six countries (UK, Greece, Spain, Finland, Poland and Malta) took place online to co-design the system based on users' requirements, followed by 4 online sessions to receive feedback on the functionalities and interfaces.

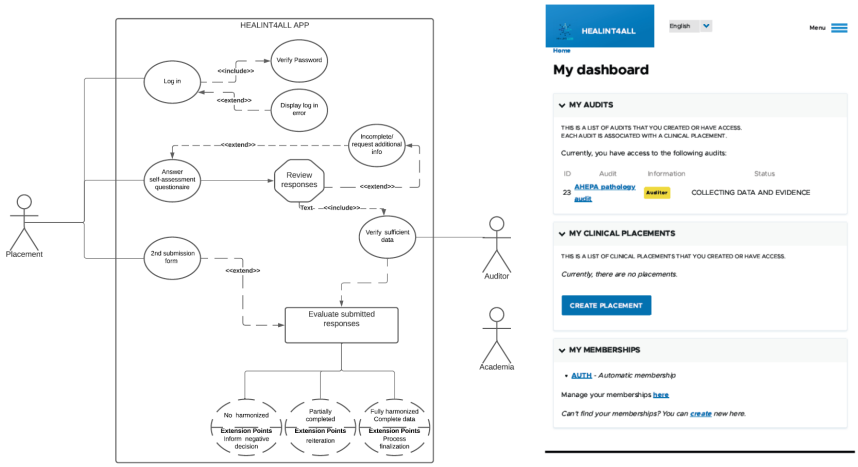

Fig. 1. HEALINT4ALL Entity Relationship Diagram after the first participatory workshop(left), and a screenshot form the alpha version of the system (right).

The platform is based on Drupal, an open-source framework for the development of web applications. The layout was implemented on the core theme Olivero2 which provides the best experience regarding usability, accessibility and speed and functionality that supports new features, meeting the Web Content Accessibility Guidelines (WCAG) 2 Level AA criteria [18] and implements an updated modern design. Fig. 1 depicts the entity relationship diagram, and an alpha version of the platform.

Furthermore, two in person evaluations with stakeholders took place in the latest steps of the development to ensure that the platform meets the requirements, and it is acceptable to be used. The feedback received in each evaluation iteration fed forward the development of the platform. There were 15 participants in the first evaluation and 12 in the second representing all the different stakeholders (academics, healthcare professionals, researchers, quality experts, technicians, and administrators).

We calculated the average for each question (5-Strongly Agree to 1-Strongly disagree) and the average value per factor for both evaluations (Fig 2). Performance expectancy (PE) is considered the level to which the platform is perceived to be useful[19, 20], and for the HEALINT4ALL platform mean PE scores (3.88 and 4.08) suggest that users will accept this digital system to evaluate clinical placements. Effort Expectancy is describing how effortless is to use the system [19], and in our case participants felt that it is mostly easy for them to learn how to use the platform and their interaction with the platform is mostly clear and understandable, however the average score of 4 on the second iteration reveals further space for improvement. Social influence (SI) reveals the level of influence by their peers for a user to use the system, and for our platform seems to be relatively low (3.47 and 3.54). Facilitating conditions (FC) defined as “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” [19], and for the HEALINT4ALL platform have been rated high (4.20 and 4.19), revealing that participants felt that they have the knowledge, the resources and the help needed to accept and use the platform. Hedonic Motivation (HD) defined as “the users' pleasure of using a system”[20], and for our platform participants average score was relatively low (3.64 and 3.83). Behavioral Intention (BI) can be seen as the probability of the user to actually use the system in the future [13] and participants strongly supported their intention to use the HEALINT4ALL platform in the future. Satisfaction for the platform is considered as an important factor for continuance intention [21]. Participants responses revealed that the content provided from the system were useful to them, but the system itself didn’t exceed their expectation of how it could help them. System Usability average scores were 3.84 and 3.83 with participants stating that the platform functions were well integrated, but they identified some inconsistences, which was partially expected as these evaluations were part of the development. Perceived value [16] of the platform felt to be at good level (4.07 and 4.17) from participants, as they stated that they can get the knowledge they need from the platform and users will trust the HEALINT4ALL platform to evaluate placements in the future.

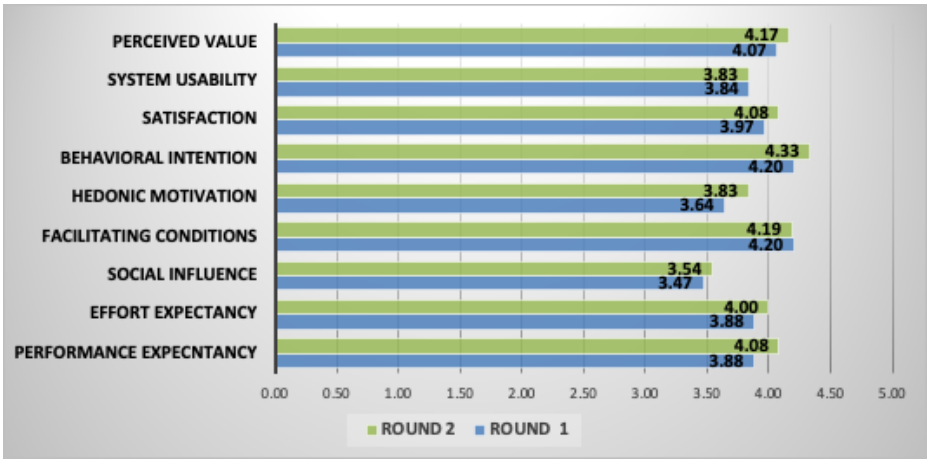

Fig. 2. HEALINT4ALL platform acceptability and usability evaluations. Round 1 bars (blue) depict the average scores for each factor at the first evaluation of the platform, while round 2 bars (green) at the second evaluation of the platform.

Finally, Nielsen's heuristic evaluation was conducted in a group of 6 experts in education technology or quality assurance of placement utilizing an online questionnaire.

Regarding "Visibility of system status", the platform mostly keeps users informed about what is going on, providing appropriate feedback, but participants highlighted that users are not informed when a task is taking too much time. Furthermore "Match between system and the real world" heuristic, revealed that the platform language is familiar to the users, with minor changes suggested around grammatical structure, style and terminology, while the platform follows real-world conventions, making information appear in a natural and logical order. Regarding "user control and freedom", the platform has consistency around design, allowing the user to correct actions, but is not always clear how actions can be reversed or canceled. "Consistency and standards" are at a good level, with controls (buttons, combo boxes, etc.) and names of the menu options to be consistent throughout the platform, while icons, color coding, and terminology needed minor adjustments in places. "Error Prevention" can be improved in places. Data entry hints are provided within the evaluation of placement forms but need to be improved in the "organization data" form. Participants also noted that the warnings before making mistakes can be further improved. "Recognition rather than recall" of the platform is at a good level with graphic elements such as colors, icons and imagery to have space for improvement focused only to help the users accomplish their tasks, leading to minimize user's memory load. The HEALINT4ALL platform has "Flexibility and [good] efficiency of use", always allowing the user to find high desirable information. An advanced search option, a contextual menu option and some shortcuts may further advance its flexibility to identify relevant information. The "aesthetic and minimalist design" is evident in the platform, by containing only essential information that needed, with icons mostly related to the concept they represent. "Titles" of screens are simple short and clear, with one participant stating that this is true sometimes. The platform "help users recognize and diagnose errors" and mostly informs an error to the user

in plain language, however it is not always "help user recover" by guiding her towards a resolution of the problem. "Help and documentation" is available in the system, mostly being available where it needed, comprehensible and complete, but it is not always allowing the user to understand, interpret and proceed correctly, as it was in a form of a help document guide. Nevertheless, participants stated that the user can easily access help information without interrupting the work, and after reading the help information, the users are able of continuing with their work right where they left it.

Suggested changes incorporated into the platform and translation of the platform into Greek, Finnish, Polish and Spanish followed.

4 Discussion and Conclusion

In this paper we propose a digital interactive platform, created following a user-centered design, for European and national placements audit to allow the collaboration between HEIs, and HEIs and placements.

Participation of stakeholders in user-centered design followed both qualitative and quantitative methods [22], and empathic and trusted relationship between participants and designers proved key for the specification and functionalities development [23].

Comparing the two evaluations and given the fact that suggested additions into the functionality of the platform implemented between the two evaluations, the average scores for the second evaluation had been either increased or remained the same. Even though we used descriptive measures to identify the factors scores, the 2 evaluations revealed that an improvement in the acceptability and usability of the system was evident, as part of the UCD. This evaluation focused the development on areas that scored lower than others such as System Usability, Hedonic Motivation and Effort Expectancy and together with a focus group discussion that followed contributed successfully to the UCD. This study was not intended to explore the influence relationships between the factors in UTAUT2, Satisfaction, System Usability and Perceived Value, but to utilize a quantitative measurement underpinned by theoretical frameworks in order to evaluate the acceptance and the usability of the system as part of the user-centered design process.

Modified Nielsen's heuristic evaluation [17] revealed further need for improvements, with the number of experts participants to be considered enough to identify the majority of the areas for improvement. Within "match between system and the real world", "consistency and standards" and "Recognition rather than recall" and "aesthetic and minimalist design" heuristics, experts identified the need for minor adjustments to grammatical structure, style, terminology, icons, color coding, and length of some titles. While these adjustments are considered minor, they showcase the need for detail as the users might find such elements confusing. Furthermore, such design inconsistencies may influence the "user control and freedom" and foster "error prevention" and "recognition rather than recall". It was also noted that a search option, a contextual menu option and some shortcuts may further advance its "flexibility and efficiency of use" to identify relevant audits of placements, and organizations when initiating a new placement, thus the "Three-clicks rule" [24] was applied to the platform. Furthermore, the

evaluation identified that the platform is not always "help user recover" by guiding her towards a resolution of the problem, and for this we employed error recovery strategies on inner feedback, exploring system feedback, external communication, planning behavior and error informed strategies [25]. Within "Help and documentation" heuristic identified that the platform was not always allowing the user to understand, interpret and proceed correctly the help even through the user can seek for help and continue at the same screen, thus a number of explanatory videos as both standalone resources and part of "Teaching Package For Auditors" developed [7].

While some efforts have been made towards the standardization of auditing clinical placements, to the best of our knowledge this is the first attempt to develop a digital interactive platform for European and national placements audit for medicine and allied health professions and its evaluation following a user-centred design approach and an evidence-based protocol, that can be used globally. The HEALINT4ALL platform supports a globally prepared medical and AHPs international workforce able to transfer skills and practice and offer best interventions to enhance patient treatment, by providing a more effective process, being able to quickly audit clinical environments, ensuring a more structured and monitored experience to preserve safety and well supported education in practice which is safe and suitable to their educational level.

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