IDENTIFYING SOFTWARE ENGINEERING CHALLENGES IN SOFTWARE SMES: A CASE STUDY IN THAILAND

SANER 2022 INDUSTRY TRACK

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SOFTWARE SMES (SSMES)

The main factors determining whether an enterprise is an SME are *

1. Staff headcount
2. Either turnover or balance sheet total

<table>
<thead>
<tr>
<th>Company Category</th>
<th>Staff headcount</th>
<th>Turnover</th>
<th>Balance sheet total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium-sizd</td>
<td>&lt; 250</td>
<td>≤ € 50 m</td>
<td>≤ € 43 m</td>
</tr>
<tr>
<td>Small</td>
<td>&lt; 50</td>
<td>≤ € 10 m</td>
<td>≤ € 10 m</td>
</tr>
<tr>
<td>Micro</td>
<td>&lt; 10</td>
<td>≤ € 2 m</td>
<td>≤ € 2 m</td>
</tr>
</tbody>
</table>

SOFTWARE SMES (SSMES)

SSMEs including software startups are among the key drivers in software industry and important for a country’s competitiveness and innovation (Larrucea et al., 2016).

Thailand’s software industry accounts for approx. $4 billion in 2020 and 2021 (DEPA, 2021).


SOFTWARE SMES (SSMES)

The country’s software sector comprises of over 8,000 software companies, large and small, with more than 100,000 employees (DEPA, 2021).
MAJOR WEAKNESSES OF SSMEs

An initial investigation (Sunetnanta et al., 2016) shows that major weaknesses of SSMEs in Thailand include

- Configuration management
- Quality assurance
- Project assessment and control

Rely heavily on manual tasks performed by their programmers.

GOAL OF THE STUDY

1. To investigate the software engineering challenges that specifically occur in SSMEs located in the Asian culture, especially in Thailand.

2. To study their tool usage for future recommendation of automated software engineering (ASE) tools and techniques.
RESEARCH QUESTIONS

RQ1 (SE Challenges): What are the challenges in the SSMEs’ day-to-day software development?

RQ2 (Current Practices): What tools are being used?
## THE STUDIED COMPANIES

<table>
<thead>
<tr>
<th>Company</th>
<th>Products</th>
<th>No. of Developers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>E-Learning platform</td>
<td>15</td>
</tr>
<tr>
<td>ProGaming</td>
<td>Web and mobile games</td>
<td>10</td>
</tr>
<tr>
<td>roots</td>
<td>Enterprise solutions</td>
<td>40</td>
</tr>
<tr>
<td>ZWIZ.AI</td>
<td>Enterprise AI chatbot</td>
<td>6</td>
</tr>
</tbody>
</table>
METHODOLOGY: SEMI-STRUCTURED INTERVIEWS

Visit the company

Perform a semi-structured interview with a developer

Repeat for all the participants

30 minutes
Participant info sheet + Consent form

Dedicated closed room

Voice recording

Identifying Software Engineering Challenges in Software SMEs: A Case Study in Thailand, Ragkhitwetsagul et al., SANER 2022

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INTERVIEW PARTICIPANTS

Company A

- CTO (6 yrs)
- Developer (2 yrs)
- Senior Developer (1 yr)
- COO (6 years)
- Developer (1.5 yrs)

-ProGaming

- Managing Director & Technical Lead (11 yrs)
- Lead Developer (6 yrs)
- Project Manager (5 yrs)
- Developer (3 yrs)
- Developer (1 yr)

-roots

- CTO (5 yrs)
- Senior Developer (4 yrs)
- Senior Developer (2 yrs)
- Developer (2 yrs)
- Developer (0.7 yr)

-zwiz.ai

- CTO (2 yrs)
- Developer (2 yrs)
- Developer (1 yr)
- Developer (0.25 yr)
- Developer (0.33 yr)
<table>
<thead>
<tr>
<th>Question</th>
<th>RQ1</th>
<th>RQ2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please explain your role at the company. How long have you been working at the company?</td>
<td></td>
<td>Please explain the tools you use during software development.</td>
</tr>
<tr>
<td>Please explain your day-to-day activity. How do you develop the software product? What works well in your company’s software development? What would you suggest to improve?</td>
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<td></td>
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</tbody>
</table>
THEMATIC ANALYSIS

(Braun and Clarke, 2006)

Voice recording

Transcribe (Thai)

Pseudonymisation

Thematic Analysis (English)

Lack of automated testing (3, 4)
Lack of unit testing (4, 16)
Low test quality (3, 6)
Lack of testing knowledge & time (2, 3)

Lack of code analysis & measurements (3, 4)
Low code quality (4, 6)
Coding convention issues (3, 4)

RESULTS
RQ1: IDENTIFIED SE CHALLENGES

Lack of Testing (4, 29)
- Lack of automated testing (3, 4)
- Lack of unit testing (4, 16)
- Low test quality (3, 6)
- Lack of testing knowledge & time (2, 3)

Code-related issues (4, 14)
- Lack of code analysis & measurements (3, 4)
- Low code quality (4, 6)
- Coding convention issues (3, 4)

Unclear & incomplete requirements (3, 13)

Inaccurate effort estimation (3, 11)

Lack of knowledge sharing and documentation (4, 8)

No configuration management (3, 4)

Issues during code review (3, 3)

Bug-inducing changes (2, 3)

Other challenges (4, 10)
RQ1: IDENTIFIED SE CHALLENGES

SSMEs in Thailand are facing several software engineering challenges in their day-to-day software development.

The four main challenges include lack of testing, code-related issues, unclear and incomplete requirements, and inaccurate effort estimation.
1. Lack company-wide adoption of unit testing frameworks.
2. Code structure and formatting are locally enforced.
3. Mixed use of project management tools.
4. Mixed use of communication tools.
LESSONS LEARNED

Before supporting SSMEs to adopt ASE tools and techniques, one must first ensure that the SSMEs have adopted contemporary best practices in software engineering.

Software engineering research should engage SSMEs more to facilitate the adoption of automated software engineering tools and techniques.
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RQ1: IDENTIFIED SE CHALLENGES

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- Issues during code review (3, 3)
- Bug-inducing changes (2, 3)
- Other challenges (4, 10)

RQ2: IDENTIFIED CURRENT PRACTICES

Some of the SSMEs have mixed use of dedicated project management and general purpose tools such as spreadsheets to manage their projects or personal chat applications for work.

Some tools are being used or known only at the individual level such as code formatters or linters, which may cause inconsistencies at the company level.