Supplementary Material

Supplementary A. A summary of the 65 possible determinants

No.	Technological	#	No.	Organizational	#	No.	Environmental	#
1	**Perceived Benefits / Advantages**	15	15	**Size**	15	44	**Competition Intensity**	17
2	Compatibility	8	16	**Top Management Support**	7	45	**Technology Policy & Regulations**	5
3	Complexity	8	17	**Scope**	6	46	Industry Maturity	3
4	Technology Readiness	6	18	Perceived Technical Competence	4	47	Information Intensity	3
5	Perceived Barriers	2	19	Perceived Financial Cost	3	48	**Trading Partner Readiness**	3
6	**Technology Maturity**	1	20	Organization Readiness	3	49	Trading Partner Influence	3
7	**Technology Characteristics**	1	21	Infrastructure	3	50	**Blockchain Industry Consortium**	2
8	Production & Operation Improvement	1	22	Formalization	2	51	Customer Power	2
9	Enhancement of Products & Services	1	23	Financial Resources	2	52	Government Pressure	2
10	Perceived Importance of Compliance	1	24	Employees' IS knowledge	2	53	Trust in Technology Service Provider	2
11	Technology Integration	1	25	ICT Experience	2	54	Critical Mass	1
12	IS Infrastructure	1	26	Absorption Capacity	2	55	Vertical Coordination	1
13	IS Expertise	1	27	**Inter-organizational Business Model**	1	56	Market Scope	1
14	Security	1	28	Centralization	1	57	Market Readiness	1
			29	Integration	1	58	Market Uncertainty	1
			30	Corporate Governance	1	59	Competitive Strategy	1
			31	Corporate Transparency	1	60	Competitor Scanning	1
			32	CEO's Innovativeness	1	61	Adaptable Innovations	1
			33	CEO's IS Knowledge	1	62	Consumer Readiness	1
			34	Championship	1	63	Customer Interaction	1
			35	Strategic Planning	1	64	Trading Partner Collaboration	1
			36	Role of IT	1	65	Trading Partner Support	1
			37	Implementation Planning	1	66	External ICT Support	1

38	Satisfaction with Existing Systems	1	67	Industry Characteristics	1
39	Information Sharing Culture	1			
40	Innovation Strategy	1			
41	Subjective Norms	1			
42	Training & Education	1			
43	Organizational Competency	1			

Note: These possible determinants are classified into technological, organizational, and environmental according to the classification in prior literature, and are ranked from most to least in order of frequency; # represents the frequency.

Supplement B. Question list of executive interviews

PART 1

Before you review these determinants, can you share your experience and involvement in Permissioned Blockchain adoption in answering the following 3 questions?

1. Are you an adopter of Permissioned Blockchain?

   Adopter

   Non-Adopter

2. Are you responsible for the adoption of Permissioned Blockchain in your organization?

   Yes Identify opportunities

   Apply and allocate budget

   Lead project

   No

3. Can you describe the purpose, nature, scale and progress of your Blockchain project?

   Purpose: Exploitation (Improvement & Optimization)

   Exploration (Transformation)

   Nature: Revenue driven

   Cost saving

   Improve customer relationship

   Improve operations

   Improve competitiveness

   Others _____

   Scale: For a single task

   Within a functional department

   Cross functional departments

   Cross business units or branches

   Cross organizations, i.e., involving business partners

   Progress: Project Initiation

   Proof of Concept

   Implementing

Project Completed

4. Does your organization participate in any Blockchain consortium?

Yes Technology Consortium

1. _____
2. _____
3. _____

Industry Consortium

1. _____
2. _____
3. _____

No

PART 2

Can you review and comment on the items under each of the following 11 determinants? Please kindly advise:

Are these items appropriate?

If not, can you propose how they should be revised?

If they should be revised, can you explain why?

Are there any new items you would like to propose? What are they?

Technological Context

1. Perceived Benefits

I perceive adopting Permissioned Blockchain in my organization can …

(*can select more than one*)

Direct Benefits (Financial)

Reduce cost

Increase revenue

Other Direct Benefit, if any _____

Indirect Benefits (Non-Financial)

Improve customer relationship

Improve competitiveness

Improve corporate image

Other Indirect Benefit, if any _____

2. Technology Maturity

I believe Permissioned Blockchain technology is ready to …

(*can select more than one*)

Improve our business operation

Bring us more business opportunities

Give us more control over our business

Enable us to be the Permissioned Blockchain advisor to our trading partners

Enable us to be a technology-enabled leader in our industry

Enable us to be fully capable of using it

Others _____

3. Existence of permissioned blockchain characteristics, i.e., trust.

I consider to adopt Permissioned Blockchain because…

(*can select more than one*)

We trust Permissioned Blockchain as a distributed and trust-free transaction system based on its good reputation (results from an evaluation of its past business cases)

We trust Permissioned Blockchain as a distributed and trust-free transaction system based on an assessment of its past performance to meet our present requirements

We trust Permissioned Blockchain as a distributed and trust-free transaction system based on its competence to perform the tasks for the system

We trust Permissioned Blockchain as a distributed and trust-free transaction system based on its assurance of confidence in future performance

Other reason _____

Organizational Context

4. Organizational Size

In my organization, …

(*can select more than one*)

Our total revenue is higher as compared to other organizations in the same industry in general

Our number of employees is higher than compared to other organizations in the same industry in general

Our IT spending is higher as compared to other organizations in the same industry in general

Our number of technological resources is higher compared to other organizations in the same industry

Others _____

5. Scope of Business

In my organization, …

(*can select more than one*)

We have more business lines/units than compared to other organizations in the same industry in general

We have presence in more locations than compared to other organizations in the same industry in general

We have a higher similarity of business lines/units in terms of industries, products, target customers, service & delivery model than compared to other organizations in the same industry in general

Others _____

6. Top Management Support

We consider adopting Permissioned Blockchain because our top management …

(*can select more than one*)

Agrees with the strategic importance of Permissioned Blockchain to our business

Engages in Permissioned Blockchain projects

Is willing to accept risks when adopting Permissioned Blockchain

Is willing to invest in the adoption of Permissioned Blockchain in our business

Others _____

Inter-Organizational Context

7. Trading Partner Readiness

We consider adopting Permissioned Blockchain because …

(*can select more than one*)

Most of our trading partners request the implementation of Permissioned Blockchain

Most of our trading partners recommend the implementation of Permissioned Blockchain

Our trading partners are generally very knowledgeable about Permissioned Blockchain

Our trading partners contain considerable technical expertise in implementing Permissioned Blockchain?

Others _____

8. Existence of the Inter-organizational business model

We consider adopting Permissioned Blockchain because …

(*can select more than one*)

We identify an Inter-organizational business model which establishes new competencies for adopting to changing market requirements

We identify an Inter-organizational business model which utilizes new technical opportunities to extend product and service portfolio

We identify an Inter-organizational business model which integrates new business partners into the business processes

We identify an Inter-organizational business model which brings new revenue opportunities for the participating organizations

We identify an Inter-organizational business model which brings cost saving opportunities for the participating organizations.

Others _____

9. Perceived Advantages of the Blockchain industry consortium

We consider adopting Permissioned Blockchain because …

(*can select more than one*)

We believe there will be cost savings in participating in Industry Consortium to adopt Permissioned Blockchain than we adopt individually.

We learn quicker and more in participating in Industry Consortium to adopt Permissioned Blockchain than we adopt individually.

We can share risks in participating in Industry Consortium to adopt Permissioned B Blockchain than we adopt individually.

We can build critical mass of adoption in participating in Industry Consortium to adopt Permissioned Blockchain than we adopt individually.

Others _____

Environmental Context

10. Competition Intensity

We consider adopting Permissioned Blockchain because …

(*can select more than one*)

Key competitors adopt Permissioned Blockchain.

Most of our competitors adopt Permissioned Blockchain.

New competitors entering our market adopt Permissioned Blockchain.

We believe we will lose customers if we do not adopt Permissioned Blockchain.

Others _____

11. Technology Policies & Regulations

We consider adopting Permissioned Blockchain because …

(*can select more than one*)

The government provides incentives to the adoption of Permissioned Blockchain

The government has policies to support the adoption of Permissioned Blockchain

The existing laws and regulations support the adoption of Permissioned Blockchain

Others _____

END

Supplementary C. Findings of executive interviews

A1. Top management support incorporates an organization's readiness as top management can provide resources to enable an organization's readiness. Top management's willingness to invest (TM4) is incorporated as one of the measurement items.

One adopter highlighted the importance of the organization's readiness and questioned why it has not been included as a determinant. Organizational readiness refers to the availability of sufficient IT resources and financial resources [31]. In the discussion with another adopter and a non-adopter, they both pointed out that resources would not be a showstopper if the adoption is supported by top management. This research agrees with this perspective, as top management can prioritize the IT and financial resources which impact the success of the adoption. Top management support rather than organizational readiness is thus introduced as a determinant in this research.

A2. Existence of the inter-organizational business model can be exploitative or explorative. Both can be reasons for adoption and measurement items reflected in both models.

During the executive interviews, one adopter mentioned that he had just expected improvement in certain business processes involving customers, while his organization started to see use cases that were transformational and explorative after permissioned blockchain was adopted. This may be due to the staff in his organization seeing more possibilities after they gained experience in adopting permissioned blockchain. Besides, two non-adopters from large public organizations commented that they are not keen to explore transformational opportunities, as their priority is to ensure service availability to the general public. Yet they were receptive to exploring if permissioned blockchain can optimize some existing business processes with limited risk exposure.

A3. The importance of trading partner readiness may depend on the scope and complexity of business cases. Decentralized applications (dApps) can be provided by the organization to its trading partners to transact for simplifying trading partner onboarding.

One adopter argued that trading partner readiness is not a technical showstopper for adopting permissioned blockchain. The adopter is to adopt permissioned blockchain to create a distributed

ledger of bonus points to enable converting of those points across multiple merchants. In this case, the adopter's organization developed dApps for its non-technology-savvy trading partners to use in collaborating in transaction processes. Conversely, a non-adopter from a large organization commented that trading partner readiness is essential as they have a large number of trading partners engaged in their complex supply chain ecosystem. According to this non-adopter, the readiness of a portion of trading partners is not enough to contribute to the success of the use case, and may make the situation even more complicated. In this case, the mass majority of the trading partners need to be ready to maximize success. The importance of trading partner readiness therefore depends on the scope and complexity of the business cases.

A4. Individual adoption and adoption through blockchain industry consortium are not mutually exclusive. Organizations may adopt both for different perceived benefits.

One adopter adopted permissioned blockchain individually and also through an industry consortium because he saw different opportunities. Some issues in the inter-organizational business process can be addressed by individual adoption, while others involving industry-wide process transformation require consortium engagement to achieve. The same view was also expressed by an individual adopter, as he was in discussion with other industry players on the idea of formulating an industry consortium. Organizations joining an industry consortium may have other objectives more than addressing industry problems, as seen in the cases of two consortium adopters interviewed – they also wanted to learn from other industry players on best practices as well as to expose themselves to a bigger group of potential customers in the consortium's network. Besides, it is interesting that participating in an industry consortium does not necessarily mean an organization has to be a permissioned blockchain network node operator depends on the governance of the industry consortium, despite it should be from a technical perspective. That is, an ordinary user can just take advantage of services offered by the industry consortium by joining the consortium. Blockchain industry consortia focusing on logistics tracking of shipments are good examples – while these stakeholders are the blockchain network node operators, other shippers, or logistics companies can merely subscribe to information of the shipment status in the blockchain without operating blockchain nodes and validate transactions. In addition, these shippers and logistics companies can still adopt permissioned blockchain individually.

A5. Different measurement items in existence of permissioned blockchain characteristics are of different value to diverse types of adopters. Specifically, distributed trust has a higher relevancy for industry consortium adopters than for individual adopters, while individual adopters are more interested in immutability.

One adopter adopted permissioned blockchain in his marketing loyalty program for the conversion and reconciliation of bonus points across different merchants. The blockchain network had been operated by the adopter individually and the objective was to ensure the trueness and validity of bonus points as well as transaction records. The adopter commented that this project had already generated significant value in improving customers' satisfaction and creating additional revenue opportunities, with the immutability in the transaction record of bonus points, and did not see the need for distributed trust among various stakeholders. Conversely, an adopter in the banking industry, using permissioned blockchain to simplify trade finance transactions with the banks, emphasized the importance of distributed trust. Given the trade finance transactions have to consolidate purchase order-related transaction data across multiple parties in the supply chain, its simplification is based on industry practices and can only be addressed by industry players collectively, because all the supply chain participants will not change a process just for one bank. Hence, this adopter's organization decided to participate in an industry consortium so that a change can be triggered across multiple banks with the corresponding supply chain participants. This adopter believes that distributed trust is essential for multiple stakeholders to validate and approve trade finance transaction data stored in permissioned blockchain under a low-trust community with all the banks are competitors with each other

Supplementary D. Measurement scales

Construct	Items
Perceived Benefits: *Adapted from Teo et al. (2009) and Wang et al. (2016)*	I think Permissioned Blockchain will allow us to: (PB1) Reduce cost (PB2) Increase revenue (PB3) Improve loyalty of existing customers (PB4) Increasing competitive advantage (PB5) Enhancing corporate image/ branding (PB6) Improve relationships with business partners
Technology Maturity: *Adapted from Lee et al. (2017)*	I think Permissioned Blockchain technology is mature because (TR1) Its effectiveness has been demonstrated by successful adoptions in many other (TR2) It has been implemented successfully in other organizations (TR3) Irregularities of Permissioned Blockchain had been resolved
Existence of Permissioned Blockchain Characteristics: *Adapted from Clohessy and Acton (2019)*	I think Permissioned Blockchain has the technology characteristics of: (BC1) Distributed trust (BC2) Immutability of data (BC3) Traceability of data (BC4) Security of data
Organization Size: *Adapted from Teo et al. (2009) and Wang et al. (2016)*	In terms of our organization size: (OS1) Our total revenue is high as compared to the same industry in general (OS2) Our number of employees is high as compared to the same industry in general (OS3) Our number of IT staff is high as compared to the same industry in general
Scope of Business: *Adapted from Zhu et al. (2003)*	In terms of the scope of our business: (SB1) We have more establishments (branches) as compared to the same industry in general (SB2) We have establishments (branches) in more geographic regions as compared to the same industry in general (SB3) We have establishments (branches) in more market segments as compared to the same industry in general
Top Management Support: *Adapted from Gangwar et al. (2015) and Wang et al. (2016)*	My top management: (TM1) Is likely to consider the adoption of Permissioned Blockchain as strategically important (TM2) Provides strong leadership and engages in the process when it comes to the adoption of Permissioned Blockchain (TM3) Is willing to take risks involved in the adoption of Permissioned Blockchain (TM4) Is likely to invest resources to Permissioned Blockchain (TM5) Actively encourages employees to use Permissioned Blockchain in their daily tasks
Trading Partner Readiness*: Adapted from Lin and Lin (2008)*	As far as the readiness of our trading partners is concerned: (TP1) Majority trading partners request implementation of Permissioned Blockchain (TP2) Majority trading partners recommend implementation of Permissioned Blockchain (TP3) Our trading partners are generally very knowledgeable regarding Permissioned Blockchain matters

	(TP4) Our trading partners contain considerable technical expertise in Permissioned Blockchain
Existence of the Inter-organizational Business Model: *Adapted from Clauss (2017)*	I believe the inter-organizational business model can: (BT1) Enable us to establish new inter-organizational competencies in order to adapt to changing market requirements (BT2) Extend our inter-organizational product and service portfolio (BT3) Enable us to utilize opportunities that arise from integration of new partners into our processes (BT4) Significantly improve our inter-organizational processes
Perceived Advantages of the Blockchain Industry Consortium: *Adapted from Mitra and Singhal (2008) and Zavolokina (2020)*	I think a blockchain industry consortium: (IC1) Makes it less expensive for individual organizational to adopt Permissioned Blockchain (IC2) Shares the efficiency among participants through system integration (IC3) Enables participants to achieve critical volume of transactions rapidly (IC4) Controls the access to trusted transaction data (IC5) Enables shared innovation among participants through collaboration
Competition Intensity: *Adapted from Premkumar and Roberts (1999)*	In terms of competition: (CI1) We will experience losing customers to competitors if we do not adopt Permissioned Blockchain (CI2) We feel it is a strategic necessity to use Permissioned Blockchain to compete in the marketplace (CI3) We are aware of Permissioned Blockchain adoption in our competitor organizations
Technology Policies and Regulations: *Adapted from Zhu et al. (2004)*	In terms of technology policies and regulations: (PR1) The government provides incentives to use Permissioned Blockchain (PR2) The government has measures to enforce the use of Permissioned Blockchain (PR3) The existing laws and regulations support the use of Permissioned Blockchain

Supplementary E. Factor analysis and reliability assessment

Constructs	Items	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Top Management Support	TM3	4.33	1.38	**0.81**	0.10	0.15	0.03	0.13	0.19	0.07	0.18	0.14	0.04
	TM2	4.37	1.39	**0.80**	0.10	0.16	0.16	0.21	0.07	0.09	-0.03	0.02	0.12
	TM4	4.35	1.35	**0.79**	0.07	0.17	0.12	0.19	0.15	0.04	0.21	0.26	0.09
	TM1	4.50	1.37	**0.78**	0.16	0.17	0.13	0.25	0.12	0.06	0.11	0.21	0.19
	TM5	3.97	1.35	**0.75**	0.07	0.32	0.07	0.17	0.19	0.18	0.13	0.11	0.11
2. Scope of Business/ Organization Size	SB1	4.19	1.41	0.03	**0.90**	0.04	-0.01	0.05	-0.01	0.01	0.00	-0.07	0.11
	SB2	4.23	1.45	0.02	**0.90**	0.03	-0.01	0.04	0.01	0.00	-0.03	-0.11	0.14
	SB3	4.25	1.41	0.04	**0.84**	0.09	0.10	0.04	0.03	-0.06	-0.04	-0.09	0.10
	OS1	4.54	1.29	0.11	**0.81**	-0.02	-0.09	0.11	0.09	0.02	-0.01	0.01	-0.01
	OS2	4.17	1.31	0.08	**0.80**	0.08	0.17	-0.02	-0.06	0.07	-0.01	0.14	-0.03
	OS3	3.94	1.46	0.11	**0.69**	0.20	0.04	0.11	0.08	0.05	0.05	0.12	-0.12
3. TP Readiness	TP3	3.08	1.27	0.12	0.08	**0.88**	0.04	0.05	0.06	0.10	-0.01	0.16	0.09
	TP4	3.08	1.30	0.17	0.08	**0.86**	0.01	0.05	0.05	0.16	0.00	0.13	0.03
	TP2	3.32	1.33	0.24	0.12	**0.86**	0.06	0.14	0.10	0.13	-0.04	0.04	0.15
	TP1	3.28	1.32	0.22	0.12	**0.84**	0.06	0.16	0.08	0.17	-0.03	-0.02	0.14
4. Blockchain Industry Consortium	IC2	5.02	0.96	0.15	0.01	0.01	**0.85**	0.13	0.15	-0.03	0.07	0.07	-0.01
	IC5	5.30	1.10	0.02	0.10	0.05	**0.79**	0.07	0.18	0.01	0.19	0.08	0.14
	IC3	4.89	0.99	0.18	0.05	0.05	**0.78**	0.15	0.22	0.04	0.12	0.10	0.13
	IC1	4.82	1.05	0.06	-0.03	0.00	**0.72**	0.08	0.17	0.07	0.02	0.28	-0.07
	IC4	5.02	1.21	0.02	0.07	0.07	**0.71**	0.07	0.06	0.01	0.21	0.04	0.10
5. Perceived Benefits	PB4	5.17	1.11	0.25	0.06	0.01	0.13	**0.75**	0.15	0.01	0.16	0.19	0.25
	PB3	4.62	1.12	0.26	0.06	0.18	0.20	**0.71**	0.20	0.03	0.02	0.06	0.04
	PB6	4.99	1.06	0.19	0.18	0.18	0.23	**0.66**	0.18	-0.05	0.13	-0.02	0.06
	PB5	5.26	1.13	0.10	0.07	0.00	0.15	**0.66**	0.10	0.10	0.26	0.14	0.31
	PB2	4.39	1.17	0.39	0.00	0.21	-0.04	**0.55**	0.20	-0.09	0.17	0.25	0.11
	PB1	4.55	1.25	0.14	0.13	0.08	-0.04	**0.54**	0.26	0.11	0.14	0.38	-0.13
6. Inter-organizational Model	BT2	4.93	1.05	0.15	0.01	0.03	0.12	0.14	**0.85**	0.04	0.13	0.10	0.17
	BT3	4.96	1.08	0.18	0.05	0.07	0.23	0.16	**0.84**	0.01	0.11	-0.01	0.03
	BT4	4.84	1.19	0.14	0.04	0.09	0.24	0.23	**0.80**	0.03	0.11	0.15	0.02
	BT1	4.95	1.15	0.15	0.05	0.13	0.29	0.18	**0.77**	-0.02	0.16	0.10	0.13
7. Technology Policies & Regulations	PR1	3.56	1.46	0.11	0.04	0.12	0.01	0.06	0.02	**0.91**	0.05	0.06	0.08
	PR2	3.15	1.39	0.07	0.01	0.22	-0.05	0.10	-0.03	**0.90**	-0.02	-0.04	0.07
	PR3	3.36	1.33	0.09	0.01	0.16	0.10	-0.10	0.07	**0.82**	0.07	0.21	-0.03
8. Permissioned Blockchain Characteristics	BC2	5.54	1.18	0.06	-0.01	-0.05	0.08	0.09	0.18	-0.03	**0.83**	0.21	0.21
	BC3	5.71	1.15	0.19	-0.04	-0.08	0.25	0.10	0.08	0.17	**0.70**	-0.06	0.03
	BC4	5.39	1.22	0.03	-0.03	0.02	0.19	0.31	0.07	0.08	**0.68**	0.10	-0.21
	BC1	5.52	1.15	0.22	0.03	0.04	0.17	0.11	0.19	-0.09	**0.65**	0.21	0.03
9. Technology Maturity	TR2	4.52	1.70	0.23	-0.04	0.06	0.22	0.14	0.11	0.01	0.12	**0.80**	0.07
	TR1	4.48	1.28	0.24	-0.04	0.13	0.25	0.20	0.17	0.06	0.15	**0.75**	0.13
	TR3	4.17	1.16	0.19	-0.02	0.21	0.18	0.20	0.00	0.28	0.22	**0.68**	0.08
10. Competition Intensity	CI2	4.31	1.41	0.36	0.06	0.20	0.17	0.27	0.26	0.10	0.08	0.16	**0.64**
	CI1	3.73	1.36	0.20	0.10	0.38	0.14	0.26	0.12	0.09	0.05	0.02	**0.64**

	CI3	4.11	1.42	0.35	0.18	0.31	0.18	0.20	0.21	0.06	-0.02	0.23	**0.59**
Eigenvalue (> 1)				3.99	4.19	3.39	3.40	3.59	3.26	2.48	2.49	2.41	2.33
AVE				0.80	0.70	0.85	0.68	0.60	0.82	0.83	0.62	0.80	0.78
Cronbach α				0.94	0.91	0.94	0.88	0.86	0.92	0.89	0.80	0.88	0.86