











Our voice application platform that forms the core of Vimprint system has been tested to scale to 200 simultaneous calls on an 8-core cpu, 4 GB RAM Intel machine running Linux and hosting Vimprint system on Apache Tomcat application server and MySQL database server. Nuance was hosted separately on a similarly configured machine.

## 5 Preliminary User Study

Deployment and evaluation of Vimprint's Vocabulary learning module is a work-in-progress. Before going all out and recruiting users from the actual end segment who are often too busy in earning a livelihood, we conducted a preliminary user study with users outside the target segment. The aim was to test the effectiveness of the technique rather than fine tune the user interface for the actual target user group.

The preliminary study was conducted with 9 subjects over a period of 3 days. Since this is a preliminary test, we recruited users from our social network who are not native English speakers but have undergone formal education in English. Given their educational background, users were exposed to 10 pre-selected English words having good difficulty level. None of the users were familiar with these words nor were these words used in their day to day conversations. Of the 10 words, revision reminders were set for only 5 words. Instead of scheduling reminders for them, the researchers simulated the scheduler by calling the subjects and requesting them to call into the system at the intervals of 1 hr, 5 hrs and 24 hrs from the time they accessed the system the first time. During each revision call, the users were quizzed by the system for meanings of words they had learnt. They were prompted to select the correct option for the word meaning from multiple choices. After the last revision call, the users were quizzed on all the 10 words – 5 for which revision calls were scheduled and 5 for which no revision call were done. Words which were revised were recalled with 93.3% accuracy while the words without revision were recalled with 55.5 % accuracy.

These preliminary results are encouraging and suggest that the classroom effect of regular prodding by teacher on a subject can probably be simulated through a push based mechanism over the phone. This motivates further investigation. Given the limiting nature of this study, an extended user study is being planned to obtain statistically significant results, with our target user group i.e. non-English speaking users with little access to web based learning tools. Although an incoming revision call can be intrusive, but if the learner is comfortable with it, such push mechanism can instill discipline and ensure continuity of learning which is missing from traditional web based learning tools that rely on pull model. Similar model of structured pull cum push based learning is now also being explored and deployed in the web world through the concept of massive open online courses (MOOC) [17].

## 6 Conclusion

This paper presented Vimprint, a system for exploring telephony voice applications as an alternative means for enabling effective learning and memorization for underprivileged in developing countries where numerous people have no or limited access to internet. It employs a push based interaction over outbound calls in addition to initial pull from the learners, to assist users in memorizing and to keep them disciplined and engaged in the learning process. The paper presented design and implementation of its Vocabulary building module along with the results of a preliminary study that encourages us to explore further with underprivileged users. While we tested the system for learning English, Vimprint itself is language agnostic and can be used to offer vocabulary building for other languages supported by Nuance Speech recognition engine.

Going forward, we are extending this application with additional learning modules and conduct a full scale study towards establishing telephony voice applications as a potential vehicle for structured learning for the underprivileged. For that purpose, we have tied up with an English learning school in the area who take everyday classes for students who may not have had the luxury to study in expensive English medium schools. With this user set, we intend to compare how Vimprint's vocabulary building module fares against classroom based vocabulary building methods.

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