

A Framework for Organisational Readiness Assessment in Digital Business Ecosystems Engagement

Ruimian Li and Kecheng Liu

Informatics Research Centre, Henley Business School, University of Reading, U.K.

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Abstract: Worldwide competition is forcing companies to collaborate in digital business ecosystems (DBEs) in order to leverage resources and survive in the global market. However, the engagement of companies in DBEs is confronted by a number of practical issues. This research has as its objective the discovery of the critical factors and the framework that enable organisations to assess their readiness in engaging in DBEs to cooperate with their peers. To accomplish the objective, this research has explained the related concepts and theories and developed a research framework grounded on a theoretical and literature review background. The assessment results help identify specific key weakness for the companies to improve themselves to implement DBE engagement in the future.

1 INTRODUCTION

With the rise of digital business ecosystems (DBEs), the business world is turning into an era of extreme competition where the only way for enterprises to succeed is to engage in DBEs and the benefits are magnificent. For many organisations, DBE is an innovative approach and interconnected networks to collaborate, leverage resources and drive innovation, efficiency and competitiveness (Senyo et al., 2019). By participating in DBEs, businesses can cooperate with diverse participants with varying expertise, share resources and infrastructure which may lead to cost savings. The vast amount of data shared in DBEs allow businesses to inform strategic decisions and thereafter improve customer satisfaction. More importantly, entities can gain competitive advantages to mitigate the impact of diversification spread in DBEs if other businesses face challenges (Koch & Windsperger, 2017; Suuronen et al., 2022).

The impact of DBEs on enterprises have been well established in previous studies, yet there still remains a gap explaining exactly what methodology organisations can adopt to implement a holistic readiness assessment at organisational level prior to DBE engagement. The remaining parts of the paper are organised as follows: Section 2 reviews prior relevant research papers in the literature. A readiness assessment framework is proposed and discussed in

Sections 3. Section 4 presents ORAM as the methodological solution to evaluate and test the proposed framework. A case study was conducted to illustrate and test the usefulness of the proposed readiness assessment framework. The readiness framework was applied to the BMW (China). The choice of this case is based on the following reasons. First, the BMW (China) involves interaction between different entities to collectively co-create values, thus, a good example of DBE. Second, vehicle DBE is one of the dominant and a major revenue earner. Hence it presents a unique domain to apply ORAM to obtain results that are useful to improve DBE engagement. Third, the case study of BMW China offers an opportunity to introduce contrasting insights into DBE literature. Research findings and implications are discussed in the following section. The last section are limitations and future research directions.

2 THEORETICAL AND PRACTICAL FOUNDATION

In order to explore the method for assessing organisational readiness in DBE engagement from organisational semiotic perspective, the concepts of organisational semiotic, digital business ecosystems and readiness assessment models will be introduced.

This section will discuss the background and previous research in each of these areas.

2.1 Organisational Semiotic

This paper argues that the well-developed organisational semiotics (OS) perspective has concepts that are highly relevant to the study of DBEs and especially when the range and depth of innovations lead to organisational architecture changes. Organisational semiosis theory emphasizes that organisations can be seen as an information system with informal, formal and automated levels (Liu & Li, 2015).

By emphasizing the three aspects of organising, OS theory has developed a particular approach to understanding changes and innovation within organisations, which could also be applied in DBE analysis. There are three aspects in this approach: one is to understand the homogeneity as well as heterogeneity about the vision, mission and values amongst organisations and see how they make strategic alignment. Another aspect is to analyse the activities and actions occurred in business process alignment and see how exact strategies, data management, business process can be implemented in distinct development stages. The last aspect is to investigate the digital infrastructure, IT systems/ apps, and the usage of digital solutions and see how cooperators can realise interoperability and achieve “win-win” outcomes.

These three aspects produce a richness and a complexity to understanding DBEs at the new products, services and process, but also, and more importantly, an emphasis on social-cultural issues which has great impact on participating DBEs at the start point. Therefore, OS will provide a framework as a scientific tool for this study to exploit the framework of the readiness assessment in DBE engagement.

2.2 Digital Business Ecosystems

The progress in digital technology has resulted in the enhancement and evolution of new collaborative networks, like Digital Business Ecosystems (DBE). DBE is a collaborative environment facilitated by information and communication technology (ICT), comprising organizations and individuals working together to generate value (Nachira et al., 2007). With the advent of DBE, an increasing number of businesses are adopting it as a strategic approach, aiming to align with its partners for the joint creation of value. Consequently, this contemporary interpretation of DBE enables companies to enhance their competitive edge (Suuronen et al., 2022).

Digital business ecosystem engagement refers to various activities, strategies and automated infrastructures established by organizations aimed at building and leveraging these relationships to achieve specific goals within a digital ecosystem (Li & Liu, 2023). Engagement within a digital business ecosystem involves the interactions, collaborations, and relationships facilitated by digital platforms, software, and data-sharing mechanisms.

2.3 Readiness Assessment Models

Despite the significant impact of DBE engagement on organisations to compete and gain vast advantages, so far only a few systematic and thorough studies have been undertaken on the subject to comprehensively integrate overall factors related to the successful implementation of DBE engagement.

Readiness models have been adopted as an instrument to conceptualize and measure the starting-point and allow for initializing the development process (Nedbal et al., 2013). To review the readiness of an organisation for participating in DBE, we understand readiness of an enterprise as the state of the starting point of internal conditions that support organisational DBE engagement. The goal of readiness model is to capture the readiness of an organisation or process regarding some specific target state. In the digital business ecosystem domain recent readiness models have been proposed in platform analysis, utility management, and digital transformation (Romero et al., 2009).

The factors and elements in previous investigations were compiled with the methods, frameworks and checklist for the implementation of organisational readiness evaluation being identified. From previous works, concepts relevant to the structures of readiness models were derived, e.g., the readiness levels, the dimensions (readiness assessed in 4 to 16 dimensions), the validation of assessment and the visualisation of readiness assessment (Huang et al, 2004; Shareef et al., 2011). With the help of concept mapping techniques, the characteristics of existing readiness framework can be extracted and evaluated for their applicability in this research.

3 ORAM: AN ORGANISATIONAL READINESS ASSESSMENT MODEL

To facilitate the formulation of a method for evaluating organisational readiness in DBEs, this

research has devised a prototype framework as an initial model. This prototype framework serves as a schematic representation illustrating the structure and constituents of the eventual method. Recognising the dynamic and evolving nature of DBEs, the design of the prototype framework underwent iterations to accommodate emerging changes. The incorporation of this prototype framework streamlines the developmental phase of the method. Drawing insights from literature on DBEs, organisational engagement, value co-creation, and Organisational Semiotics theory, the prototype framework, delineated in Figure 1, consists of three principal components: context articulation, readiness analysis, and readiness improvement.

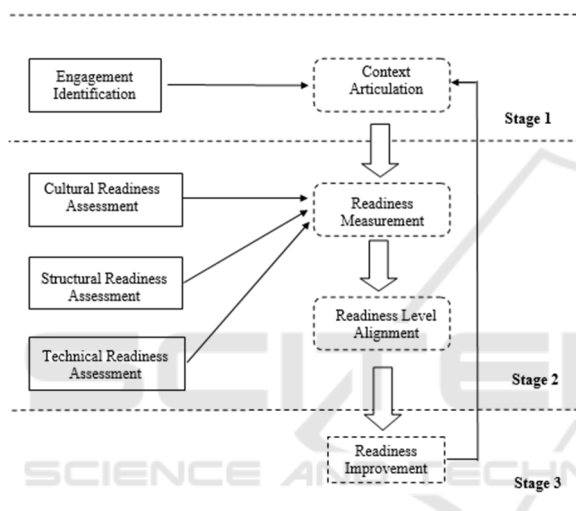


Figure 1: Framework for organisational readiness assessment.

3.1 Articulation of DBE Engagement

The first stage is context articulation including the identification of DBE engagement. To delineate the DBE environment, the prototype framework proposes the context articulation concept. The engagement articulation supports the identification of engagement within DBEs. Engagement analysis enables better understanding of the modes by which value co-creation is achieved through interaction between DBE entities. For each organisational engagement, the engagement modes pertaining to informational, physical and financial flows are derived. The outcomes from the engagement identification component helps to obtain a better understanding of an engagement structure and underlying issues driving the organisational readiness assessment in engaging in DBEs. As the first component of the prototype

framework, the outcomes from the DBE environment supports the readiness analysis in the next step.

This research suggests a formal notation for representing DBE engagement. This notation offers a more detailed view of DBE engagement, making it simpler to distinguish various categories of these engagement (Nuutinen et al., 2020). Additionally, this notation ensures the consistency by establishing a universal foundation for classifying all types of DBE engagement. By using this notation, it becomes more straightforward to grasp the underlying mechanisms of DBE engagement refer to Li &Liu (2013).

In digital business ecosystems, industry collaborators engage in the sharing of three key resource types: information, finance, and physical resources. Their aim is to achieve their business objectives and collectively create value (Tan, 2020). These three elements serve as the primary categories for classifying various engagement practices and activities within the ecosystem. This classification framework offers insights into the diverse dimensions of engagement. Below are some typical categories of DBE engagement based on the sharing of these three resource types: information flow, finance flow, and physical resource flow, refers to (Li and Liu, 2023).

3.2 Dimensions and Metrics of Readiness Assessment

The second stage is readiness analysis which offers the opportunity to distil more information on the organisational readiness during the engagement identified in the DBE environment. The main concept under this component is readiness measurement and readiness level alignment.

Based on the existing research and practice, DBEs are mainly composed of three main entities: automated part such as digital infrastructures, formal part such as business process and informal part such as visions, strategies (Li &Liu ,2013; Liu &Li, 2015) which has been further elaborated into dimensions, factors and aspects as shown below (Li &Liu ,2013).

- The Informal part includes four factors: vision/mission/strategy, values, leadership, culture & mindset.
- The Formal part consists of three factors: organisational structure, business process, data generation & management.
- The Automated part has three factors: digital infrastructure, IT systems/ apps, use of digital solutions.

Each dimension includes several factors. Each factor consists of several indicators that are specifically used to assess the readiness of an

organisation’s engagement in DBEs. The proposed readiness framework contains 47 indicators.

The first dimension for organisations in their DBE engagement is the interoperability with its technological facets. In this dimension, technological challenges and barriers refers to the incompatibility of information technologies (Curry, 2012), for example, the digital infrastructure, the IT systems/apps, the usage of digital solution. To be more specific: 1) the standards to present, store, exchange and transfer data and information should be clearly established (Curtis et al., 2011); 2) the digital systems, interfaces, ways and rules for data exchange should be developed; 3) the data usage, analysis and the way to be processed should be developed. In addition, it is basic prerequisites for personnels to acquire the innovation and relevant novel knowledge originated from computer science and information accordingly.

In addition to the technological facet, there are structural dimension in organisations. Participating firms in DBEs have different structures and therefore follow different organising systems in terms of decision-making, responsibilities and autonomy (Barykin et al., 2020). Based on the interview, one expert in the interview argues that coherency can be a main prerequisite for evolvability of DBEs. Meanwhile, the coherency is crucial to achieve a balanced exchanges relationship and trust construction between autonomous partners in the ecosystems (Centobelli et al., 2022). To achieve this goal, the following key concerns in DBE engagement should be resolved: 1) the standardised articulation of the rules, regulations; 2) the semantic consistency of business procedures and produces & services strategies should be identified.

On the cultural level, the attitude, behaviour and competence of the individual level as well as the mission and vision on the collective level constitute the prerequisites for participating in the new platforms of DBEs. One of the interviewed experts highlights the vision and mission of stakeholders, executives, managers, and creativity, connectivity, collaboration and community are vital competences of partners. On the one hand, the keystone entities within DBEs take the dominant role and have a comparatively strong coordinating function and responsibility for the information flow, finance flow and physical resources flow in certain situations, while dependent complementary partners have a subordinated function in niches. In this aspect, the keystones will establish the standards to enhance interoperability (Korpela, 2014). On the other hand, the participating partners have complementary roles

to coordinate and interact which emphasis the competences of all participants (Jacobides et al., 2018). To foster the interoperability, the companies should: 1) adjust the cognition and cultures of the employees which is crucial to cope with the opportunities and heterogeneity; 2) enhance competences and reshape styles of communication to meet the dynamics and complexity in the organisational readiness assessment to achieve successful outcomes.

In the next step, every indicator is scored anchored on a 4-point Likert scale. The scores obtained are matched onto a readiness level score rating guide to determine their readiness level (Huang et al., 2004). Specifically, this step show whether an organisational has achieved extensive, moderate, little or no readiness in DBE engagement.

The readiness level alignment concept determines the significant effect of an organisational readiness in value co-creation based on the three metrics. This concept matches the readiness scores to determine if it has either low, medium or high readiness levels on value co-creation. The concept proposes a benchmark with inherent decisions that serve as recommendations to reorganised engagement in DBEs to achieve improved performance.

Table 1: Readiness score rating guide.

Readiness level	Rating score
no	0
little	1
moderate	2
extensive	3

As presented in Table 1, the readiness score 3 indicates extensive readiness level, and score 2 indicates a moderate readiness level. Lastly, score 1 and score 0 corresponds to little and no readiness respectively.

The last stage of the framework is the readiness improvement. The readiness improvement concept proposes series of steps designed to execute the recommendations derived from the assessment of readiness during this stage. This component serves as a strategic guide for implementing measures aimed at enhancing organisational preparedness.

The assessment framework can also provide specific suggestions to a company regarding areas that need improvement, enabling the company to formulate a plan for the future. Subsequently, the company has taken steps to implement the recommendations outlined in the to-do list presented in the assessment report as a preliminary measure before executing its business strategy.

4 CASE STUDY

As DBE engagement is adopted as a useful tool for organisations to achieve value co-creation, hereby we further identify the key organisational engagement categories existed in the DBE and elaborate an approach for organisations to cope with these challenges and fulfil the organisational readiness in engaging with DBEs.

4.1 Background to the Case Study

The scenario of the case study is conducted in the BMW (China), an organisation that already is engaged in the automotive ecosystem. The choice of this case is based on the following reasons. First, the BMW (China) involves interaction between different entities to collectively co-create values, thus, a good example of DBE. Second, vehicle DBE is one of the dominant and a major revenue earner. Hence it presents a unique domain to obtain results that are useful to analysis DBE engagement and facilitate the construction of the architecture of the prototype framework. Third, the case study of BMW China offers an opportunity to introduce contrasting insights into DBE literature.

BMW, which stands for Bayerische Motoren Werke AG in German (translated as Bavarian Motor Works in English), is a renowned and prestigious German automobile manufacture. Founded in 1916, the company has its headquarters in Munich, Germany, and has established itself as one of the world's leading premium automobile manufacturers. As a global company, the BMW Group has more than 30 production sites worldwide; The sales network covers more than 140 countries and regions. In 1994, BMW Group set up BMW Beijing Representative Office in China, marking the official entry of BMW Group into the Greater China market. In 2005, BMW (China) Automotive Trading Co., Ltd. was established. In 2003, BMW Brilliance Automotive Co., Ltd. was established as a joint venture between BMW Group and Brilliance Automotive Group Holding Co., LTD. BMW (China) continues to maintain solid growth momentum in the Chinese mainland market, and thereafter a typical DBE chosen for this case study.

Our readiness assessment project received the full support from BMW (China). With the assistance of BMW (China)'s Business Senior Consultant, we were granted access to the essential company resources required for the assessment. We extended invitations to personnel at three organisational levels within the company - senior management, middle

management (department managers), and front-line employees to participate in evaluating DBE engagement readiness. This project integrated the assessment results of the three levels to work out final assessment scores.

4.2 Data Source and Data Analysis

In this study, the combination of primary and secondary data will be incorporated into the empirical research. The data collected were grouped in thematic categories and analysed. Interview helps investigate the physical setting, key participants and their actions, with specific focuses on events, sequence, processes and emotions. Therefore, interview was conducted with each participant for understanding the role of readiness and exploration during the engagement in DBEs. In this case study, the secondary data will be incorporated for the main purposes of mapping and structuring stakeholders' demands into the model design. The documentations collected is listed in the following.

Qualitative analysis technique of interview script is applied in the case study. Other than quantitative analysis which merely deals with numerical data, conducting qualitative analysis obtains information of demands, intentions, and social norm from users' feedback. Capturing users' feedback and analysing it is based on the dimensions of socio-technical design (e.g., technical fitness; semantic interpretability; pragmatic fulfilment; and awareness of social norm).

In complementary, document analysis is utilised to extract data by reviewing the reports published by the platforms. This process consists of categorising data based on their semantic meanings (the business domain knowledge from previous research will be incorporated). dimensioning data based on users' requirements and intentions and presenting data representations to users and collecting feedback for further improvement.

The project presented an assessment report to the readiness of BMW (China) engagement in DBEs. In general, BMW (China) was found to be not prepared for engagement in DBEs with an all-encompassing strategy across the entire organization immediately. Instead, it was shown that the company adopted a phased approach. The initial phase could involve developing a business strategy plan and business processes that leverage IT infrastructure, aligning them with the unique characteristics of its products and services, and soliciting customer feedback. The management's stance was largely in alignment with the assessment findings. This study demonstrated the

practicality of the proposed readiness assessment framework in the business context.

The assessment framework can also provide specific suggestions to a company regarding areas that need improvement, enabling the company to formulate a plan for the future. For example, we observed that, despite being one of the largest automobile companies, BMW (China) had not established a robust and efficient internal control system. Our readiness assessment framework pinpointed this weakness and suggested that BMW (China) work out an effective internal auditing and control system before engaging with new business cooperators. Subsequently, the company has taken steps to implement the recommendations outlined in the to-do list presented in the assessment report as a preliminary measure before executing its business strategy.

Table 2: The assessment scores and suggestions.

Indicator	Score	Suggestions after assessment
IN1-1: Long-term goals	2	Further improve feedback receiving and decision-making strategies; work out the data and information standard for implementing customer personalization strategy.
IN2-1: Strategy	2	
FO1-2: Organisational structure	2	Enhance the existing payment system through the development of a more efficient and transparent motivation and rewards structure.
FO2-3: Business process	2	Enhance employees' knowledge of information technology
FO3-3: Data management	2	
AU2-2: Digital management	2	Awareness and understanding of infrastructure change for enterprise employees
AU1-1: IT infrastructure	2	integration and diffusion of automated applications

Table 2 illustrates examples of specific weakness identified and recommendations that were provided to BMW (China), based on the findings of the readiness assessment. The effective utilization of the assessment framework with BMW (China) also enabled the authors to refine the framework, making it easier for practitioners to learn and understand.

5 CONCLUSION AND DISCUSSION

This study proposes a readiness assessment framework specifically from the perspective of organisational semiotic to assess organisational readiness in DBE engagement. Further, a case study

was conducted to demonstrate and test the usefulness of the proposed assessment framework.

Some limitations are worth noting. First, the current study is limited to a single case study, BMW (China) in the mainland China, which may have limited generalizability. As a result, this sample may not be adequate to represent China's automotive industry, and multi-case study approach is needed to address this limitation. Second, this research was conducted within the specific industry and in one country. However, organisations may differ in various contexts and application in other contexts would increase confidence of the research framework. Further research may also be undertaken in a cross-industrial setting to test the applicability of the scale items in a different context, and broader practical implications for other organizations considering DBE engagement could be more thoroughly explored.

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APPENDIX

BMW Readiness Assessment with the ORAM Framework (partial results).

Dimensions	Factors	Code	Indicators
Informal Part (IN)	Long-term goals (IN1)	IN1-1	The goal of organisational engagement in DBEs is to achieve real-time control
		IN1-2	The goal of organisational engagement in DBEs is to achieve standardized management
		IN1-3	The goal of organisational engagement in DBEs is to achieve transparent operation

	Strategy (IN2)	IN2-1	The enterprise is very close to the end consumers
		IN2-2	The enterprise is clearly positioned in the DBEs
	
	Leadership (IN3)	IN3-1	Chief executives are involved in organisational engagement strategy planning
		IN3-2	Financial/account executives are involved in organisational engagement strategy planning
...		...	
Formal part (FO)	Organisational structure (FO1)	FO1-1	Standard purchasing procedures
	
	Business process (FO2)	FO2-1	The enterprise has built clear incentive mechanism across all the whole enterprise
	
	Data management (FO3)	FO3-1	The transaction data can be well documented and analysed
	
Automated Part (AU)	IT infrastructure (AU1)	AU1-1	The adoption and diffusion of information technology in organization
	