

# 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 in the Pacific

naist-se.github.io/BRIDGES2019/

View On GitHub

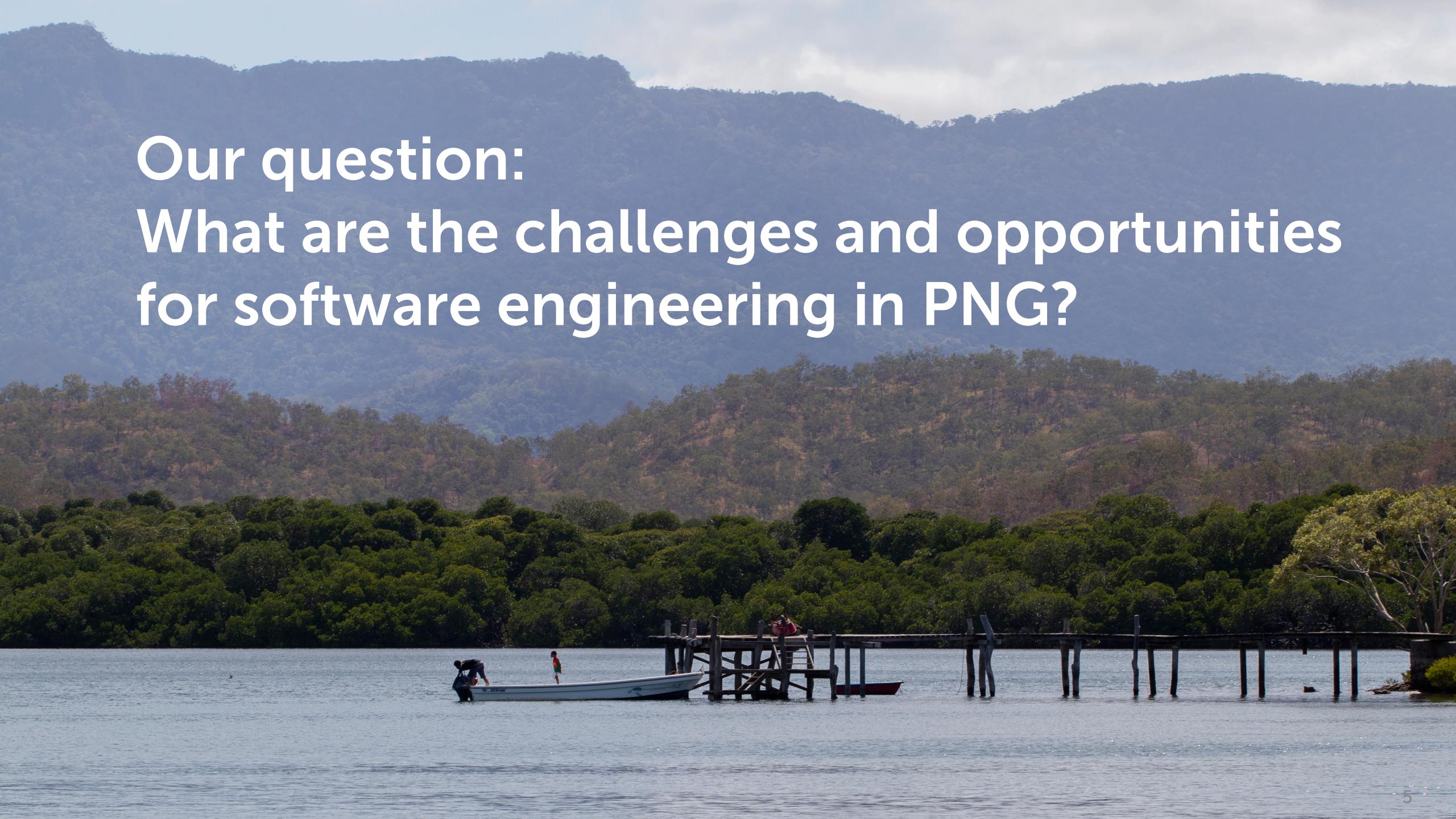


**About**

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.



The background of the slide features a wide-angle photograph of a tropical landscape. In the foreground, there's a body of water with a long, weathered wooden pier extending from the right side towards the center. A small white boat with two people is near the pier. The middle ground is filled with dense green mangrove forests. In the background, there are several large, dark green mountains under a bright, slightly cloudy sky.

**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

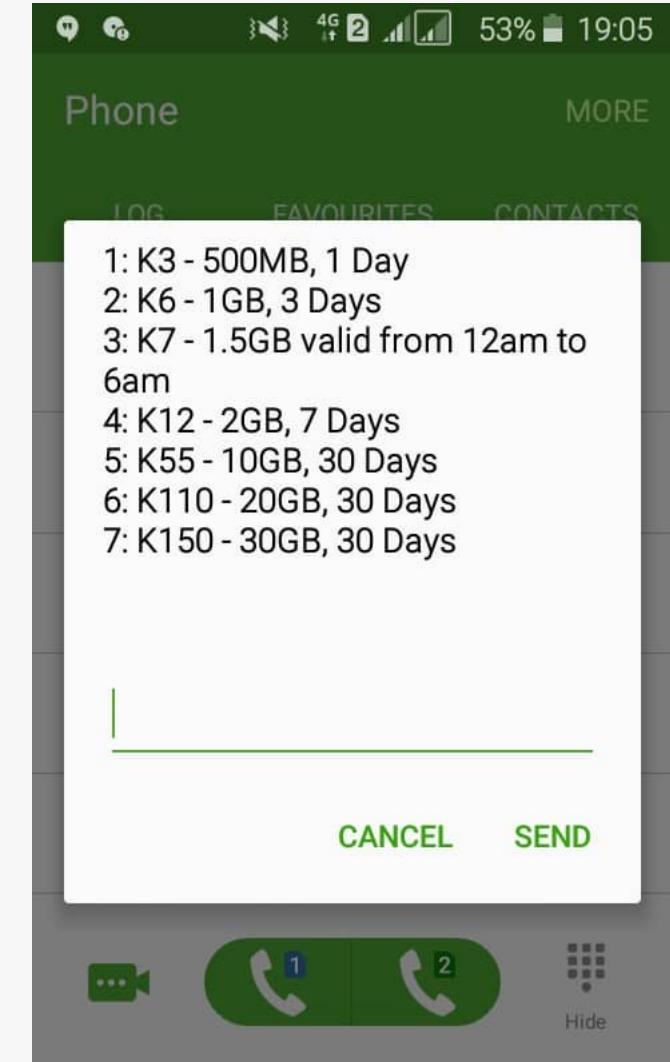
- Economy currently dominated by **primary sector**
- 75% of population rely on **subsistence economy**
- **Internet access**
  - Only 30% of the population (2018)
  - Neighboring country Fiji: 84% (2018)
  - 2020: New sea cable to Australia to increase bandwidth
  - Often no computer at home → access 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)



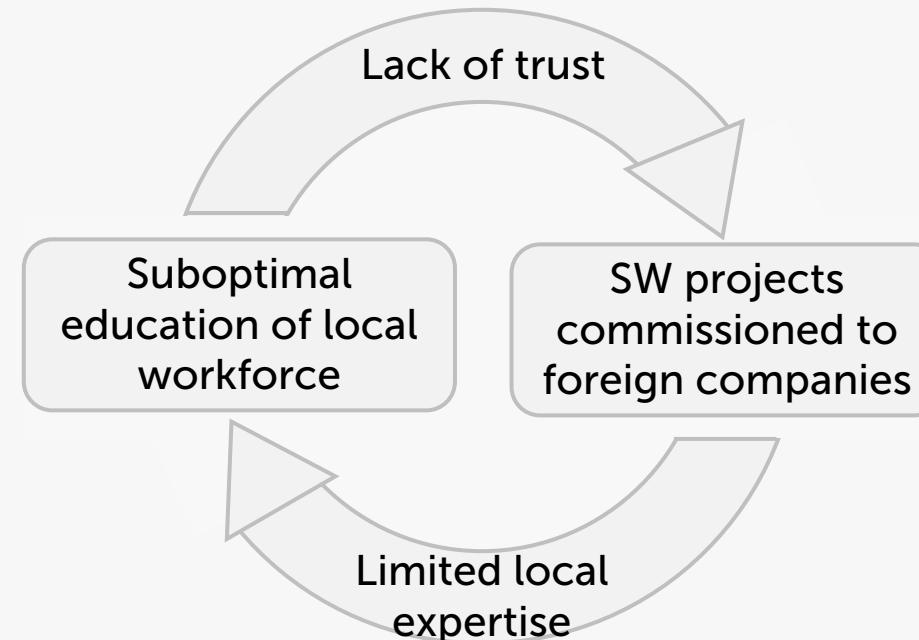
# Contextualization of internet costs

- **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)

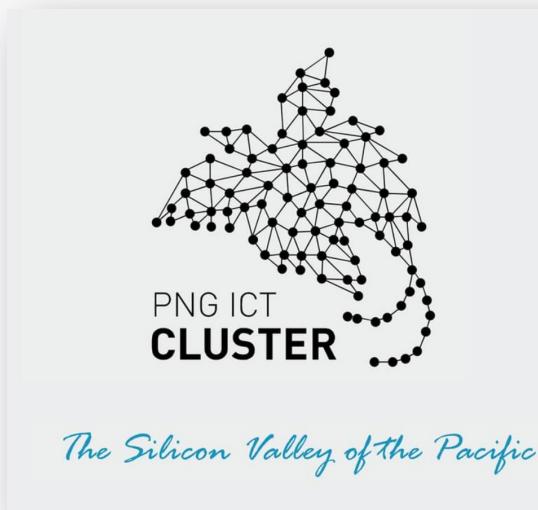


# Challenges related to education and trust

- 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**:



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



## THE PNG DIGITAL ICT CLUSTER

SHARING INNOVATION,  
CREATING OUR FUTURE

ICT Jobs PNG >

Public group · 2.487 members

Join Group

Rooms Topics Photos Events Files

**About**

This group should provide an avenue for people/organisations/government departments specifically looking for skilled labor with qualifications in ICT and other IT related jobs.

# 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 preferable
- 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

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*Abstract*—Software plays a central role in modern societies, with its high economic value and potential for advancing societal change. In this paper, we characterise challenges and opportunities for a country progressing towards entering the global software industry, focusing on Papua New Guinea (PNG). By hosting a Software Engineering workshop, we conducted a qualitative study by recording talks ( $n=3$ ), employing a questionnaire ( $n=52$ ), and administering an in-depth focus group session with local actors ( $n=5$ ). Based on a thematic analysis, we identified challenges as barriers and opportunities for the PNG software engineering community. We also discuss the state of practices and how to make it inclusive for practitioners, researchers, and educators from both the local and global software engineering communities.

*Keywords*-Inclusion, emerging society, software engineering.

### I. INTRODUCTION

Advances in technology have the potential to transform

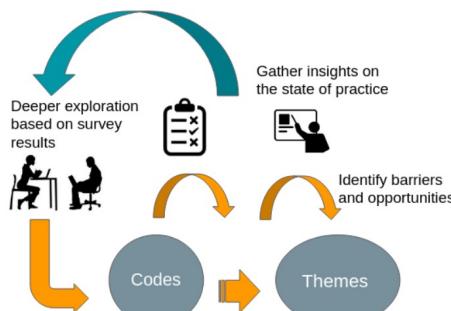


Figure 1. Overview of the thematic approach for the study

**BRIDGES2019**  
Software Engineering Workshop in the Pacific

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First International Workshop on BRIdging the Divides with Globally Engineered Software (BRIDGES2019)

12th - 14th Sept. 2019



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

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