Opening Panel: The Next Generation of Services and Agenda for Finance, Economic, Management and IT Business

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Application of Business Process Modelling and Blockchain Technologies for Financial Cloud

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Main Theme

- Digital economy, digital currencies, and advancement in information technology have contributed to tremendous growth in the global economy and financialisation.
- In order to have contributed sustain this growth, a systematic approach is necessary for all aspects of the financial process and applications.
- To a certain extent, it has also created problems in social and economic instability. In order to minimize damaging impacts caused by the lack of regulatory compliance, governance, ethical responsibilities and trust, we have been applying rigorous business requirements analysis framework known as Business Integrity Modelling and Analysis (BIMA) and detailed Business Process Modelling and Simulation (BPMN) techniques to unify business integrity with business performance using by intelligent big data predictive analytics and business intelligence.
- This talk will provide an application of BPMN for financial application as a Service and will also provide an overview of blockchain technology adoption for the financial cloud.

Blockchain Technology (Gary Wills, University of Southampton)
In this talk...

- Digital Economy and Knowledge Capital (Information Age)
- Business Case for this talk (Motivation and Research Statement)
- Why BPM (Business Process Management = BPMN+CMMN+DMN) for Financial Services and Financial Cloud Based Applications?
- Business Integrity Modelling and Analysis (BIMA)
- BIMA, BPMN, Domain Modelling, and SOA Driven Approaches to Financial Cloud (FC) Based Applications
- Predictive Modelling & Technologies for FC: AI, ML, Smart Devices, IoTs, Cloud, Blockchain Technologies
- Blockchain Technology (Gary Wills, University of Southampton)
- Conclusion and Questions
DIGITAL ECONOMY, KNOWLEDGE CAPITAL, ICT BUSINESSES & GROWTH PREDICTIONS
Value of Digital Economy

2016

15.5% of Global Economy is Digital
2.5X Digital Economy Growth vs Global Economy Growth
6.7X Digital Investment ROI vs Non-Digital Investment ROI

2025

24.3% of Global Economy is Digital
$23T Digital Economy worth
$500 Equivalent extra income for average worker
Digital Economy Impacts on GDP Growth

GDP growth in 2016-2018 (%)

- **Global**: 2.3, 2.9, 2.7
- **Asia-Pacific**: 4.1, 4.4, 4.0
- **China**: 6.7, 6.8, 6.5

IDC
Components of Digital Economy

- IT/ITeS: 160 (2016-17) vs 350 (2024-25)
- Electronics: 100 (2016-17) vs 300 (2024-25)
- Telecom: 80 (2016-17) vs 150 (2024-25)
- Ecommerce: 30 (2016-17) vs 150 (2024-25)
- Digital payments: 3 (2016-17) vs 50 (2024-25)
- Cyber security: 18
- IoT: 6
- Sharing economy: 1
- Digital skilling: 15

Total: $413 bn (2016-17) vs $1.15 trillion (2024-25)

* Projections | @ Internet of Things
Connected Devices

Present: Internet of Things

50 Billion Connected Devices by 2020

Adoption rate of Digital infrastructure: 5x faster than electricity and Telephony

Timeline

Source: Cisco Internet of Things Report; Cisco Consulting Analysis
Business and knowledge Capital

- Business Productivity is boosted through efficient use of data by 5-10%.
- Internet openness.
- 65% of kids today will do jobs that haven't been invented yet.
- Jobs & skills.
- Global connectivity: 14 billion connected devices in OECD homes by 2022.
- Trust in leading countries: 90% of internet users bank online, and 80% shop online.
The most recent report also shows that the number of technology brands (20%) and their value (US$872.6 billion, 40%) are much greater than other industries (see Figure 1.1). The value of the financial services industry is only US$160.2 billion with thirteen brands. This difference of number and value of brands in the tech and financial industries is due to the difference in strategy toward innovation and digitalization.
BUSINESS CASE FOR THIS TALK: FINTECH
Fintech: Ant Financial Services, China (Business Case for this talk...)

Figure 1. Ci Ren Ge Dan uses Ant Financial’s services to receive and make payments for the tent store he operates at the foot of Mount Everest, 5,200 meters above sea level.

Figure 2. Zhang Yousheng, a herdsman, uses Ant Financial microloans to purchase calves and fodder.
Digital revolution vs. Challenges for Financial Service Sectors: Fintech Claims

- FINANCIAL TECHNOLOGY, ALSO known as fintech, is a fast-evolving field that has reshaped the financial industry.

- Financial service providers face major challenges when digitizing service for the future economy: Customers and Businesses vs. Low-cost vs. Fast vs. Risks vs. Trust vs. Intelligent Way of providing business services

- Ant Financial focuses on five technologies: Blockchain, AI, Security, IoT, and Computing (BASIC) or also known as AI, Blockchain, Cloud, Data Analytics (ABCD)

- Ant Financial has redefined digital financial services, specifically mobile payment and microloan services, and Ping An Technology has developed.

- The innovation of QR payment builds a point-of-sale transaction (offline payment) for remote villages in the foot steps of mount Everest. Decisions made instantly for microloans and car accidental damages with customer sent photos
Main Finding of Fintech

Their main findings

- Blockchain provides a new trust mechanism to transactions
- Deep learning and natural language processing technologies helped intelligent customer service robots achieve higher customer satisfaction rates than live service staffs
- AI Assessment of Claims and Risks for Insurance and Loans Sectors
Therefore, it is essential to design and implement well proven business processes which is customer driven.
The Future is here!

Why SOA? Multitude of devices, seamless data, intelligence, multitude of software, systems, services, and platform integration, and predictions. The Future is here!

SOA is a formalised way of integrating applications existing traditional applications and legacy systems) into an enterprise architecture and hence suitability for connecting IoEs.
YESTERDAY: GADGETS ARE EVERYTHING

Cool toys...

Too bad they can’t talk to each other...
TODAY: COMMUNICATION IS EVERYTHING
Tomorrow: Service is Everything: they communicate, compose new services, and self recover themselves.

MC10’s Biostamp: wireless health reading data

A Robot Penguin chick to monitor others (IoT)
The main focus and purpose is customer driven methods, processes (applicable to both traditional as well as Agile based), and technologies
Example SOA Design: Muthu SOA Architecture for Big Data Applications (Ramachandran 2017, CRC Book Chapter)

Service Requirements with BPMN
- Initial process models: Actors/roles/Workflows
- Detailed workflows
- Service Task modelling
- UI prototyping
- Process Simulation:
  - Configure Resources need for tasks
  - Load profiles in sec/min/days/no.of instances
  - Start the Process Simulation as a Service (PSSaaS)

SOA Requirements with use case modelling, story cards, (Agile), Story Boards, CRC Cards, Feature-Oriented modelling

SOA Design with Service Component Models (Design Techniques using UML component model & SoaML)

SOA Implementation with SOAP/RESTful

SOA Test & Deliver
Why BPM (Business Process Management = BPMN+CMMN+DMN) for Financial Services and Financial Cloud Based Applications?

WHAT & WHY BPMN-CMMN-DMN?
(BUSINESS PROCESS MODELLING NOTATION FOR BUSINESS PROCESS MANAGEMENT)
What is BPMN?

Why BPMN?

The life cycle comprises the management activities of analysis, design, implementation, enactment, monitoring and evaluation:

- Allows us to identify services
- Useful as a Requirements Engineering method
- Allows us to study process effectiveness, performance, and efficiency requirements
- Validating Big Data Analytics (learn from existing business process effectiveness)
- Evaluation of services, business, etc
- We can’t guarantee QoS if we haven’t validated the planned business process
- Changing nature of the businesses
- Managing Digital revolution: Service and cloud computing, Big Data, IoT, and Blockchain Technologies
BPM Life Cycle
Business Requirements Gathering Technique

- Service Requirement Analysis
- Business Requirements Gathering and Specification from stakeholders
- Target Goals
- Predict Business Performances
Business Process Design, Simulation, and Validation

- Model or Design Business Process
- Manage Resources
- Simulation
- Change Management
- Validation and Testing

Business Process Design and Simulation with BPMN
BPM: the “secret sauce” of SOA

The relationship among BPM, services, and components
Davis, J (2009) Open Source SOA, Manning Publisher
Since the early nineties, Work Flow Management Systems (WFMSs) have been developed as a global market for organizations to implement within their businesses.
Triple Crown Processes

- BPMN (Business Process Modeling Notation) is the new developing detail for making the rupture between the business procedure plan and the procedure execution.
- CMMN (Case Management Modelling Notation) is pushing the boundary to create easy to use software and the newest addition,
- DMN (Decision Modelling Notation) is empowering business flexibility.
- OMG standards
Why Should You Care?

- Processes are at the core of any organisation, yet they are not always clearly defined, documented or optimised.
- The need to bridge the communication gap between business and IT is stronger than ever.
- As the rate of change in the business environment increases and with greater pressure to become more efficient; organisations must form a clear view of how their processes operate.
- BPMN offers a notation that you can use to document your own processes without ambiguity.
BPMN: Business Process Modelling Notation
CMMN: Case Management Modelling Notation
DMN: Decision Modelling Notation
Example BPMN Model for a Cloud Data Security Process

Start

Login Required

Login Approval

Yes

Approved

Login in

System

Cloud Provider

Upload Data

Data Status Decision

Data in Transit

Data in Use

Security Centre

End
BPMN provides four variants of timer event, with two of them being interrupting events and the other two being non-interrupting events. Usually, an interrupting event would abruptly interrupt the execution of an ongoing subprocess or task when a deadline is reached. An non-interrupting event, on the other hand, is used for triggering some background and/or parallel processing at a given time, without stopping the ongoing process.

BPMN timers is useful to write smart contracts for Blockchain Technology. Smart Contracts are computer programs that can be deployed and ran on the blockchain. The Ethereum consortium has defined the following contract-oriented programming languages: Serpent[Ethb] or Solidify[Ethc]
Simulation Result

Upload Data Instances Execution Time
represents the execution times of simulated activity instances through the total simulation timespan

Execution Time in Hours

0 25 50 75 100 125 150 175 200 225 250

14-Apr 21-Apr 28-Apr 5-May 12-May 19-May 26-May 2-Jun
Automation and code generation tool from BPMN Engine
WORKFLOW MANAGEMENT WITH BPMN
Represents an example of a Work Flow Management System in a business setting
We can simulate and validate workflow & required resources within minute with BPMN simulation tools.
Represents an error and to identify business risks occurring during the “Handle Order” activity
Verify and Validate Business Rules and Risks with SLA and Smart Contract in Blockchain Technology
Decision Management Notation (DMN) allows to validate Business Risks

Component | Notation | Description
---|---|---
Decision | ![Decision Notation](image1) | Signifies a point where an output is determined from one or more several inputs, using decision logic. It might require at least one business knowledge models.
Knowledge Source | ![Knowledge Source Notation](image2) | Portrays an authority, which must be considered amid a decision or business model function.
Input Data | ![Input Data Notation](image3) | Input Data components contain data which is utilized by one or a few decisions as well as business knowledge models.
Business Knowledge Model | ![Business Knowledge Model Notation](image4) | Capacities giving logic to one or various decision components e.g. business rules, analytical model
DMN simulation allows quick validation of the Business Decisions

![Diagram showing decision nodes and data flows]

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BPMN Tools

- **Commercial BPMN Tool Reviews**
  - [Enterprise Architect (Sparx Systems)](https://www.sparxsystems.com/)
    Rated 3.5 stars
  - [MagicDraw (No Magic)](https://www.magicdraw.com/)
    Rated 3.5 stars
  - [UModel (Altova)](https://www.altova.com/)
    Rated 3 stars
  - [Visual Paradigm (Visual Paradigm)](https://visualparadigm.com/)
    Rated 3 stars
  - [Rational Software Architect (IBM)](https://www.ibm.com/)
    Rated 2.5 stars
- **Free & Open Source BPMN Tool Reviews**
  - [Modelio (Open Source)](https://modelio.org/)
    Rated 2.5 stars
  - [BonitaSoft,](https://www.bonitasoft.com/)
CLOUD DEPLOYMENT MODELS
Cloud Deployment Models

Public Cloud

Private Cloud

Community Cloud

Hybrid Cloud
Three key services in cloud computing (BMC Blogs, 2019)

- **On-Premises**
  - Applications
  - Data
  - Runtime
  - Middleware
  - O/S
  - Virtualization
  - Servers
  - Storage
  - Networking

- **Infrastructure as a Service**
  - Applications
  - Data
  - Runtime
  - Middleware
  - O/S
  - Virtualization
  - Servers
  - Storage
  - Networking

- **Platform as a Service**
  - Applications
  - Data
  - Runtime
  - Middleware
  - O/S
  - Virtualization
  - Servers
  - Storage
  - Networking

- **Software as a Service**
  - Applications
  - Data
  - Runtime
  - Middleware
  - O/S
  - Virtualization
  - Servers
  - Storage
  - Networking

*You Manage* vs. *Other Manages*
FINANCIAL CLOUD APPLICATIONS & TECHNOLOGIES
Improving the use of Current Technologies for Fintech Growth (Digital Transformation)

- It was inevitable that technology would meet finance and spawn fintech.
- The use of technologies like algorithmic machine learning, collecting massive amounts of data and interpreting them for decision-making or “crystal-ball” predictions (predictive analytics), and distributed ledgers (blockchain) in financial industry will give rise to innovative business models with increased levels of efficiency, productivity, cost-effectiveness while also improving on customer-centricity.
- The most important thing and also a great challenge for both fintech platforms and financial institutions is to adopt and implement a very pertinent, practical, and transparent strategy for digital transformation within the organization as well as in external engagements.
FinTech Growth
Current Applications

- Crowdfunding
- Peer-to-Peer (P2P) Finances: Lending & Loan
- E-Banking
- E-Insurance
- E-Investments
- E & M-Commerce
Technologies

- E-Commerce
- Machine Learning and AI
- Big Data Analytics
- Predictive Analytics for Decision-Making (Crystal-ball)
- Blockchain
- IoT
- Cryptocurrencies (Bitcoin vs Ethereum (ETH))
Integrated Financial Cloud Services
Financial Cloud Services
Simultation View of the Financial Cloud Services
Reference Framework for Financial Cloud Services
Event Logs Data of Loan Application Process for a Dutch Financial Institution between 2012-17 as part of BPI Challenge, https://tinyurl.com/bpic2017
BUSINESS INTEGRITY MODELLING AND ANALYSIS (BIMA)
Relationship between business integrity and performance

Business performance vs. integrity: identifying and managing risks on governance, social responsibility, process, etc. and to integrate them with Business Information Technologies
The evolution from managing individual integrity for policy, process, and information to managing

Today

- **Policies**
  - Policies not consistently understood or followed

- **Processes**
  - Incomplete view of process execution

- **Information**
  - Inconsistent information in multiple sources

Emerging

- **Policy Integrity**
  - Formal standards and policy management solutions

- **Process Integrity**
  - Formal standards and process management solutions

- **Information Integrity**
  - Master Information Management: a single semantic definition of core entities

Future

- **Business Integrity**

- **Policy**

- **Process**

- **Core Entities**

- **Master Information Management**: a single semantic definition of core entities (e.g. customer, employee, product)
- **Policy integrity**: Common and/or Best Practices (e.g. accounting practices) stored in policy repository/warehouse
- **Process integrity**: Standardized Business Processes (e.g. enterprise process framework) stored in Process Warehouse (e.g. catalog, models, metadata)
The Pillars of Business Integrity Driven Approach to Implementing Financialization

Our approach to financialization, through the use of the BIMA framework, is the adoption of big data processing and analysis services (BDPAS), which typically run advanced algorithms and advanced formulas to simulate complex, large-scale and real-time financial calculations. BDPAS can process thousands of data at once within seconds with well established algorithms for financial predictions Monte Carlo simulation, Black Scholes Merton model and Heston to model for performing financial and operational risk analysis and present outputs in the form of analytics and visualization.
Key points

- Decisions making is a huge challenge for financial applications and services where AI, ML, Deep Learning can help making decisions and predictions faster.

- Blockchain technology can help building trust with application of BPM and BIMA framework.
References

- **Fintech: AI Powers Financial Services to Improve People’s Lives** BY YUAN QI/ANT FINANCIAL, JING XIAO/PING AN TECHNOLOGY (SHENZHEN) CO., LTD. NOVEMBER 2018 | VOL. 61 | NO. 11 | COMMUNICATIONS OF THE ACM