roles has been designed. Further NSDC has partnered with 267 training partners in 25 sectors and 2500+ fixed and mobile centers. The partners are advised to customize the model curriculum as per local context, requirements, students and training methodology. However, most of the training today is done manually except using a few online videos. Can computing help? We see that manually developing educational technologies for the scale and variety present in this domain is a herculean task and our approach can be experimented in this sector.

How much effort is required to provide customized educational technologies for schooling in India? (KG1 to KG12)? How much effort is required for supporting teaching of engineering subjects (approximately around 800 courses?)? The problems become compounded due to the number of subjects to be learnt, each subject having many topics, the number of languages used as media of instruction, and the number of students as well as teachers. There is a serious debt of ways to accelerate educational technologies even if we borrow ideas of software reuse from software engineering. We see that these challenges can push the limits of software engineering and computing.

In this thesis, we made an attempt to address a research problem driven by societal challenges. We hope that this research lays down a foundation for this line of research and adds significant value to computing as well as society.
Related Publications

Research

Journal Papers
• Chimalakonda, S., & Nori, K. V., Modeling Domain and Software Patterns using Ontologies: Approach, Tool and Case Study, To be submitted to Journal of Systems and Software
• Chimalakonda, S., & Nori, K. V., Design of Educational Technologies – Quality, Scale and Variety, To be submitted to Springer Briefs [Monographs of 50 to 120 pages]

Full Papers

Short Papers
• Chimalakonda, S; Nori, K. V., "A Patterns-Based Approach for Modeling Instructional Design and TEL Systems," Advanced Learning Technologies (ICALT), 2014 IEEE 14th International Conference on


Doctoral Consortium


Tutorial

Work-In-Progress


Peer-Reviewed Workshop Papers


Peer-Reviewed Posters

Presentations/Miscellaneous


• Chimalakonda, S., & Nori, K. V., Why Software Product Lines for a family of eLearning Systems {9 Existing + 13 New + X Variants} has worked? and Why is it not enough?, Accepted for presentation at HICSS-45 and PLEASE 2011 @ ICSE 2011.

• Chimalakonda, S., & Nori, K. V., Towards Improving Quality of Instruction & Accelerating Educational Technologies using Software Product Lines (Poster), Presented at Microsoft TechVista 2012, Kolkata, India

• Chimalakonda, S., & Nori, K. V., Designing Technology for 287 million Adult Learners – Experiences & Challenges, Presented at Microsoft TechVista 2013, Coimbatore, India

Industry/Practice

Contributions to International Standards through Working group 4 (WG4) of the seventh subcommittee (SC7) titled “Software and Systems Engineering” of the Joint ISO/IEC Technical Committee (JTC1) of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC)


• ISO/IEC 26550:2015, Software and systems engineering – Reference model for product line engineering and management, Technical contribution through comments and comment resolution

The work on patterns and software product lines of this thesis has impacted the following standards in software and systems product lines

• Co-Editor, ISO/IEC 26551, Software and systems engineering – Tools and methods for product line requirements engineering, Published as International Standard, 2016

• Co-Editor, ISO/IEC 26552, Software and systems engineering – Tools and methods for product line architecture design, Co-Editor, work-in-progress since 2014, WD stage

• Co-Editor, ISO/IEC 26553, Software and systems engineering – Tools and methods for product line realization, work-in-progress from 2012 onwards

• Co-Editor, ISO/IEC 26554, Software and systems engineering – Tools and methods for product line verification and validation, work-in-progress from 2012 onwards

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Society

This thesis was motivated from the grand challenge of adult literacy in India and as such is proposed to make solid contributions to society. During the progress of this thesis, we made technical suggestions to a steering committee meeting on adult education and literacy.


Research Suggestions to Planning Commission

- The 12th Five Year plan [2012-2017] should focus on “Quality of Education” improving teaching-learning processes, and technology-driven solutions
- Qualitative Assessment is also more important while assessing learning outcomes rather than objective tests and quantitative measures. This approach can help teachers understand the process of deriving an answer rather than testing answers alone
- “how can we empower inexperienced teachers through technology such that they can deliver same quality of teaching as an experienced teacher? Which would be possible only if technology-driven solutions are embedded with strong teaching-learning processes?
- Technology solutions have to be looked cautiously and should be in in sync with learning methodologies

The work in this thesis was presented to Shri Y.S.K. Seshu Kumar, Joint Secretary & DG - National Literacy Mission Authority and Chairman of CBSE board (then) in July 2016 and later to the 32 SRCs for further proliferation. The SRCs are formally instructed to use the approach and technologies developed as part of the thesis. Even though not part of this thesis, some experiments are specifically planned with SRC Hyderabad in the coming days.

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Formulation of the 12th Five Year Plan- Minutes of the second meeting of the Steering Committee on Elementary Education and Literacy held on 25.08.2011-regarding