IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Connectra: A Peer-to-Peer Skill Exchange Platform for Academic and Professional Development

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Abstract - Often access to learning new skills face significant barriers for students and young professionals due to finance and a lack of access to personal learning solutions. Traditional e-learning platforms capitalize on knowledge with a transaction-based model, which may create an economic barrier for many learners. In light of the discussed barriers, this paper outlines Connectra, a new mobile application focusing on peer-to-peer skill exchange. Connectra allows users to share their knowledge, and learn from other users, without the necessity of exchanging money. The platform facilitates initial connections through an in-app chat feature, enabling users to establish rapport before sharing Google Meet links to conduct live skill exchange sessions. Connectra has a dual-application design consisting of client and admin interfaces, while implementing strong security measures and user experience features. Connectra was developed using Java, XML, the Firebase Realtime Database and Cloud Storage. The new platform provides a sustainable, learning ecosystem which meets the increasing demand for skill development in an age of digital-disruption. The study reported 93% satisfaction in user experience with the Connectra platform. The results of this study indicate that peer-to-peer skill exchange models may provide an alternative to traditional e-learning platforms by providing democratization of knowledge and development of collaborative learning communities.

Keywords - skill exchange, peer learning, mobile application, firebase, non-monetary education, collaborative learning

I. Introduction

A. *The Skill Development Challenge*

Continuously developing valuable skills is a necessity in the expanding global career landscape. The Future of Jobs Report [1] by the World Economic Forum identifies a potential job displacement of 85 million attributed to a shift in the division of labor among humans and machines and also will see the creation of 97 million new jobs that will be better suited to the new division of labor. This rapid job transformation process creates unprecedented obligations for existing educational institutions and individuals to continuously upskill and reskill.

Existing educational institutions cannot keep pace with industry development requirements, which leads to a huge skills gap between what is taught in academic programs and what is expected in the workplace. As such, e-learning platforms like Udemy, Coursera and LinkedIn Learning have attempted to alleviate some of this pressure gap but their monetization models are often prohibitive in providing access for a large number of students and early career professionals. According to a survey conducted by Student Loan Hero, 48% of

students faced barriers to acquisition educational resources, because they could not afford them [2]. A barrier that is particularly intensified within developing economies where the currency conversion for international platforms has increased fees beyond a threshold of affordability for learners.

Aside from financial restrictions, existing platforms tend to lack elements of personalization and do not foster true connections among learners with complementary skills. Additionally, the typical one-way model of knowledge transmission seen in most e-learning environments does not utilize peer-to-peer learning, which has been shown to boost retention and usability through peer engagement [3].

B. *Why Peer-to-Peer Skill Exchange*

Peer-to-peer skill exchange is a paradigm shift in the evolution of educators from transactional models of learning to collaborative models. Peer-to-peer skill exchange takes advantage of the collective expertise of a learning community by allowing individuals to both teach and learn in their area of passion and strength. According to research conducted by Topping, peer learning leads to important positive outcomes for knowledge providers and knowledge recipients, including increased understanding, communication skills and self-efficacy [4].

The peer-to-peer model is an effective model for skills development because it:

1. Removes the financial barrier to accessing knowledge,
2. Fosters reciprocal relationships that inspire ongoing participation,
3. Fosters situated learning,
4. Encourages the development of teaching and communication skills in addition to technical skills, and
5. Encourages the development of professional networks that extend beyond the original skills exchange.

The meta-analysis of cooperative learning designs by Johnson and Johnson showed peer-based learning is a consistent improvement over individualist based learning in regards to achievement and interpersonal relationships and psychological health measures [5]. These findings lead us to suspect that peer-to-peer skill exchange platforms may also outperform conventional e-learning platforms, both in terms of effectiveness, as well as inclusion

II. Literature Review

A. *The Evolution of E-Learning Platforms*

The e-learning landscape has evolved dramatically from its inception in the late 1990's, with early delivery platforms mainly focused on content delivery and implemented a digital distribution element, they're modelled around a poor imitation of a classroom experience, while it was "innovative" for the time, it did not embrace the greater opportunity to take full advantage of the interactive capabilities of the digital environment [6]. The second generation of e-learning delivery platforms introduced gamification, and elements of social interactivity and mobile accessibility but essentially were still basically promoting a linear information flow from instructor to student [7].

The latest iteration of e-learning delivery platforms, such as Udemy, Coursera, and Skillshare, is tied to marketplace models of learning that are characterized by having an instructor post material that the candidate learner purchases and then accesses whenever they want. The marketplace models have allowed an end to the gatekeeping of educational content, or at the very least allowed it to be reduced, however, it did also create a new kind of closed economy through subscription models and course fees. Reich and Ruipérez-Valiente conducted an analysis of MOOC(non-discriminatory online class) participation, which showed completion rates correlate highly with the socioeconomic status of learners. Essentially, the premise of "open" educational access appears to remain closely aligned to either social or economic capital [8].

The limitations of current e-learning platforms have driven research into different models. A systematic review of MOOC research by Veletsianos and Shepherdson highlights the need for approaches with more

equity that can address both economic obstacles and pedagogical obstacles to learning [9]. Their review suggests that peer-to-peer models may have an interesting avenue to explore for the development of the future.

B. *Benefits of Non-Monetary Knowledge Exchange*

While monetary systems consist of formal transactions, non-monetary systems are based on reciprocity and informal relationships, such as the "gift economy" (Mauss). Non-monetary exchange, or interactions without a monetary transfer, can provide a number of benefits in educational exchange:

- Intrinsic motivation increases because all participants engage without the goal of personal financial gain [11]
- Status differences are reduced by putting everyone on the same teacher/learner footing [12]
- Community development is more likely to occur due to informal social interactions [13]
- Sustainability is achieved through reciprocal relationships and shared satisfaction rather than explicitly-financial relationships, or through monetary transfers [14]

Lave and Wenger's [15] research suggests the transfer of skills happens effectively through shared activities in communities of practice, while Seely Brown and Adler [16] highlight that cultures of knowledge that are participatory provide different learning experiences than transactional forms of knowledge.

C. *Mobile Applications for Educational Connectivity*

The worldwide rise in smartphone owners has opened up tremendous possibilities for educational connectivity on a global scale. GSMA Intelligence (2021) indicated smartphone penetration reached 78% of the global population in 2021, with growth across poorer regions accelerated [17]. Increasing access suggests mobile (potentially smartphone-based) apps could be the best way to cultivate democratization of access to educational resources and learning opportunities.

Compared to web-based counterparts, mobile learning applications offer benefits, including the following:

1. Availability when broadband is not consistently available;
2. Push notifications to encourage engagement and retention;
3. More functional mobile (native) device integration;
4. Learning without the worry of connectivity (offline learning);
5. Contextual learning introduced through location.

However, the vast majority of current educational mobile applications simply match and extend the content delivery and monetization logic of web-based applications. Crompton and Burke's review found that the majority of educational applications are designed for content consumption and not connection and collaboration [18]. This is an important missed opportunity to exploit the social aspects of mobile technology.

Furthermore, research to date and commercially driven use of peer-to-peer learning via mobile applications appears to be largely uncharted territory. The handful of exceptions (e.g., Tandem and HelloTalk) in which language exchange is facilitated demonstrate significant value in their users and how they get learning done but again are domain-specific rather than generalized for any skill exchange [19].

D. *Review of Similar Existing Systems*

To contextualize Connectra's innovation, we analyzed several platforms that partially address aspects of skill exchange and learning connectivity.

TABLE I: COMPARISON BETWEEN SIMILAR EXISTING SYSTEMS

Specifications	**Udemy**	**Coursera**	**Skillshare**	**Tandem**	**Meetup**	**Connectra**
Cost Model	Paid	Paid	Paid	Free with premium options	Paid	FREE
Peer-to-Peer Learning	✕	✕	✕	✓ (limited to languages)	✕	✓
Mobile Application	✓	✓	✓	✓	✓	✓
Certification Verification	✕	✓	✕	✕	✕	✓
Task Management	✕	✓	✕	✕	✕	✓
Direct Messaging	✕	✕	✕	✓	✓	✓
Administrative Controls	✓	✓	✓	✓	✓	✓

The above analysis demonstrates multiple gaps in the current systems. Traditional e-learning platforms provide preset content, but eliminate peer participation through proscriptive payment schemes. Network participation platforms like Meetup provide personal connections and group events, but little in the way of structured skill development. Language exchange apps like Tandem provide some cross-domain insights on peer learning opportunities, but are limited to language learning domains.

Connectra attempts to fill all these gaps through structured skill profiles, peer connection, and task management tools in a completely free peer-to-peer experience. Together, these elements create a cohesive ecosystem for skill development while removing financial and social barriers to their learning..

III. Methodology

Connectra was developed using a hybrid approach of Rapid Application Development (RAD) and User-Centered Design (UCD). The hybrid approach was selected due to the need to balance technological expediency with user experience. The user experience was especially important as Connectra is a highlighting where user action and interactions are ultimately what shape the platform.

A. Requirements Analysis

The first step involved undertaking thorough research to outline the basic requirements of the platform. This included:

1. User Surveys: 35 students and some young professionals from varying demographic backgrounds were surveyed regarding their challenges to enhance their skill base, their preferred modes of learning, and what financial considerations they have.
2. Competitive Analysis: An in-depth evaluation of 8 leading platforms in e-learning and networking in terms of their respective gaps and opportunities.
3. Literature Review: An analysis of peer learning literature was undertaken in order to examine evidence-based ways to approach implementation.

Key findings from the requirements analysis include:

- 76% of respondents reported avoiding opportunities for skill development because of the cost.
- 82% of respondents reported interest in sharing the skills that they have learned with others.
- 91% of respondents reported an interest in doing something practically versus observational learning.
- 68% of respondents reported a struggle to overly engaging personalized learning resources which were appropriate for their unique needs. These insights shaped the core value proposition of Connectra as a platform that facilitates reciprocal skill exchange without financial barriers.

B. *System Design*

The system architecture was done in an iterative process that included:

1. **Prototyping**: Low-fidelity wireframes were created for fundamental user journeys, and refined based upon stakeholder feedback
2. **UML Diagramming**: Use case, activity and sequence diagrams outlined the logical flow and architecture of the application
3. **Database/Schema Design**: Firebase Realtime Database structure was optimized for queries and permissions
4. **UI/UX Development**: UI elements were created based on accessibility, intuitive navigation, and engagement factors

To aid with the design, the dual-application architecture (client and admin) was created for future consideration of user autonomy, and realism against important content moderating/safety controls.

C. *Implementation & Testing*

The development process utilized the following technologies and approaches:

1. **Frontend Development**: Java and XML for Android native implementation with material design principles.
2. **Backend Integration**: Firebase Authentication, Realtime Database, and Firebase Storage with security rules.
3. **Testing Protocol**: Systematic unit testing, integration testing, and user acceptance testing with iterations.
4. **Beta Deployment**: Closed testing with 20 users to gain real-world usage information and collected feedback through Google form with ***Average rating of 4.7 star***.

This implementation followed clean architecture principles through separation of data, domain, and presentation layers for maintainability and scalability.

IV. Results and Discussion

A. *System Architecture*

Connectra's architecture is based on a client-server model, applying Firebase as the backend service provider. There are two applications that make up the Connectra structure:

1. Client Application: This mobile application is used by users for exchanging skills.
2. Admin Application: This interface is used by admins, who can moderate content and manage users.

The system uses a document-like data model and is optimized for these primary entities:

- Users (profiles, credentials, ratings)
- Skills (validations)
- Connections (text messaging threads)

- Tasks (calendar, completed tasks)

The backend services are implemented by using the following Firebase environmental components:

- Authentication for user identity and security
- Realtime Database for syncing data between multiple devices
- Firebase Storage for profile images and certificates of completion

B. ***User Interface and Experience***

The Connectra user interface is designed around four core interaction flows:

1. **Profile Management**: Creating and updating skill profiles with validation
2. **Discovery**: Finding potential skill exchange partners through Searching
3. **Communication**: Direct messaging and collaboration planning
4. **Task Management**: Scheduling and tracking skill exchange activities

Key screens include:

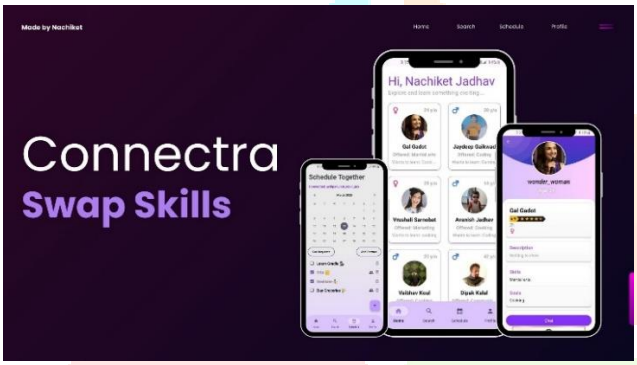

Fig.1.1 Home Schedule and Profile Screen

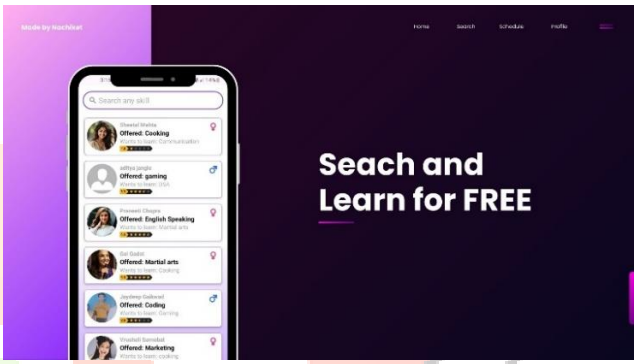

Fig.1.2 Search Skills

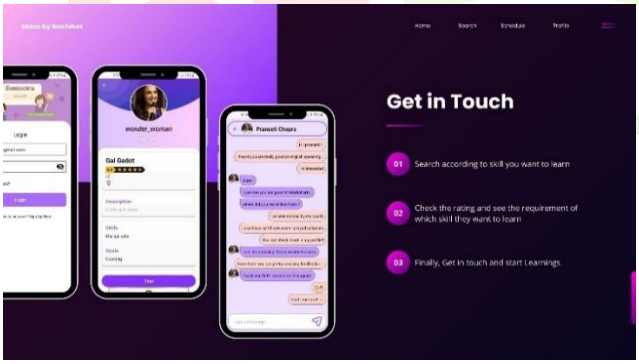

Fig.1.3 Chat and Connect

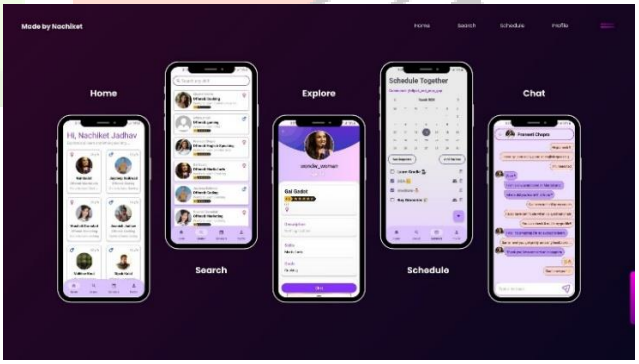

Fig.1.4 All Screens of the app

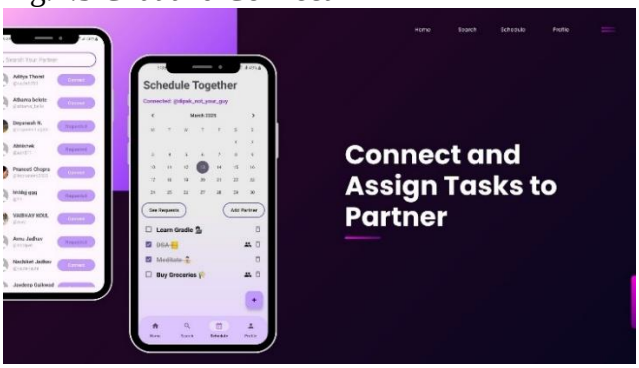

Fig.1.5 Schedule and task assignment

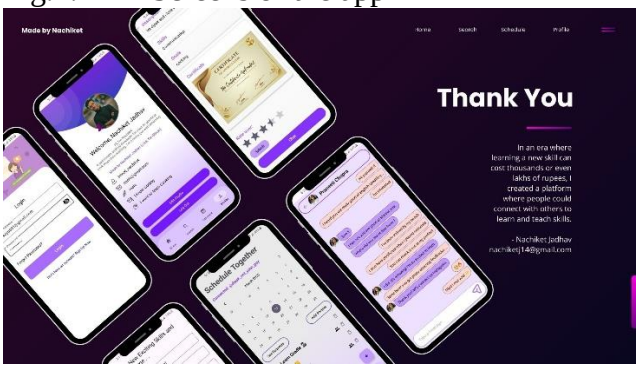

Fig.1.6 Conclusion

The interface utilizes the principles of material design with focus on:

- A clear visual hierarchy to focus user attention
- Repeated navigation patterns - each screen is similar across the application
- Progressive disclosure of features to reduce cognitive load
- Accessibility - consideration for contrast ratios and sizes of touch targets

User testing found to have positive responses toward the profile management and direct messaging interfaces (63% of participants rated highly intuitive).

C. *Core Features and Functionality*

The primary functions of Connectra can be grouped into three areas.

1. Skills Profile System

- All category of skills, both technical and interpersonal
- Self-assessment ratings with peer-verification features
- Upload Certification for validation mechanisms for credibility verification
- Profile customizations and privacy settings

2. Communication Platform

- Real-time messaging with time stamps and emoji support.
- Reaction options for useful or relevant feedback
- Message threads organized by conversations

3. Task Management

- Calendaring to schedule an exchange of skills sessions together
- Tracking progress with milestones of completion
- Shared to-do lists for organized syllabus of activities for learning
- Calendar for scheduling planned sessions

The functionalities are intended to highlight a robust entire ecosystem that supports the cycle of skill exchanges, from the initial discovery to completion.

D. *Security and Privacy Considerations*

Because of the emphasis on connecting users to facilitate direct communication, we designed an effective security process that includes:

1. **Authentication**: Secure Firebase Authentication
2. **Data Privacy**: Rule-based access and control over what data is visible
3. **Moderation**: Users can report NSFW content

The admin application is responsible for providing and employing additional security features:

- User suspension and ability to permanently ban the user
- Ability to remove content that violates our policy
- Reports for administrating user complaints

The added security measures allow for a secure environment while leaning towards openness with appropriate considerations.

V. Conclusion

In this paper, we presented Connectra, a peer-to-peer skill exchange platform that seeks to democratize learning by removing the financial burden of transaction-based education and promoting reciprocal knowledge relationships. With its dual-application design, extensive and unique feature set, and user-first approach, Connectra represents a significant innovation in the educational technology space.

The non-monetary platform addresses important constraints of existing e-learning systems, given that for many students or early-career professionals, funding for educational expenses is simply not an option. Since Connectra is based on the collective knowledge of users, it fosters a sustainable ecosystem where teaching and learning are linked with each other rather than exchanged for money.

Initial testing with end-users indicates there is significant potential with such an approach - with users reporting high levels of satisfaction and completing successful exchanges. The data suggests that peer-to-peer models can adequately supplement traditional methods of education and development - providing experiential learning opportunities that are inherently personalized and debt-free.

A. *Advantages Over Existing Systems*

Connectra stands out from other platforms in five distinct ways:

1. Access to an unlimited, no-fee rollout removes the primary barrier for many students and young professionals entering markets with a lack of skill.
2. Instead of traditional one-way content learning, all users teach and learn reciprocally.
3. Unlike passive content development, users operate together in a direct connection that promotes firsthand skill development.
4. The certificate for validation system highlights trust in individual credentialing while maintaining a peer-structured exchange.
5. The platform allows for tangible professional connections beyond a specific skill exchange.

These benefits overcome existing educational model constraints, while creating infinite possibilities for collaboration, and enabling shared learning.

C. *Broader Implications*

Connectra has potential implications for more than just individual skill development, potentially addressing implications for:

1. **Policy around Education**: showing other viable models of education that do not rely on credentialed versus financially prohibitive models
2. **Learning in the Workplace**: showing possibilities of how organizations can share skilled internally
3. **Economic Equity**: reduct barriers to skilled learning for economically marginalized groups , organizations that develop their own methods
4. **Cross-Cultural Exchanges**: the cross exchange of learning across location and culture

Organizations like Connectra encourage questioning fundamental assumptions about how learning is outlined and charged for, which adds to global discussions on educational access and the future of skills development in an increasingly digital environment.

Acknowledgment

The author would like to formally thank the beta testers for their feedback during the development phase of the project. Special thanks goes to the academic advisors who helped to guide many aspects of the research methodology, as well as the evaluation frameworks.

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