Building Trust in AI and Data Analytics

MAS "Principles for the use of Artificial Intelligence and Data Analytics" and their impact on Financial Services organisations in Singapore

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Introduction

The need for responsible artificial intelligence

On 12 November 2018, the Monetary Authority of Singapore (MAS) released a set of generally accepted principles to promote fairness, ethics, accountability and transparency (FEAT) in the use of artificial intelligence and data analytics (AIDA) in Singapore's Financial Sector[1]. In this paper we summarise the Principles and assess their impact on banks, asset managers and insurance companies in Singapore. Implementing the essence of the Principles may require upfront investment in client interfaces, data governance, model validation frameworks and control procedures. On the other hand, developing and deploying AI and data analytics in a responsible manner will allow companies to increase stakeholder trust and shareholder value in an increasingly digital and connected world.

PwC has estimated[2] that AI will add USD 15.7 trillion to global GDP by 2030, making it the biggest opportunity in today's fast changing economy. AI systems augment human decision making and continuously learn from their interactions with humans and the environment. New technologies often bring new fears, and in recent years concerns have grown over how AI could impact privacy, cybersecurity, employment, inequality and the environment. Stakeholders are questioning whether AI can be trusted. Ensuring that AI systems are trustworthy and responsible has therefore become a top priority and challenge for companies. PwC has identified[3] five aspects of responsible AI:

Fairness: Are we minimizing bias in our data and AI models? Are we addressing bias when we use AI?

Interpretability: Can we explain how an AI model makes decisions? Can we ensure those decisions are accurate?

Robustness and security: Can we rely on an AI system's performance? Are our AI systems vulnerable to attack?

Governance: Who is accountable for AI systems? Do we have the proper controls in place?

System ethics: Do our AI systems comply with regulations? How will they impact our employees and customers?

[1] http://www.mas.gov.sg/News-and-Publications/Media-Releases/2018/MAS-introduces-new-FEAT-Principles-to-promote-responsible-use-of-AI-and-data-analytics.aspx
[2] https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html
[3] https://www.pwc.com/us/en/services/consulting/library/artificial-intelligence-predictions-2019

Responsible AI in national strategies and policies

As the development and adoption of AI accelerate, countries are racing to catch up by releasing AI strategies and policies[4]. While most national policies focus on promoting AI technological development and industrial applications, we see increasing attention given to the risks, ethics and security of AI. The following table recounts recent developments in the European Union, the United Kingdom, the United States, China and Singapore.

Developments towards responsible AI in national strategies and policies			
Jurisdiction	**Development**	**Date**	**Responsible AI focus**
European Union	"Communication Artificial Intelligence" released[5]	April 2018	Ethical principles, accountability, transparency
	Expert Group on AI appointed[6]	October 2018	Ethical, legal and societal issues
United Kingdom	Centre for Data Ethics and Innovation[7] created as part of "AI Sector Deal"[8]	April 2018	Ethical uses of data
United States	"Leadership in AI" named second highest R&D priority for fiscal year 2020[9]	August 2018	N/A
	National Security Commission on Artificial Intelligence created[10]	August 2018	Ethical issues
China	"Next Generation Artificial Intelligence Development Plan" released[11]	July 2017	Ethical norms, policy systems, security, control
Singapore	Advisory Council on the Ethical Use of AI and Data established[12]	June 2018	Ethics standards, governance frameworks
	"Discussion Paper on AI and Personal Data" published by Personal Data Protection Commission[13]	June 2018	Explainable, transparent and fair decisions

[4] https://medium.com/politics-ai/an-overview-of-national-ai-strategies-2a70ec6edfd
[5] https://ec.europa.eu/digital-single-market/en/news/communication-artificial-intelligence-europe
[6] https://ec.europa.eu/digital-single-market/en/high-level-expert-group-artificial-intelligence
[7] https://www.gov.uk/government/consultations/consultation-on-the-centre-for-data-ethics-and-innovation/centre-for-data-ethics-and-innovation-consultation
[8] https://www.gov.uk/government/publications/artificial-intelligence-sector-deal
[9] https://futureoflife.org/ai-policy-united-states/
[10] https://www.fedscoop.com/alphabet-microsoft-leaders-named-national-security-commission-artificial-intelligence/
[11] http://www.gov.cn/zhengce/content/2017-07/20/content_5211996.htm
[12] https://www.mci.gov.sg/pressroom/news-and-stories/pressroom/2018/6/speech-by-mr-s-iswaran-at-the-innovfest-unbound-2018-on-5-june-2018
[13] https://www.pdpc.gov.sg/Resources/Discussion-Paper-on-AI-and-Personal-Data

Summary of FEAT Principles

Fairness, ethics, accountability and transparency in the use of artificial intelligence and data analytics

Firms should consider the Principles when assessing existing or developing new internal frameworks to govern the use of AIDA and calibrate actions and requirements under their internal governance framework based on the materiality of the AIDA-driven decisions. In the following table we summarise the Principles and provide our viewpoint on each.

FEAT Principles	PwC Point of View
Fairness	
Justifiability 1. Individuals or groups of individuals are not systematically disadvantaged through AIDA-driven decisions, unless these decisions can be justified. 2. Use of personal attributes as input factors for AIDA-driven decisions is justified. Accuracy and Bias 3. Data and models used for AIDA-driven decisions are regularly reviewed and validated for accuracy and relevance, and to minimize unintentional bias. 4. AIDA-driven decisions are regularly reviewed so that models behave as designed and intended.	Financial companies employ machine learning to micro-segment clients based on a multitude of demographic, behavioural, social, transactional and other input factors. This in itself is a good thing because it creates relevant, differentiated and "client-centric" service offerings. Principles 1-4 aim to prevent unjustified differentiation and model bias, which unintentionally puts some client segments at a systematic disadvantage compared to others. Note that the Principles do not provide definitions or set criteria for "justified" vs. "unjustified". This will have to be specified in an internal governance framework.
Ethics	
5. Use of AIDA is aligned with the firm's ethical standards, values and codes of conduct. 6. AIDA-driven decisions are held to at least the same ethical standards as human driven decisions.	In the absence of a globally recognised ethics framework for AI, the Principles take a pragmatic approach by postulating that AI-enabled software or robots be held to the same ethical standards and values as human employees.
Accountability	
Internal Accountability 7. Use of AIDA in AIDA-driven decision-making is approved by the appropriate internal authority. 8. Firms using AIDA are accountable for both internally developed and externally sourced AIDA models. 9. Firms using AIDA proactively raise management and Board awareness of their use of AIDA.	Internal accountability for AIDA-driven decisions and AIDA models can be viewed in the context of the "Guidelines on Individual Accountability and Conduct" that the MAS issued for consultation on 26 April 2018[14]. When firms build an internal governance framework and standards of conduct for individual accountability, they should ensure that Principles 7-9 are included. Similarly, accountability for externally sourced AIDA models should be implemented in conjunction with the revised MAS Guidelines on

[14] http://www.mas.gov.sg/News-and-Publications/Consultation-Paper/2018/Consultation-Paper-on-Proposed-Guidelines-on-Individual-Accountability-and-Conduct.aspx

	Outsourcing Risk Management[15] and the MAS Technology Risk Management Guidelines[16].
External Accountability 10. Data subjects are provided with channels to enquire about, submit appeals for and request reviews of AIDA-driven decisions that affect them. 11. Verified and relevant supplementary data provided by data subjects are taken into account when performing a review of AIDA-driven decisions.	The original text provides very little guidance on the type of communication channels to be provided to data subjects, what criteria can be used to decide whether an appeal or recourse is justified, how detailed any review of AIDA-driven decisions should be and what constitutes verified and relevant supplementary data.
Transparency	
12. To increase public confidence, use of AIDA is proactively disclosed to data subjects as part of general communication. 13. Data subjects are provided, upon request, clear explanations on what data is used to make AIDA-driven decisions about the data subject and how the data affects the decision. 14. Data subjects are provided, upon request, clear explanations on the consequences that AIDA-driven decisions may have on them.	Principles 13-14 essentially ask firms to provide information (using clear and non-technical language) on the input factors and potential output scenarios of a statistical or machine learning model – without going as far as revealing the underlying intellectual property. Implementing Principles 13-14 to the full extent will require significant changes to client interfaces and potentially to the models themselves. Note that data subjects have similar transparency rights under EU GDPR, e.g., Article 13 (“Information to be provided where personal data are collected from the data subject”) and Article 22 (“Automated individual decision-making, including profiling”)[17].

[15] http://www.mas.gov.sg/News-and-Publications/Media-Releases/2016/MAS-Issues-New-Guidelines-on-Outsourcing-Risk-Management.aspx
[16] http://www.mas.gov.sg/Regulations-and-Financial-Stability/Regulatory-and-Supervisory-Framework/Risk-Management/Technology-Risk.aspx
[17] https://gdpr-info.eu/

Impact of the FEAT Principles

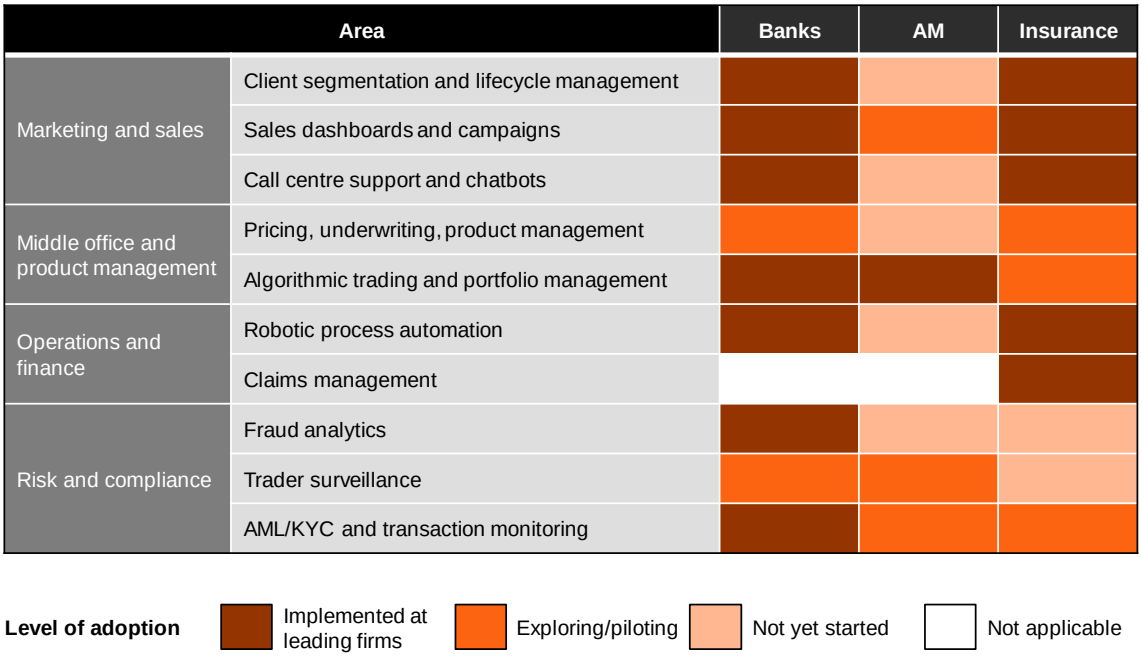
Practical considerations for banks, asset managers and insurance companies

The Principles are not intended to be prescriptive but can serve as a rough blueprint of a yet to be designed regulatory framework for AIDA in Singapore. Even though rules and regulations on AI may still be a few years away, business and risk professionals are well advised to start familiarising themselves with the Principles and consider how they will impact client-facing and internal processes and procedures.

Current levels of adoption of AIDA within the Financial Services industry

Banks, asset managers and insurance companies have adopted AIDA to various degrees.

- Leading banks have implemented machine learning technologies in marketing, sales, trading, risk and compliance. In addition they are automating operations and finance processes using intelligent automation (a combination of Robotic Process Automation and AI)[18].
- Asset managers are using machine learning models for trading, portfolio management and advisory. They are now evaluating AIDA-supported solutions for research, trader surveillance, regulatory compliance (AML/KYC) and front-to-back intelligent automation[19].
- Insurance companies were quick to roll out machine learning for client segmentation, call centre support, underwriting and claims management. They are now looking to build digital and data-enabled risk and compliance functions.



[18] https://www.pwc.com/us/en/industries/financial-services/research-institute/top-issues/artificial-intelligence.html
[19] https://www.pwc.com/gx/en/industries/financial-services/publications/pressure-on-profitability.html

For an overview of technological advances in the Financial Services industry see also PwC's global report "Financial Services Technology 2020 and Beyond"[20].

Implementation considerations

Below is a list of recommended actions (on the basis of the Principles) that firms should undertake in order to implement fair, ethical, accountable and transparent AI and Data Analytics. Some are specific for banking, asset management or insurance, others apply to all Financial Services firms.

Firms	Specific	Overarching
Banks	• Provide simple simulation tools or clear explanations in online banking channels that use AIDA (e.g., lending, pricing, product recommendations) • Prepare processes and tools to deal with client recourse or requests for explanation	• Develop and roll out data governance framework covering at the minimum – Ownership of data assets – Data architecture and sourcing – Data quality criteria – Model governance and validation • Define internal accountability and oversight for AIDA-driven decisions • Document all AI models (including libraries used and input data) • Evaluate explanatory techniques, especially for deep learning models • Clarify AI-specific risks; define and implement additional controls • Ensure AIDA solutions are covered by outsourcing registry and governance
AM	• Establish detailed documentation of all AIDA-based trading and portfolio risk management models • Ensure that robo-advice to end clients (data subjects) is explainable and suitable • Implement data and model governance framework before rolling out additional AIDA technologies	
Insurance	• Provide simulation tools or clear explanations for AIDA-powered underwriting and claims management • Investigate underwriting models for bias or unjustified differentiation • Prepare processes and tools to deal with client recourse or requests for explanation	

These recommendations are not meant to be exhaustive. Business COOs and local heads of risk and compliance departments are advised to commission their own detailed AIDA risk and impact assessments to identify gaps with the Principles.

[20] https://www.pwc.com/gx/en/industries/financial-services/publications/financial-services-technology-2020-and-beyond-embracing-disruption.html

How PwC can help

Building trust in AI and data analytics

The MAS wants firms to consider the Principles “when assessing existing or developing new internal frameworks to govern the use of AIDA” with the objective to “foster greater confidence and trust in the use of AIDA”. PwC can help firms to develop and implement robust data management and AI model governance frameworks. We are familiar with data protection guidelines and can assess their impact on local and cross-border operations. Our data scientists can independently assess AI models for bias, performance and security and will be able to propose and implement technical solutions for explainability. The following is a summary of our service offerings for trusted data and AI models in Singapore.

Data

- Design and implement enterprise-wide data management framework, including
  - Data strategy
  - Policies and procedures
  - Architecture (structured and unstructured data)
  - Data quality standards
  - Governance and accountability
- Identify and protect strategic data assets
- Implement local and cross-border data privacy and confidentiality regulations
- Explore opportunities for data sharing and monetisation

AI models

- Adapt existing model governance and validation frameworks to cover AI-based models
- Amend risk management frameworks and controls
- Independently assess data and model bias
- Introduce explainability and interpretability to AI systems
- Monitor performance, robustness and security of AI models
- Implement enterprise-wide accountability for AI applications and consistency of operations
- Advise on local and global regulations and ethical considerations

Our team combines experience in implementing large-scale risk and regulatory transformation programmes with deep technical understanding of emerging technologies and digitalisation in the Financial Services industry. We look forward to speaking with you.

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“When used responsibly and effectively, AIDA has significant potential to improve business processes, mitigate risks and facilitate stronger decision-making.”

Monetary Authority of Singapore, “Principles to Promote FEAT in the Use of AI and Data Analytics in Singapore’s Financial Sector”, November 2018