Development and Testing of Mobile Phone Messaging Monitoring Software (Ulfamijuu) for Enhancing Maternal and Newborn Health Using the Waterfall Model

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Background

- Mobile health intervention emerges as a promising strategy in the global effort to enhance maternal and newborn care practices (1)

- It is crucial, especially where challenges such as unreliable information sources, low health professional-to-population ratio, and long distances to medical facilities exist (2).

- However, such health interventions are scarce in Ethiopia. Therefore, we aim to develop and test mobile phone messaging monitoring software .

Methodology

- We followed the stages proposed by the waterfall model to develop the software.

- Initially, the project team collected and carefully analyzed requirements from stakeholders to understand the software's desired outcomes.

- During the development phase, we wrote the actual code to build software components, modules, and features according to the established requirements.

- Finally, we tested the software, including unit testing and prototype testing, to identify and fix any defects or issues before deploying it.

- Nine (9) people were involved in requirement analysis, 5 people were involved in unit testing, and 15 people were involved in prototype testing.


Interface
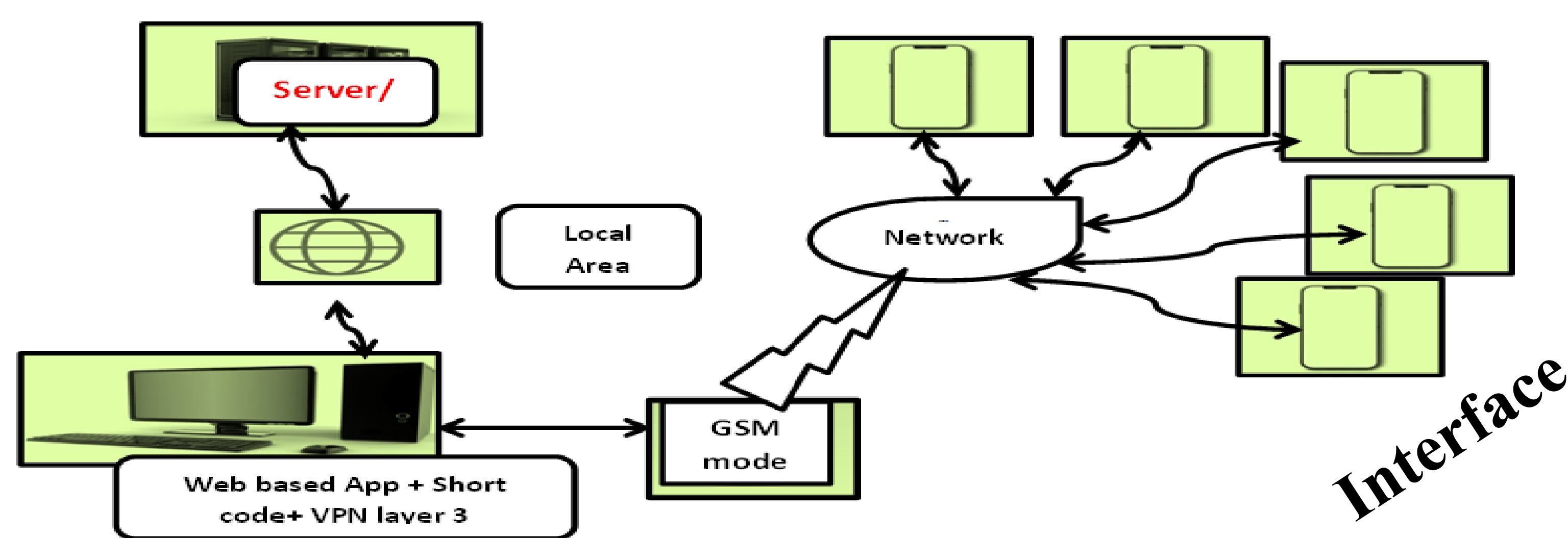
Conclusions

- The software has been successfully developed and tested.

- It serves various functions such as providing timely health information and support, tracking pregnancies, facilitating remote consultations, and connecting women with local support groups, while also enabling feedback with health workers.

- Additionally, the software offers organized SMS scheduling and prioritizes user privacy, making it an ideal choice for reliable and organized messaging.

- Furthermore, it effectively tailors messages based on pregnant mothers' last menstruation period, expected date of delivery, and postnatal appointments.

Results

- The system sends 78 key messages to pregnant women between 16-20 weeks gestation, covering 10 thematic areas: nutrition, lifestyle modification, danger signs, birth preparedness, breastfeeding, labor, newborn care, immunization, and antenatal/postnatal care.

- Unit testing across eight dimensions confirmed reliability, varied network performance, efficient contact management, strong security, user-friendly interface, and device compatibility.

- Prototype testing identified usability issues, leading to design refinements.

- While the software was user-friendly, some healthcare providers encountered minor navigation issues.

- Messaging was smooth, although with slight delays; testers suggested customizable notifications. Security features were robust, but compatibility improvements were suggested by IT professionals.

- The software shows promise in improving maternal and newborn health, with suggestions for future updates and integration.

Elements of the software
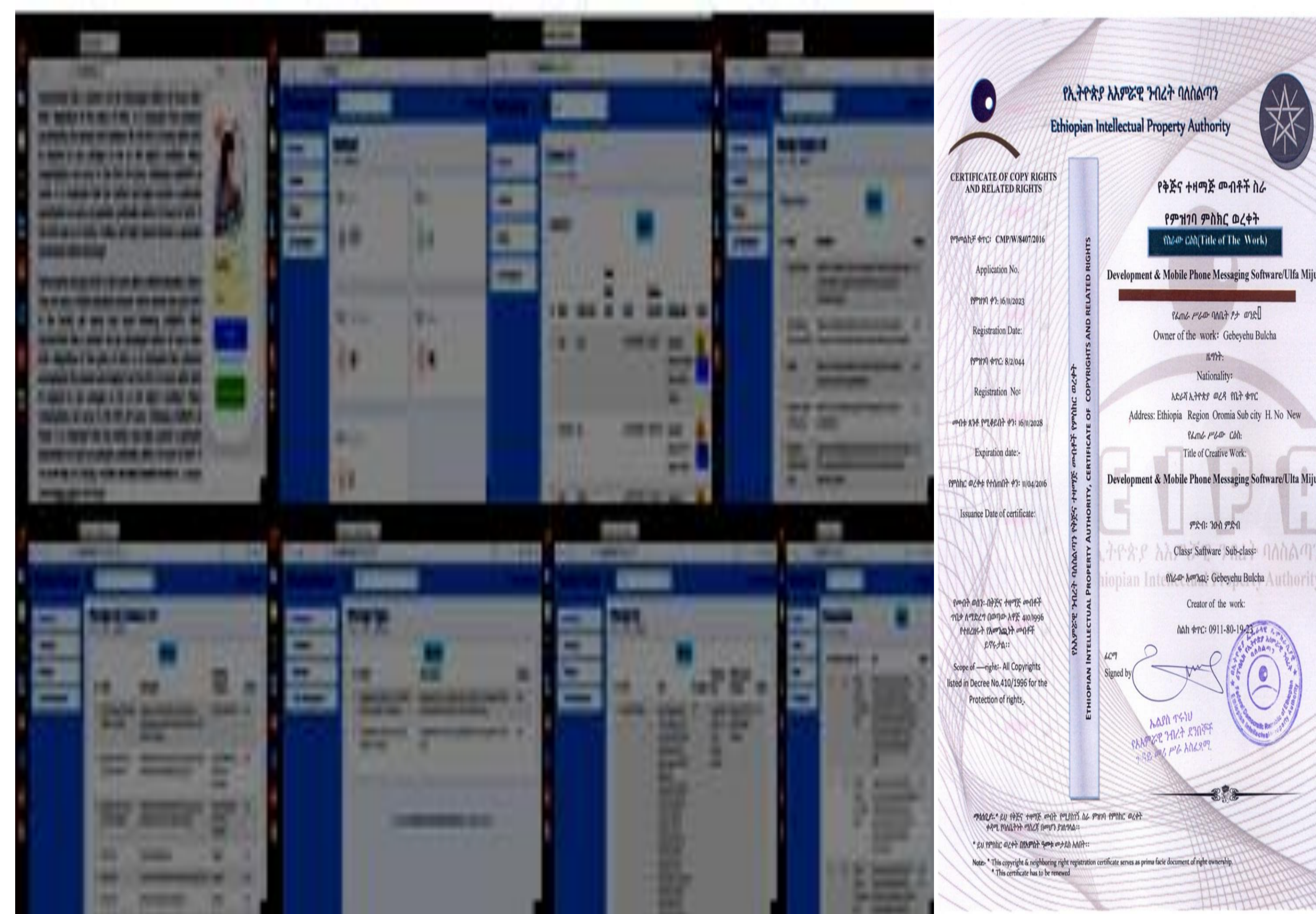
References:

1. Knop, M.R., Nagashima-Hayashi, M., Lin, R. *et al*. Impact of mHealth interventions on maternal, newborn, and child health from conception to 24 months postpartum in low- and middle-income countries: a systematic review. *BMC Med* **22**, 196 (2024).

2. Hall, C. S., Fottrell, E., Wilkinson, S., & Byass, P. (2014). Assessing the impact of mHealth interventions in low- and middle-income countries – what has been shown to work? Global Health Action, 7(1). https://doi.org/10.3402/gha.v7.25606