Challenges and Opportunities for Software Engineering in Papua New Guinea

It Will Never Work in Theory: Live!
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My Background

Principal Expert ESE

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Papua New-Guinea (PNG)

- **Population:**
8.9 million
- **Capital city:**
Port Moresby
- **GDP per capita:** IMF 2021
US$2,952 (155 of 216)
- **HDI 2019:** UN 2019
0.555, medium (155 of 189)
- **Independency from Australia:** 16 Sep 1975

BRIDGES2019

Software Engineering Workshop in the Pacific

View On GitHub
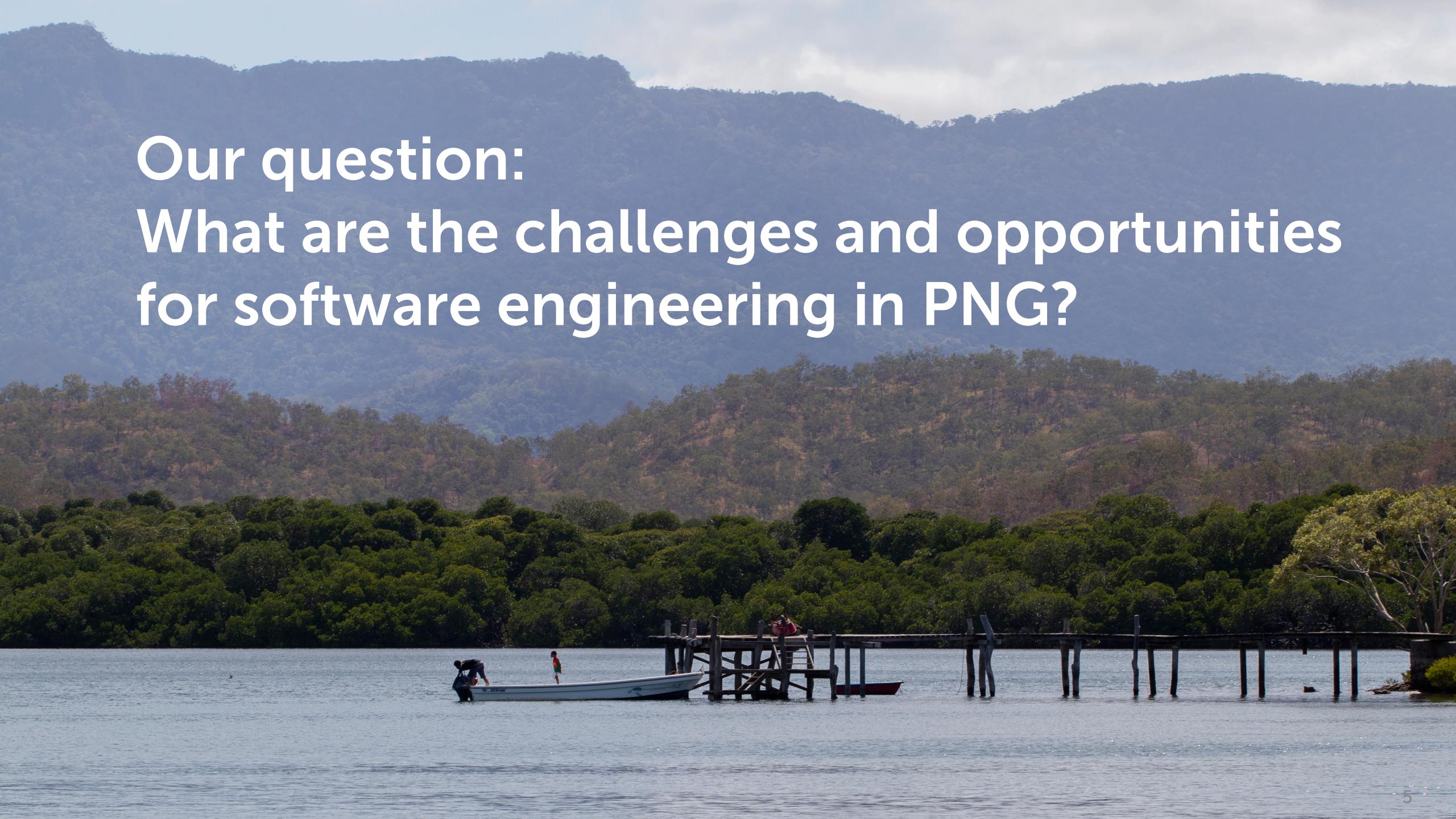
About

The objective of the International Workshop on BRIdging Divides with Globally Engineered Software (BRIDGES) is to foster development by providing a forum where researchers and practitioners can report on and discuss issues and solutions to bridge the digital divide of information within a practical geographic-free global software engineering setting.

The workshop encourages the exchange of ideas within the local and international community with its ultimate goal to make software engineering universal; for anyone, anywhere, without any technical, cultural and educational boundaries. This involves a round-table discussion with invited talks from both local and international participants.

Our question:
What are the challenges and opportunities
for software engineering in PNG?

Results based on data collected in Sep 2019

Three-day workshop in Port Moresby:

- **Day 1:** Conference with national and international speakers, including panel discussion on SE in PNG

- **Day 2:** Preliminary analysis of talk recordings and survey responses collected during conference (n=52)

- **Day 3:** Focus group interview with local experts on day three (n=5)

Infrastructure-related challenges

US$ 250
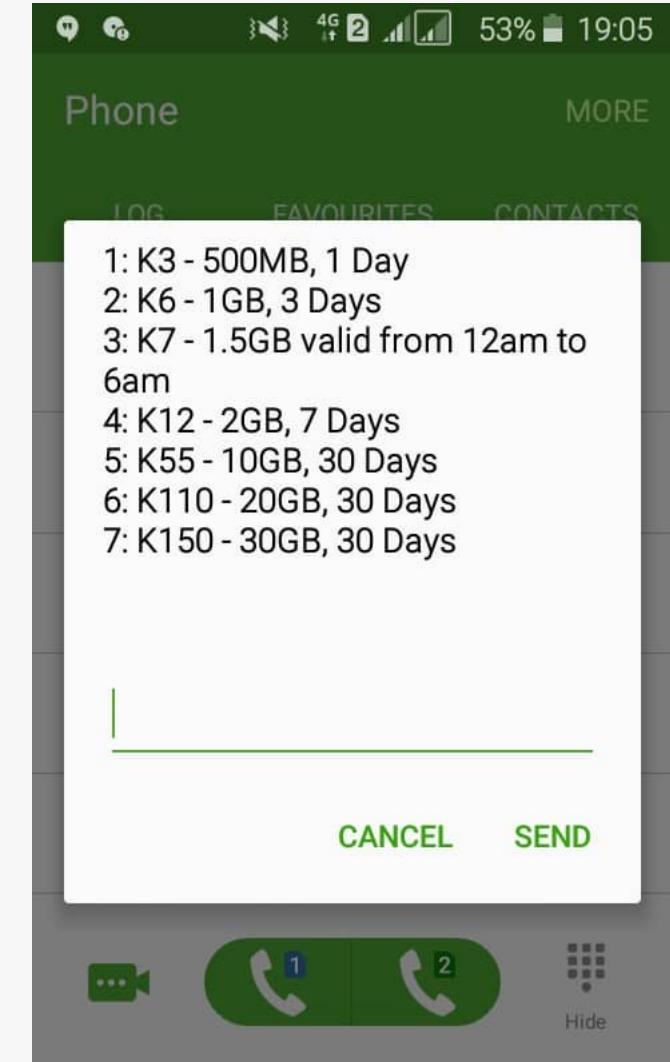
- Economy currently dominated by **primary sector**
- 75% of population rely on **subsistence economy**
- **Internet access**
  - Only 30% of the population (2018)
  - Neighboring country Fiji: 84% (2018)
  - 2020: New sea cable to Australia to increase bandwidth
  - Often no computer at home → access via phone
  - **Expensive, slow, usually mobile, few flat rates**
- Importance of **schools/universities** for access to computers and internet
- For many people Internet = Facebook

USD 1 = PGK 3.4
(Sep 2019)
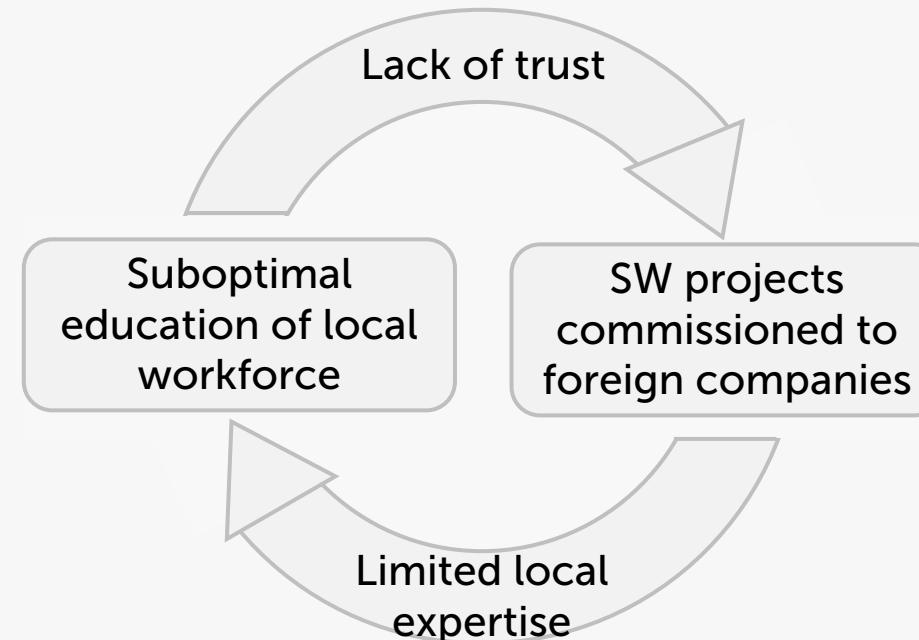
Contextualization of internet costs

- **Lower middle income** class poverty line:
325 PGK (2019)
  (200 PGK per month in 2009 according to World Bank,

  assuming 5% yearly inflation rate)

- **30 GB** for 30 days already cost **46%** of that monthly income

- This translates to **22 hours of Zoom calls**
  (a 720p group Zoom call uses about 1.35 GB/hour)
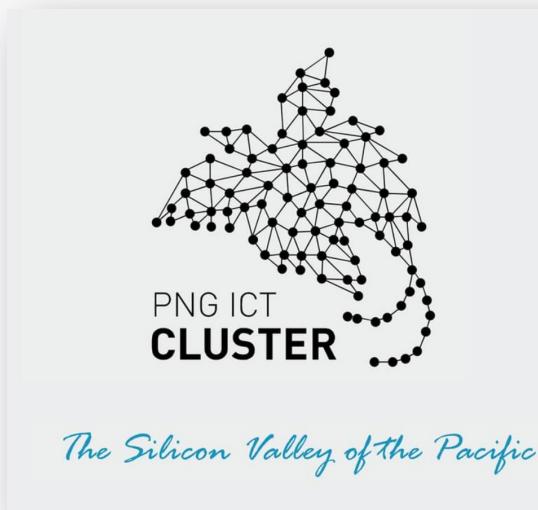
Challenges related to education and trust

- Adult **literacy** rate: 63% (2015)

- Revising/updating **school and university curricula** were mentioned frequently by participants as means to improve state of SE in PNG

- Quality of local **education** and **trust** are **intertwined**:

Lack of trust

Suboptimal education of local workforce

SW projects commissioned to foreign companies

Limited local expertise

Despite these major challenges, a local software engineering community is forming

Huge potential for software engineering in PNG

- Situation in PNG:
  - **Software needs to be adapted** to local legislation (e.g., tax system)
- Challenges:
  - Very few local software developers
    → **dependence on foreign workforce**
  - **Huge costs** for government/local companies since expats are paid salaries that are competitive on an international level
- Opportunities:
  - **PNG government:** Invest in building a local software engineering community, starting with customization of standard software
  - **Development aid:** International universities can help designing up-to-date SE curricula for schools and universities

What can you do?

- Consider **customization/adaptation** of your software
  - Mainly relevant for software relying on local legislation, standards, etc.
- Make your **software/documentation** accessible for **users with limited resources**
  - Example: Do not auto-play videos and always **provide alternatives** (e.g., written tutorials besides video tutorials)
- Consider limitations when **communicating with locals**
  - Sometimes a phone call might be preferrable
- Consider corresponding **personas** when designing your software
  - Limited bandwidth and data volume
  - Access to internet primarily via phones
  - Might use your (web) apps on old hardware and outdated software
  - Might not have their own computer at home → shared usage

More information

Challenges for Inclusion in Software Engineering: The Case of the Emerging Papua New Guinean Society

Raula Gaikovina Kula, Christoph Treude, Hideaki Hata, Sebastian Baltes, Igor Steinmacher, Marco Aurélio Gerosa, Winifred Kula Amini

https://empirical-software.engineering/assets/pdf/ieeesw21-bridges.pdf

https://naist-se.github.io/BRIDGES2019/