資訊管理研討

Artificial Intelligence in Fintech, Green Finance, and Sustainability Innovation
(人工智慧應用於金融科技、綠色金融與永續創新)

時間：2022/11/28 (一) 19:10-21:30
地點：淡江大學資訊管理研究所 EMBA 城區部 D312
主持人：施盛寶 主任, 淡江大學資訊管理學系

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2022-11-28

NTPU
國立臺北大學
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戴敏育 博士
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2020 Cohort

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Accredited Educator

aws certified
Solutions Architect
Associate

aws certified
Cloud Practitioner

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國立臺灣大學 資訊管理 博士

Publications Co-Chairs, IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2013-)

Program Co-Chair, IEEE International Workshop on Empirical Methods for Recognizing Inference in TExt (IEEE EM-RITE 2012-)

Publications Chair, The IEEE International Conference on Information Reuse and Integration for Data Science (IEEE IRI)

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Outline

- AI in FinTech
  - Metaverse, Web3, DeFi, NFT
  - Financial Services Innovation and Applications
  - Technology-driven Financial Industry Development
- Green Finance, Sustainability Innovation
  - SDGs: Sustainable Development Goals
  - CSR: Corporate Social Responsibility
  - ESG: Environmental, Social, and Governance

yahoo! 新聞 台灣新生報

臺北大學 國際發光

【記者王志誠、周貞伶／新北報導】

2022年7月9日 週六 下午8:33

由臺北大學資管所戴敏育副教授領軍的「IMNTPU」跨國團隊，在第十六屆NTCIR國際資訊存取技術評估研討會上榮獲多項大獎。其中在投資者與管理者的細粒度聲明檢測的中文分析報告分項與對話系統評測（DialEval-2）的英文金塊偵測分項EnglishNuggetDetection（ND）子任務，兩項子任務皆拿下第一名的優秀成績。

國立臺北大學資管所在戴敏育副教授帶領IMNTPU跨國團隊，其成員包括資管所碩士班研究生鄧詠薇、邱沛慈與蕭婷云，以及與日本東京Zeals公司AI自然語言科學家姜天戩共同合作，參與2022 NTCIR-16研討會榮獲許多獎項，為臺北大學資管所在NTCIR研討會上，建立良好的國際聲譽。

臺北大學資管所IMNTPU團隊在投資者與管理者的細粒度聲明檢測任務（FinNUM3）中，最終在七支隊伍中脫穎而出，除了在任務中取的平均效能為所有隊伍中最佳榮獲第一名，還囊括多項大獎，包含「口頭報告獎」與「海報展示獎」。不僅在FinNUM3口頭報告中以優秀的國際簡報與問答獲得主辦單位的高度賞識與重視；在海報展示期間，以精美海報展示與生動活潑的解說，吸引大批與會人員前來駐足交流與提問，獲得超高人氣。

戴敏育表示，希望藉由此次在國際研討會的優良成果，鼓勵學生積極參與相關國際競賽，讓學生能與國際接軌。IMNTPU隊長鄧詠薇認為，整個NTCIR-16比賽從拿到資料集、模型建置到最後預測結果，花了近半年的時間，突破重重關卡，到最後甚至能順利的在研討會中發表，這一過程受益良多。從主辦方提供的專業財務分析報告資料集，進一步針對聲明內容作細粒度分析，判斷聲明內容中的數字是否為其中重要資訊，以利相關利益者更能了解數字對於專業財務報告的重要性。

副隊長邱沛慈更談到，能夠在NTCIR-16 FinNUM中文財務分析報告中獲得第一名的績效，除了團隊共同努力外，也非常感謝戴老師與姜天戩博士在過程中給予很多建議與幫助。「經過約半年的努力，IMNTPU團隊在NTCIR-16 Dial-Eval-2對話系統評測任務英文金塊偵測分項能獲得第一名，真的很高興。」副隊長蕭婷云認為，從參與國際資訊競賽的過程中，可學習到許多寶貴經驗。

校方表示，在此次競賽中，透過與來自世界各國的高手較量，展現北大資管所的研究成果，不僅能開闊國際視野，也同時能讓世界各國看到臺灣隊伍的實力。

Source: https://tw.news.yahoo.com/%E8%87%BA%E5%8C%97%E5%A4%A7%E5%AD%B8-%E5%9C%8B%E9%9A%9B%E7%99%BC%E5%85%89-123346251.html

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zeals

IMNTPU at the NTCIR-16 FinNum-3 Task: Data Augmentation for Financial Numclaim Classification

[1] Information Management, National Taipei University, New Taipei City, Taiwan
[2] Zeals Co., Ltd. Tokyo, Japan





Yung-Wei Teng [1] Pei-Tz Chiu [1] Ting-Yun Hsiao [1] Mike Tian-Jian Jiang [2] Min-Yuh Day [1,*]

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2022

IMNTPU Dialogue System Evaluation at the NTCIR-16 DialEval-2 Dialogue Quality and Nugget Detection

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[2] Zeals Co., Ltd. Tokyo, Japan





Ting-Yun Hsiao [1] Yung-Wei Teng [1] Pei-Tz Chiu [1] Mike Tian-Jian Jiang [2] Min-Yuh Day [1,*]

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AI in FinTech: Metaverse, Web3, DeFi, NFT, Financial Services Innovation and Applications

AI

in

FinTech

FinTech ABCD

AI

Block Chain

Cloud Computing

Big Data

Decentralized Finance (DeFi)

Block Chain Financial Technology

Block Chain & Bitcoin (BTC)

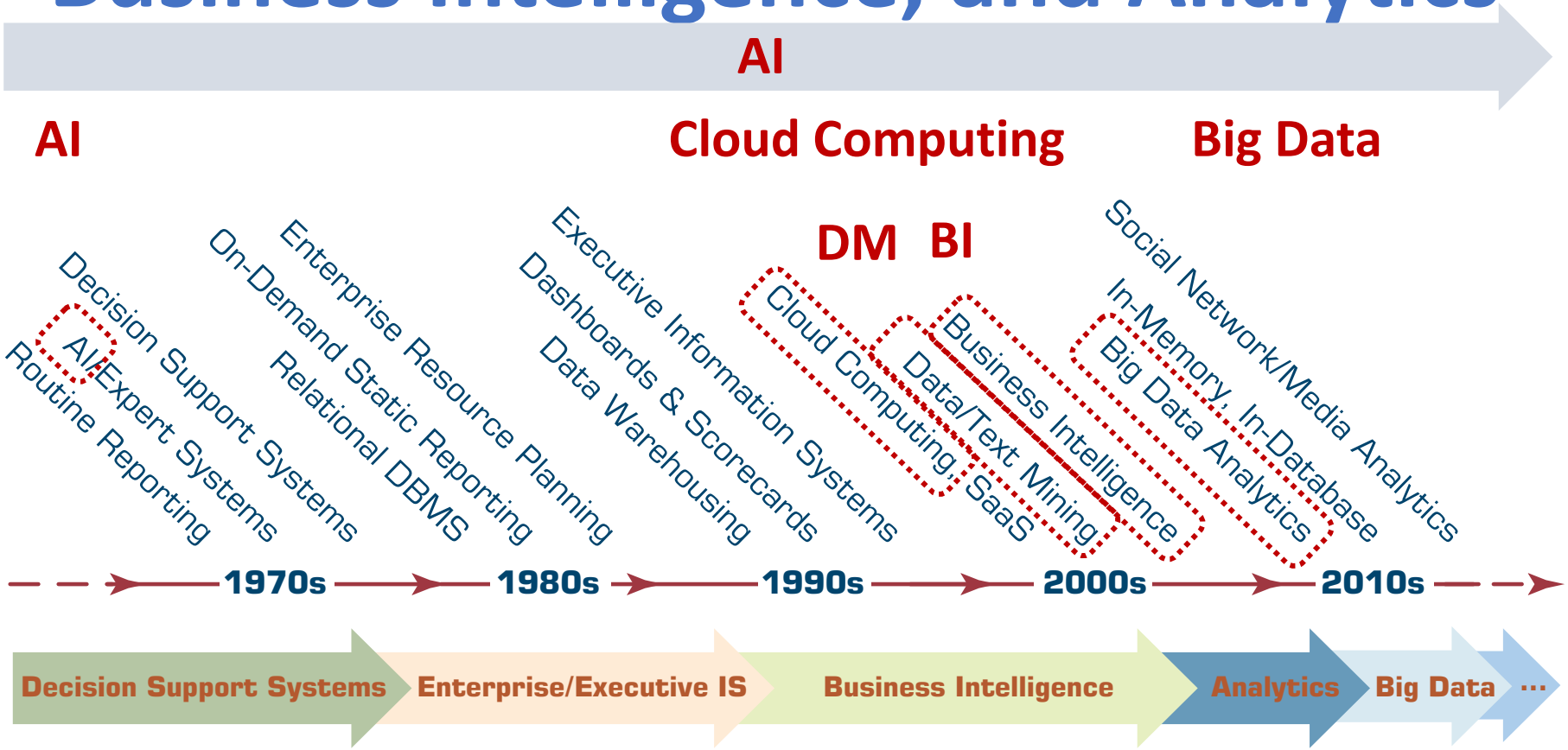
Smart Contract & Ethereum (ETH)

Decentralized Application (DApp)

Artificial Intelligence (AI)

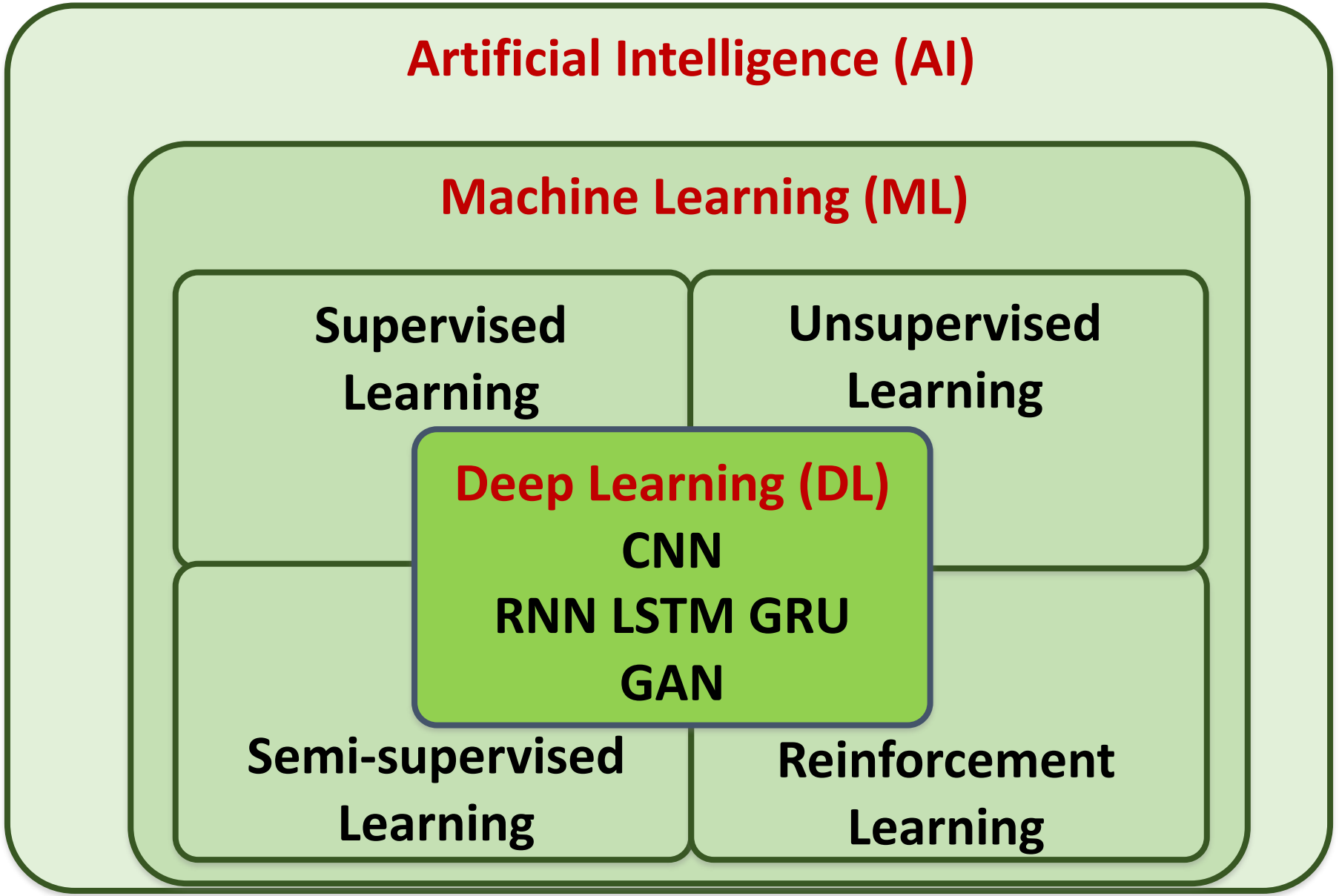
AI, Big Data, Cloud Computing

Evolution of Decision Support, Business Intelligence, and Analytics



Source: Ramesh Sharda, Dursun Delen, and Efraim Turban (2017),
Business Intelligence, Analytics, and Data Science: A Managerial Perspective, 4th Edition, Pearson

AI, ML, DL



Source: https://leonardoaraujosantos.gitbooks.io/artificial-inteligence/content/deep_learning.html

Definition of Artificial Intelligence (A.I.)

Artificial Intelligence

"… the science and engineering of making intelligent machines"

(John McCarthy, 1955)

Source: https://digitalintelligencetoday.com/artificial-intelligence-defined-useful-list-of-popular-definitions-from-business-and-science/

Artificial Intelligence

“… technology that thinks and acts like humans”

Source: https://digitalintelligencetoday.com/artificial-intelligence-defined-useful-list-of-popular-definitions-from-business-and-science/

Artificial Intelligence

"… intelligence exhibited by machines or software"

Source: https://digitalintelligencetoday.com/artificial-intelligence-defined-useful-list-of-popular-definitions-from-business-and-science/

4 Approaches of AI

Thinking Humanly	**Thinking Rationally**
Acting Humanly	**Acting Rationally**

Source: Stuart Russell and Peter Norvig (2020), Artificial Intelligence: A Modern Approach, 4th Edition, Pearson

4 Approaches of AI

2. **Thinking Humanly:** **The Cognitive Modeling Approach**	**3.** **Thinking Rationally:** **The "Laws of Thought" Approach**
1. **Acting Humanly:** **The Turing Test Approach (1950)**	**4.** **Acting Rationally:** **The Rational Agent Approach**

Source: Stuart Russell and Peter Norvig (2020), Artificial Intelligence: A Modern Approach, 4th Edition, Pearson

AI Acting Humanly:
The Turing Test Approach
(Alan Turing, 1950)

- Knowledge Representation
- Automated Reasoning
- Machine Learning (ML)
  - Deep Learning (DL)
- Computer Vision (Image, Video)
- Natural Language Processing (NLP)
- Robotics

Source: Stuart Russell and Peter Norvig (2020), Artificial Intelligence: A Modern Approach, 4th Edition, Pearson

FinTech

Financial Technology
FinTech

"providing
financial services
by making use of
software and
modern technology"

Source: https://www.fintechweekly.com/fintech-definition

Financial Technology

Financial Services

FinTech: Financial Services Innovation

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

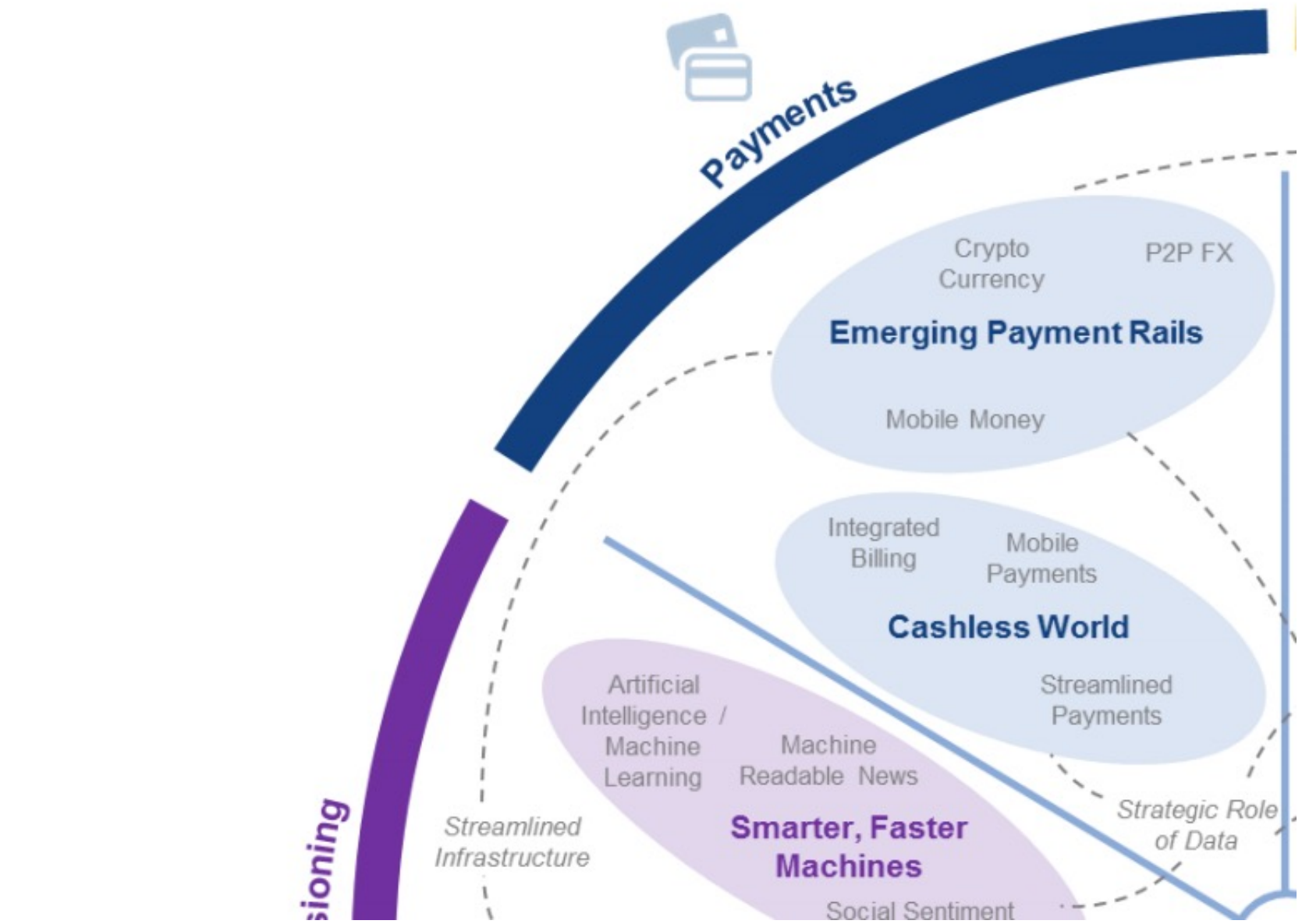
FinTech:

Financial Services Innovation

1. Payments
2. Insurance
3. Deposits & Lending
4. Capital Raising
5. Investment Management
6. Market Provisioning

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

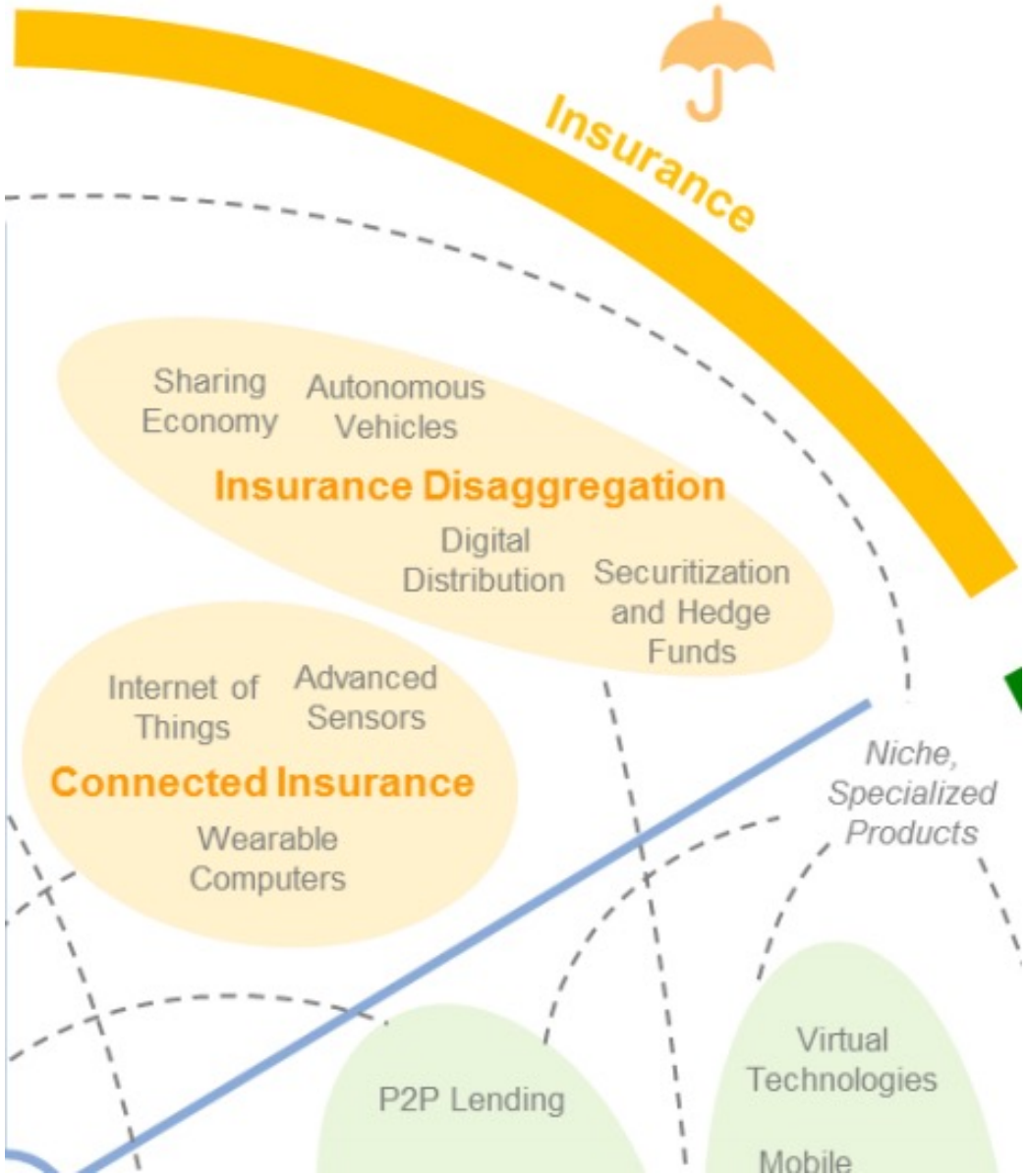
1 FinTech: Payment



Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

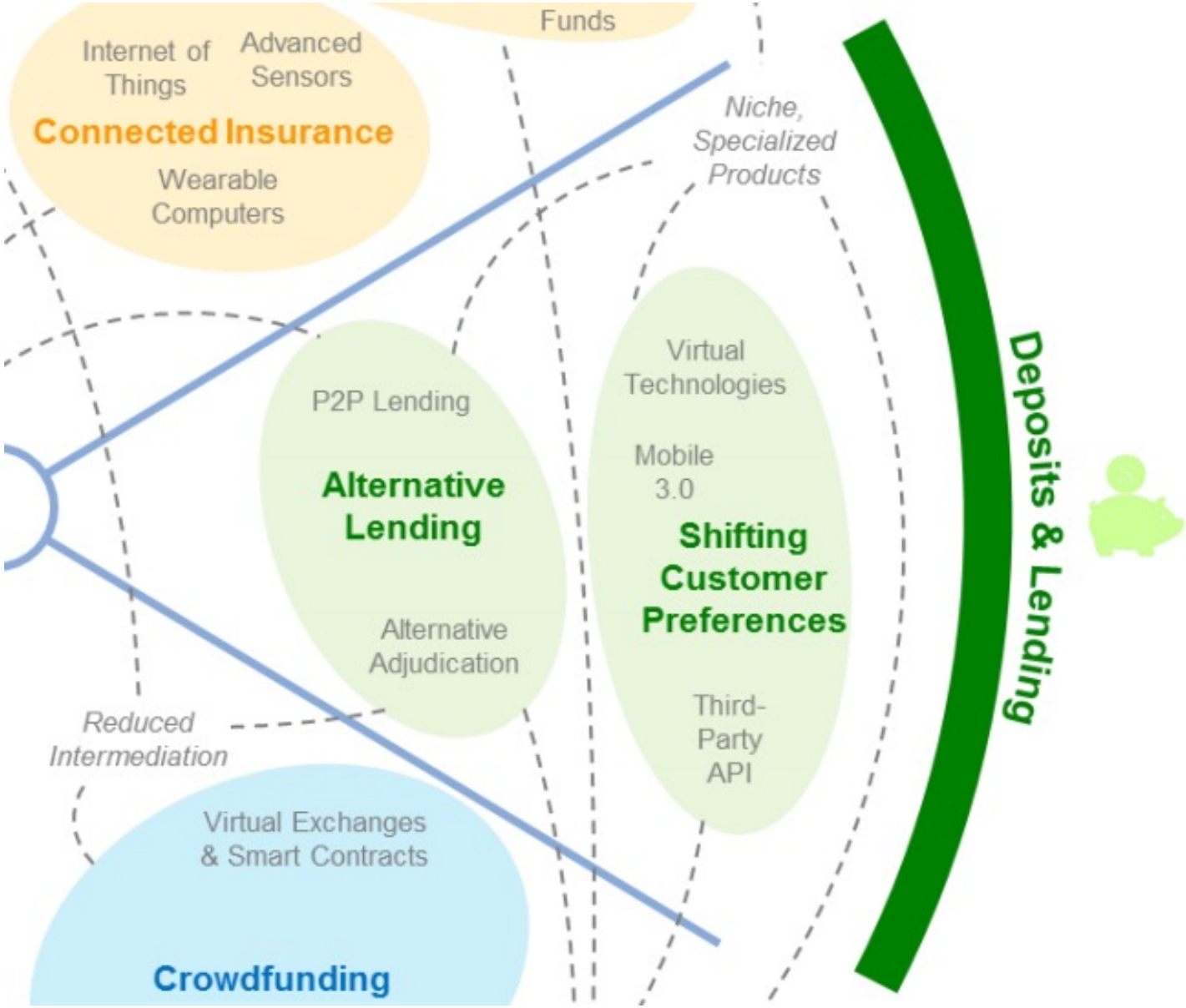
2

FinTech: Insurance



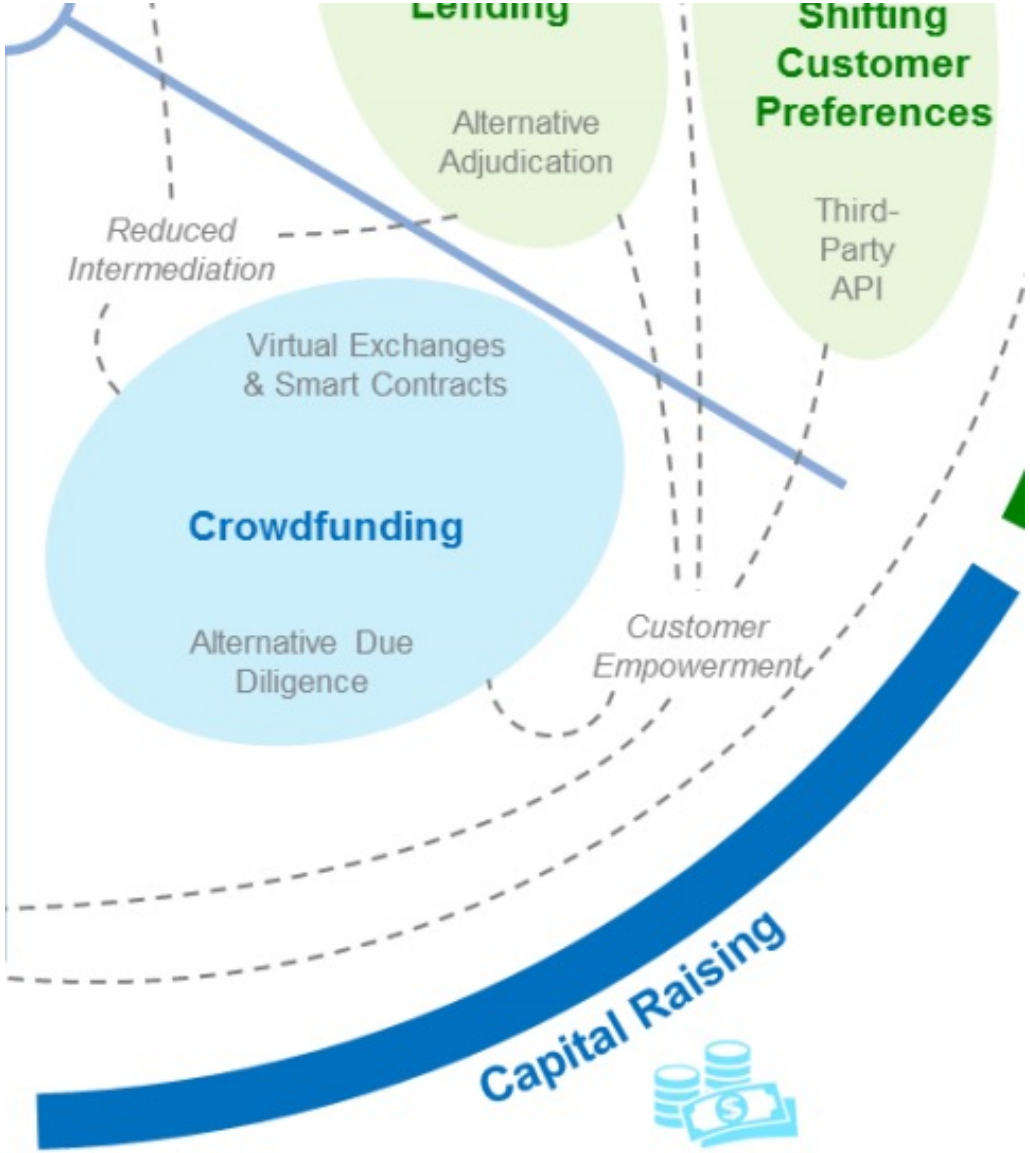
Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

3 FinTech: Deposits & Lending



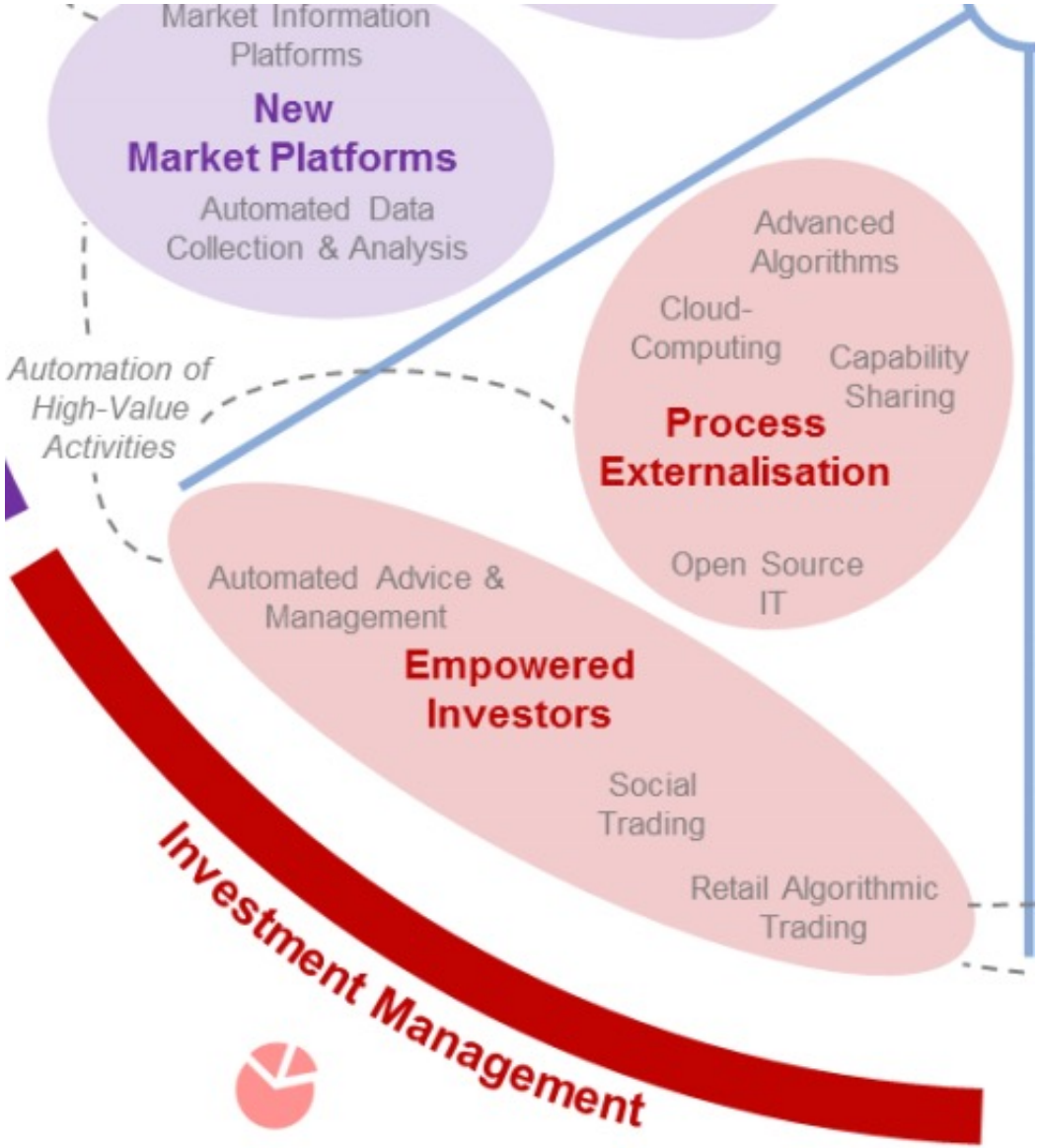
Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

4 FinTech: Capital Raising



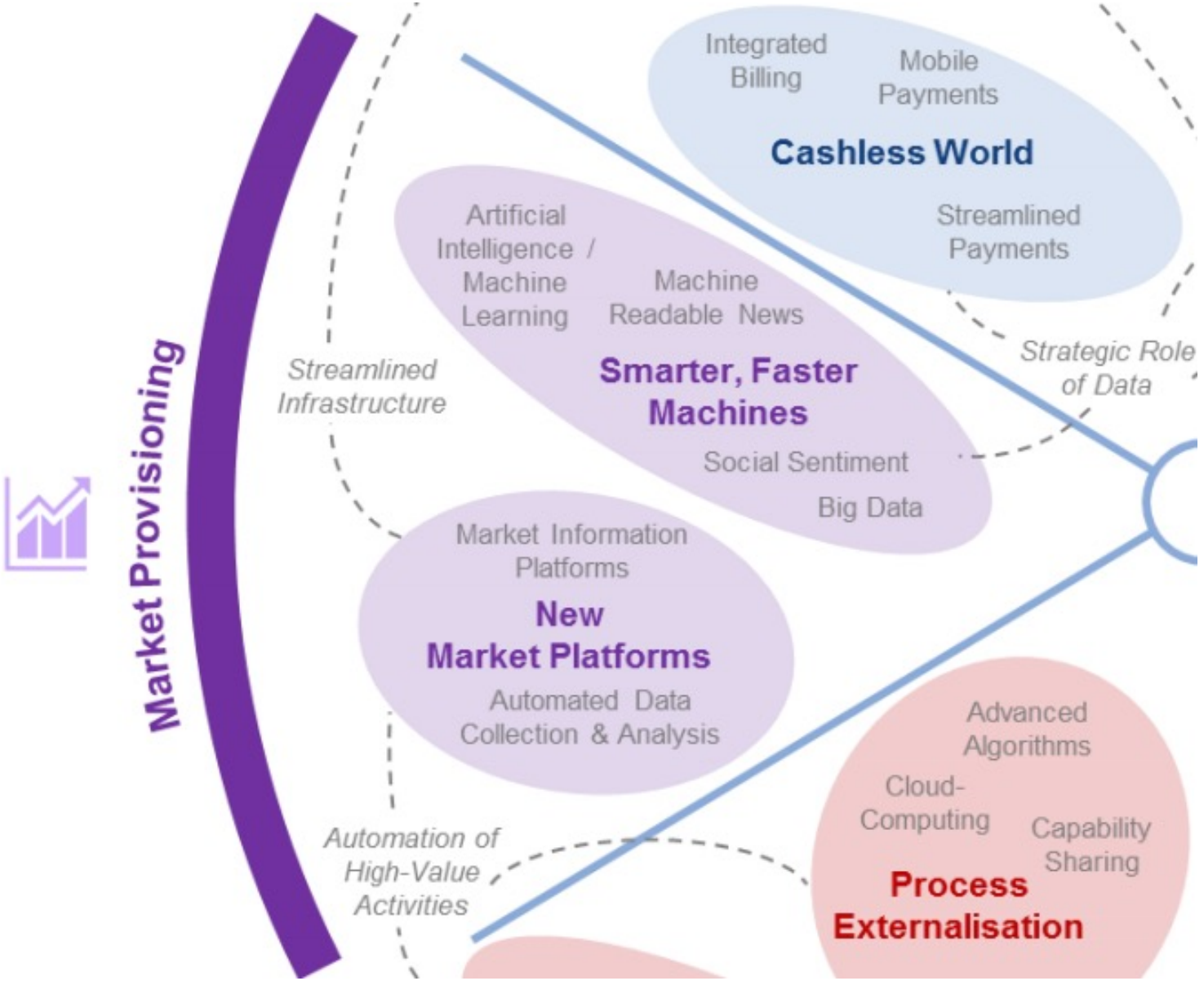
Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

5 FinTech: Investment Management



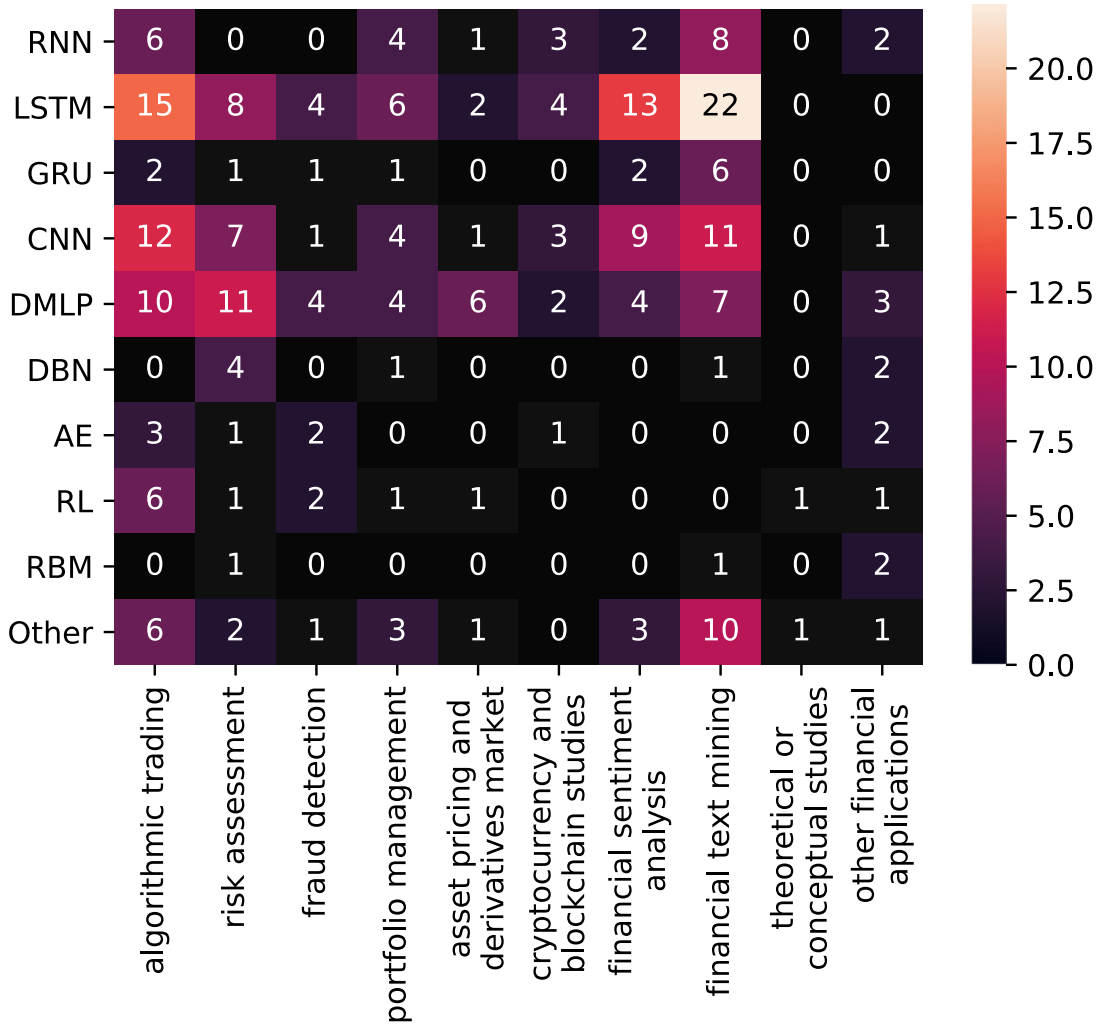
Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

6 FinTech: Market Provisioning



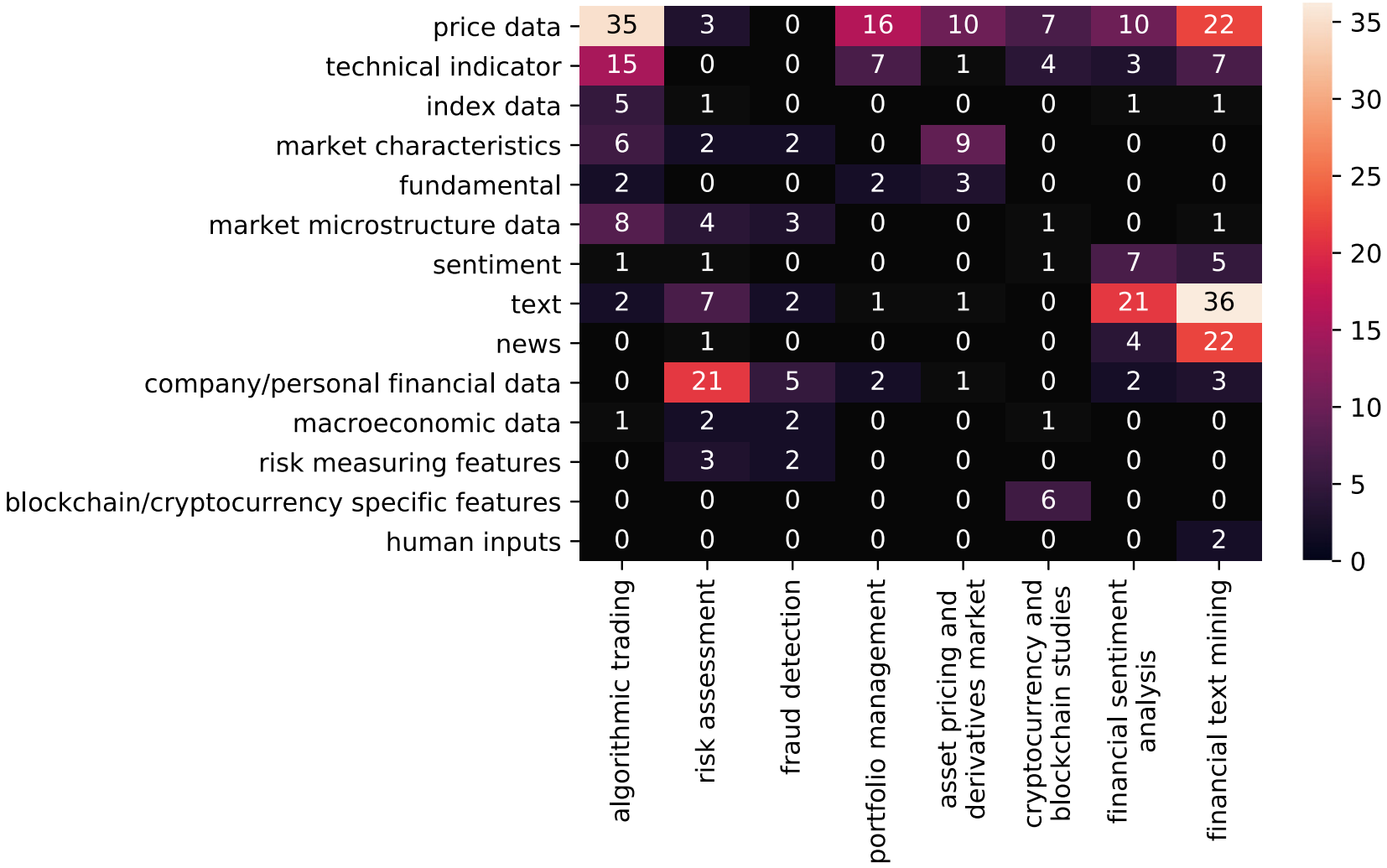
Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

Deep learning for financial applications: Topic-Model Heatmap



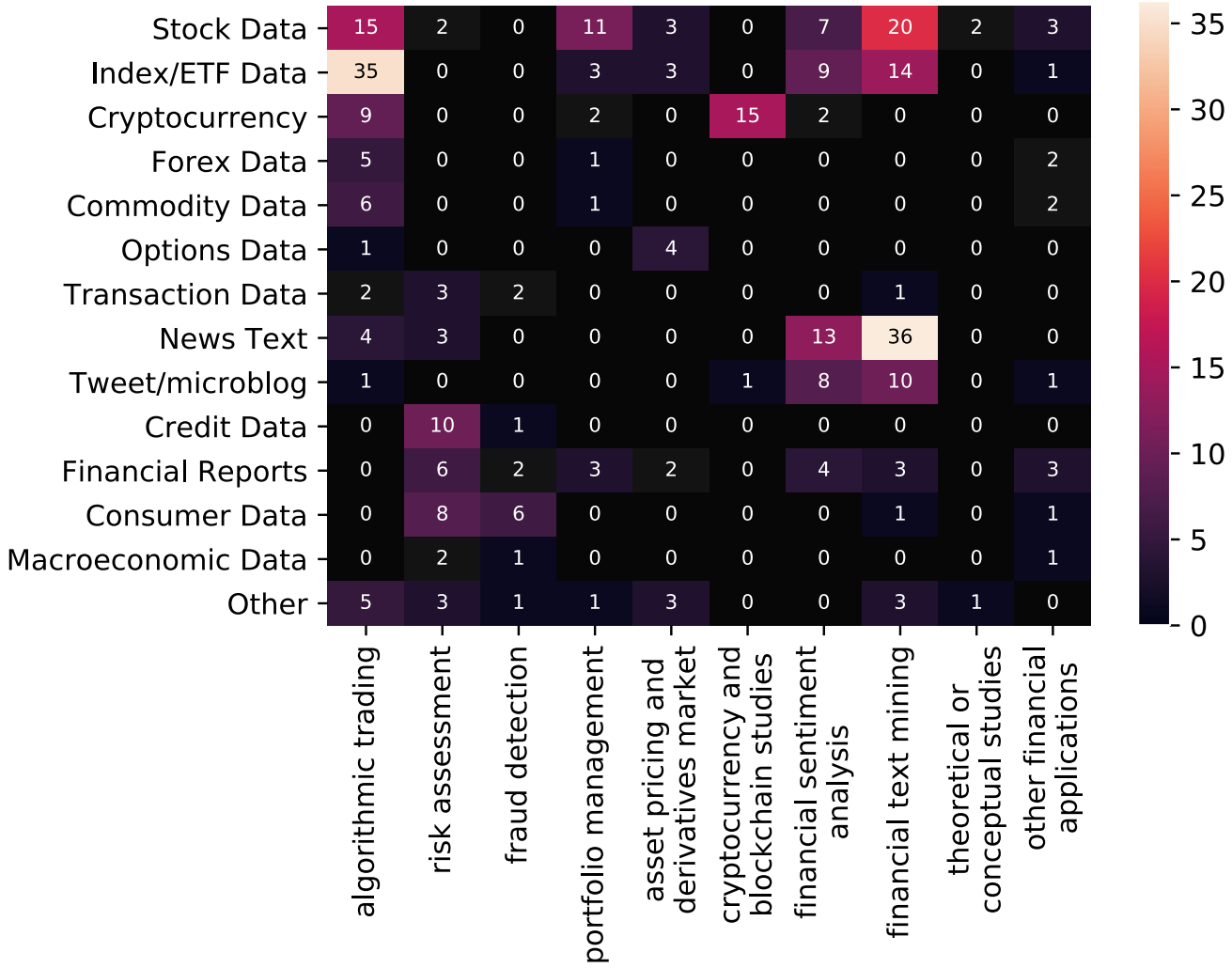
Source: Ahmet Murat Ozbayoglu, Mehmet Ugur Gudelek, and Omer Berat Sezer (2020). "Deep learning for financial applications: A survey." Applied Soft Computing (2020): 106384.

Deep learning for financial applications: Topic-Feature Heatmap



Source: Ahmet Murat Ozbayoglu, Mehmet Ugur Gudelek, and Omer Berat Sezer (2020). "Deep learning for financial applications: A survey." Applied Soft Computing (2020): 106384.

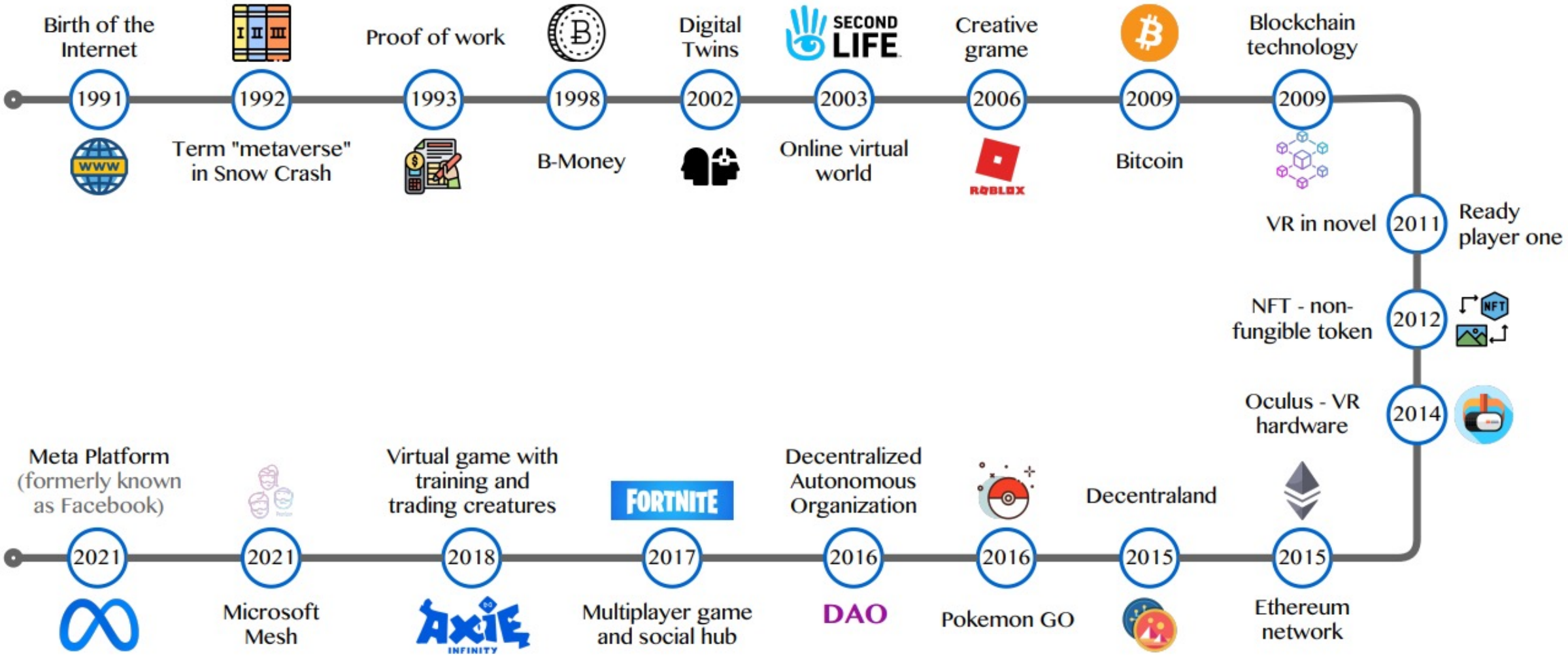
Deep learning for financial applications: Topic-Dataset Heatmap



Source: Ahmet Murat Ozbayoglu, Mehmet Ugur Gudelek, and Omer Berat Sezer (2020). "Deep learning for financial applications: A survey." Applied Soft Computing (2020): 106384.

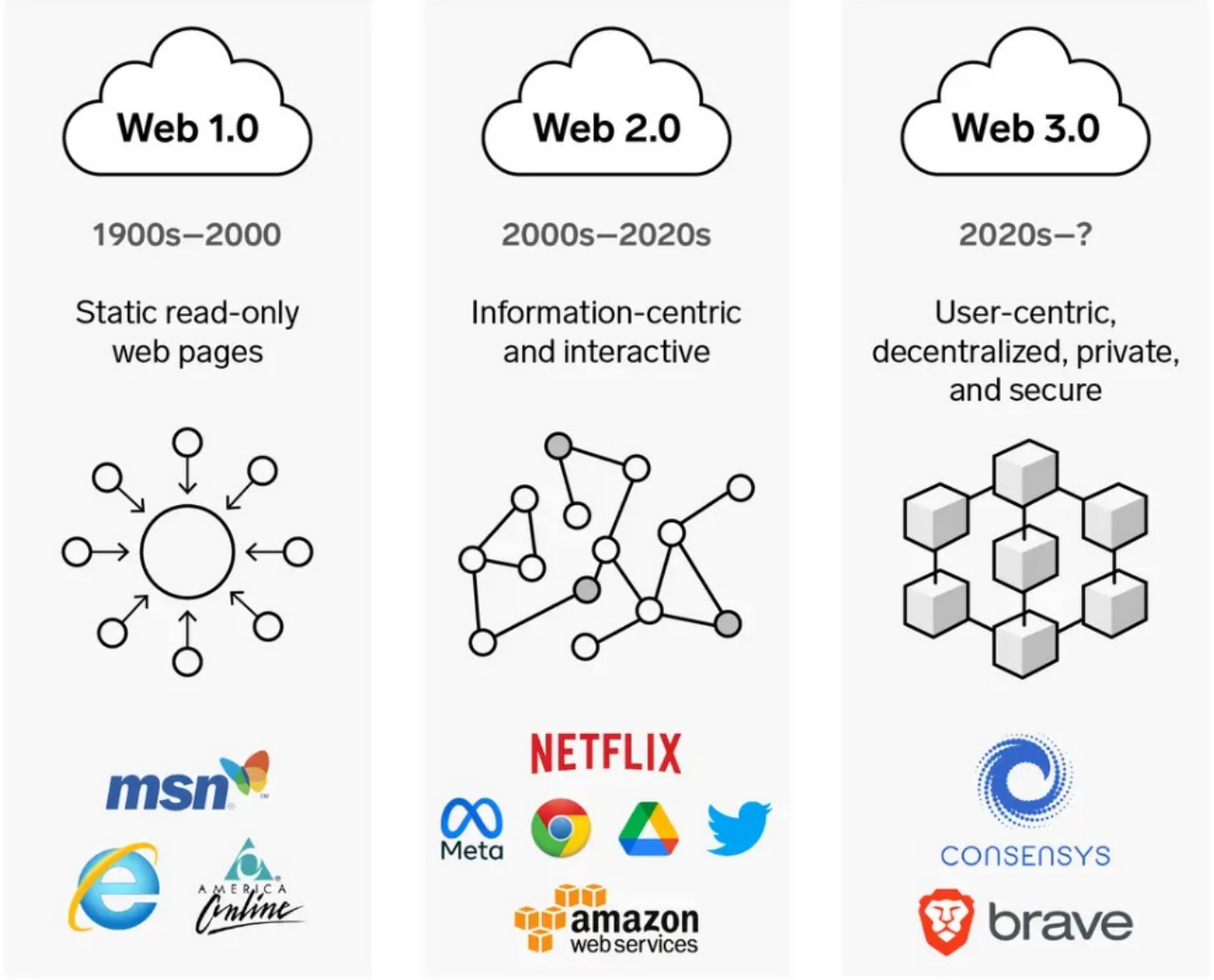
Metaverse
Web3
DeFi
NFT

Metaverse Development from 1991 to 2021



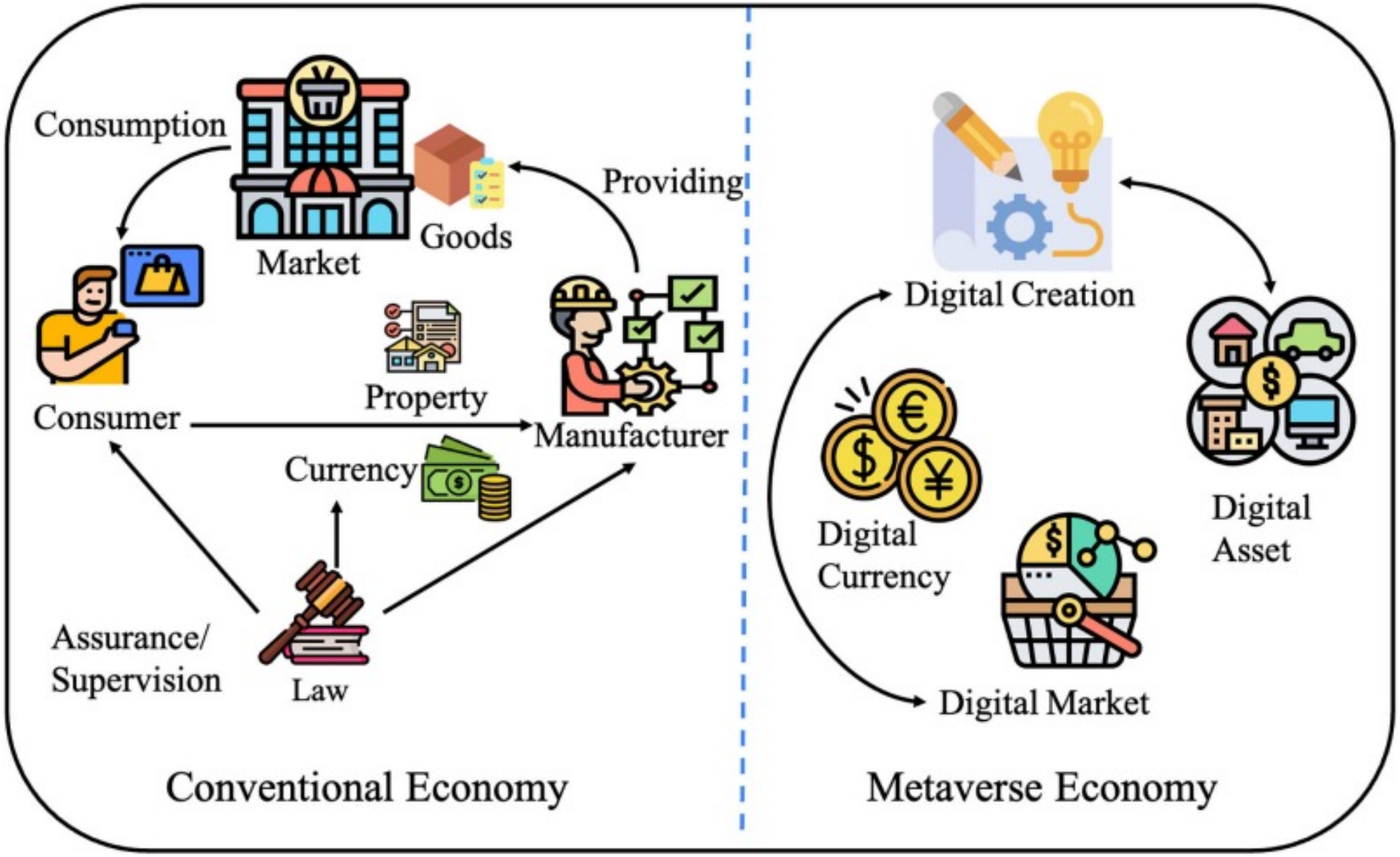
Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

Web3: Decentralized Web Internet Evolution



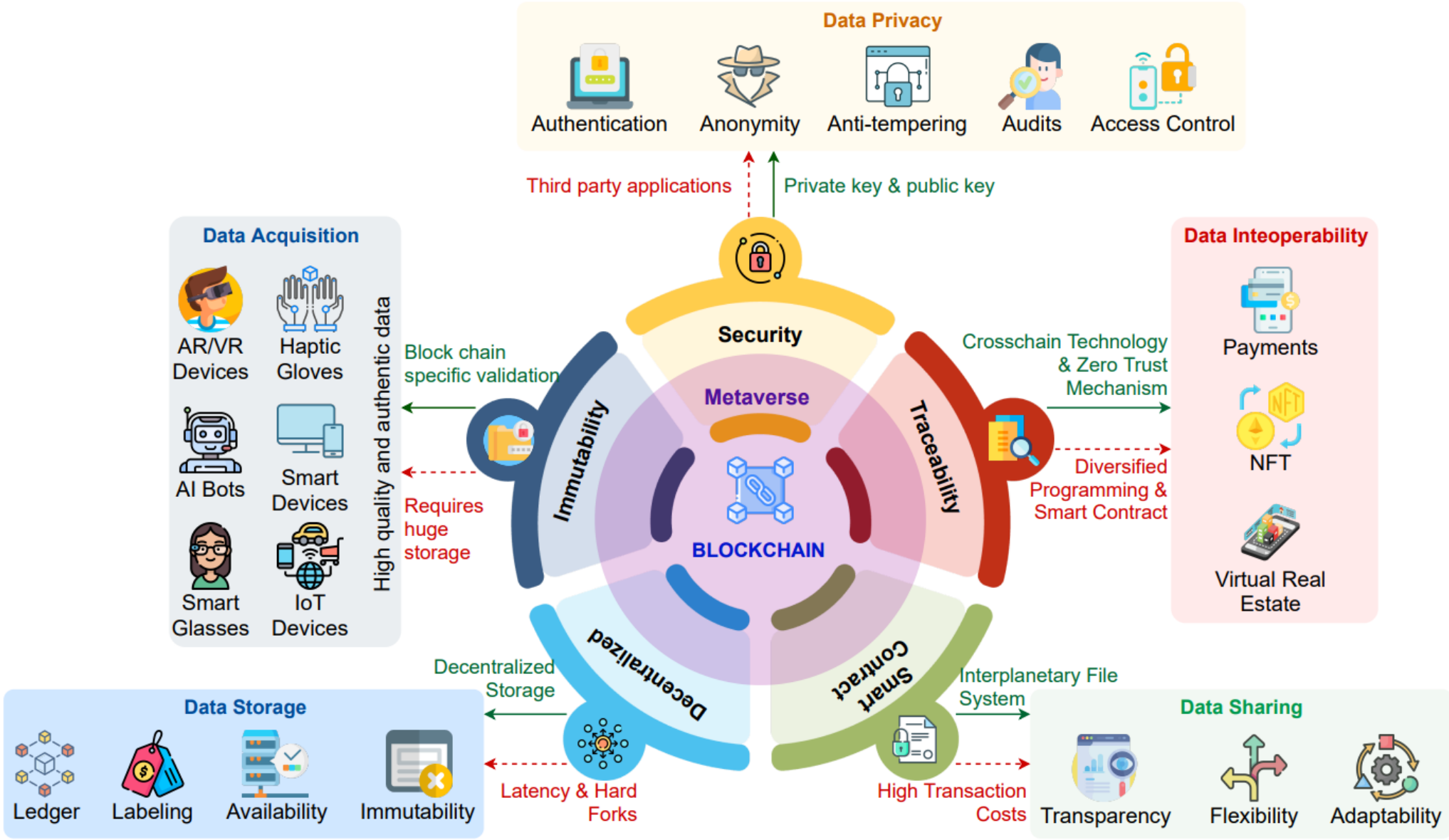
Source: https://www.businessinsider.com/personal-finance/what-is-web3

Metaverse Economy



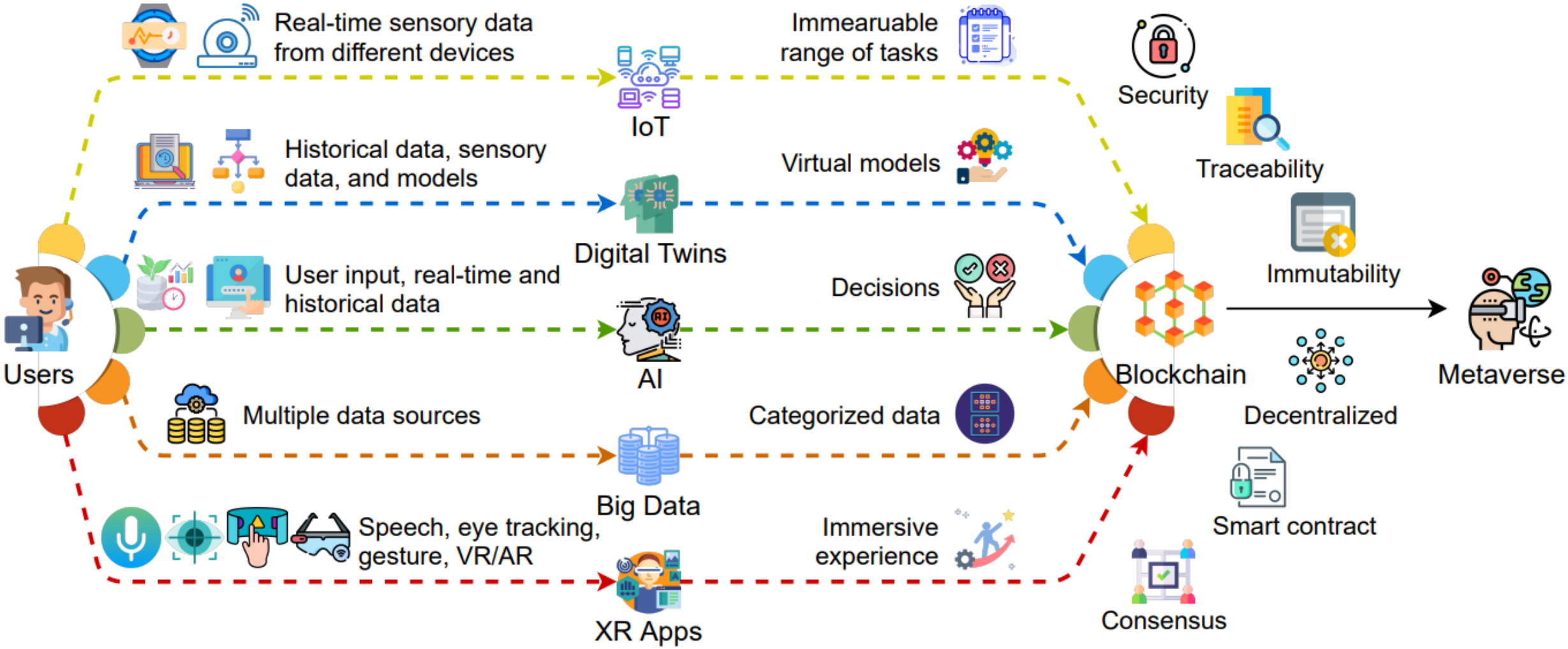
Source: Yang, Qinglin, Yetong Zhao, Huawei Huang, Zehui Xiong, Jiawen Kang, and Zibin Zheng (2022).
"Fusing blockchain and AI with metaverse: A survey." IEEE Open Journal of the Computer Society 3 : 122-136.

Blockchain in the Metaverse



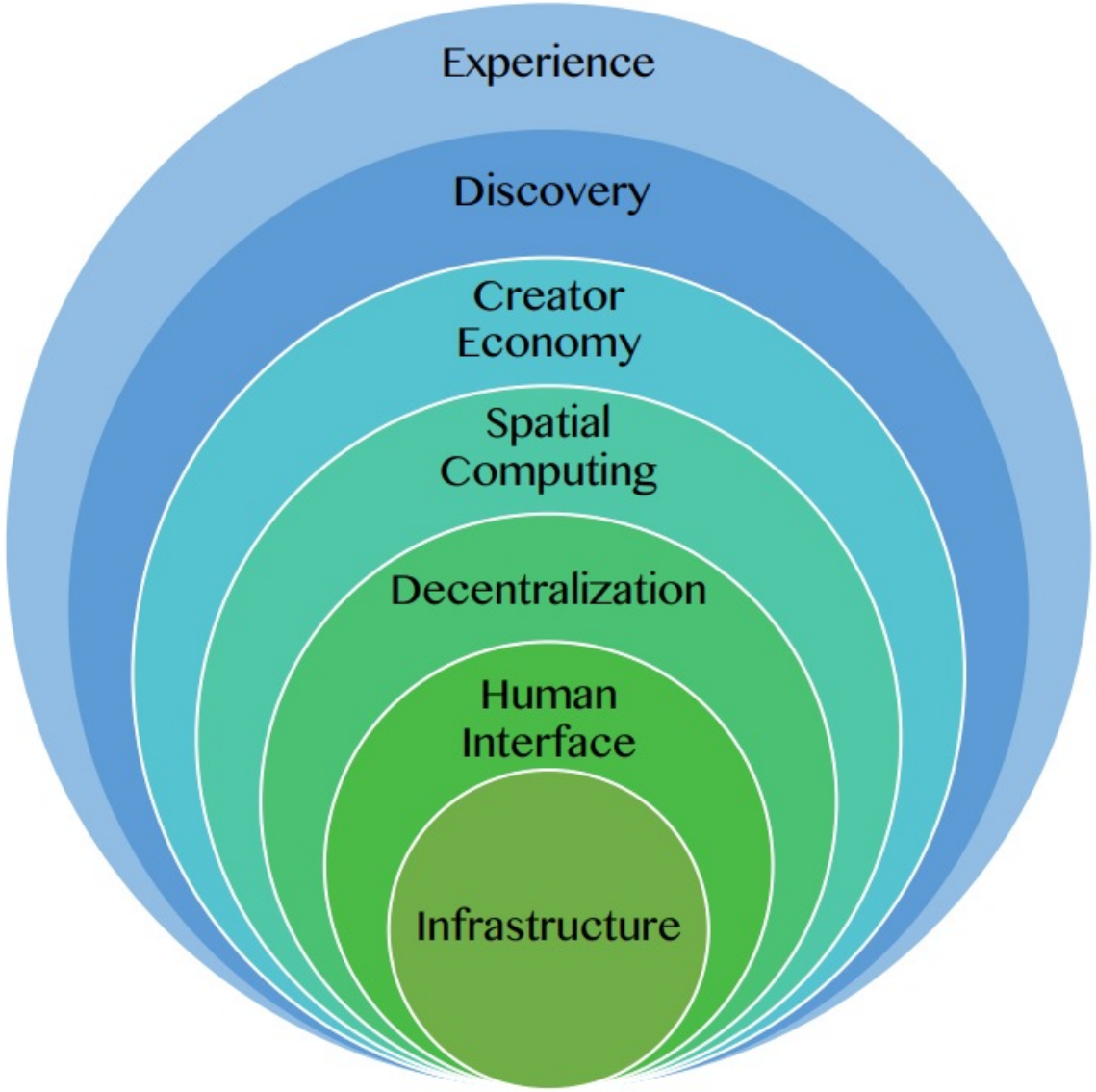
Source: Gadekallu, Thippa Reddy, Thien Huynh-The, Weizheng Wang, Gokul Yenduri, Pasika Ranaweera, Quoc-Viet Pham, Daniel Benevides da Costa, and Madhusanka Liyanage (2022). "Blockchain for the Metaverse: A Review." arXiv preprint arXiv:2203.09738..

Blockchain for Key Enabling Technologies of the Metaverse



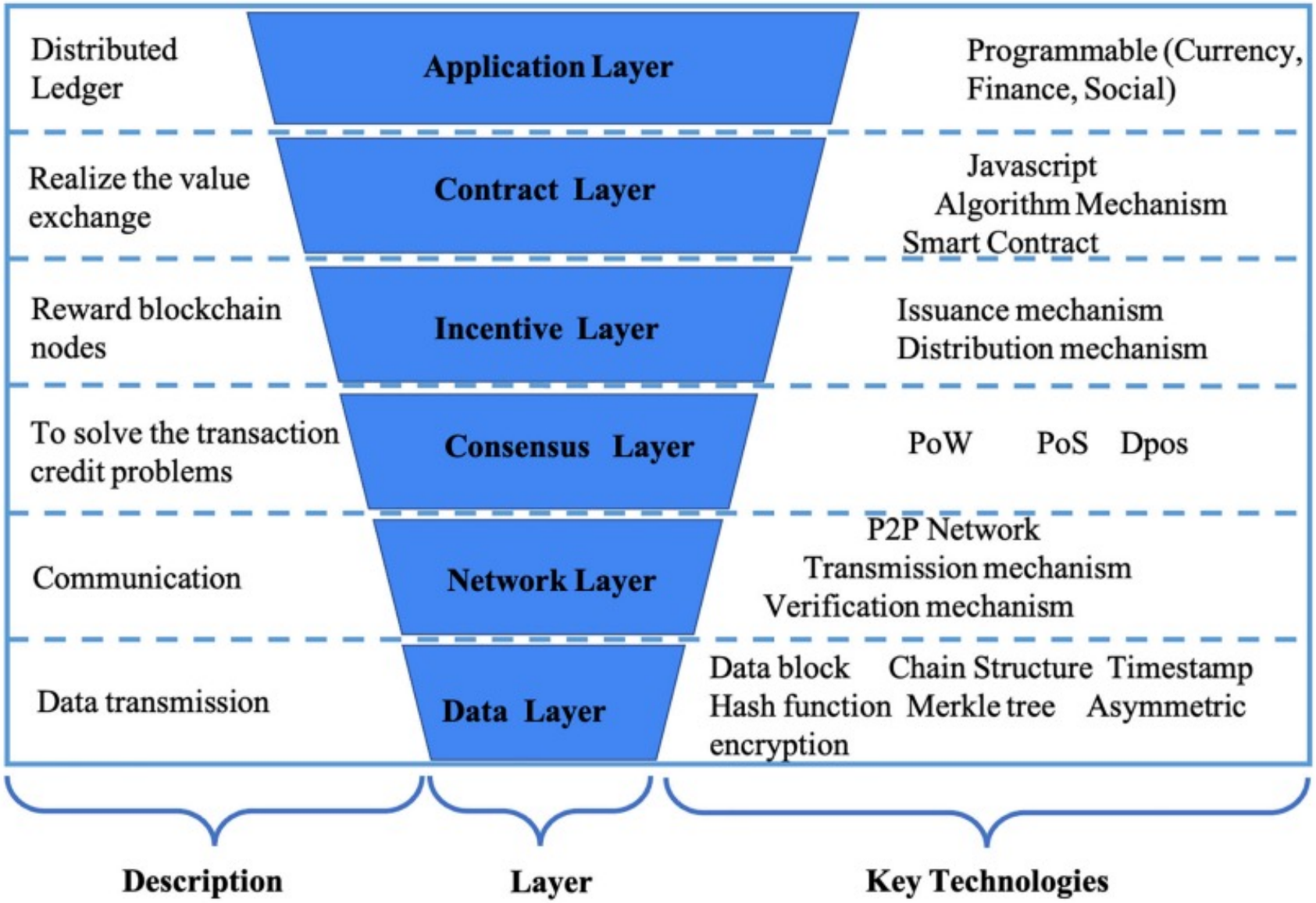
Source: Gadekallu, Thippa Reddy, Thien Huynh-The, Weizheng Wang, Gokul Yenduri, Pasika Ranaweera, Quoc-Viet Pham, Daniel Benevides da Costa, and Madhusanka Liyanage (2022). "Blockchain for the Metaverse: A Review." arXiv preprint arXiv:2203.09738..

Seven Layers of a Metaverse Platform



Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

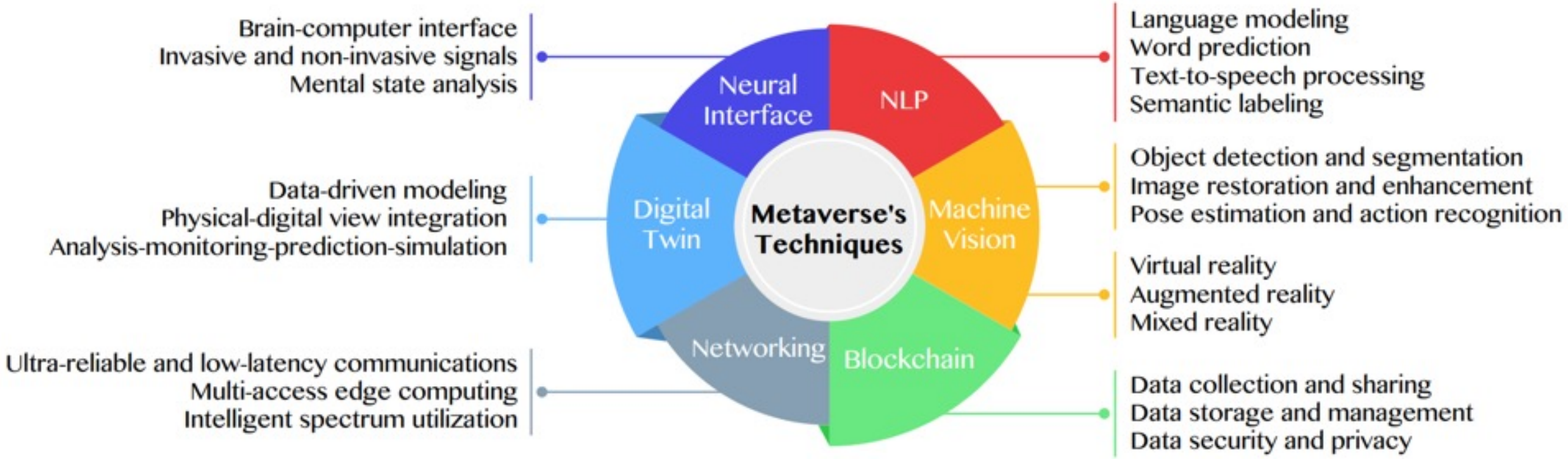
Layered Architecture of Blockchain



Source: Yang, Qinglin, Yetong Zhao, Huawei Huang, Zehui Xiong, Jiawen Kang, and Zibin Zheng (2022). "Fusing blockchain and AI with metaverse: A survey." IEEE Open Journal of the Computer Society 3 : 122-136.

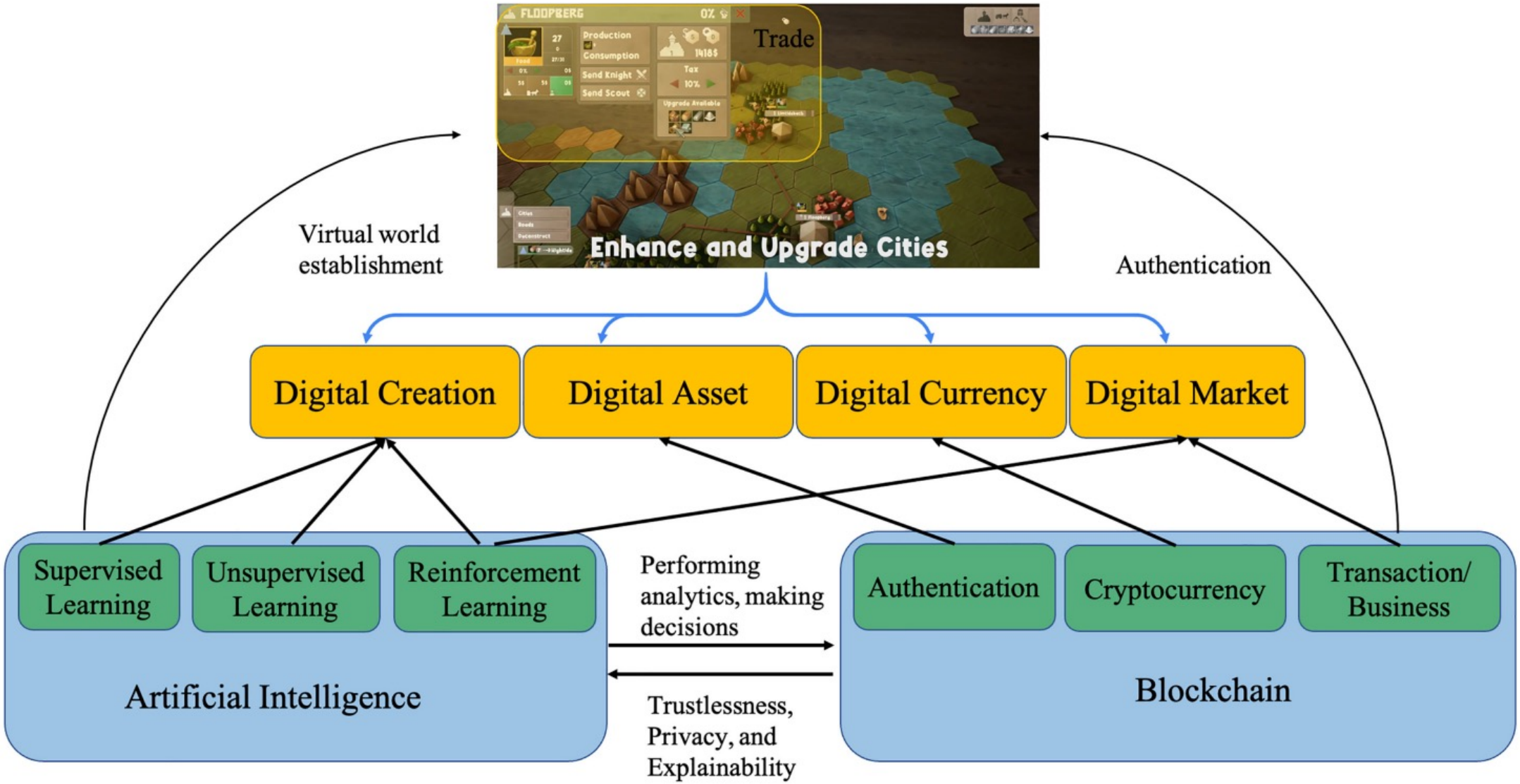
Primary Technical Aspects in the Metaverse

AI with ML algorithms and DL architectures is advancing the user experience in the virtual world



Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

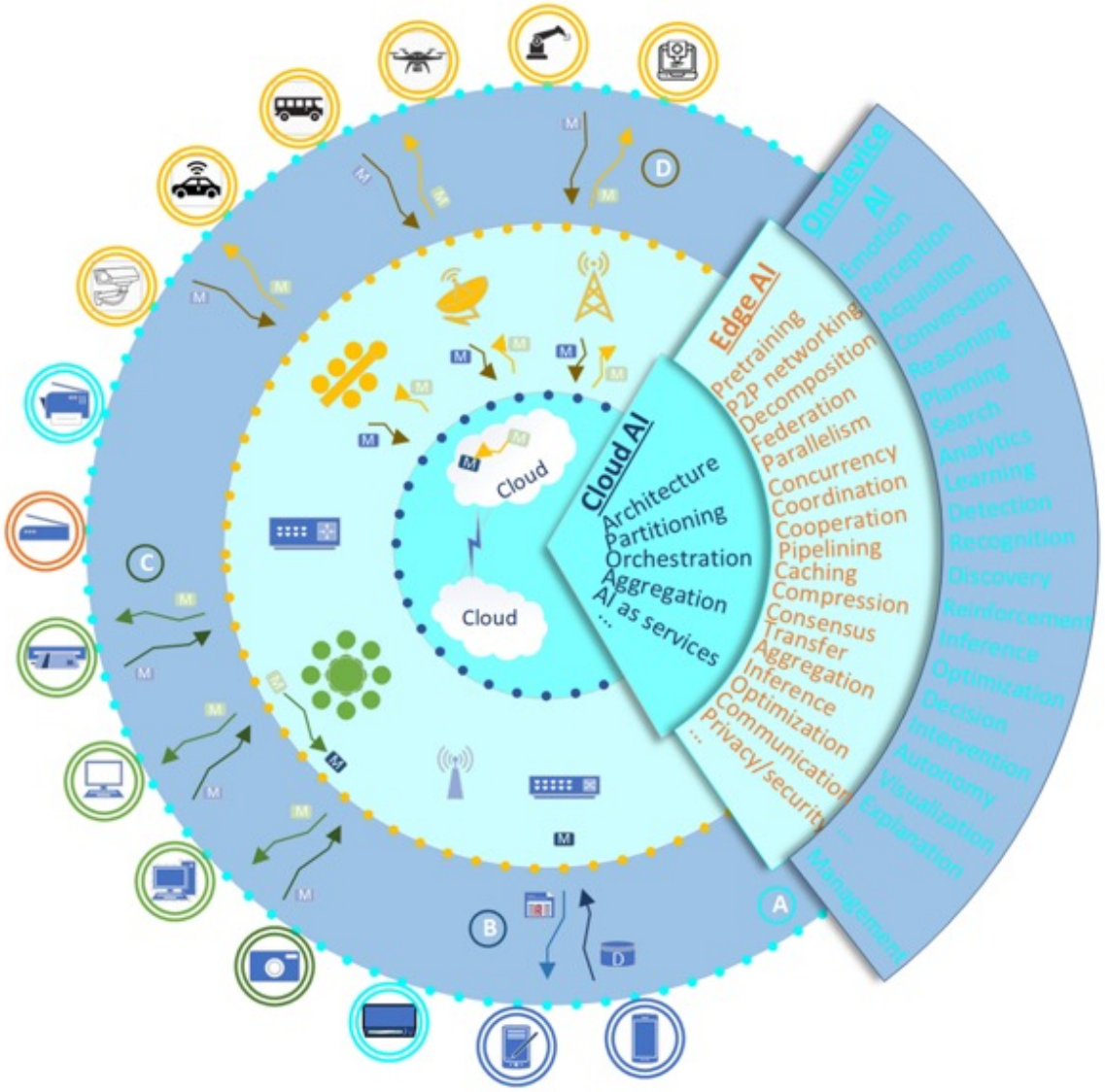
Fusion of AI and Blockchain in Metaverse



Source: Yang, Qinglin, Yetong Zhao, Huawei Huang, Zehui Xiong, Jiawen Kang, and Zibin Zheng (2022). "Fusing blockchain and AI with metaverse: A survey." IEEE Open Journal of the Computer Society 3 : 122-136.

DeAI:

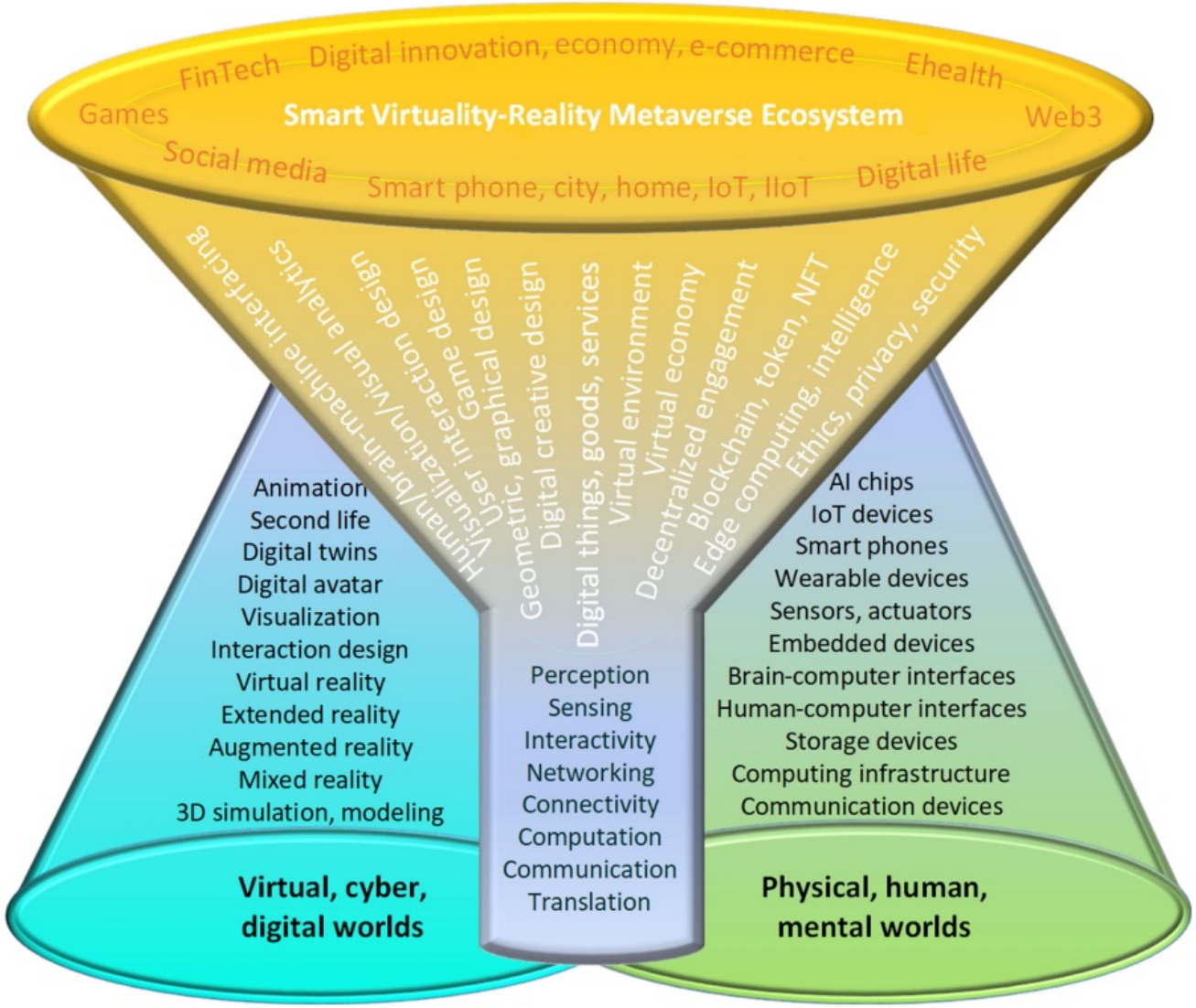
Synthesizing On-device AI, Edge AI, and Cloud AI



Source: Cao, Longbing (2022). "Decentralized ai: Edge intelligence and smart blockchain, metaverse, web3, and desci." IEEE Intelligent Systems 37, no. 3: 6-19.

Smart Virtuality-Reality Metaverse Ecosystem:

Metasynthesizing DeAI, Metaverse, Blockchain, Web3



Source: Cao, Longbing (2022). "Decentralized ai: Edge intelligence and smart blockchain, metaverse, web3, and desci." IEEE Intelligent Systems 37, no. 3: 6-19.

The difference between AR, MR, and VR under the umbrella of XR

XR

Extended Reality

Entire experience spectrum from fully virtual to fully real

VR

Virtual Reality

User is completely immersed into a virtual world

MR

Mixed Reality

Environment aware 2D/3D content is overlaid onto the physical space

AR

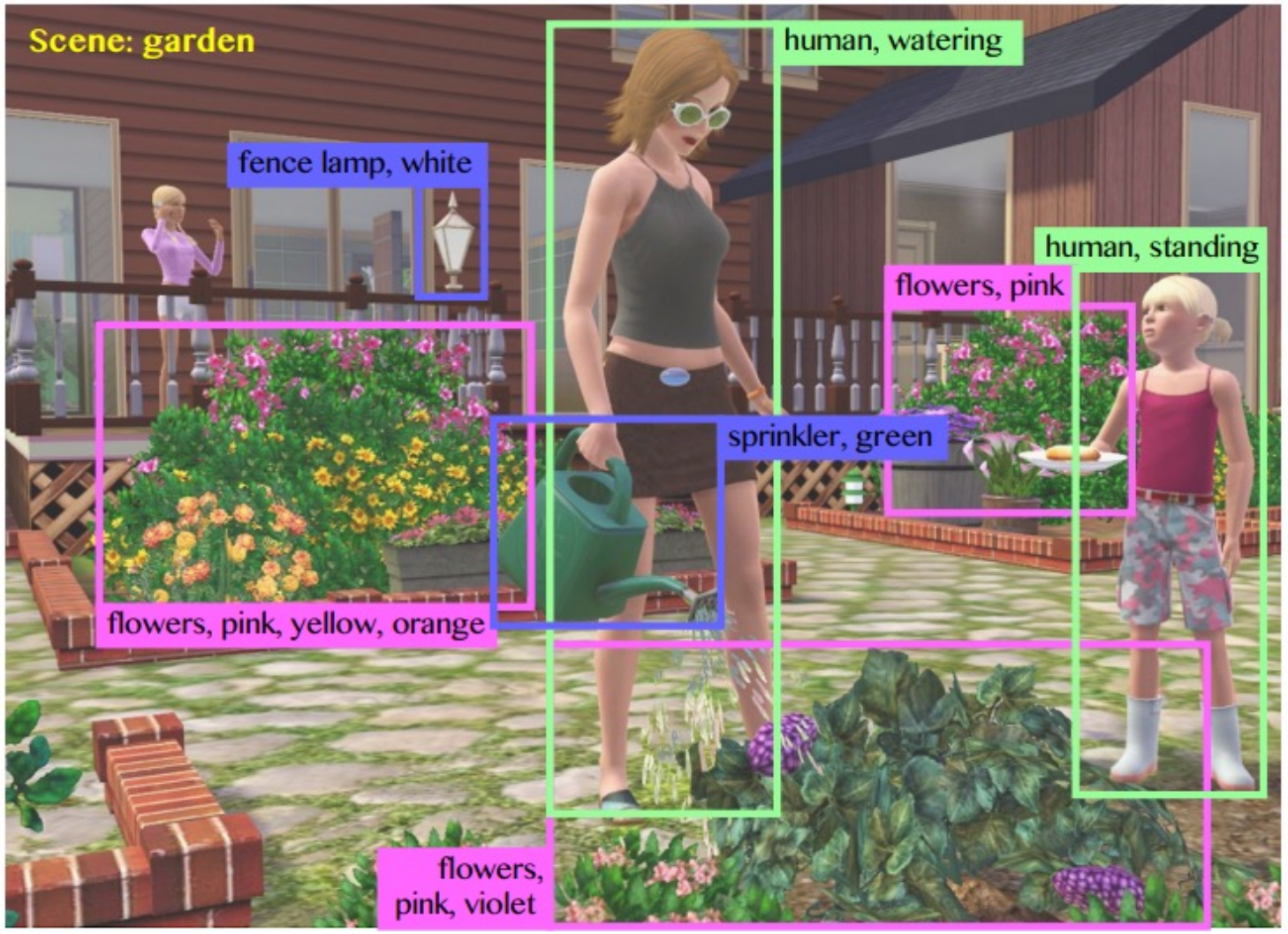
Augmented Reality

Non-environment aware 2D/3D content is overlaid onto the physical space

Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

Computer vision in the metaverse

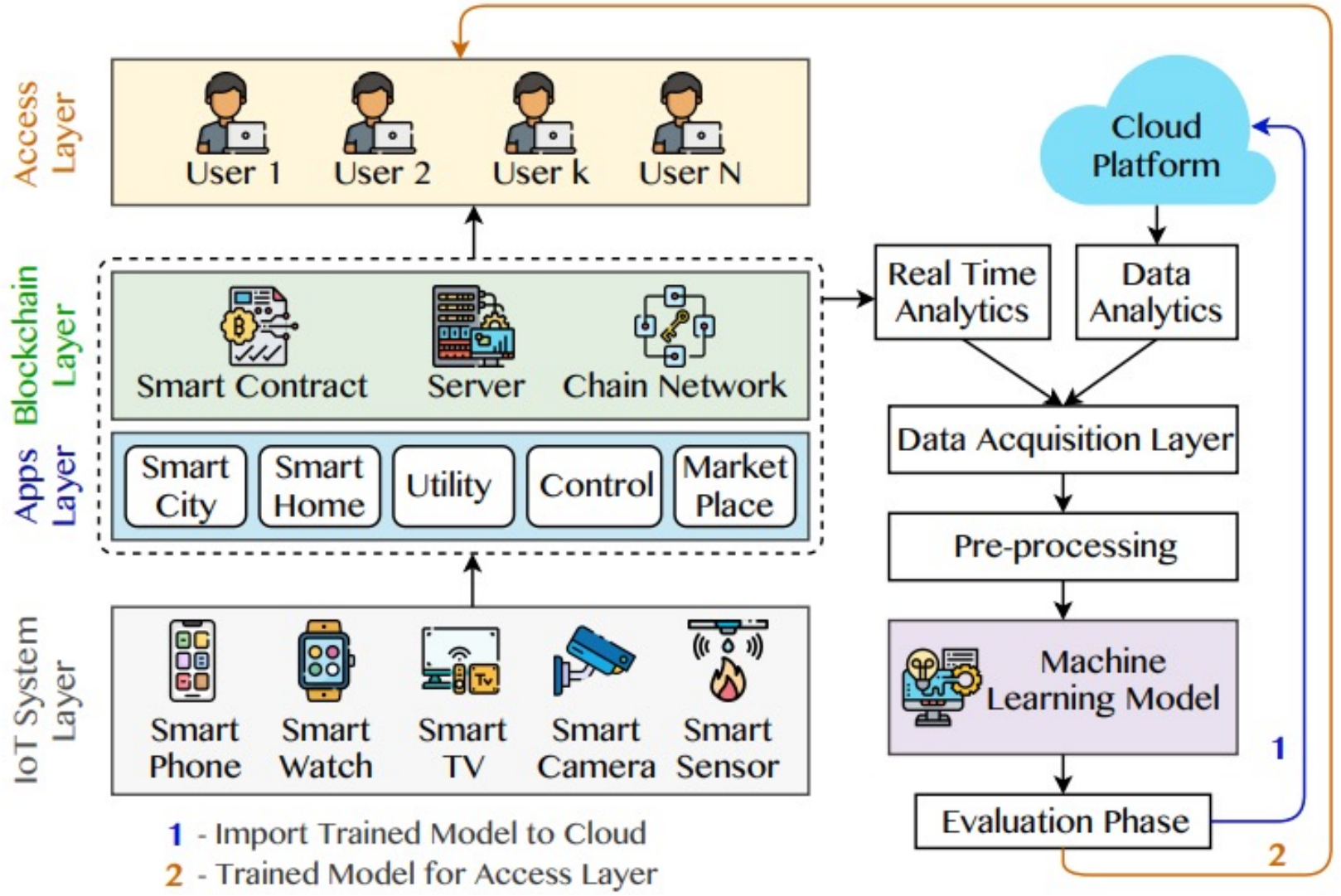
with scene understanding, object detection, and human action/activity recognition



Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

A Blockchain-based IoT Framework

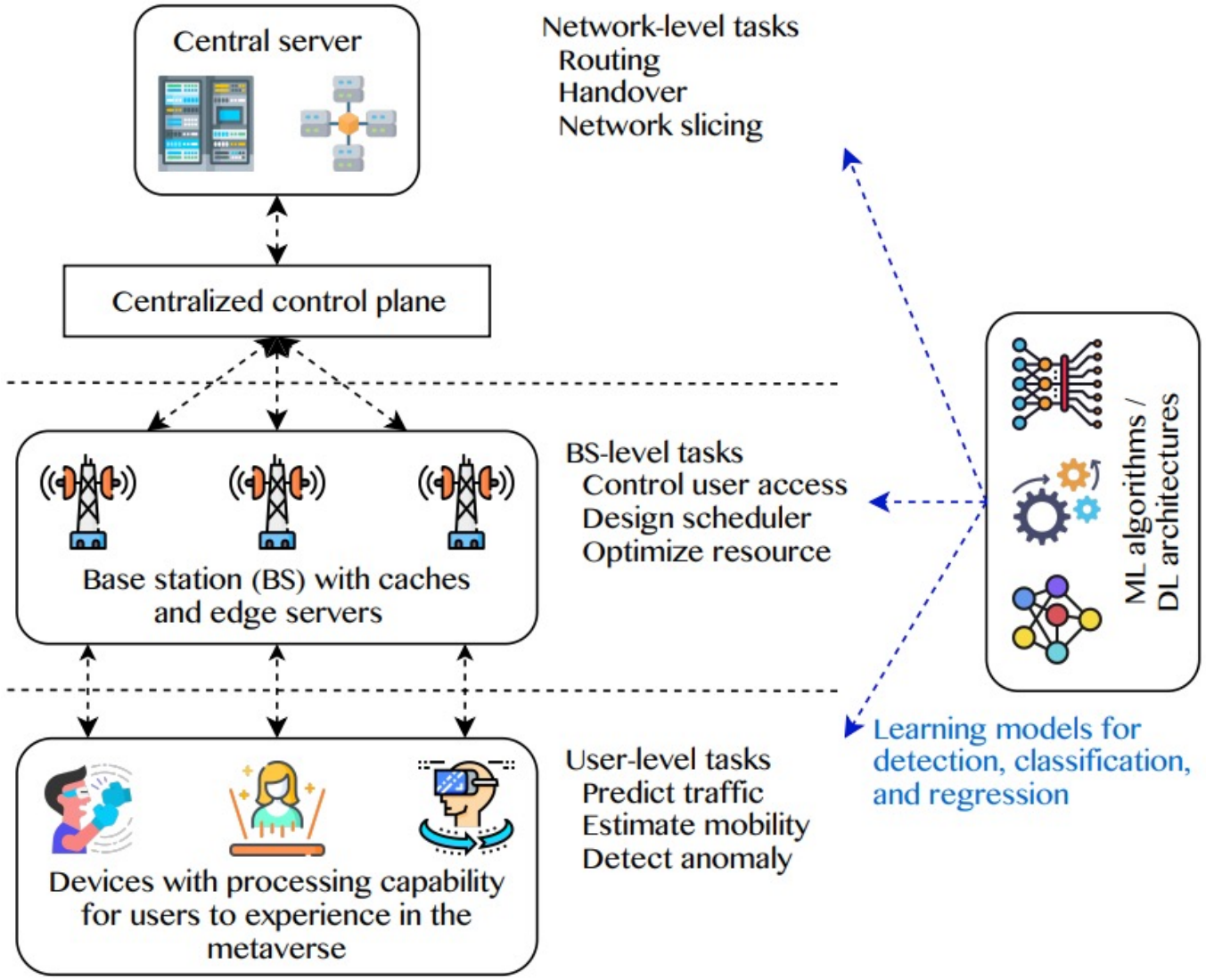
with ML to enhance security and privacy



Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

5G and beyond for Metaverse Services

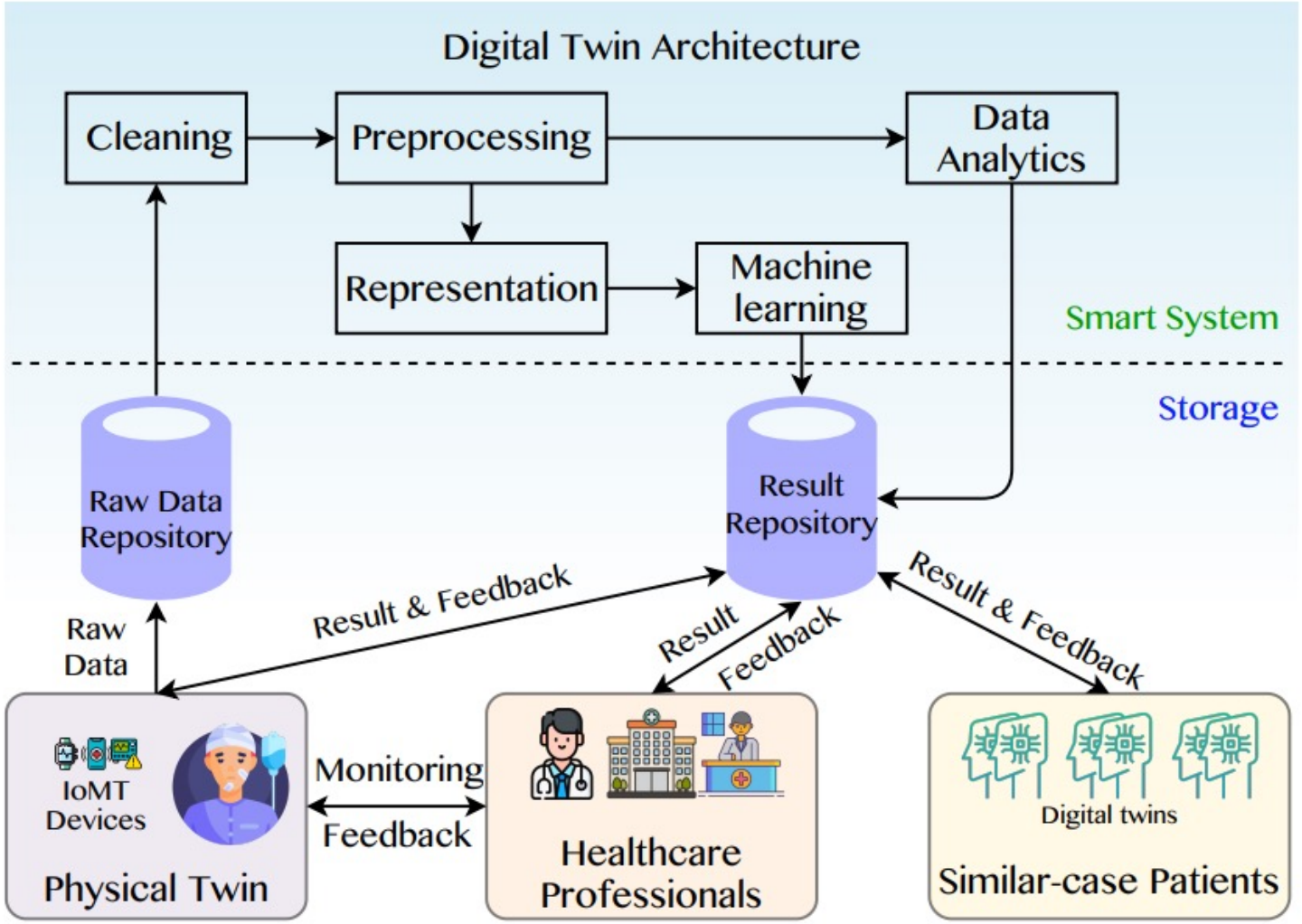
AI with ML algorithms and DL models contribute in multi-level tasks



Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

A Data-Driven Digital Twin Architecture

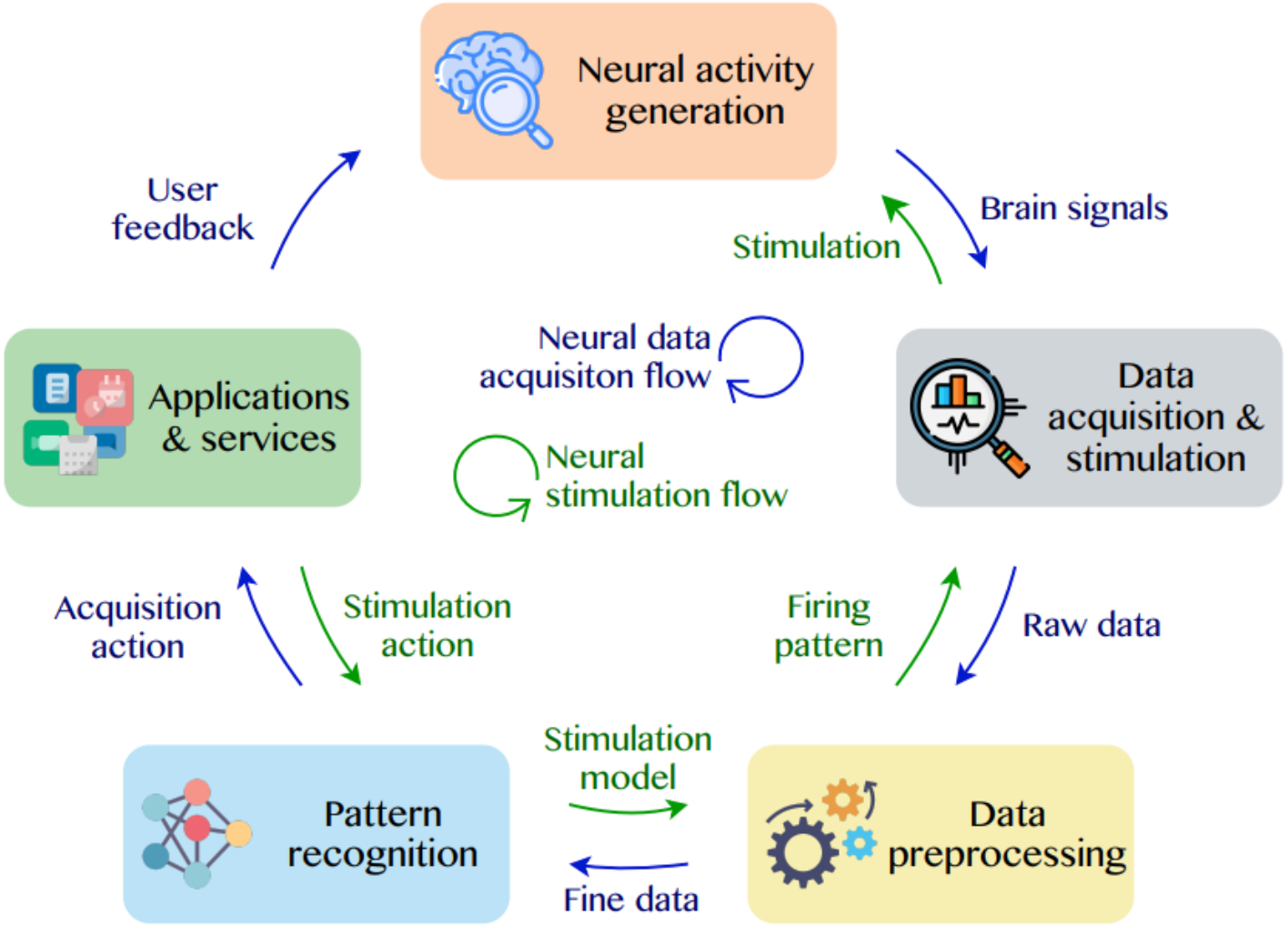
for intelligent healthcare systems using ML to process raw data of IoMedicalThings devices



Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

Brain-Machine Interfaces (BMIs)

for processing neural signals and responding neural stimulations



Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

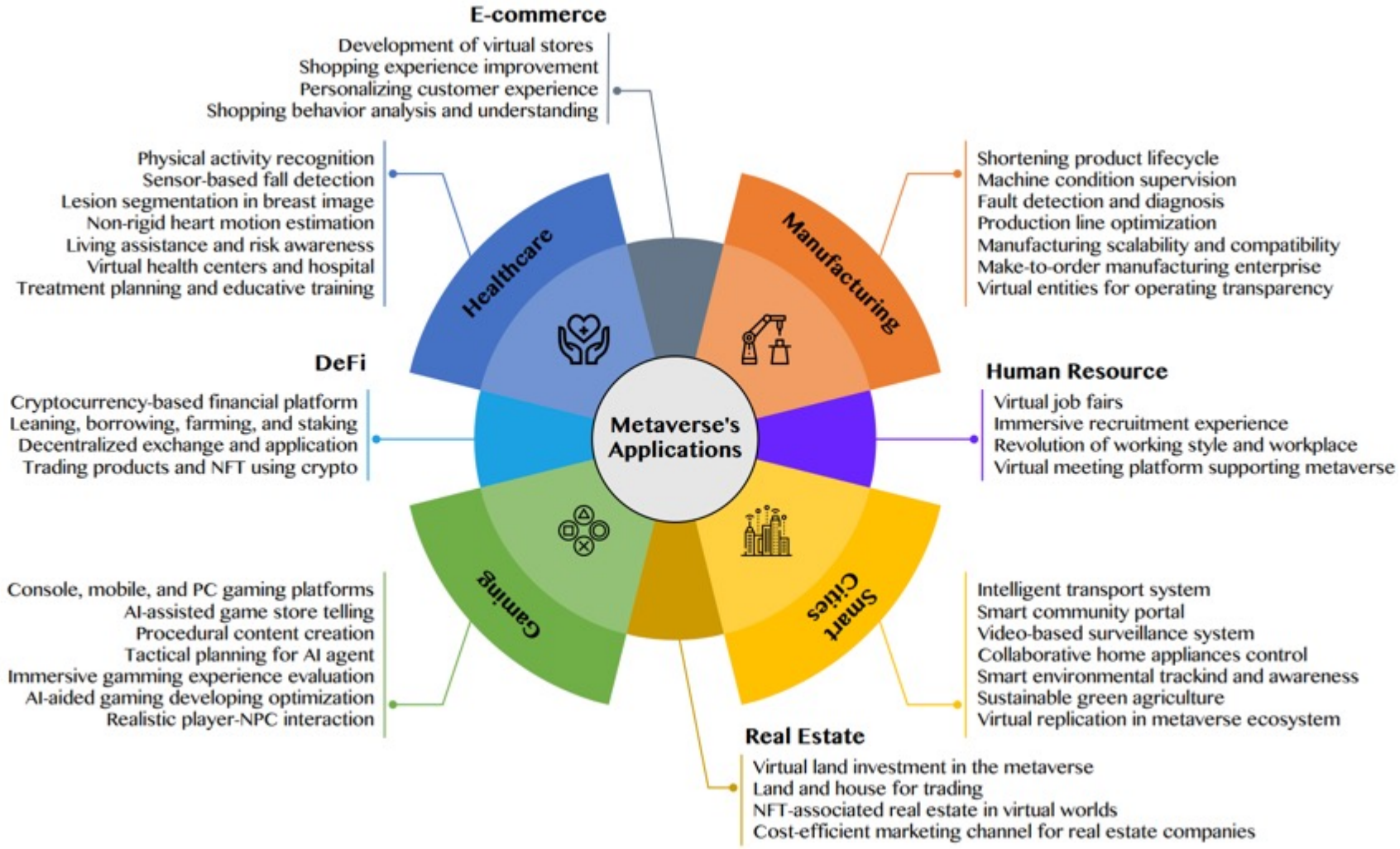
AI for the Metaverse

Technical Aspect	Ref	Task	AI Technique
NLP	[20]	Word and linguistic prediction for language modeling.	RNNs and LSTM networks with the attention mechanisms.
	[21]		Advanced memory network with residual connection.
	[24]		Deep networks with gated connection and bi-directional structure.
	[25]	Analyzing and understand the representation of words from characters	General deep networks with CNN and LSTM architectures.
	[27]	Identifying prefixes and suffixes and detecting misspelled words	DL framework with CNN, Bi-LSTM, and conditional random field.
	[29]	Sentiment prediction and question type classification.	Various CNNs and LSTM networks with simple structures and advanced-designed architectures.
	[31]	Generate short text in image captioning and long text in virtual question answer.	DL framework with single RNN/LSTM and mixture LSTM-CNN models.
	[32]	Semantic labeling, context retrieval, and language interpretation.	Unsupervised and reinforcement learning with common RNN/LSTM and CNN models.

Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

AI for the Metaverse in the Application Aspects

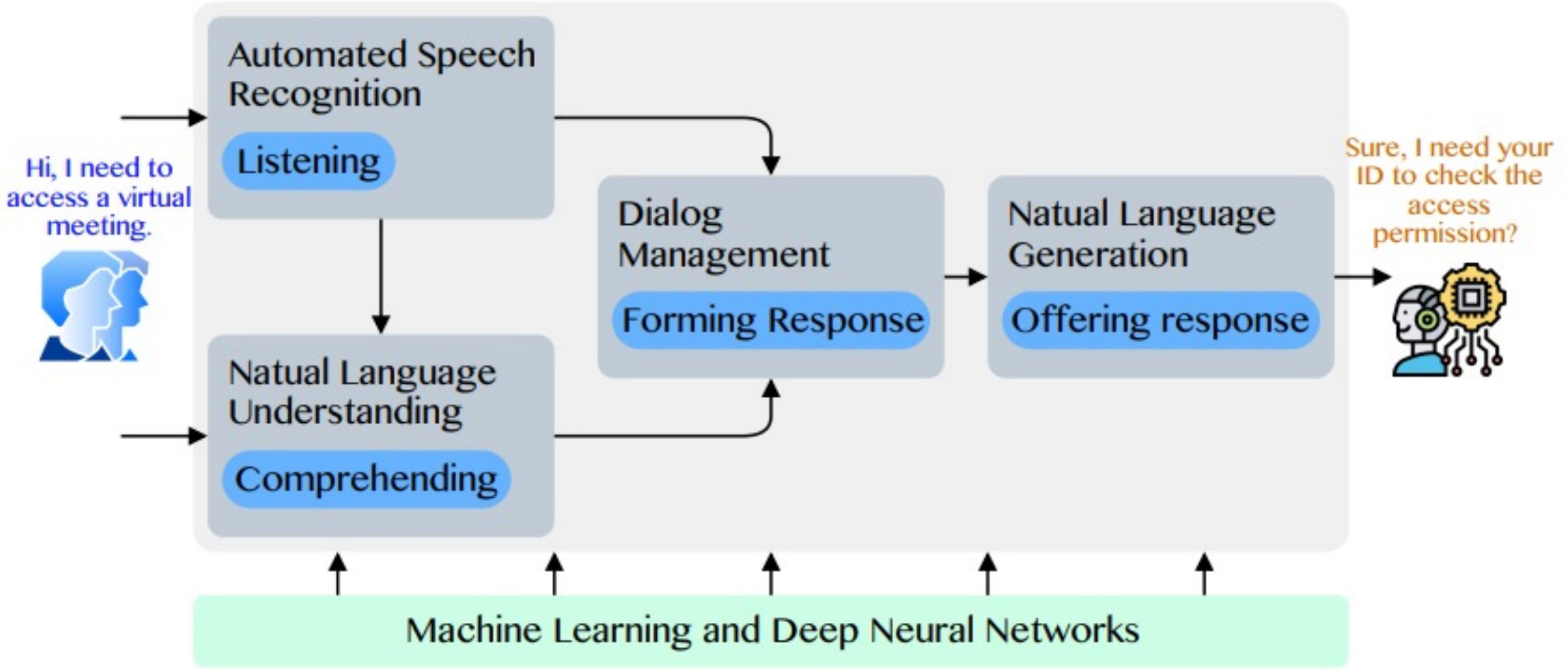
healthcare, manufacturing, smart cities, gaming
E-commerce, human resources, real estate, and DeFi



Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

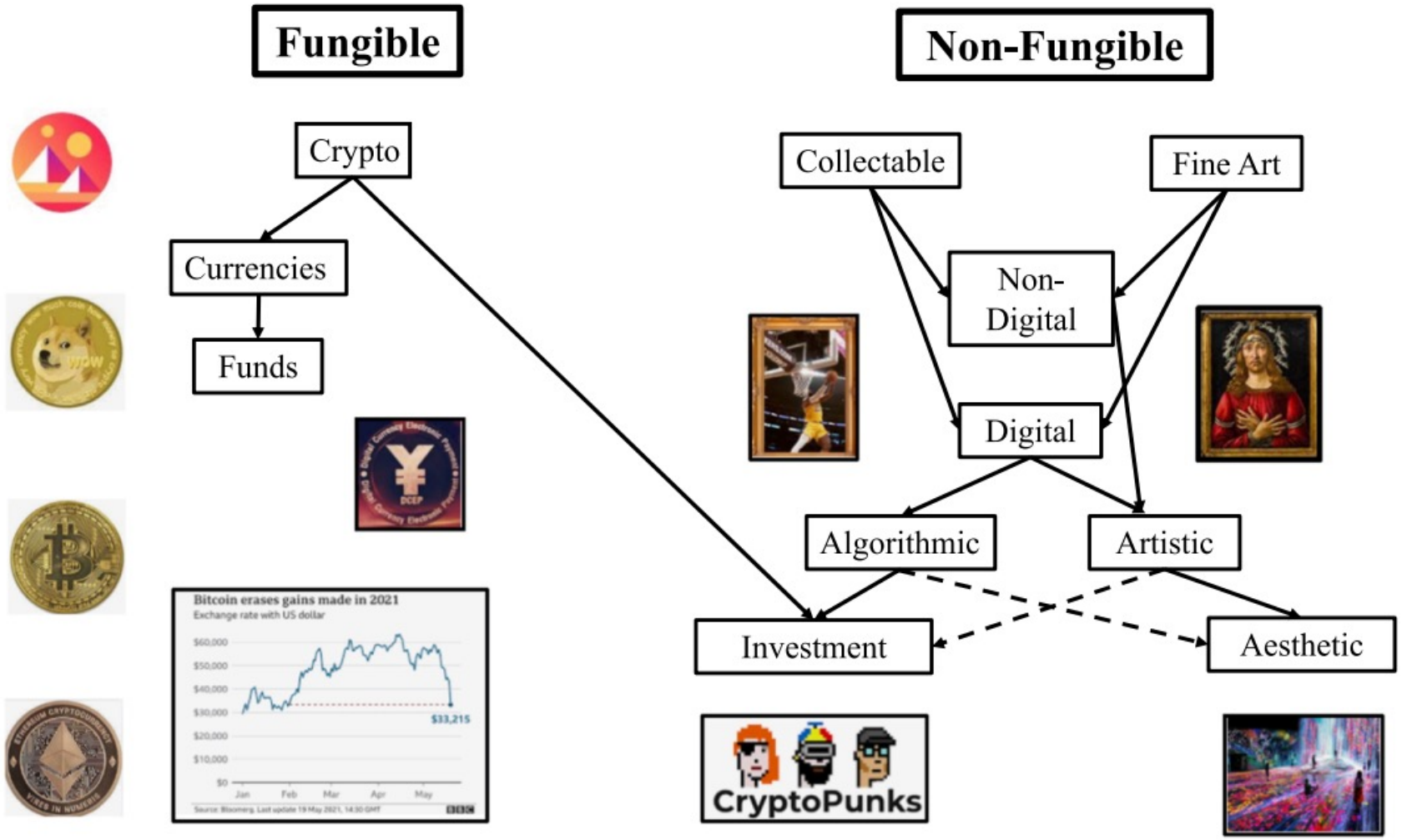
Conversational AI

to deliver contextual and personal experience to users



Source: Huynh-The, Thien, Quoc-Viet Pham, Xuan-Qui Pham, Thanh Thi Nguyen, Zhu Han, and Dong-Seong Kim (2022). "Artificial Intelligence for the Metaverse: A Survey." arXiv preprint arXiv:2202.10336.

Blockchain-Registered: Crypto, Collectables, and Art.



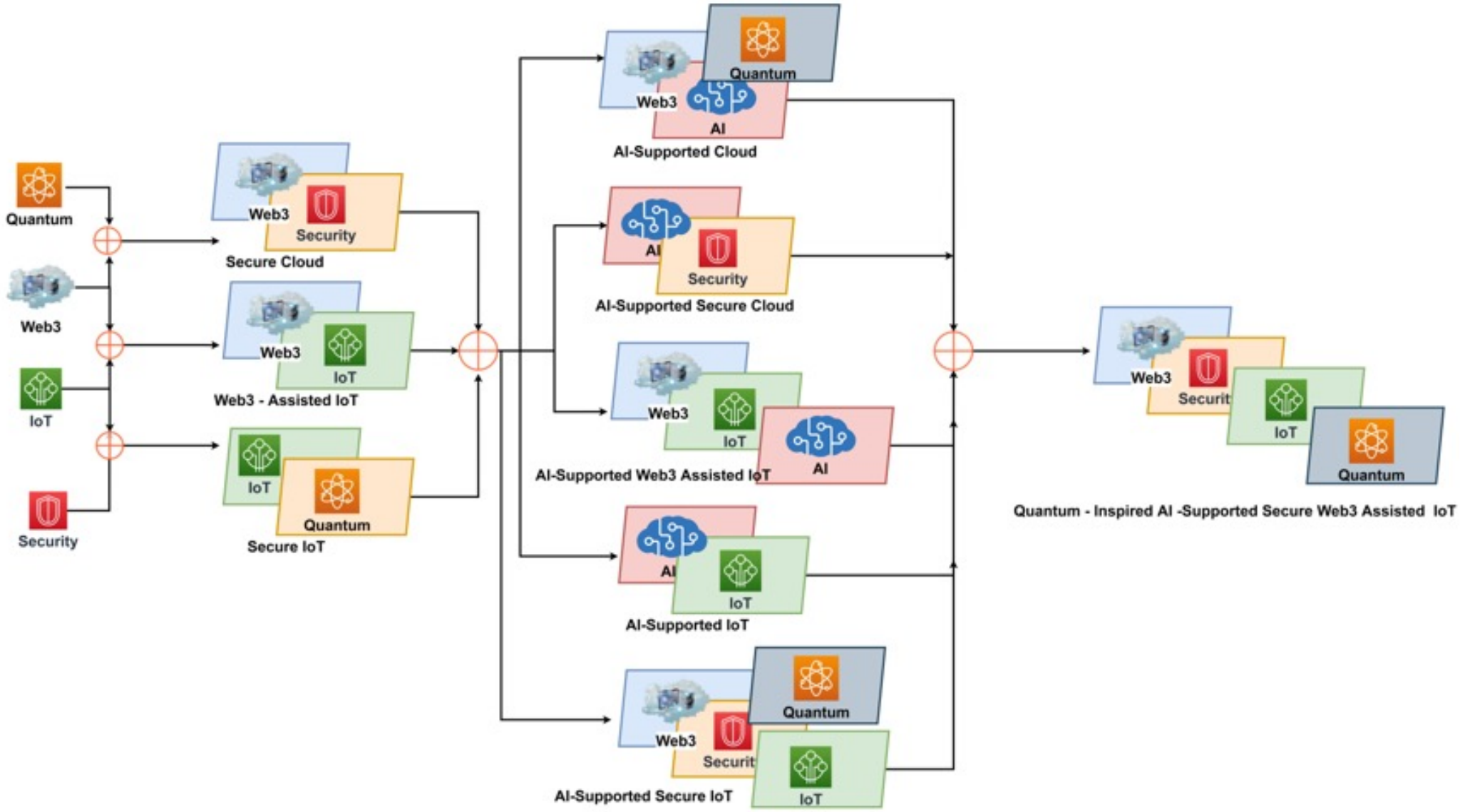
Source: Belk, Russell, Mariam Humayun, and Myriam Brouard. (2022)
"Money, possessions, and ownership in the Metaverse: NFTs, cryptocurrencies, Web3 and Wild Markets." Journal of Business Research 153: 198-205.

Full Versus Fractional [NFT] Property Ownership Rights for an Artwork

RIGHTS	Full Ownership	NFT (Fractional Ownership)
Use	Yes	Yes
Sell or dispose of	Yes	Yes
Manipulate or modify	Yes	No
Exclude Others	Yes	No
Copyright	No	No
Intellectual property	No	Possibly with some NFTs
Income from	Yes	Mostly no
Artist Resale (% for artist)	No	Possibly yes

Source: Belk, Russell, Mariam Humayun, and Myriam Brouard. (2022)
"Money, possessions, and ownership in the Metaverse: NFTs, cryptocurrencies, Web3 and Wild Markets." Journal of Business Research 153: 198-205.

Combination of Web3 with other Technologies



Source: Sheridan, Dan, James Harris, Frank Wear, Jerry Cowell Jr, Easton Wong, and Abbas Yazdinejad. (2022) "Web3 Challenges and Opportunities for the Market." arXiv preprint arXiv:2209.02446.

Decentralized Finance (DeFi)

Block Chain FinTech

Decentralized Finance (DeFi)

- A global, open alternative to the current financial system.
- Products that let you borrow, save, invest, trade, and more.
- Based on open-source technology that anyone can program with.

Source: https://ethereum.org/en/defi/

Traditional Finance
Centralized Finance (CeFi)

- Some people aren't granted access to set up a bank account or use financial services.
- Lack of access to financial services can prevent people from being employable.
- Financial services can block you from getting paid.
- A hidden charge of financial services is your personal data.
- Governments and centralized institutions can close down markets at will.
- Trading hours often limited to business hours of specific time zone.
- Money transfers can take days due to internal human processes.
- There's a premium to financial services because intermediary institutions need their cut.

Source: https://ethereum.org/en/defi/

DeFi vs. CeFi

Decentralized Finance (DeFi)	Traditional Finance (Centralized Finance; CeFi)
You hold your money.	Your money is held by companies.
You control where your money goes and how it's spent.	You have to trust companies not to mismanage your money, like lend to risky borrowers.
Transfers of funds happen in minutes.	Payments can take days due to manual processes.
Transaction activity is pseudonymous.	Financial activity is tightly coupled with your identity.
DeFi is open to anyone.	You must apply to use financial services.
The markets are always open.	Markets close because employees need breaks.
It's built on transparency – anyone can look at a product's data and inspect how the system works.	Financial institutions are closed books: you can't ask to see their loan history, a record of their managed assets, and so on.

Source: https://ethereum.org/en/defi/

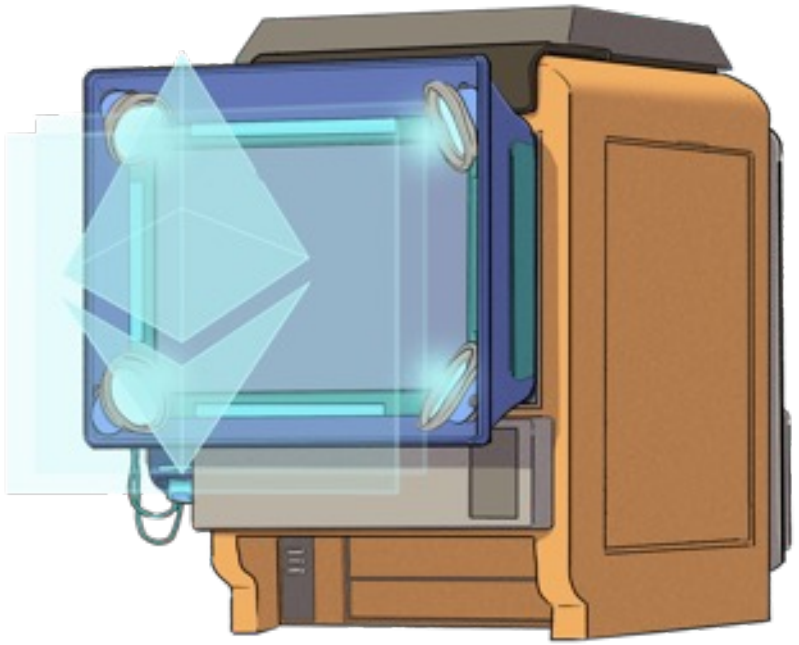
(DeFi)
Decentralized Applications (Dapps)

- **Ethereum-powered tools and services**
- **Dapps are a growing movement of applications that use Ethereum to disrupt business models or invent new ones**

Source: https://ethereum.org/en/defi/

The Internet of Assets

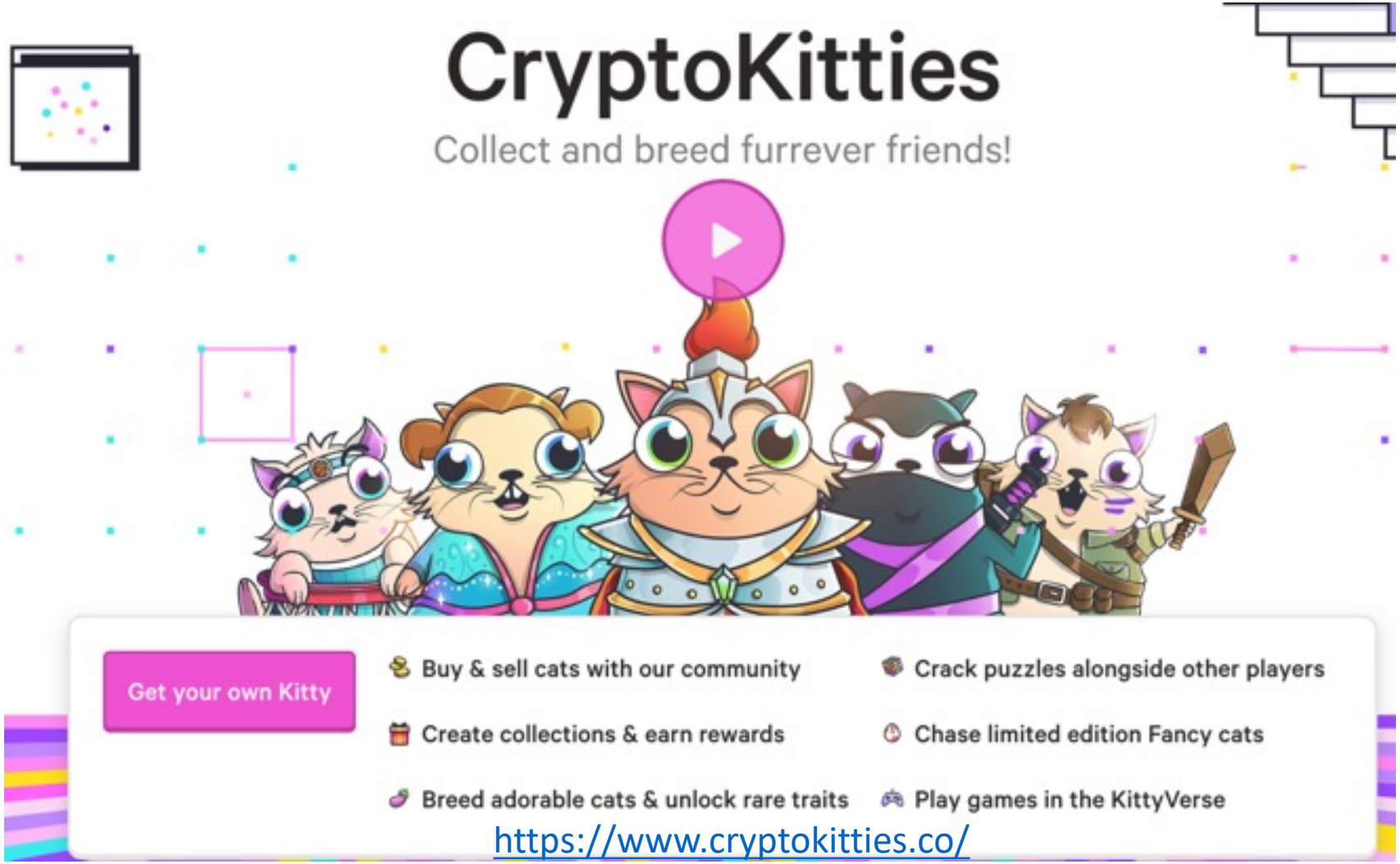
- **Ethereum** isn't just for **digital money**.
- Anything you can own can be **represented**, **traded** and **put to use** as **non-fungible tokens (NFTs)**.



Source: https://ethereum.org/en/defi/

Non-Fungible Tokens (NFT)

CryptoKitties



https://www.cryptokitties.co/

Source: Matt Fortnow and QuHarrison Terry (2021), The NFT Handbook - How to Create, Sell and Buy Non-Fungible Tokens, Wiley

Top 10 Cryptocurrency Prices by Market Cap

The global cryptocurrency market cap today is $949 Billion (2022/09/19)

#	Coin		Price	1h	24h	7d	24h Volume	Mkt Cap	Last 7 Days
☆ 1	Bitcoin BTC	Buy	$18,661.01	1.1%	-6.4%	-14.0%	$36,957,734,563	$357,450,768,001	
☆ 2	Ethereum ETH	Buy	$1,313.63	1.3%	-8.5%	-25.4%	$18,988,880,341	$158,564,862,486	
☆ 3	Tether USDT		$0.997150	-0.2%	-0.5%	-0.0%	$46,657,045,064	$68,000,277,868	
☆ 4	USD Coin USDC		$0.996395	-0.2%	-0.5%	-0.1%	$5,228,754,733	$50,102,628,549	
☆ 5	BNB BNB		$260.50	0.6%	-5.9%	-11.6%	$689,626,161	$42,564,018,996	
☆ 6	Binance USD BUSD		$1.00	0.1%	0.4%	0.2%	$9,983,425,894	$20,819,973,178	
☆ 7	XRP XRP		$0.353198	1.3%	-7.0%	-0.4%	$2,380,959,267	$17,549,730,741	
☆ 8	Cardano ADA		$0.442609	1.4%	-7.6%	-13.0%	$713,335,000	$14,972,334,641	
☆ 9	Solana SOL	Buy	$31.30	1.2%	-6.1%	-10.3%	$859,963,985	$11,095,015,943	
☆ 10	Dogecoin DOGE		$0.056770	0.6%	-6.7%	-10.7%	$320,451,732	$7,535,360,925	

Source: https://www.coingecko.com/en

Top Stablecoins
(Tether USDT, USD Coin USDC, Dai)

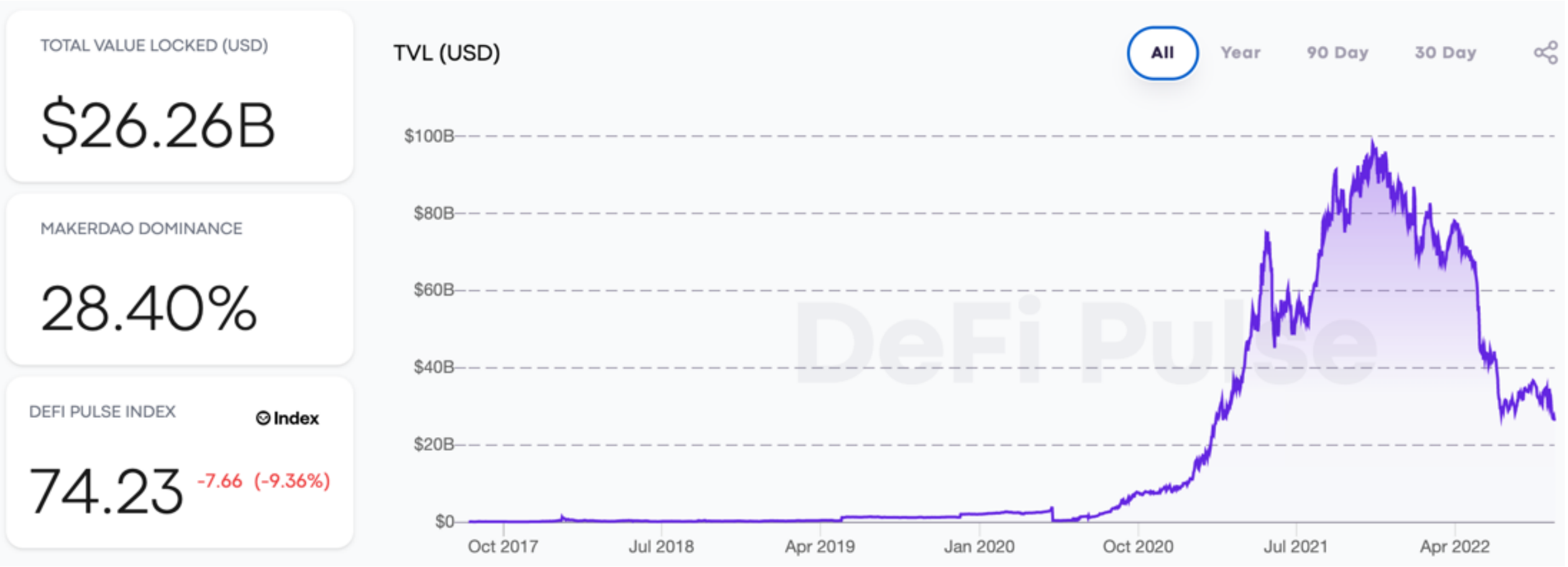
Digital money for everyday use
Stablecoins are
Ethereum tokens designed to
stay at a fixed value,
even when
the price of ETH changes.

CURRENCY	MARKET CAPITALIZATION	COLLATERAL TYPE
Tether	$67,921,899,068	Fiat
USD Coin	$50,081,277,279	Fiat
Binance USD	$20,811,100,732	Fiat
Dai	$6,411,784,420	Crypto
Frax	$1,358,584,284	Algorithmic
TrueUSD	$1,074,503,081	Fiat
Pax Dollar	$963,944,923	Fiat

Source: https://ethereum.org/en/stablecoins/

DeFi Total Value Locked (USD)

(DeFi Pulse)



Source: https://defipulse.com/

Top 10 DeFi Applications (DApps)

(DeFi Pulse)

Lending

DEXes (Decentralized Exchanges)

Derivatives

Assets

Payments

#	NAME	CHAIN	SECTOR	TVL (USD)
1	MakerDAO	Ethereum	Lending	$7.25B
2	Curve	Ethereum	DEXes	$4.22B
3	Aave	Ethereum	Lending	$3.98B
4	Uniswap	Ethereum	DEXes	$3.60B
5	Compound	Ethereum	Lending	$2.10B
6	InstaDApp	Ethereum	Lending	$1.19B
7	Liquity	Ethereum	Lending	$643.3M
8	Balancer	Ethereum	DEXes	$488.8M
9	dYdX	Ethereum	Derivatives	$471.3M
10	SushiSwap	Ethereum	DEXes	$305.1M

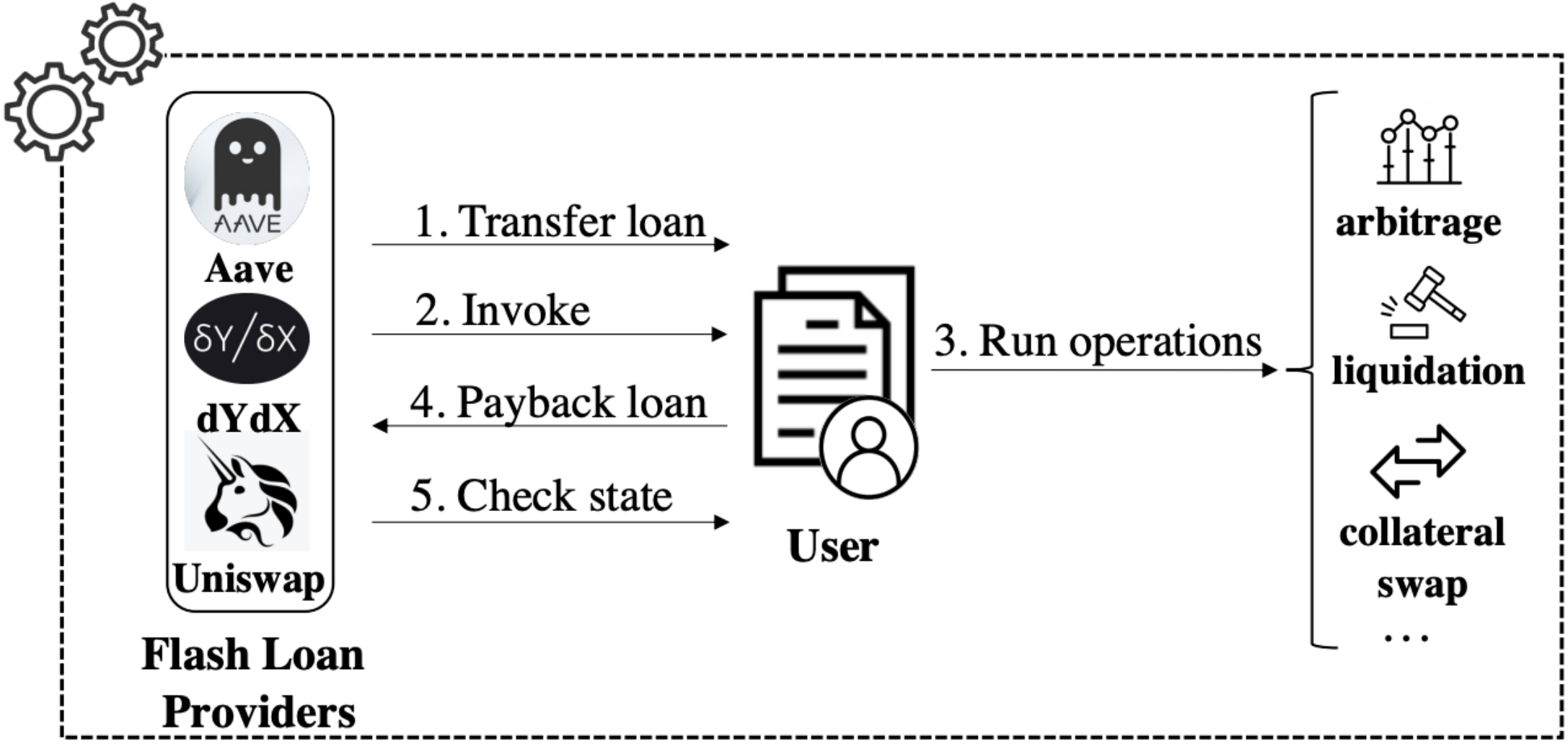
Source: https://defipulse.com/

Financial Stability Challenges

Crypto Ecosystem	• **Operational, cyber, and governance risks** • **Integrity (market and AML/CFT)** (Anti–Money Laundering / Combating the Financing of Terrorism) • **Data availability / reliability** • **Challenges from cross-boarder activites**
Stablecoins	• **How stable are stablecoins?** • **Domestic and global regulatory and supervisory approaches**
Macro-Financial	• **Cryptoization, capital flows, and restrictions** • **Monetary policy transmission** • **Bank disintermediation**

Source: Parma Bains, Mohamed Diaby, Dimitris Drakopoulos, Julia Faltermeier, Federico Grinberg, Evan Papageorgiou, Dmitri Petrov, Patrick Schneider, and Nobu Sugimoto (2021), The Crypto Ecosystem and Financial Stability Challenges, International Monetary Fund, October 2021

Decentralized Finance Applications (DApps): Flash Loan Transaction



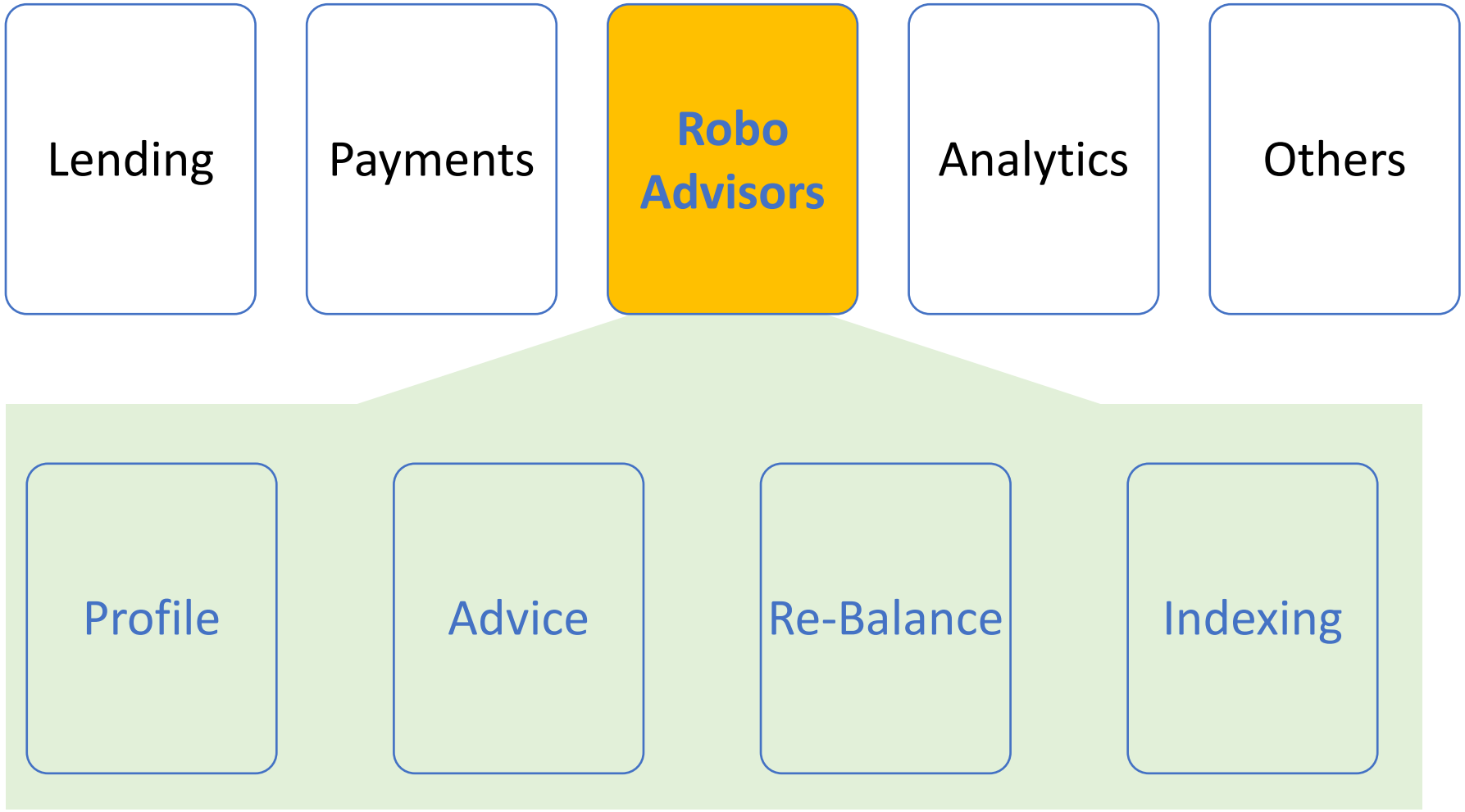
Source: Wang, Dabao, Siwei Wu, Ziling Lin, Lei Wu, Xingliang Yuan, Yajin Zhou, Haoyu Wang, and Kui Ren (2021). "Towards A First Step to Understand Flash Loan and Its Applications in DeFi Ecosystem." In *Proceedings of the Ninth International Workshop on Security in Blockchain and Cloud Computing*, pp. 23-28. 2021.

Financial Services

Technology Innovation

FinTech Innovation

FinTech high-level classification

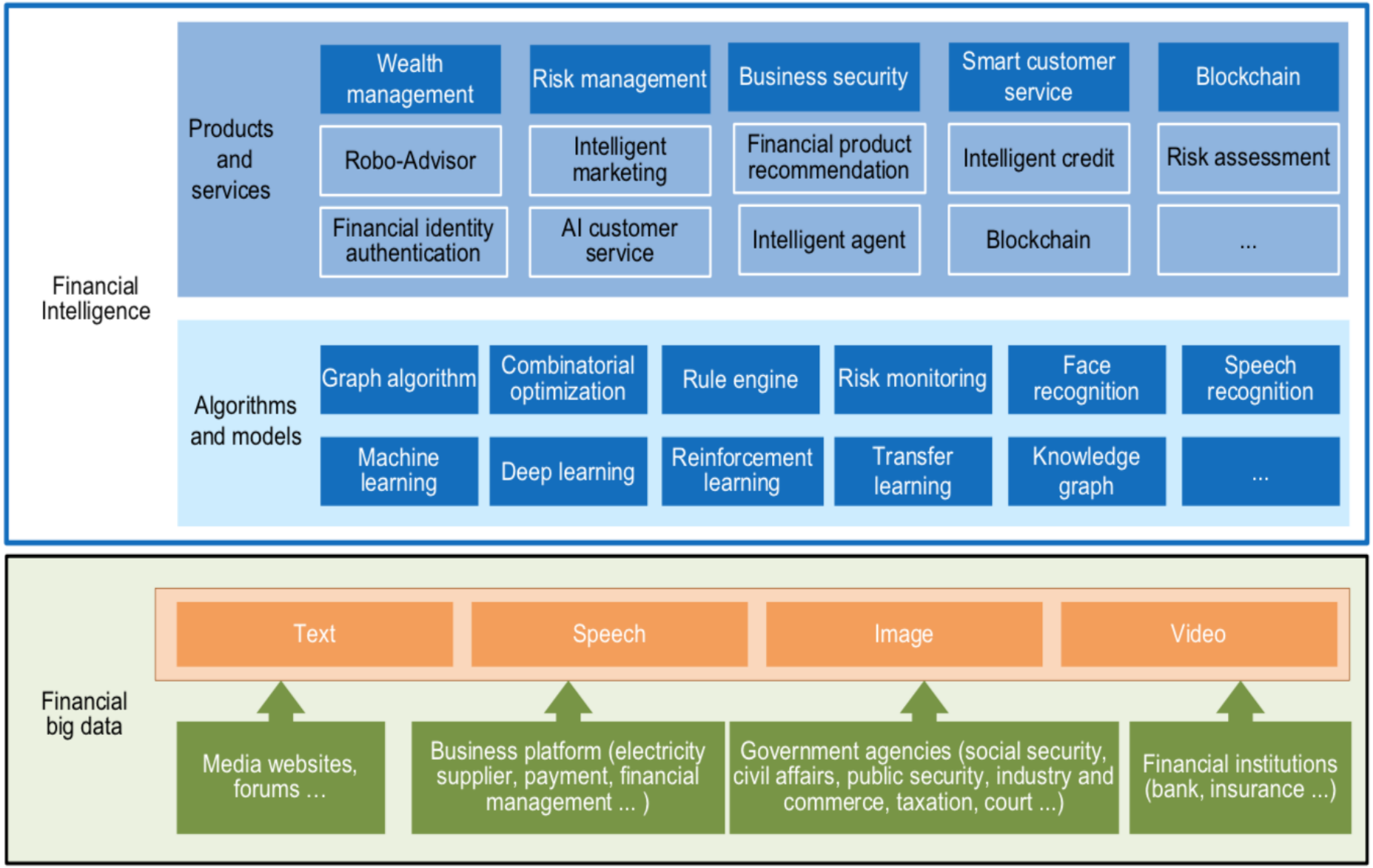


Source: Paolo Sironi (2016), "FinTech Innovation: From Robo-Advisors to Goal Based Investing and Gamification", Wiley.

Technology-driven Financial Industry Development

FinBrain: when Finance meets AI 2.0

(Zheng et al., 2019)



Source: Xiao-lin Zheng, Meng-ying Zhu, Qi-bing Li, Chao-chao Chen, and Yan-chao Tan (2019), "Finbrain: When finance meets AI 2.0." Frontiers of Information Technology & Electronic Engineering 20, no. 7, pp. 914-924

AI 2.0

a new generation of AI
based on the
novel information environment of
major changes and
the development of
new goals.

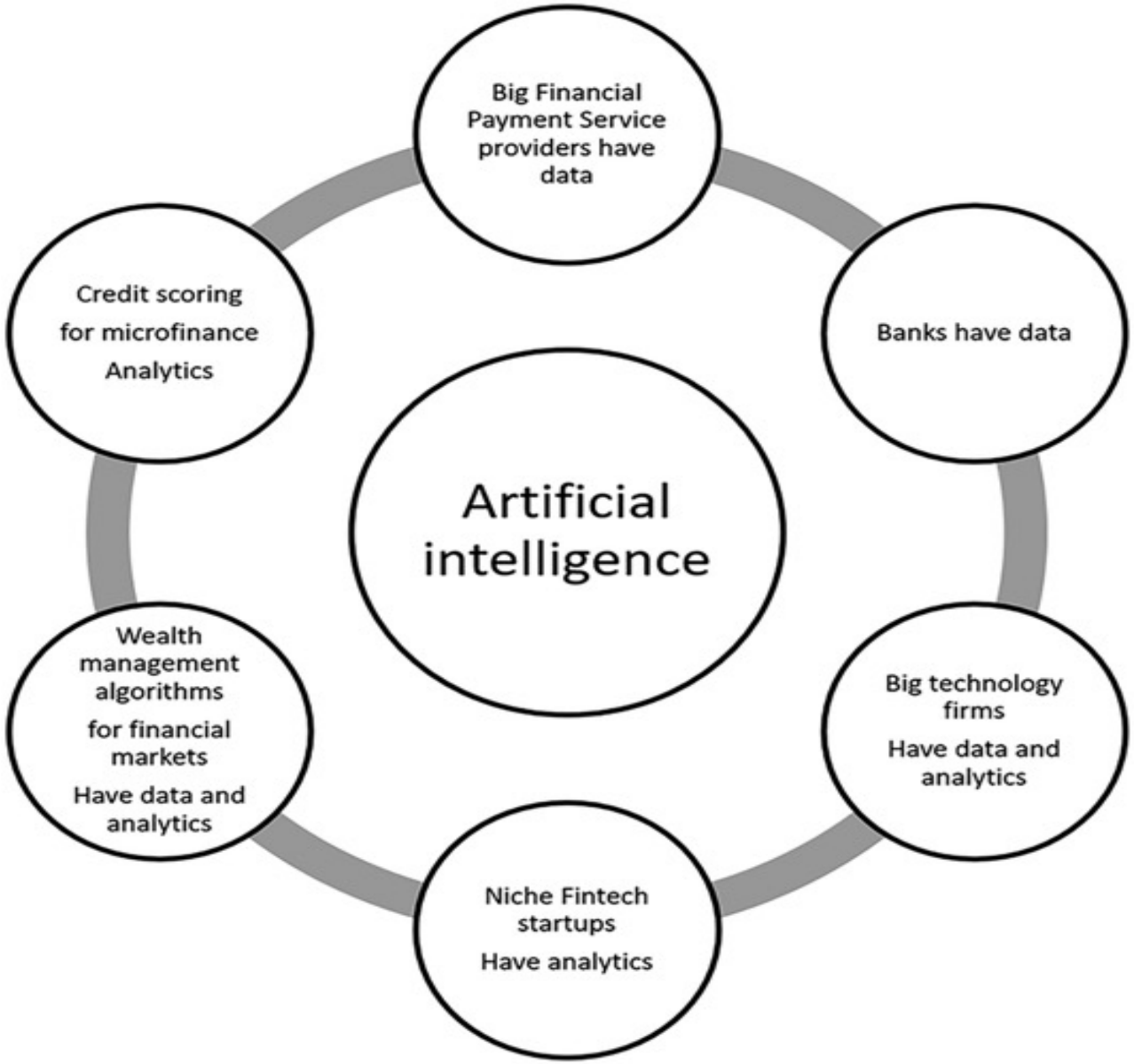
Yunhe Pan (2016), "Heading toward artificial intelligence 2.0." Engineering 2, no. 4, 409-413.

Technology-driven Financial Industry Development

Development stage	Driving technology	Main landscape	Inclusive finance	Relationship between technology and finance
Fintech 1.0 (financial IT)	Computer	Credit card, ATM, and CRMS	Low	Technology as a tool
Fintech 2.0 (Internet finance)	Mobile Internet	Marketplace lending, third-party payment, crowdfunding, and Internet insurance	Medium	Technology-driven change
Fintech 3.0 (financial intelligence)	AI, Big Data, Cloud Computing, Blockchain	Intelligent finance	High	Deep fusion

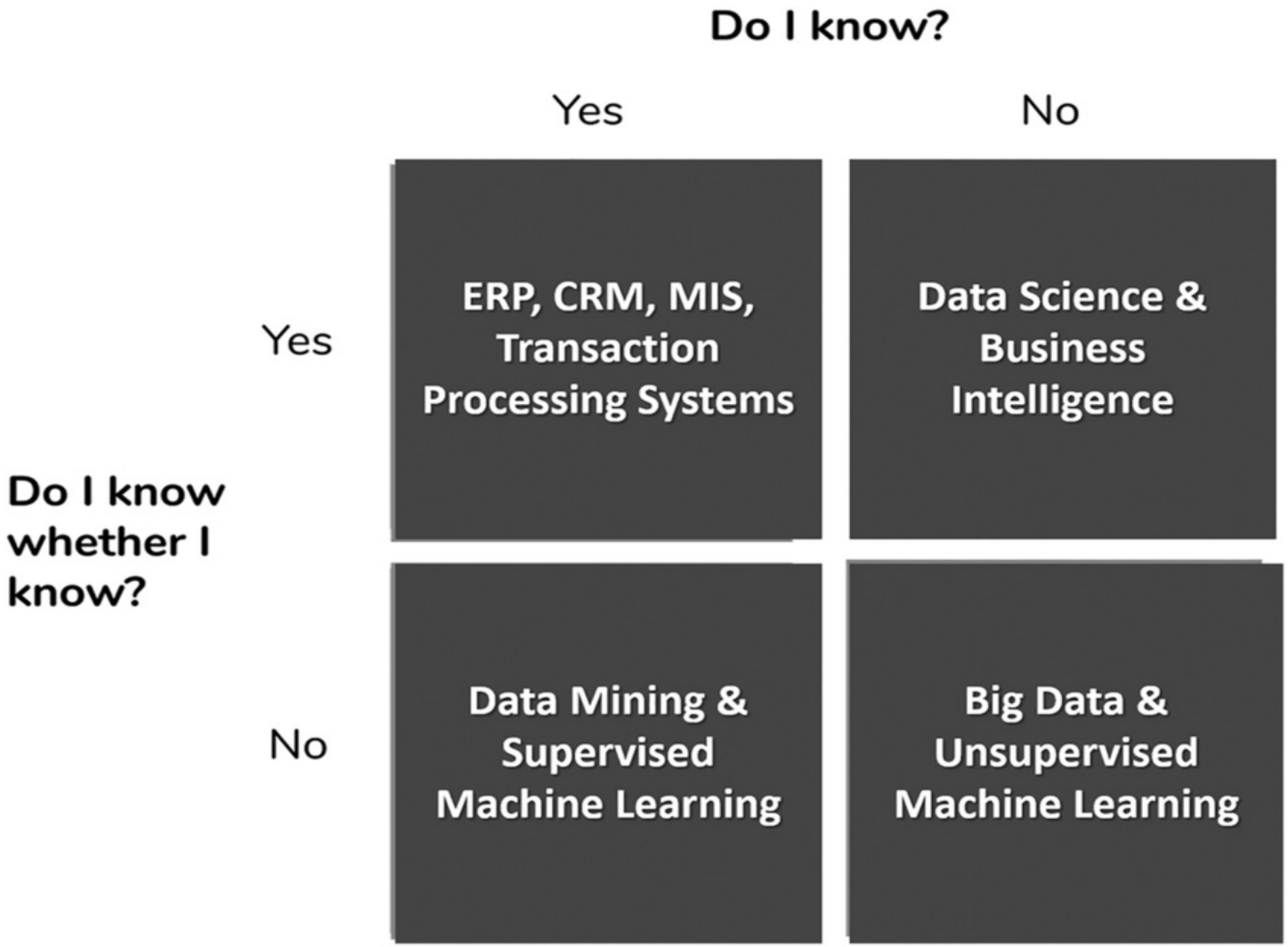
Source: Xiao-lin Zheng, Meng-ying Zhu, Qi-bing Li, Chao-chao Chen, and Yan-chao Tan (2019), "Finbrain: When finance meets AI 2.0." Frontiers of Information Technology & Electronic Engineering 20, no. 7, pp. 914-924

Artificial Intelligence in the Financial Markets



Source: Ashta, Arvind, and Heinz Herrmann (2021). "Artificial intelligence and fintech: An overview of opportunities and risks for banking, investments, and microfinance." Strategic Change 30, no. 3 (2021): 211-222.

AI in Managerial Blind Spots:
Unknown Knowns and Unknown Unknowns



Source: Ashta, Arvind, and Heinz Herrmann (2021). "Artificial intelligence and fintech: An overview of opportunities and risks for banking, investments, and microfinance." Strategic Change 30, no. 3 (2021): 211-222.

Green Finance

Sustainability Innovation

Sustainable Development Goals (SDGs)

Source: https://sdgs.un.org/goals

Sustainable Development Goals (SDGs) and 5P

Partnership

Peace

Prosperity

People

Planet

Source: Folke, Carl, Reinette Biggs, Albert V. Norström, Belinda Reyers, and Johan Rockström. "Social-ecological resilience and biosphere-based sustainability science."Ecology and Society 21, no. 3 (2016).

Green Finance

Generic term
implying use or diversion
of financial resources
to deploy and support projects
with long term positive impact
on the environment

Source: Bhattacharyya, Rupsha. "Green finance for energy transition, climate action and sustainable development: overview of concepts, applications, implementation and challenges." Green Finance 4, no. 1 (2022): 1-35.

Sustainable Finance

Finances

deployed in support of projects that ensure just, sustainable and inclusive growth or attainment of one or more sustainable development goals

Source: Bhattacharyya, Rupsha. "Green finance for energy transition, climate action and sustainable development: overview of concepts, applications, implementation and challenges." Green Finance 4, no. 1 (2022): 1-35.

Carbon Finance and Climate Finance

- **Carbon Finance**
  - Financial instruments based on economic value of carbon emissions which an organization cannot avoid but which it offsets by funding other compensatory projects that contribute to carbon emissions reduction
- **Climate Finance**
  - Finances deployed in support of low carbon and climate resilient projects that help in climate change mitigation and adaptation efforts, particularly in the energy and infrastructure sectors

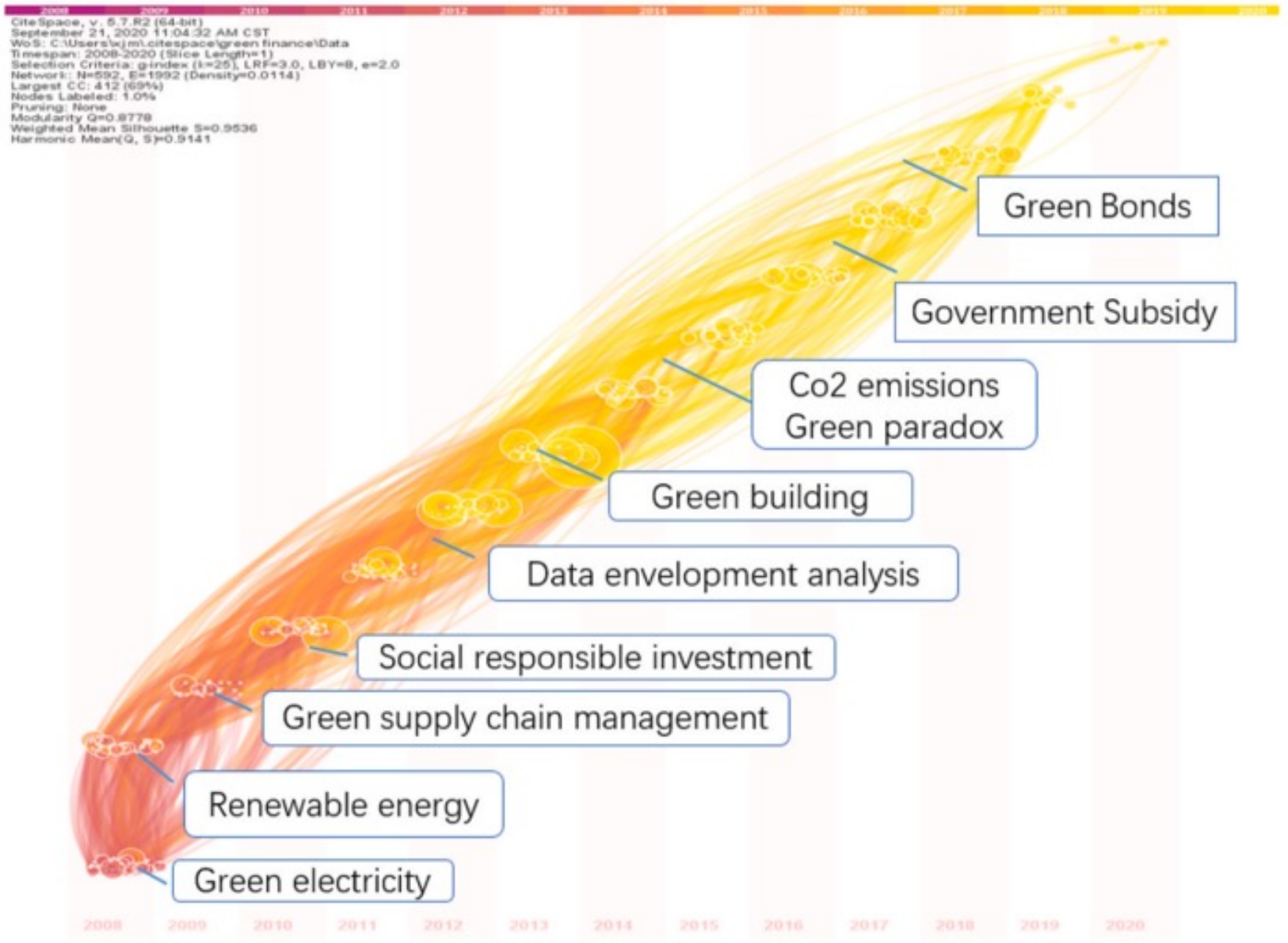
Source: Bhattacharyya, Rupsha. "Green finance for energy transition, climate action and sustainable development: overview of concepts, applications, implementation and challenges." Green Finance 4, no. 1 (2022): 1-35.

Impact Investing and ESG Investing

- **Impact investing**
  - Investing in projects that solve a social or environmental problem; the focus is on the positive impact rather than the means used to produce that impact
- **ESG Investing**
  - Investments considering the broad range of
    environmental (e.g. climate change, pollution biodiversity loss),
    social (e.g. working conditions, human rights, salary or compensation structures)
    and governance (e.g. board composition, diversity and inclusion, taxes)
    characteristics of the projects or companies being invested in; ethical and business sustainability considerations are integral part of financing

Source: Bhattacharyya, Rupsha. "Green finance for energy transition, climate action and sustainable development: overview of concepts, applications, implementation and challenges." Green Finance 4, no. 1 (2022): 1-35.

Dynamic Trends of Green Finance and Energy Policy



Source: Wang, Moran, Xuerong Li, and Shouyang Wang. (2021) "Discovering research trends and opportunities of green finance and energy policy: A data-driven scientometric analysis." Energy Policy 154 (2021): 112295.

ESG:

Environmental

Social

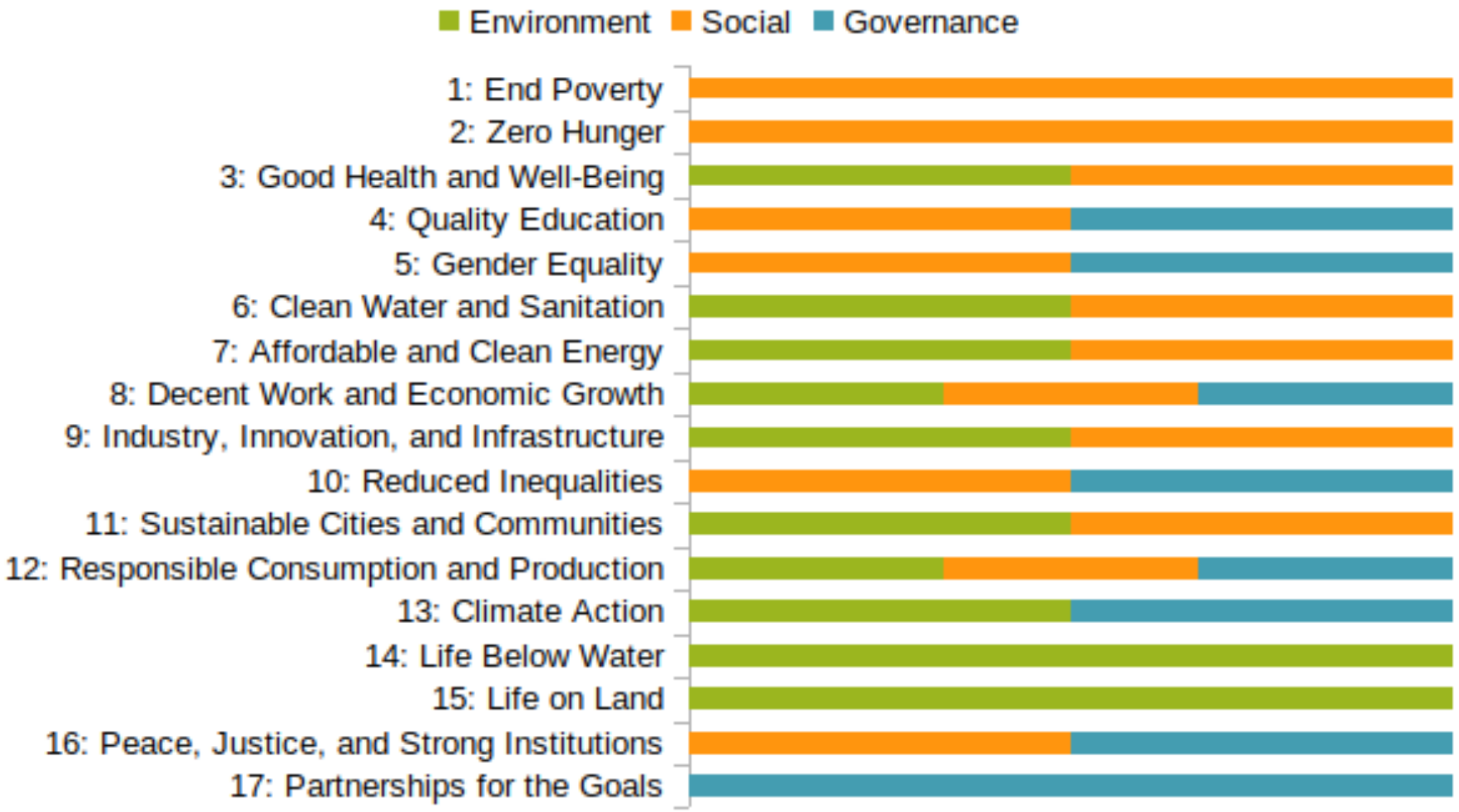
Governance

CSR: Corporate Social Responsibility

ESG to 17 SDGs

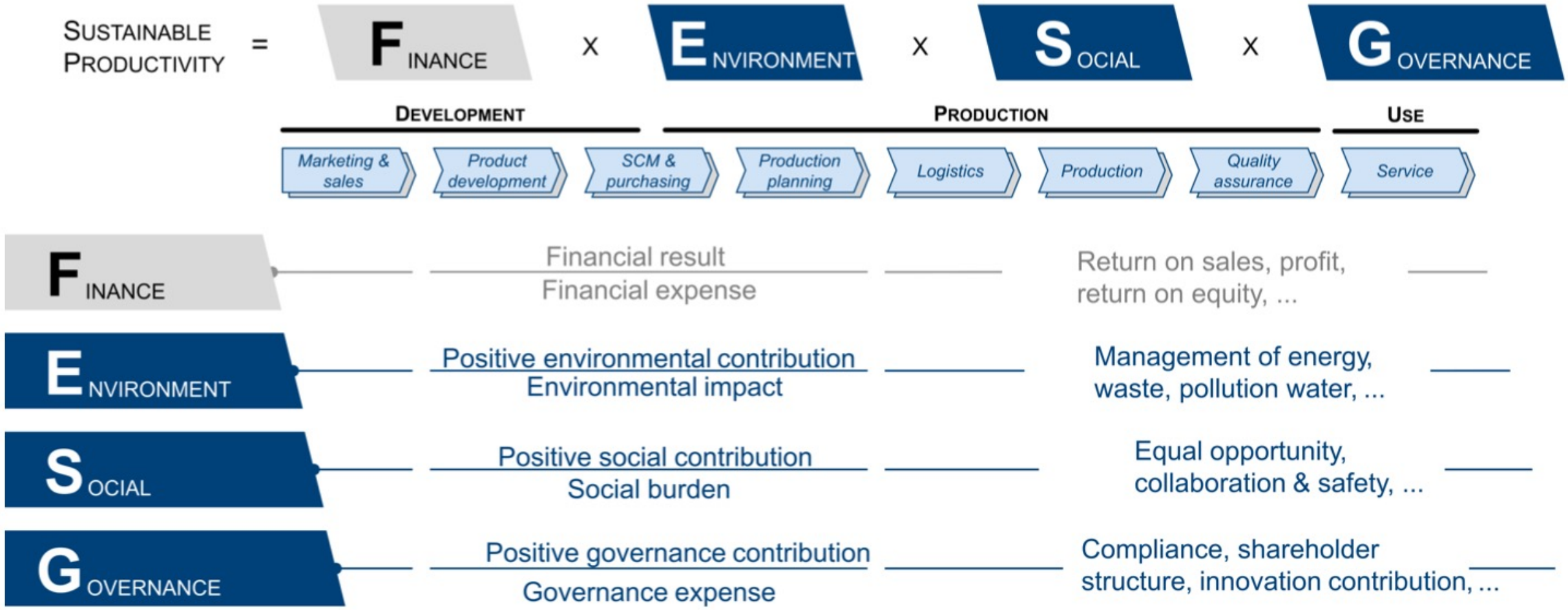
Source: Henrik Skaug Sætra (2021) "A Framework for Evaluating and Disclosing the ESG Related Impacts of AI with the SDGs." Sustainability 13, no. 15 (2021): 8503.

ESG to 17 SDGs



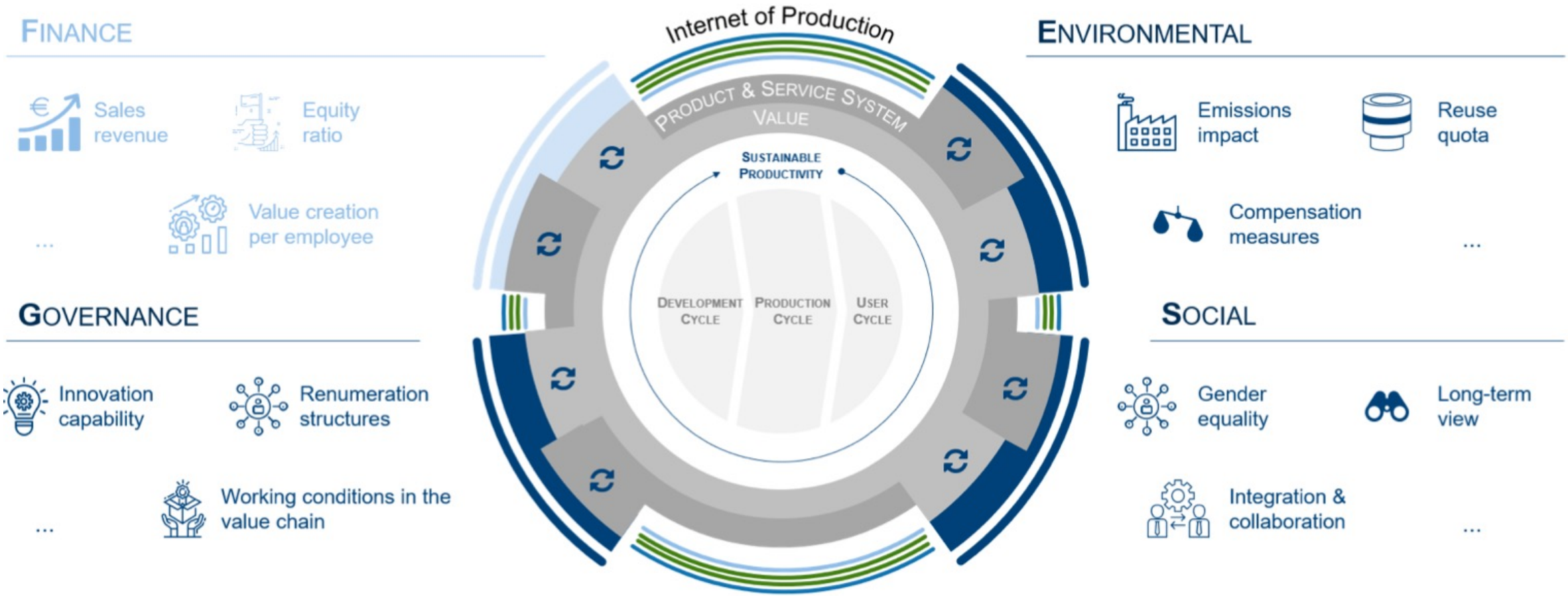
Source: https://sustainometric.com/esg-to-sdgs-connected-paths-to-a-sustainable-future/

Sustainable Productivity: Finance ESG



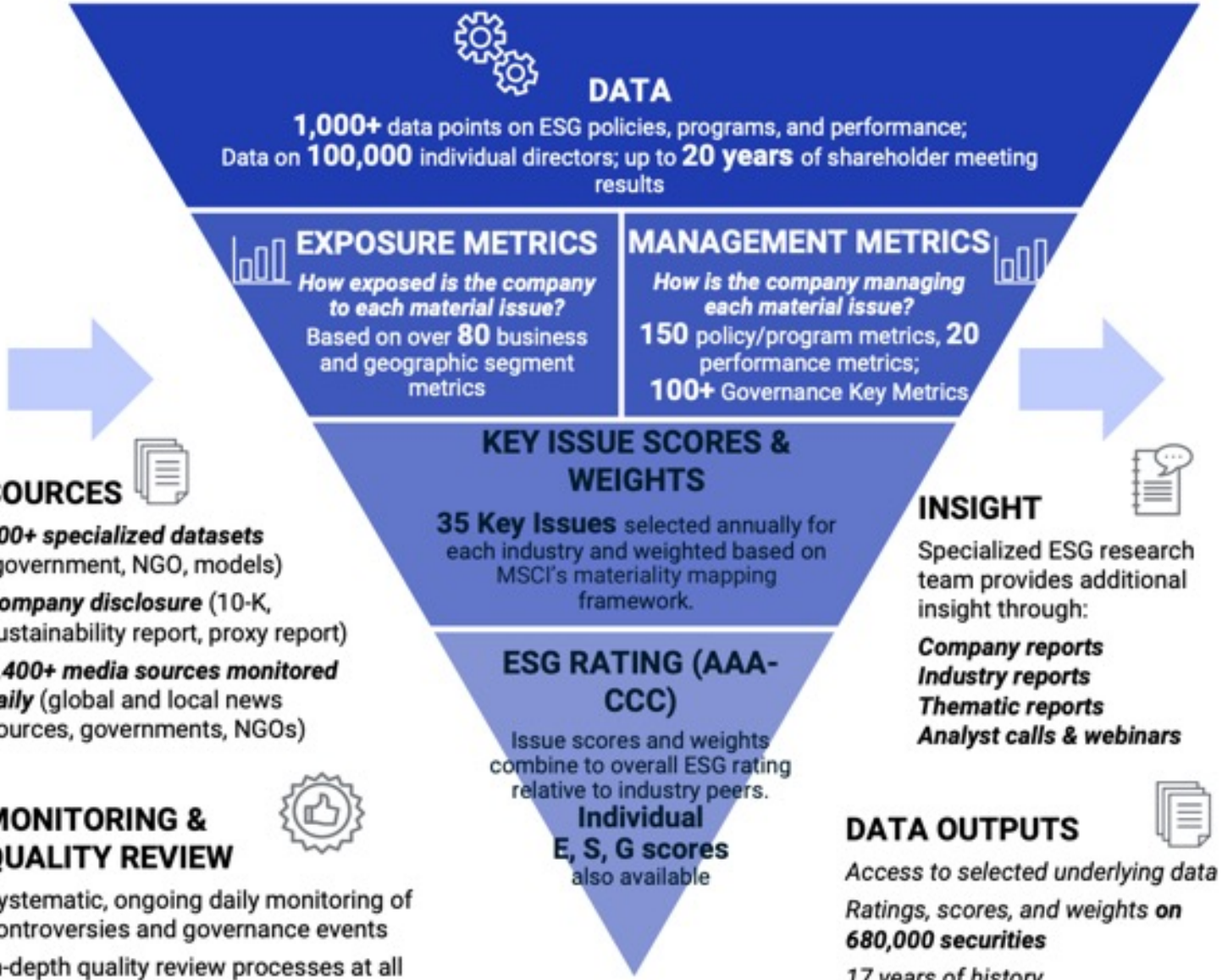
Source: Huang, Ziqi, Yang Shen, Jiayi Li, Marcel Fey, and Christian Brecher (2021). "A survey on AI-driven digital twins in Industry 4.0: Smart manufacturing and advanced robotics." Sensors 21, no. 19: 6340.

Sustainable Resilient Manufacturing
ESG



Source: Huang, Ziqi, Yang Shen, Jiayi Li, Marcel Fey, and Christian Brecher (2021). "A survey on AI-driven digital twins in Industry 4.0: Smart manufacturing and advanced robotics." Sensors 21, no. 19: 6340.

MSCI ESG Rating Framework



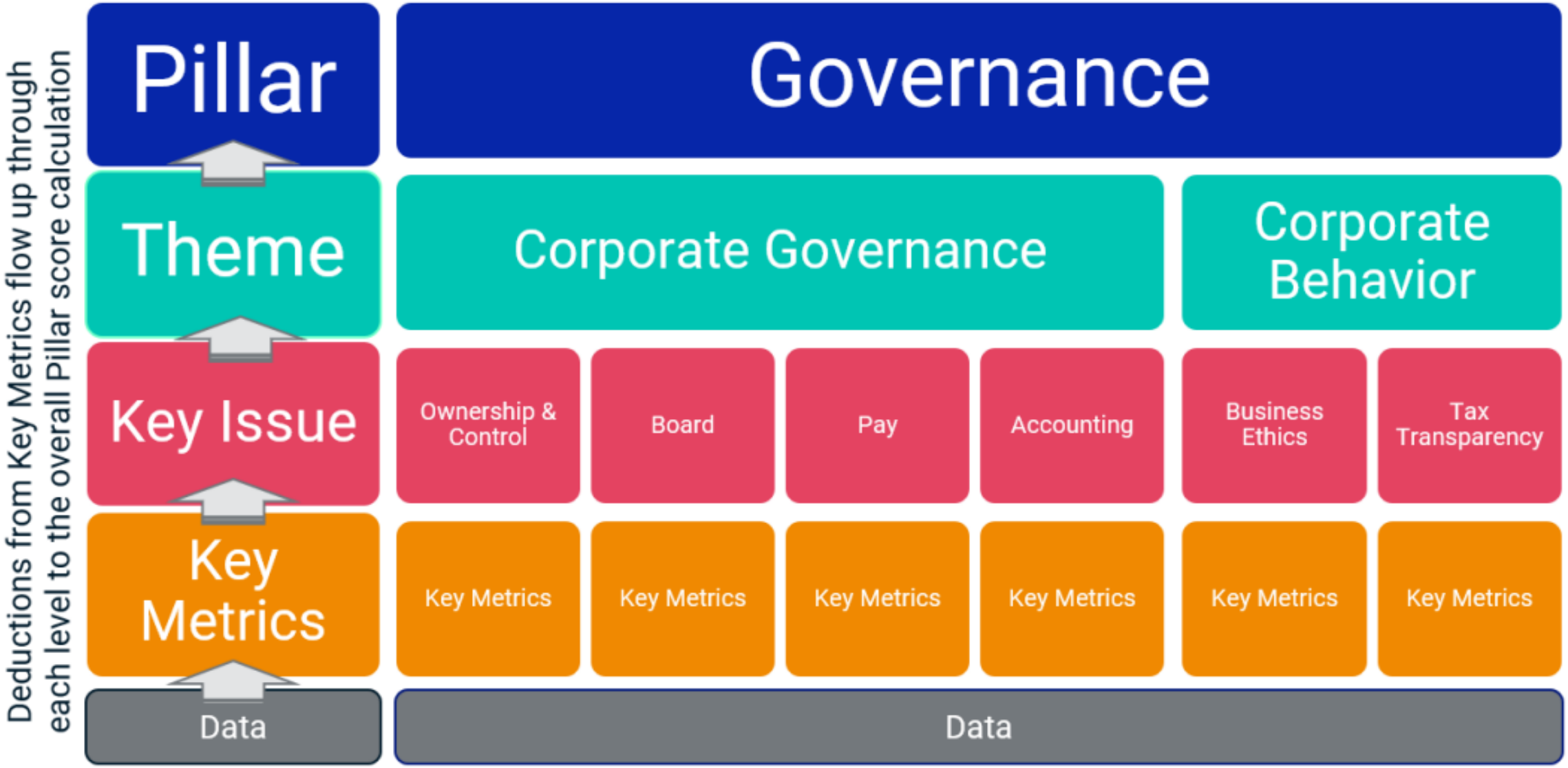
Source: https://www.msci.com/documents/1296102/21901542/ESG-Ratings-Methodology-Exec-Summary.pdf

MSCI ESG Key Issue Hierarchy

3 Pillars	10 Themes	35 ESG Key Issues	
Environment	**Climate Change**	Carbon Emissions	Financing Environmental Impact
		Product Carbon Footprint	Climate Change Vulnerability
	Natural Capital	Water Stress	Raw Material Sourcing
		Biodiversity & Land Use	
	Pollution & Waste	Toxic Emissions & Waste	Electronic Waste
		Packaging Material & Waste	
	Environmental Opportunities	Opportunities in Clean Tech	Opportunities in Renewable Energy
		Opportunities in Green Building	
Social	**Human Capital**	Labor Management	Human Capital Development
		Health & Safety	Supply Chain Labor Standards
	Product Liability	Product Safety & Quality	Privacy & Data Security
		Chemical Safety	Responsible Investment
		Consumer Financial Protection	Health & Demographic Risk
	Stakeholder Opposition	Controversial Sourcing	
		Community Relations	
	Social Opportunities	Access to Communications	Access to Health Care
		Access to Finance	Opportunities in Nutrition & Health
Governance	**Corporate Governance**	Ownership & Control	Pay
		Board	Accounting
	Corporate Behavior	Business Ethics	
		Tax Transparency	

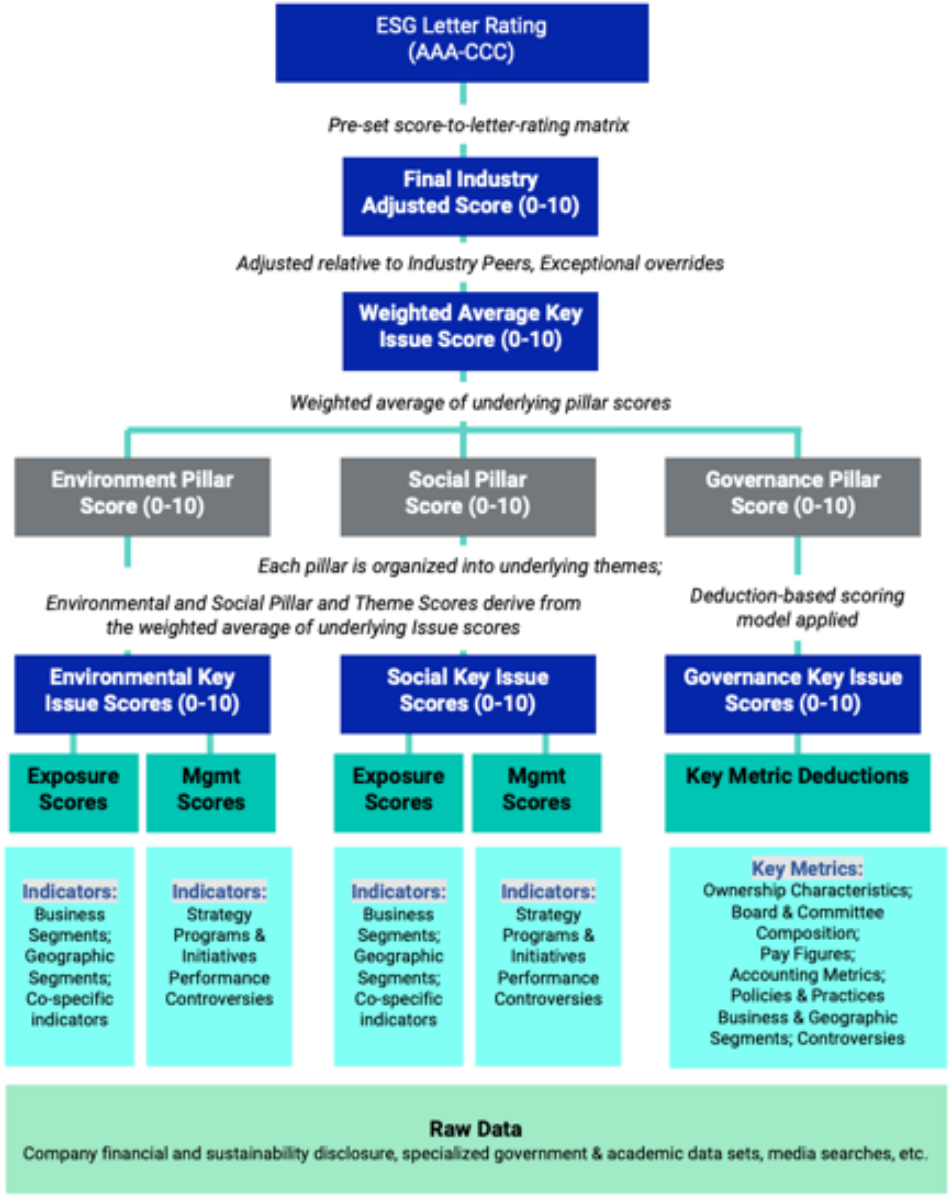
Source: https://www.msci.com/documents/1296102/21901542/ESG-Ratings-Methodology-Exec-Summary.pdf

MSCI Governance Model Structure



Source: https://www.msci.com/documents/1296102/21901542/ESG-Ratings-Methodology-Exec-Summary.pdf

MSCI Hierarchy of ESG Scores



Source: https://www.msci.com/documents/1296102/21901542/ESG-Ratings-Methodology-Exec-Summary.pdf

Innovation

Source: https://www.merriam-webster.com/dictionary/innovation

Innovation:

a new idea, method, or device

Source: https://www.merriam-webster.com/dictionary/innovation

Innovation: something new

Source: https://www.merriam-webster.com/dictionary/innovation

Novelty :

something new or unusual

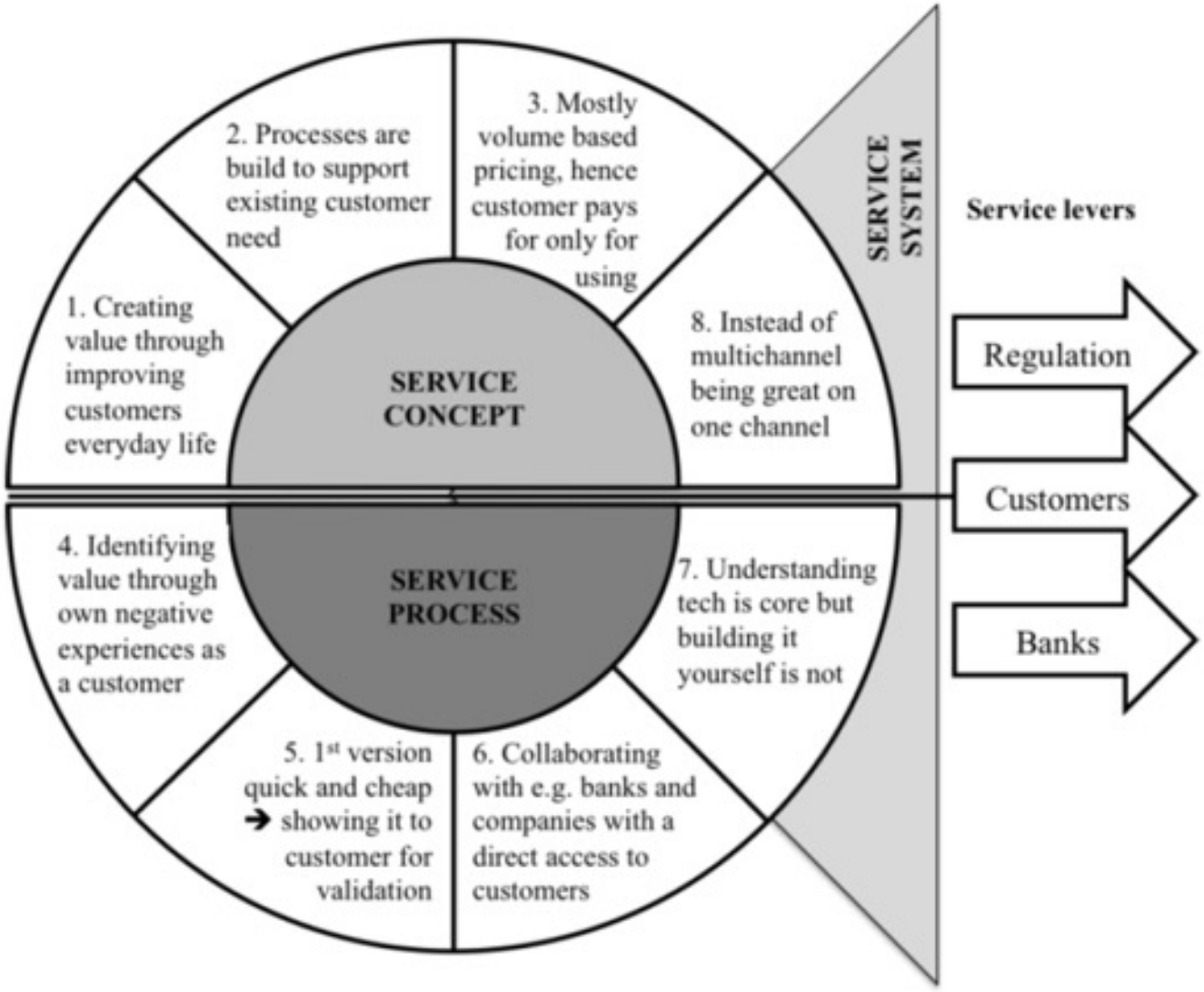
the novelty of a self-driving car

Source: https://www.merriam-webster.com/dictionary/novelty

Creativity is not a new Idea.

Creativity is an old belief you leave behind

FinTechs as Service Innovators: Analysing Components of Innovation



Source: Riikkinen, Mikko, Kaisa Still, Saila Saraniemi, and Katri Kallio. "FinTechs as service innovators: analysing components of innovation." In *ISPIM Innovation Symposium*, The International Society for Professional Innovation Management (ISPIM), 2016.

Innovation

“a process of searching and recombining existing knowledge elements”

Source: Savino, Tommaso, Antonio Messeni Petruzzelli, and Vito Albino. "Search and recombination process to innovate: A review of the empirical evidence and a research agenda." International Journal of Management Reviews (2017).

Search and recombination process to innovate:
A review of the empirical evidence and a research agenda

Source: Savino, Tommaso, Antonio Messeni Petruzzelli, and Vito Albino. "Search and recombination process to innovate: A review of the empirical evidence and a research agenda." International Journal of Management Reviews (2017).

Innovation Research in Economics, Sociology and Technology Management

Source: Gopalakrishnan, Shanti, and Fariborz Damanpour.
"A review of innovation research in economics, sociology and technology management." *Omega* 25, no. 1 (1997): 15-28.

Innovation Research in Economics, Sociology and Technology Management

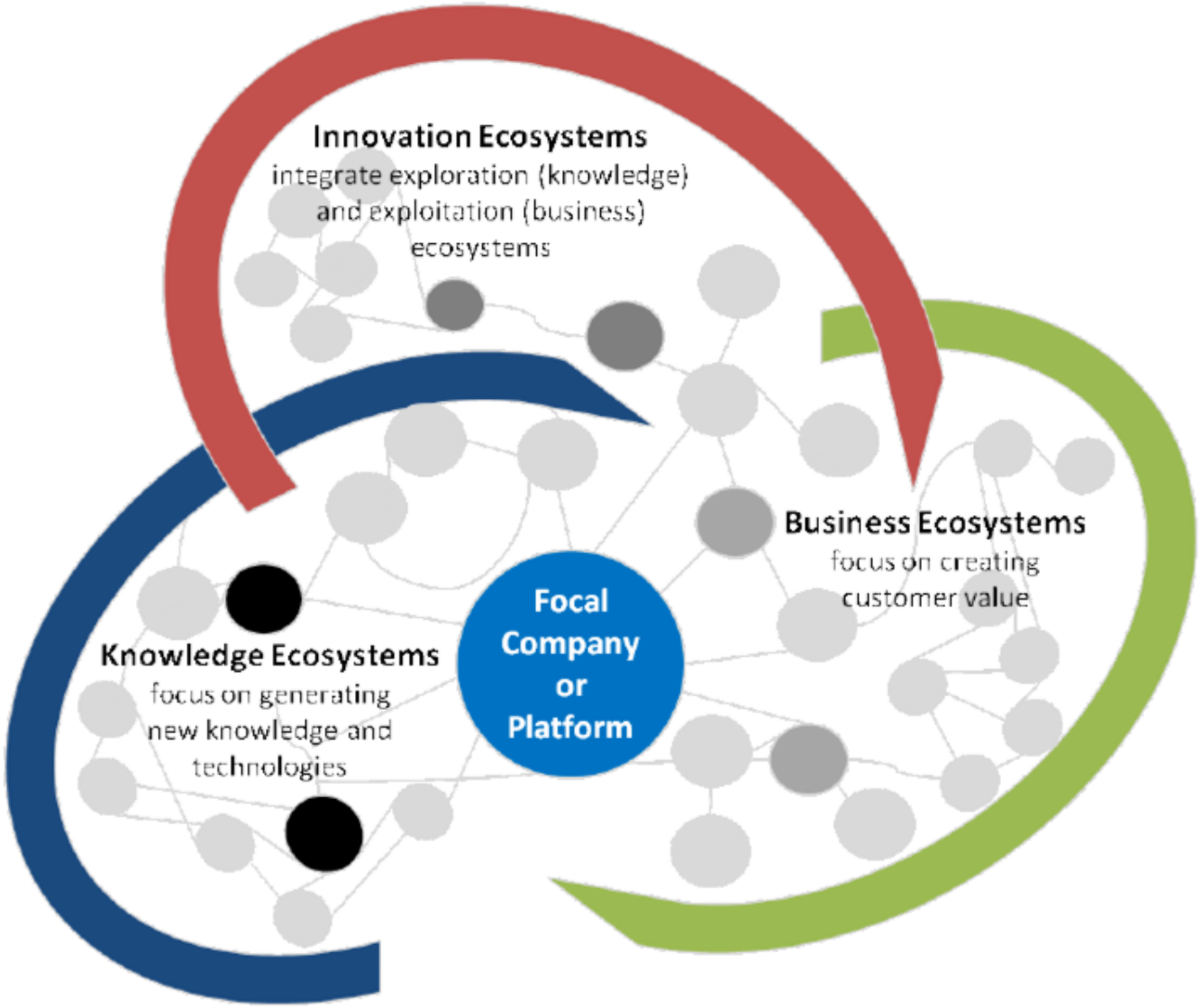
	Stage of process	Level of study	Type of innovation
Economists	Generation Idea generation Project definition	Industry	Product and process Only technical Only radical
Technologists			
Contextual technologists	Generation Commercialization and marketing Diffusion	Innovation (in the industry context)	Product and process Only technical Radical and incremental
Organizational technologists	Generation Idea generation Problem solving adoption Adoption Initiation	Organizational Sub-system	Product and process Only technical Radical and incremental
Sociologists			
Variance sociologists	Adoption Initiation Implementation	Organization	Product and process Technical and administrative Radical and incremental
Process sociologists	Adoption Initiation Implementation	Innovation (at the organizational level)	Product and process Technical and administrative Radical and incremental

Source: Gopalakrishnan, Shanti, and Fariborz Damanpour.
"A review of innovation research in economics, sociology and technology management." *Omega* 25, no. 1 (1997): 15-28.

Business, Innovation, and Knowledge Ecosystems

Source: Valkokari, Katri. "Business, innovation, and knowledge ecosystems: how they differ and how to survive and thrive within them." *Technology Innovation Management Review* 5, no. 8 (2015).

Business, Innovation, and Knowledge Ecosystems



Source: Valkokari, Katri. "Business, innovation, and knowledge ecosystems: how they differ and how to survive and thrive within them." *Technology Innovation Management Review* 5, no. 8 (2015).

Innovation Ecosystems Characteristics

	Business Ecosystems	Innovation Ecosystems	Knowledge Ecosystems
Baseline of Ecosystem	Resource exploitation for customer value	**Co-creation of innovation**	Knowledge exploration
Relationships and Connectivity	Global business relationships both competitive and co-operative	Geographically clustered actors, different levels of collaboration and openness	Decentralized and disturbed knowledge nodes, synergies through knowledge exchange
Actors and Roles	Suppliers, customers, and focal companies as a core, other actors more loosely involved	**Innovation policymakers, local intermediators, innovation brokers, and funding organizations**	Research institutes, innovators, and technology entrepreneurs serve as knowledge nodes
Logic of Action	A main actor that operates as a platform sharing resources, assets, and benefits or aggregates other actors together in the networked business operations	Geographically proximate actors interacting around hubs facilitated by intermediating actors	A large number of actors that are grouped around knowledge exchange or a central non-proprietary resource for the benefit of all actors

Source: Valkokari, Katri. "Business, innovation, and knowledge ecosystems: how they differ and how to survive and thrive within them." *Technology Innovation Management Review* 5, no. 8 (2015).

Diffusion of Innovation Theory (DOI)

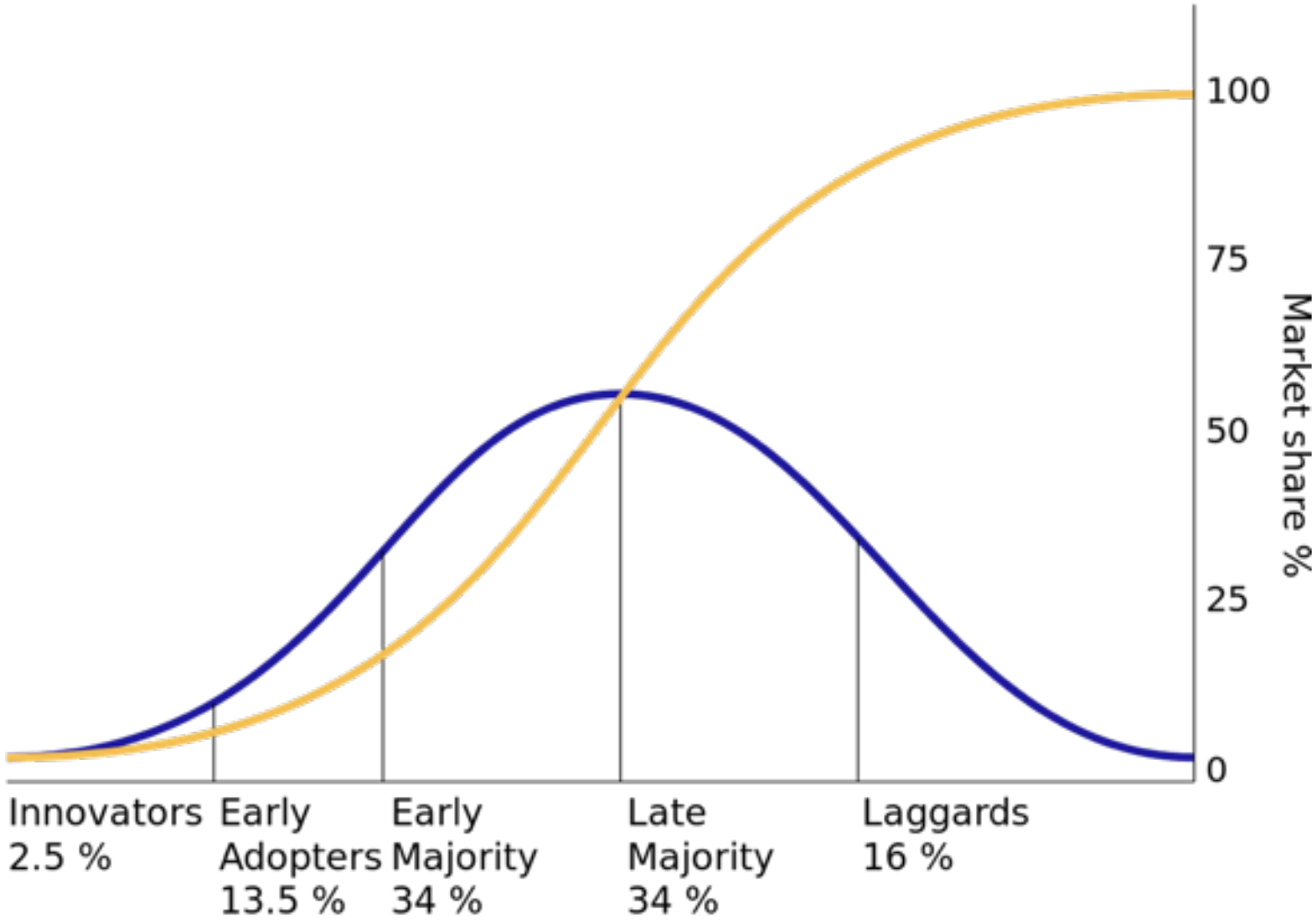
Source: Everett M. Rogers (2003), “Diffusion of Innovations”, Free Press, 5th Edition

Innovation
(Diffusion of Innovation)

1. Relative advantage
2. Compatibility
3. Complexity
4. Trialability
5. Observability

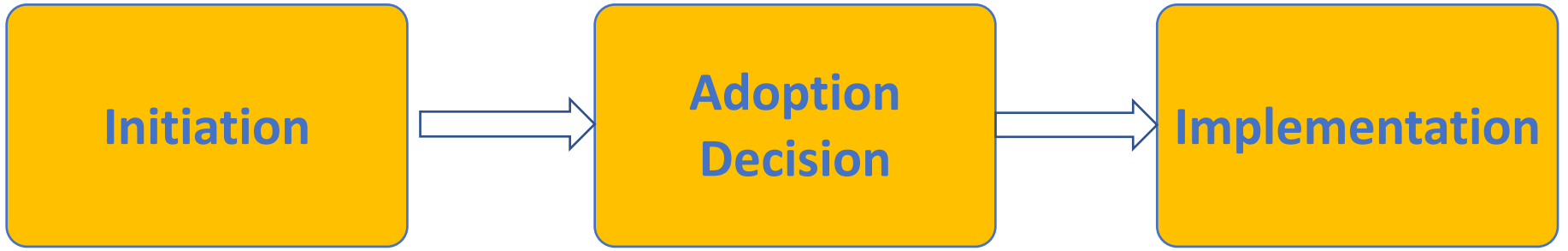
Source: Everett M. Rogers (2003), “Diffusion of Innovations”, Free Press, 5th Edition

Diffusion of Innovation



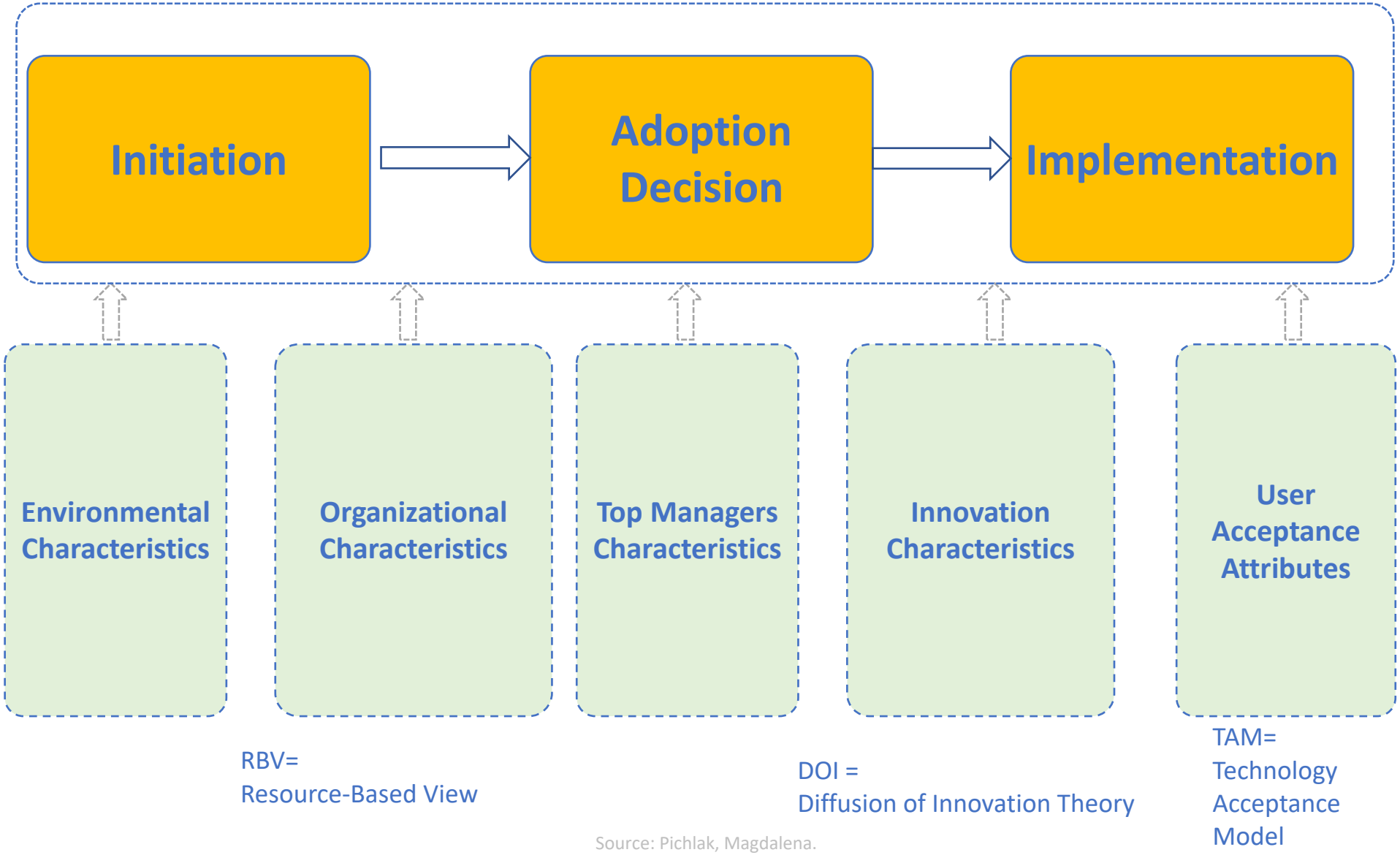
Source: https://en.wikipedia.org/wiki/Diffusion_of_innovations

Innovation Adoption Process



Source: Pichlak, Magdalena.
"The innovation adoption process: A multidimensional approach." Journal of Management and Organization 22, no. 4 (2016): 476.

Innovation Adoption Process



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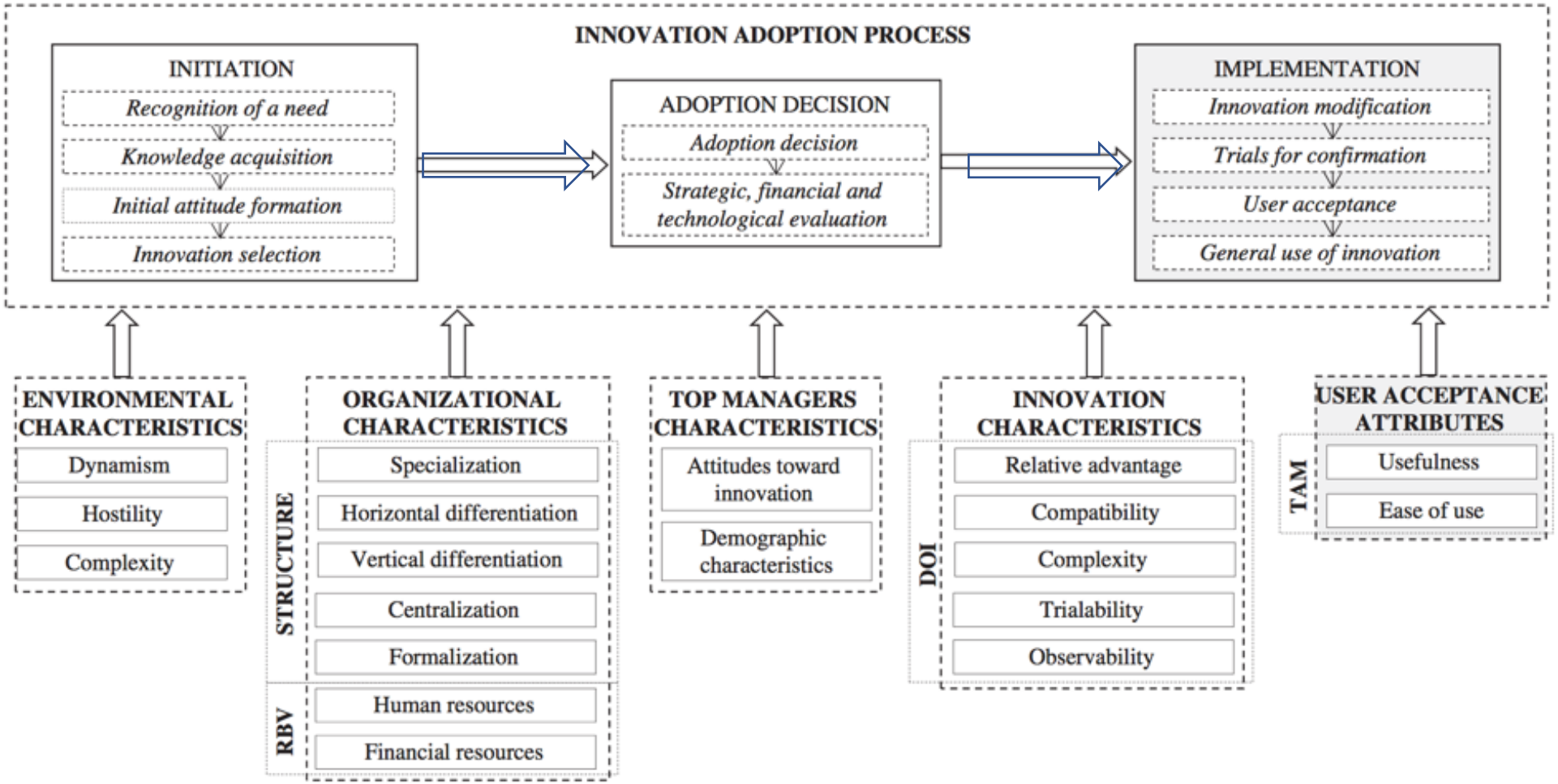
Innovation Adoption Process



RBV=
Resource-Based View

DOI =
Diffusion of Innovation Theory

TAM=
Technology Acceptance Model

Source: Pichlak, Magdalena.
"The innovation adoption process: A multidimensional approach." Journal of Management and Organization 22, no. 4 (2016): 476.

Summary

- AI in FinTech
  - Metaverse, Web3, DeFi, NFT
  - Financial Services Innovation and Applications
  - Technology-driven Financial Industry Development
- Green Finance, Sustainability Innovation
  - SDGs: Sustainable Development Goals
  - CSR: Corporate Social Responsibility
  - ESG: Environmental, Social, and Governance

資訊管理研討

Q & A

Artificial Intelligence in Fintech, Green Finance, and Sustainability Innovation
(人工智慧應用於金融科技、綠色金融與永續創新)

時間：2022/11/28 (一) 19:10-21:30
地點：淡江大學資訊管理研究所 EMBA 城區部 D312
主持人：施盛寶 主任, 淡江大學資訊管理學系

Min-Yuh Day, Ph.D,
Associate Professor

Institute of Information Management, National Taipei University

https://web.ntpu.edu.tw/~myday

2022-11-28

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