Research Statement

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Background

Prior to joining the faculty at Singapore Management University (SMU) in January 2012, I worked in two different industries spanning 30 years - high tech manufacturing for the first 20, and banking for the next 10. Most of my high-tech industry experience was in disk drive manufacturing where I held various Engineering/Management roles covering test software development and manufacturing information systems. I transitioned into banking in 2002 where my roles included Vice President and Head of Service Oriented Architecture at OCBC Bank, Senior Enterprise Architect at ANZ Bank, and Chief Technology Officer at TIBCO Software Asia supporting over 20 banks across the region. While working in banking, I was concurrently an adjunct lecturer at the National University of Singapore (NUS) Institute of System Science for 3 years, covering enterprise architecture in banking.

I am currently an Associate Professor of Information Systems (Practice) at SMU School of Information Systems (SIS). I teach a Master of IT in Business – Financial Services, and have covered Digital Banking Enterprise Architecture, Corporate & Institutional Banking, Digital Payments & Innovations, and Lifecycle Implementation of Banking Products. In addition to these courses, I have sponsored/supervised over 20 banking related postgrad Capstone Projects. I also teach undergraduate courses, and have covered Enterprise Solution Development, Enterprise Integration, Architectural Analysis, Software Engineering, and Low Code Solution Development. In addition, I have sponsored/supervised over 50 undergrad Capstone Projects. I served as Faculty Advisor and Track Coordinator for our undergrad Financial Technology Career Track.

During my years working in the banking industry, I came to realize the importance of Enterprise Architecture (EA) and its role in implementing a bank's business strategy while minimizing the overall IT cost for the bank. As a natural consequence of a growing bank, organizations tend to become "silo-ed", with each business unit having its own dedicated technology and operations functions. While this organizational model is meant to be more agile in terms of time-to-market, the downside effect is that bank-wide technology and platform standards are harder to enforce, resulting in higher overall IT costs for the bank. EA frameworks, platforms, and best practices are meant to address this problem. My direct experience with both successful and failed EA in multiple banks forms the core of my intellectual contribution to the SMU-SCIS academic community and forms the basis for my area of research.

Research Areas

My Central Concern

In my years as an architect (OCBC, ANZ) supporting over 20 banks (TIBCO), I have observed that banks with a high degree of SOA maturity are able to overcome their legacy system problems and, as a result, are able to have a faster time-to-market. This improved agility enables banks to better compete with FinTech companies which are inherently more agile. As a practice track faculty, my objective is to help industry practitioners, and academics, to understand how SOA/microserves architecture can help traditional banks become digital, through empirical research, research collaboration projects with industry partners, and

developing a reference implementation/example (e.g., SMU tBank) of a microservices-based (coreless) digital banking platform.

Research Questions

Aligning to my central concern, I can summarize my main research questions as follows:

- Do traditional banks view FinTech firms as a threat? (Do they care?)
- If so, what are they doing about it? (The rise of "digital banking"?)
- What are their digital banking strategies?

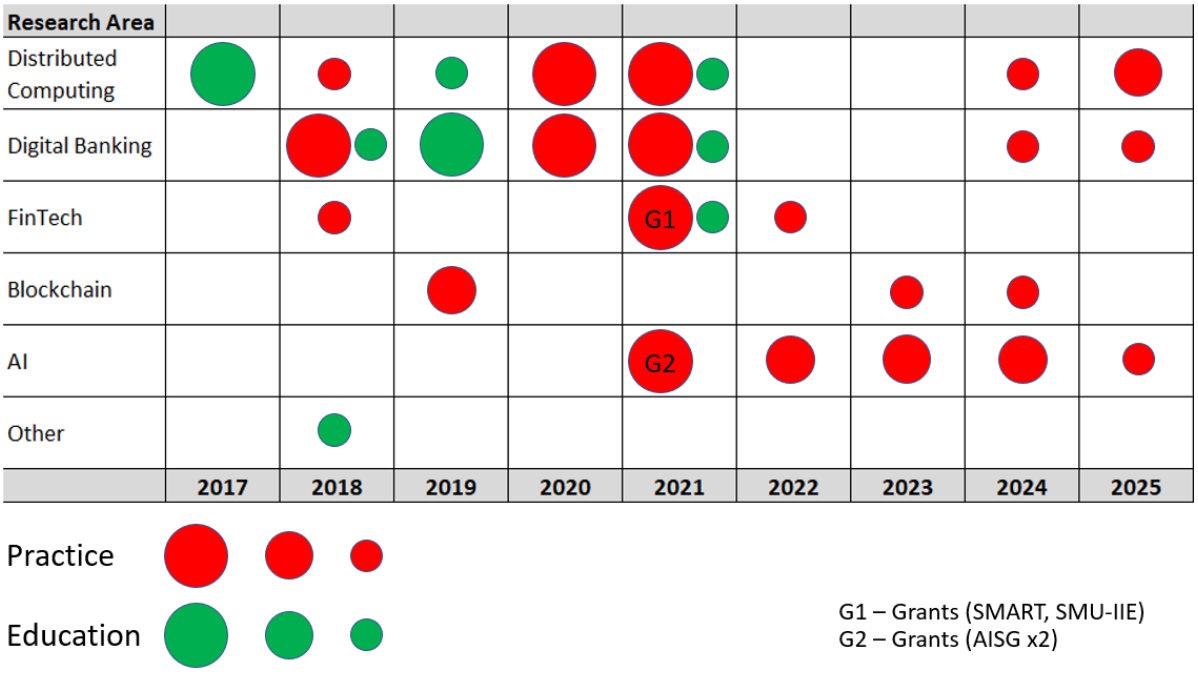
- What are the inhibitors (barriers-to-entry) for digital banking?
- How can traditional banks overcome these barriers?
- Once digitalized, what can digital banks do better than traditional banks?

- What is the role of SOA/microservices architecture in digital banking?
- How can banks accelerate their adoption of SOA/microservices architecture?
- How can banks migrate from their legacy monolithic core banking systems to a cloud-based microservices architecture without changing any application code?

- How can AI improve the efficiency of digital bank customer onboarding?
- How can AI optimize FX risk management (FX hedging) for digital banks?
- How can AI improve the efficiency of digital bank back-office operations?

How my work has evolved over time

Even though most of my research work has occurred from 2017 onward, a shift in focus is observable during this period. Figure 3 below illustrates the evolution of my research focus over time. During 2017-2019, my research outputs were evenly split between practice-based papers and pedagogical papers. In contrast, during 2020-2024, my research outputs have been heavily skewed towards practice-based papers (which are more aligned to my track). During the entire period, my research outputs have been primarily focused on distributed computing (SOA/Microservices) and digital banking, and the intersection between the two. During 2021-2022 I have an additional focus on FinTech alternatives (funded by SMART and SMU-IIE grants) and AI applications in financial services (funded by two AISG grants).



My future research directions and aspirations

My research direction going forward is to continue focusing on Distributed Computing and Software Systems as applied to Digital banking and FinTech. I have developed a reputation as an expert in these areas, and I am comfortable in this domain. I have recently extended my research portfolio to include AI applications in financial services, an area which has recently become increasingly important in the Digital Banking and FinTech landscape.

I am in the unique position also having founded an SMU spin-off company, Narwhal Financial Systems (a.k.a. "Narfin"), based on my invention disclosure around SMU tBank. Literally all my practice-based research outputs have influenced or directly applied to the Narfin digital banking platform. Symbiotically, the Narfin implementation will inform my future research outputs and visa-versa going forward.

Selected Publications and Outputs

Collectively, the following papers tell a story, or describe a journey, of incumbent banks' transformation from traditional banking to digital banking, from a technology architecture perspective. These papers are practice-based, leveraging my banking industry experience as enterprise architect and CTO, with the aim of guiding banking industry practitioners through their digitalization journey, as well as contributing to the academic knowledge in this area. The list only includes papers where I am the first author.

1. Megargel, A., Shankararaman, V., & Fan, T.P.C. (2018). SOA maturity influence on digital banking transformation. *IDRBT Journal of Banking Technology*, *2*(2), 1.

2. Megargel, A., Shankararaman, V., & Reddy, S. K. (2018). Real-time inbound marketing: A use case for digital banking. In *Handbook of Blockchain, Digital Finance, and Inclusion, Volume 1* (pp. 311-328). Academic Press.

3. Megargel, A., Shankararaman, V., & Walker, D. K. (2020). Migrating from Monoliths to Cloud-Based Microservices: A Banking Industry Example. In *Software Engineering in the Era of Cloud Computing* (pp. 85-108). Springer.

4. Megargel, A., & Shankarararman, V. (2020). Digital Banking Accelerator: A Service-Oriented Architecture Starter Kit for Banks. *IEEE Software*.

5. Megargel, A, Fan, T.P.C., Shankararaman, V., & (2019). SMU Teaching Bank: Case Study of a Multiyear Development Project Utilizing Student Resources. *AIS SIGED International Conference on Information Systems Education and Research*, Munich, Germany. [**BEST PAPER AWARD**]

6. Megargel, A., Poskitt, C. M., & Shankararaman, V. (2021). "Microservices Orchestration vs. Choreography: A Decision Framework," *2021 IEEE 25th International Enterprise Distributed Object Computing Conference (EDOC)*, 2021, pp. 134-141, doi: 10.1109/EDOC52215.2021.00024.

7. Megargel, A., Shankararaman, V., & Arul, O. K. (2025). Transformation of digital banking back-office operations using AI. In *Handbook of Blockchain, Digital Finance, and Inclusion, Volume 3* (pp. 183-198). Academic Press.

Paper (1) was an empirical study which revealed the barriers-to-entry, e.g., legacy systems, which inhibit traditional banks from becoming digital. A key finding was that SOA maturity plays an important role in overcoming these barriers.

Paper (2) describes how digital banks enhance customer experience and proposes an architecture for realtime inbound marketing. The paper presents a set of complex event processing patterns to support this use case.

Paper (3) proposes a systematic approach for migrating from legacy monolithic core banking systems to a cloud-based microservices architecture, with minimal impact to the bank's existing systems. This approach was developed using SMU tBank as a testbed and was later proven at O-Bank (Taiwan) which referenced the SMU tBank architecture. This is my most highly cited paper.

Paper (4) presents a "digital banking accelerator", an SOA starter kit for banks, based on the SMU tBank architecture, which reduces the SOA implementation time by one year. The paper described in detail the SOA implementation at O-Bank, mentioned above in paper (3).

Paper (5) provides a case study of the SMU tBank multiyear development journey. The paper won the [**BEST PAPER AWARD**] at AIS-SIGED 2019. The resulting digital banking architecture forms the background IP which has since been uplifted to a commercial-grade digital banking platform (the foreground IP). The foreground IP has been licensed to an SMU spin-off company which I have founded called Narwhal Financial Systems (a.k.a. Narfin).

Paper (6) compares two microservice collaboration patterns, namely choreography and orchestration, and proposes a decision framework to help solution architects choose an appropriate pattern. Bank case studies are used to demonstrate the decision framework.

Paper (7) provides a case study of how four banks in SE Asia use AI technology to transform their back-office operations spanning across retail, corporate, and investment banking. It then proposes a maturity model for guiding the AI adoption in bank back-office operations.