USER-CENTRED DESIGN IN EDUCATIONAL APPLICATIONS: A SYSTEMATIC LITERATURE REVIEW

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INTRODUCTION

- Nowadays, an educational application is essential in the education setting. It is used to engage students and gives them modern ways to learn and enjoy their learning. Additionally, it provides the benefit of being accessible to be used anywhere and anytime.

- UCD is a design approach that focuses on involving the users at every stage of the design process to develop an effective and efficient application [3].

- The UCD process is considered a multi-stage problem-solving process that includes the direct involvement of users and requires designers to analyze and understand the user and business needs.

- UCD methods are an iterative design process that validates each step with end-users.

- Designers apply the UCD concepts and methods to ground the design of innovation in information about the users who will ultimately use the innovation [24, 25].

- From the user (student, educator, etc.) perspective, there are several issues with educational applications such as privacy, enjoyment, learnability, etc. While fixing these issues is the designer (UX/UI) responsibility, the designers rely on several approaches and methods/ techniques to find the best possible solution to these challenges such as UCD.

- This study discussed the use of UCD methods for educational applications in additional to draw a best practice of using the UCD .

- We structured this study as follows:
  - Section 1 - the research methodology and data collection method of the study are discussed
  - Section 2 - lists the findings of the research, discussing how UCD methods are used in educational applications, and the different UCD methods and practices followed by researchers.
  - Section 3 - provides a conclusion of the report.

MOTIVATION

- The focus and outcome of this research will provide an approach that offers UI designers and developers a best practise modle of using UCD, which will sit firmly within the focus of WelTec& Whitireia's Core Goal of "Ākonga At the Centre" *(Students At The Centre)*

- User-Centred Design is at the forefront of improving the learning experience and outcomes for students. At this time, when WelTec & Whitireia academic staff are increasingly providing for an online teaching and learning experience to meet the needs of our learners, this will add significant value and critical understanding to the design of online offerings.

- We argue that principles of user-centered design can and should be more than only understanding the end users and their needs

RESEARCH METHODOLOGY

- A.   The manuscript selection process

- The method used includes searching the literature to find articles related to a topic and selecting relevant articles based on inclusion and exclusion criteria. After selecting the articles, data is extracted and analyzed to group some research findings.

- B.   Data Collection

- A systematic literature review was conducted on the following scientific databases – SpringerLink, Google Scholar, IEEE, and ScienceDirect. The inclusion criteria built for selecting the articles included journal and conference articles which were published from the year 2010 to 2020.

- The keywords used to select the relevant articles were; ("User centered design" OR "user-centred design" OR "UCD") AND ("Education" OR "Educational Applications" OR "University" OR "Students").
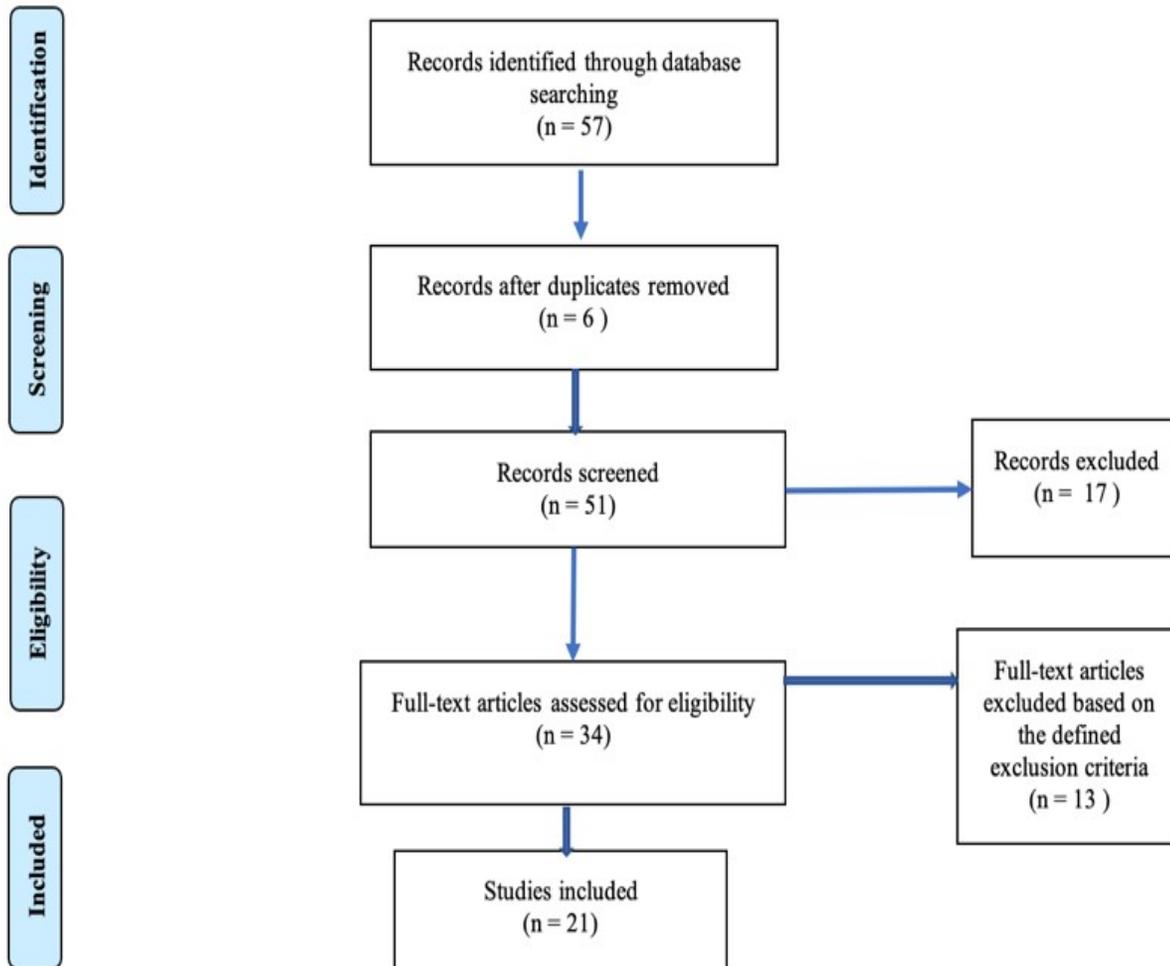
Fig 1. Selecting flow diagram

- Following exclusion criteria were developed for further analysis –
  Articles not focused on user-centred design process.
  Articles focused on evaluating the performance of an application designed using the UCD process.
  Articles where the UCD approach was not clearly defined.
  Articles that do not relate directly to an educational application.

FINDINGS

- Studies have shown that educational applications designed using the UCD approach results in more effective and efficient systems. Different user centred design methods such as interviews, focus groups, surveys are used in developing educational applications.

- Researchers have used students and teachers as participants for executing various UCD methods. Educational applications designed using user-centred design approach were found to be more useful and popular among the users.

Paper Source	Participants	Use of UCD	Methods/Activities	Results
Llema and Vilela-Malab anan [7]	Two subject matter experts and 10 senior high students and 2 subject matter experts from the English reading and writing skills classes. Two sets of forty university students for evaluation.	Using the user-centred approach, a mobile learning application MLERWS was designed and developed for improving English reading and writing skills and to ensure the appropriate use of mobile learning for the user.	Interviews students and educators, Brainstorming, Prototyping, Questionnaire	The mobile application was successfully developed for facilitating the learning of senior high school students. Initially, an android version of the mobile application was designed. The app had translations features that helped students in translating the lessons from English to their local language.
Anindhita and Lestari [8]	Deaf youth in Indonesia	Use user-centered design to collect the needs of students and teachers, analyze the use environment of educational applications, and analyze and design for the specific needs of the deaf. Test the application design by making prototypes	Field Observations and ethnography, Develop prototypes, Prototyping and usability evaluation, Human factors analysis, Focus groups and Early prototyping & usability evaluation	Through interviews and analysis of young deaf people, their user needs and goals are clarified. A conceptual prototype of educational applications was established by creating personas. Afterwards, a second interview and questionnaire were conducted with young deaf people, and their feedback on the prototype was collected.
Costa, Reis and Loureiro [9]	Education professionals, professionals in the field of computer science, usability designers, teachers and students.	In the hybrid development model, UCD is seen as a supplement to the application development method, providing support for different development stages. In this development model, a variety of UCD methods including the creation of personas, user analysis, and creation of prototypes are used to help the development team obtain the expected results within a predetermined time.	In-depth analysis of work and lifestyles, Consult stakeholders, Human factors analysis, Work context analysis, Early prototyping & usability evaluation, Personas, Define detailed user interface requirements, Develop prototypes, Prototyping and usability evaluation	When developing educational software, a user-centered hybrid development method is a good solution for educational software development.

UCD METHODS AND PRACTICES

- During all the phases of the project lifecycle, UCD focuses on the characteristics and needs of the users. The main aim of the UCD process is to develop a usable and accessible system for all users [22]. In other words, this approach incorporates information about the users of the application into the design, development, and implementation phase of the project [20]. Under the UCD process, the entire development process is focused on user-centred activities to develop an application that is easy and adds value to the intended users [19]. UCD methods focus on operational requirements which include observing and understanding the user needs along with technical requirements through prototyping and testing the application during all phases of the software lifecycle [13].
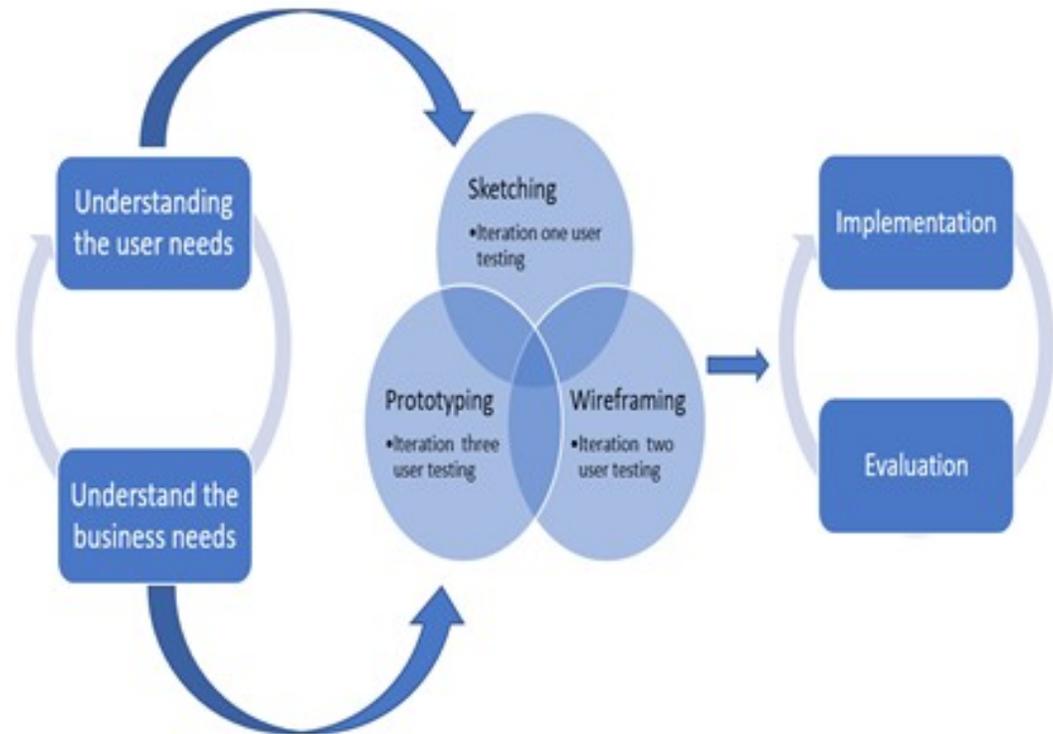
Fig 2: UCD process

- The typical UCD starts by identifying the user's and what are their problems and then what are their goals which include so common UCD methods such as User Persona. Then design identifies the user and business needs (requirements) using methods such as interview, focus group and questionnaires. Design solution is the next to meet the user and business needs and usually this includes sketching, wireframing and prototyping where the design evaluates and gets the feedback form end-users using usability testing methods such as A/B testing, card sorting. The final stage in the design will be the implementation which is again evaluated by the end-user using methods such as thinking aloud as shown in figure 2.

CONCLUSION

- UX/UI designers have limited guidance on how UCD fits within their existing perspectives and strategies for the translation of educational applications into practice. As an important step in establishing such a review, we review the use of UCD strategies for experts in implementation research and practice for education systems. UCD is a diverse, innovative field that remains highly variable in terms of language and approaches.

- Quality of education makes a big difference. Students who graduate from accredited programs have had access to better learning opportunities at school and therefore secure better employment opportunities.

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