

Full Length Article

Contents lists available at ScienceDirect

Egyptian Informatics Journal



journal homepage: www.sciencedirect.com

Configuring the RegTech business model to explore implications of FinTech



Jen-Sheng Wang^{a,*}, Yen-Tzu Chen^b

^a Department of Business Administration, National Pingtung University, Pingtung, Taiwan
 ^b Department of Information & Learning Technology, National University of Tainan, Taiwan

ARTICLE INFO

Keywords: RegTech Business Model Canvas FinTech Cloud Computing

ABSTRACT

Regulatory technology (RegTech) is a significant technology in the financial technology (FinTech) field that can assist FinTech and innovations to solve issues of complying with laws and regulations. However, RegTech is mainly composed of the finance, regulatory and emerging technology sectors, and its business model involves multiple dimensions, such as those among governments, banks and technology companies and cross-border FinTech. Therefore, RegTech startups exhibit distinctive features, and the optimum business model for their operation needs to be rapidly determined. This study uses a business model canvas (BMC) as an example to configure the elements and determinants of a RegTech start-ups and applies the Delphi technique and multiple criteria decision-making (MCDM) approaches for the analysis.

The results indicate that 'customer relations (CR)' and 'key activities (KA)' are the most significant BMC elements. Additionally, the relevant top-ranked determinants are, in their order of importance, 'Big Data analysis', 'system feasibility evaluation', 'long-term customization', 'data assessment and stakeholder descriptions', and 'short-term projects'. In particular, business models of RegTech are the most complex in FinTech. This study concludes with business elements that can be beneficial not only for RegTech advancement but also for other emerging technologies in the FinTech.

1. Introduction

The development of financial technology (FinTech) has had a comprehensive impact on the business models of the traditional financial sector, such as banking, insurance, and securities [1,2]. Currently, FinTech have very rapidly developed industrial applications, but studies of its practices are still insufficient [3,4]. At the same time, these studies have different scopes of application, which leads to multidisciplinary arguments [1,5]. In summarizing many viewpoints of scholars and research reports about FinTech, several concepts are worth addressing in the future development of FinTech that will change the structure of financial industries, including consumer behaviours, business models, long-term financial sector service procedures, and relevant regulations [6]. In the previously described transformation, the steps of FinTech are often plagued by laws and regulations. Governments, financial enterprises and other stakeholders must collaborate to understand the risks posed by FinTech [7]. In this situation, regulatory technology (RegTech) plays a very important role in information integration [8].

RegTech consists of a combination of regulations and technology. Some scholars have referred to it as supervision technology, compliance technology or regulation technology [9,10]. RegTech is regarded as an emerging form of FinTech [11]. Supervision agencies use RegTech to supervise, and regulators use RegTech to ensure compliance with the law [12]. New RegTech can be used to shorten the time needed to compose and organize reports retrieved from messy and interwoven data to comply with legal requirements. RegTech can also help companies better understand and manage their risks [13].

For example, in response to the financial service model and industry transformation, the British government considers effective financial supervision regulations and technologies as key factors in both the success of FinTech and in industry development more generally. Therefore, the British Financial Conduct Authority (FCA) defines RegTech as the application through which 'new technologies can consistently proceed and implement the requirements of surveillance management' [11,14,15]. However, most studies on RegTech-relevant issues are based on legal perspectives, such as risk management [16,17], compliance management [10], and regulatory reporting [9,18–20], and there are fewer studies that independently discuss the information integration of RegTech for commercialization.

Furthermore, the innovative products and services provided by

* Corresponding author at: No.51, Minsheng E. Rd., Pingtung City, Pingtung County 900393, Taiwan. *E-mail addresses:* vincentwjs@mail.nptu.edu.tw (J.-S. Wang), yentzu@mail.nutn.edu.tw (Y.-T. Chen).

https://doi.org/10.1016/j.eij.2024.100483

Received 25 October 2023; Received in revised form 14 February 2024; Accepted 18 May 2024 Available online 4 June 2024

^{1110-8665/© 2024} THE AUTHORS. Published by Elsevier BV on behalf of Faculty of Computers and Artificial Intelligence, Cairo University. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

FinTech startups are increasingly favoured by individual consumers and business consumers [21]. This approach has had a considerable impact on traditional FinTech, as the brands of traditional financial institutions can be eroded and their market shares can decline [22]. However, such brands face an opportunity to engage in this FinTech revolution and provide customers with FinTech products and services [7,23]. Based on these considerations, we conclude that a tailor-made business model is undoubtedly an optimal solution posing beneficial advantages [24,25]. In particular, new value propositions of FinTech should be applied to the business models of the financial industry [26-28]. Business model archetypes driven by technologies appreciate the relevance of taking a strategic approach towards the use of emerging technologies [29]. RegTech is a typical technological fusion that integrates multiple information (customer relationships, Big Data analysis, databases, artificial intelligence (AI) and cloud computing) at different organizational levels to create new business models and unique growth strategies for global banking and FinTech [11,15,16]. Consequently, this study proposes a business model of a RegTech start-up as an example to clarify the concept of financial cloud service implementation.

Therefore, this study initially constructs a business model for RegTech by applying the business model canvas (BMC) theory developed by Osterwalder and Pigneur [30]. Although a BMC can help enterprises develop strategies, it does not instruct strategy makers how to prioritize the implementation of strategies based on a BMC or how to effectively implement them. This study attempts to determine the importance ranking of the nine elements and relative determinants of a BMC as a basis for implementation. Constructing this ranking is an important step in the success of BMCs [31–34]. Tzeng and Huang [35] addressed the multiple criteria decision-making (MCDM) research methods that can help researchers evaluate various factors or determinants under a limited research structure to determine the optimal solution [36–38]. The study applied a two-step examination approach that has been used in other studies [39–41]. Accordingly, we apply the Delphi approach to assess the BMC and extract the four most critical elements and relative determinants to appropriately process the second MCDM research, which is more precise. In that study, the Delphi method was applied to filter out and identify the relatively important elements and determinants of the BMC and then to optimize the MCDM results.

Through the abovementioned discussion, this study reviews the literature on RegTech and BMC in section 2. In section 3 and section 4, we develop the research framework of this study and apply an MCDM approach to configure the elements of the RegTech business model and relevant determinants. We conclude with suggestions that can be beneficial to other emerging technologies in developing business models to explore implications of information integration for FinTech.

2. Literature review

2.1. RegTech

2.1.1. Definition of RegTech

This study agrees with the following key declarations about RegTech:

- 1. After the financial crisis, the supervisory approach changed, and supervisory authorities required supervised units to present reports with a large amount of data [15].
- Cloud computing developments, such as artificial intelligence (AI), deep learning, new encryption technologies, data mining algorithms, machine learning, blockchain, robotics and visual analysis, have improved the data management and analysis of RegTech [42,43,8].
- 3. In terms of economic factors, supervised units hope to substantially reduce the cost of compliance with the law by using RegTech. After the crisis, financial supervisory agencies reformed the way that financial institutions operate and the supervision requirements so that relevant stakeholders could automatically follow laws and regulations through the cloud [7]. Enterprises that apply RegTech can

effectively reduce the possibility of noncompliance and regulatory costs and fines [16].

 Supervisory agencies can use RegTech to effectively evaluate and improve regulatory efficiency to maintain system and market safety and soundness [12,14].

2.1.2. Features of RegTech

The development of RegTech eventually led financial regulations to adopt a 'follow-design' framework for achieving automated monitoring compliance standards through the cloud. For supervisory agencies, this finding indicates that data security and use are more important than ever [20]. In the era of legal compliance, RegTech should fully utilize data and conduct research to understand existing corporate organizational governance techniques. By leveraging cloud computing, RegTech can ensure that both existing technologies and new technologies can be leveraged to obtain the data required for regulatory compliance [17,44].

RegTech proceeding information integration and compliance with regulations can provide competitive advantages for financial sector players and help supervisory agencies fulfil their consumer protection goals while ensuring the maintenance of fair and effective market competition [19]. RegTech is a sustainable and scalable solution that enables flexible adjustments to interpret FinTech as a platform for the development of sustainable finance growth and as a prompter of the compliance of cloud computing [11,45]. RegTech proposes a stable risk management system to assist companies in analysing data, identifying risks and problems, reducing compliance costs, simplifying compliance and standardizing the regulatory process by applying cloud computing. Supervisory agencies can also use RegTech to identify risks, analyse data, generate reports and remediate problems [8,12,15,46].

Through a literature review, this study identifies the difference between RegTech and conventional methods, as shown in Table 1.

2.2. Business model canvas

When companies seek innovative technologies, they also facilitate the development of business models [2,47]. Business models previously focused on utilizing the internal network resources of an enterprise and converting them to a collaborative network between the enterprise and its customers and partners [48,49]. Understanding the dynamics of the business model due to the injection of emerging technologies (how it is shaped and adapted by entrepreneurs over time), the consequent alignment process takes place within startups [29]. In addition, Seyb, Shepherd, and Williams [50] mentioned that companies can work on technology convergence that is not fully deployed internally with outside partners to discover the competitive profit model.

Despite the arguments of many scholars, Osterwalder and Pigneur [30] demonstrated a complete BMC framework that considers nine elements, namely, 1. value proposition, 2. customer relationships, 3. customer segments, 4. channels, 5. key activities, 6. key resources, 7. key partners, 8. revenue streams, and 9. the cost structure. This model has been widely utilized in many new technology commercialization and strategy optimization studies, such as enterprise sustainable management and continuous innovation research [31]. This model has also been employed to determine how companies use business models to enhance competitiveness and how to improve the inherent uncertainty of

Table 1
Comparison of RegTech with Conventional Methods.

Features	Conventional Methods	RegTech
Orientation	Single-point check	Preference for full monitoring
Method	Rely on staff experience	Use cloud computing to analyse data
Confirm	Random check	Detect anomalies
Influence	Post-examine	Risk prevention
Frequency	Periodic review	Continuous supervising
Information	Static	Dynamic

successive economic innovations [32,33]. These examples show that a BMC can improve the emerging business models of startups that have not yet been well developed and can even optimize their business development strategies [51].

A BMC defines a business model as the blueprint for corporate strategies that is related to how enterprises create, deliver, and capture value [26], that is, the business model is a conceptual tool that describes the business logic of a company by expounding the key components, ideas, and relationships in the business cycle [52]. It is helpful to complete the business model of startups by applying a BMC [23].

Therefore, we apply a BMC as the framework theory to explore the nine elements of the RegTech business model and to optimize strategies.

2.3. Business model canvas of a RegTech startup

In this section, we define the nine elements of the business model of a RegTech startup included in this study and discuss the definitions of the four dimensions and the nine elements of RegTech.

2.3.1. Value dimension

1 Value proposition

Value proposition (VP) comprise the core of the business model, that is, the VP of the business model could generate revenue streams by making customers willing to consume the proposed products or services [50]. Therefore, the business model must be able to create products or services that bring value to customers, such as products that are cheaper, that reduce customer risk, and that provide customers with better performance [52–54]. Innovations of FinTech may be penalized for conflicting with the law. RegTech is the solution for this critical issue [8,13]. The determinants of the VP are detailed as follows: (1) improve the efficiency of the know-your-customer inquiry for the financial sector [41], (2) avoid high-risk events [19], (3) enhance the security of customers' capital chain [44], and (4) reduce the operational risks of small and medium enterprises (SMEs) [54].

2.3.2. Customer dimension

1 Customer segments

Enterprises should provide different services and products by segmenting customers with the same needs [24]. Different customer segments depend on criteria such as the type of customer relationship or the customers' constituent features [37]. The VP of enterprises must be consistent with the target customer segment [31]. RegTech customer segments are mainly groups and large enterprises, the financial industry, and government-related institutional units [12]. Therefore, the determinants of customer segments are presented as follows: (1) the financial sector [41], (2) supervisory authorities [21], and (3) groups and large enterprises [55].

2 Channels

In a BMC, channels are described as how the enterprise communicates with and transfers its VP to its customer segments [47], which are the most efficient ways to reach their target audience and sell customers the VP [32]. When RegTech start-ups have not established a reputation or face unfamiliar markets, they can sell only through existing banking system providers, which can quickly open up the market and reduce marketing costs [21]. This approach is conducive to developing followup service platforms [26]. The determinants of channels are listed as follows: (1) information system providers [28], (2) financial institutions (internal examination) [27], and (3) SMEs (outsourcing consultancy) [41].

3 Customer relationships

In a BMC, customer relationships (CR) should link the VP to the customer segments [24]. This channel indicates how to increase customer loyalty that can sell more products and services [56]. RegTech startups focus on enterprise standards and customized services, which can strengthen compliance through data analysis and risk assessment [44], improve the accuracy of regulatory information [40], reduce

potential uncertainty, and reduce the costs associated with enterprises in the financial sector [27]. The determinants of CR are listed as follows: (1) backend tests [8], (2) system feasibility evaluations [42], (3) short-term projects, and (4) long-term customization [28].

2.3.3. Partner dimension

1 Key partners

In a BMC, key partners (KP) are the partners and suppliers who can help the business model to operate well [47]. Key partners can contribute the benefits of reducing risk and costs or acquiring key resources [33]. RegTech startups need to perform in-depth and extensive work in the financial sector and hire experts in the regulatory field who are proficient in anti-money laundering and financial crime prevention processes [3,44]. In addition, RegTech start-ups can collaborate with all industries of the financial sector, including financial management, security, banking, and insurance [42]. The determinants of key partners are listed as follows: (1) official joint credit information centres [8], (2) private credit bureaus [19], (3) the security industry, and (4) the banking industry (open API) [55].

2 Key resources

Key resources (KR) are defined in a BMC as important assets that enable business models to operate [50]. Simply having such resources is insufficient; enterprises must apply activities to enable the resources to create value [53]. Based on integrating various databases, RegTech start-ups help customers to find the background information and financial criminal records of their trading partners through database integration and intelligent computing technology [19]. RegTech can analyse customer information and eliminate financial crimes early in the process [17]. The determinants of KR are detailed as follows: (1) open information provided by the government [26], (2) the undisclosed enterprise databases of public institutions [28], (3) licensed global databases [44], and (4) court databases [9].



Key activities (KA) are the necessary activities that enable business models to operate. Enterprises create value through KA, and some KA are directed towards solving problems that must be eliminated before enterprises can generate value [34,51]. RegTech startups must be proficient in international financial regulations and technologies, such as using Big Data and AI technologies to ensure regulatory compliance [42]. RegTech can quickly analyse the network relationship between clients' trading objects and customers. In this way, RegTech can effectively detect potential financial fraud or money laundering intention in the transaction [27]. The determinants of KA are listed as follows: (1) algorithm analysis, (2) Big Data analysis, (3) AI search engines, and (4) data assessment and stakeholder descriptions [8,28,44].

2.3.4. Finance dimension

1 Revenue streams

In a BMC, revenue streams are defined as cash that enterprises can obtain from the target customers [49]. Therefore, revenue streams are based on how the company makes customers willing to spend money to consume its products or services (VP) and how it collects money [48]. RegTech can target customer segments and channels to expand revenue streams and manage CR to increase earnings [8]. The determinants of revenue streams are listed as follows: (1) a system to implement revenue, (2) a system to maintain revenue, (3) a consultancy on revenue, and (4) an evaluation report on revenue [17,19,27].

2 Cost structure

In a BMC, enterprise expenditures result mostly from the three execution elements of key partners, KA and KR. How to effectively adjust the cost structure of an enterprise so that it has excess profits is a plus-value proposition [32,51]. For RegTech startups, the cost structure is divided into several parts, including equipment investment and hiring research and development (R&D) engineers, data experts, and business consultants for development and research [8]. The determinants of the cost structure are presented as follows: (1) R&D expenses, (2)

operational expenses, and (3) other expenses [10,18].

3. Configuring and determining the BMC elements of RegTech

In this study, first, we applied the Delphi technique to determine the prior four elements of a BMC. Second, we applied the decision-making trial and evaluation laboratory (DEMATEL) to confirm the relationship between the influences of each element and to explore the correlations between the factors of the relative elements. Third, we utilized a DEMATEL-based analytic network process (DANP) to evaluate the weights of the elements and factors in the network relation map (NRM) developed by DEMATEL [36,57]. Finally, according to the DANP analysis results, we concluded by offering a strategy-optimized solution and explaining the implications of information integration. The research design is shown in Fig. 1.

3.1. Defining the elements and determinants of the RegTech BMC

This study proposes a BMC of a RegTech startup and describes the nine elements and relative determinants. We aim to configure the



Fig. 1. Research Design.

blueprint of this BMC and how it might operate. The main steps of defining the BMC are detailed as follows. Step 1: Based on the nine elements of a BMC, define the elements of the business model of the RegTech startup. Step 2: Based on the definition of each element, with RegTech dominant business logic, identify the relative determinants of the nine elements that have a role while this BMC is actually operating. According to the literature review in section 2.3, we constructed a RegTech BMC, as shown in Fig. 2.

3.2. Determining the elements and determinants of the RegTech BMC

The Delphi technique is based on unique expert insight into and knowledge of specific issues. The differences among the claims of these experts are minimized through engagement in several circular repeated question-and-answer processes [40,58]. The Delphi technique is vulnerable to the subjective judgement of experts, the representative-ness of the expert group, and the risk that expert opinions could be inconsistent over a prolonged period of discussion; these problems can disrupt the research process [59,60].

The modified Delphi technique can save time by replacing the original, first-round, open-ended questionnaire with a structural questionnaire designed by researchers. In contrast to the open questionnaire, this approach prevents the experts from speculating and allows the experts to focus on the research topic [61]. Therefore, this study applies the modified Delphi technique. The modified Delphi technique is widely utilized in various fields, including curriculum planning, trend forecasting, capability evaluation, and technology prediction [62,63].

Based on the developed RegTech BMC, we designed questionnaires to probe the elements and determinants to evaluate their importance from the perspectives of experts and scholars. The scoring method is a five-point Likert scale, with 5 representing strongly agree, 4 representing agree, 3 representing no comment, 2 representing disagree, and 1 representing strongly disagree. Hsu and Sandford [58] pointed out that approximately 10 experts should be selected; otherwise, it is difficult to obtain effective conclusions. The data collected by each questionnaire in the Delphi process were analysed with Excel. We separately calculated the average, mode, median and quartile as the basis for examining the consistency of expert opinions [59,62,64].

We conducted and completed the Delphi survey and the analysis from August to September 2022. Table 2 lists the experts who participated in the survey. We interviewed or communicated through an online application with a total of 12 experts from the three segments relative to this research topic, including the RegTech field, the banking sector and several academic institutions. These experts have worked on or specialized in the development, research and related work of RegTech. The responders thus had qualified knowledge regarding RegTech. After two rounds of expert discussion and analysis based on the modified Delphi technique, KA, KR, VP and CR were identified as the top four preferred elements of the RegTech BMC per the calculated mode. These four elements require maintaining a particular focus when optimizing strategies. In addition, we measured the determinants of the four elements on the basis of the average score. The determinants with the lowest average scores were eliminated so that the DANP could more precisely assess the importance of the determinants [41,63]. The results are shown in Fig. 3.

Based on the results obtained via the Delphi technique (refer to Fig. 3), KA, KR, VP, and CR are the most potentially effective elements that dominate the development of the RegTech BMC. The determinants of these four elements were also screened. We re-adjust them and assigned codes to them to facilitate subsequent MCDM analysis. There are KA1 (Big Data analysis), KA2 (AI search engine), KA3 (Data assessment and stakeholders' descriptions), KR1 (Undisclosed enterprise databases of public institutions), KR2 (Court databases), KR3 (Licensed global databases), VP1 (Improve the efficiency of the know-your-customer inquiry for the financial sector), VP2 (Avoid high-risk events of the customers' capital chain), VP3 (Enhance the security by applying

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
 Official joint credit information centers Private credit bureaus Security industry Banking industry (open API) 	 Algorithm analysis Big Data analysis AI search engine Data assessment and stakeholders' descriptions 	1. Improve the efficiency of the know-your- customer inquiry for the	 Backend test System feasibility evaluation Short-term project Long-term customization 	 Financial sector Supervisory authorities Groups and large enterprises
	Key Resources 1. Open information provided by the government 2. Undisclosed enterprise databases of public institutions	 classical inquiry for the financial sector 2. Avoid high-risk events of the customers' capital chain 3. Enhance the security by applying cloud computing 4. Reduce the operational risks of financial cloud 	Channels 1. Information system provider 2. Financial institutions (internal examination) 3. SMEs (outsourcing	
	 4. Licensed global databases 		consultancy)	
Cost Structure		Revenue Streams		
 R&D expenses Operational expenses Other expenses 		 System to implement revenue System to maintain revenue Consultancy on revenue Evaluation report on revenue 		

Fig. 2. RegTech BMC.

Table 2	
Delphi Ex	pert List.

No.	Туре	Affiliation	Education	Employment (years)
1	Practitioner	DewLight Co., Ltd., Singapore	Ph. D	12
2	Practitioner	eBay Inc., USA	Master	8
3	Practitioner	BNP Paribas Cardif Bancassurance, Paris, France	Ph. D	18
4	Practitioner	Standard Chartered Bank, Hong Kong, China	Master	16
5	Practitioner	LGT Bank AG, Vaduz, Liechtenstein	Master	11
6	Practitioner	OK Bank, Taipei, ROC	Master	13
7	Practitioner	Fubon Financial Holding Co., Ltd., Taipei, ROC	Ph. D	21
8	Practitioner	Shin Kong Commercial Bank Co., Ltd., Taipei, ROC	Ph. D	7
9	Practitioner	E.SUN Commercial Bank Co., Ltd., Taipei, ROC	Master	14
10	Scholar	University of Surrey, UK	Ph. D	20
11	Scholar	University of Delaware, USA	Ph. D	18
12	Scholar	National Yang Ming Chiao Tung University, Hsinchu, ROC	Ph. D	11

cloud computing), CR1 (System feasibility evaluation), CR2 (Short-term project), and CR3 (Long-term customization).

4. DANP calculation and discussion

Tzeng and Huang [35] declared that MCDM approaches can simultaneously assess multiple evaluation specifications when the references and criteria of a research topic are limited and can assist decision makers in realizing optimal solutions [36,39,62]. The DANP was integrated with two approaches, the decision-making trial and evaluation laboratory (DEMATEL) approach and the analytic network process (ANP) approach, to create a more rigorous MCDM technique [62,64]. Saaty [63] designed the ANP to compensate for the limitations in the analytic hierarchy process (AHP), which lacks an analysis of the relationships between two factors. In contrast to the simple linear analysis of the AHP, the ANP can complete a network correlation analysis. The ANP uses the extreme process method to calculate a supermatrix to avoid possible dependencies and inversely effective problems [65-67]. Although the ANP can theoretically modify the dependencies of the factors, with the NRM described by the DEMATEL approach, the ANP can completely solve the problem of dependencies [62,68]. This hybrid MCDM approach has been successfully applied to many research questions, particularly in exploratory studies [40,63,68]. Furthermore, the DANP analysis results can serve as a reference for practical plans and implementation of the RegTech BMC.

4.1. Data collection

The RegTech BMC is a relatively professional research issue. Therefore, the data collection was based on the opinions of professionals in the information security departments of the financial sector, RegTech startups and FinTech-related companies. We designed an investigation of the study facets, criteria and factors on the basis of the DANP to accurately achieve the purpose of the study. The data from the experts were collected by using a questionnaire divided into two parts: the first part was designated for the DEMATEL (please refer to Appendix A), and the second part was designated for the DANP (please refer to Appendix B). The data collection period ranged from October 2022 to December 2022. The backgrounds of the respondents are summarized in Table 3 and described as follows: 38 respondents worked in information security departments of the financial sector; 11 respondents worked in RegTech start-ups; and 18 respondents worked in FinTech-related companies.

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
 Official joint credit information centers Private credit bureaus Security industry Banking industry (open API) 	 Algorithm analysis Big Data analysis AI search engine Data assessment and stakeholders' descriptions Key Resources 1. Open information provided by the government 2. Undisclosed enterprise databases of public institutions 3. Court databases 4. Licensed global databases	 Improve the efficiency of the know-your- customer inquiry for the financial sector Avoid high-risk events of the customers' capital chain Enhance the security by applying cloud computing Reduce the operational risks of SMEs 	 1. Backend test 2. System feasibility evaluation 3. Short-term project 4. Long-term customization Channels 1. Information system provider 2. Financial institutions (internal examination) 3. SMEs (outsourcing consultancy) 	 Financial sector Supervisory authorities Groups and large enterprises
Cost Structure			Revenue Streams	
 R&D expenses Operational expenses Other expenses 		 System to implement revenue System to maintain revenue Consultancy on revenue Evaluation report on revenue 		

Fig. 3. Modified RegTech BMC.

Table	3
-------	---

Statistical Distribution of the Expert Questionnaire.

Field	Number	Ratio
Information technology departments of the financial sector	38	56.71 %
RegTech startups	11	16.42~%
FinTech-related companies	18	26.87 %
Total	67	100 %

The total sample number was 67 persons.

4.2. Influence analysis of the NRM of selected BMC elements

Following the DEMATEL approach, we chose Excel to calculate multiple matrixes and then obtained the net influence matrix, as shown in Table 4. In addition, we conducted the NRM of the four selected BMC elements, as shown in Fig. 4. Based on these results, we compared the four elements to determine their relationships. The experts indicated that CR are the most effective element dominating BMC development, as they obviously affect the other three elements. Next, in order of importance, are KA, KR and VP (for more DEMATEL calculation details, please refer to Appendix A); that is, the influence order of CR > KA > KR > VP forms the NRM of the DANP.

Using the same method, we can also obtain the NRM of the determinators in each element. For the KA element, the order of the NRM is KA3 > KA2 > KA1. For the KR element, the order of NRM was KR2 >

Table 4



Fig. 4. NRM of the Selected BMC Elements.

KR1 > KR3. For the VP element, the order of NRM was VP3 > VP2 > VP1. For the CR element, the order of NRM was CR1 > CR2 > CR3.

4.3. DANP analysis of selected BMC elements and determinants

The DANP analysis framework was mainly composed of the four selected elements and the relevant determinants of the RegTech startup BMC. In addition, we utilized the NRMs of the four elements and the four

Element	Key Activities	Key Resources	Value Proposition	Customer Relationships
Key Activities	_	_	_	_
Key Resources	0.292	_	_	_
Value Proposition	0.248	0.284	_	_
Customer Relationships	0.341	0.346	0.314	-

other NRMs of each element's relevant determinants as calculated via the DEMATEL to help the DANP confirm the dependencies in the analytic network, as shown in Fig. 5. Each element and each determinant are also both externally and internally dependent.

In this study, we employed Super Decisions software (developed by the Creative Decisions Foundation in Pittsburgh, U.S.) to conduct the DANP analysis (for more details on the DANP questionnaire, please refer to Appendix B). The Super Decisions software implements the DANP to enable the inclusion of intangibles in decision-making for combining judgement and data to effectively rank options and predict outcomes. The analysis results are shown in Table 5. We applied the weights calculated by the DANP to further deduce the importance and priority of the elements and determinants. In addition to avoiding the viewpoints that could be disregarded when the BMC of a RegTech start-up operates, this approach also enabled us to explore effective recommendations and implications of information integration. We discuss these issues in the following section.

4.4. Discussion of the DANP analysis results

Based on the weights obtained from the DANP analysis, we explore the representativeness of each element and each determinant of the RegTech startup BMC and provide suggestions to apply the model according to the priority ranking. We separately discuss the elements and determinants in order of their weight as follows:

This research indicates that 'CR' is the most significant element of the model, with a weight of 0.292, followed by 'KA' (0.271) and 'KR' (0.242), but the 'VP' element has a weight of only 0.195 (refer to Table 5). This finding does not mean that VP is not important, as it was selected through the Delphi technique. In general, the goals of RegTech strongly match its original VP so that the weight is not outstanding when assessing business perspectives.

The evaluation of the third level of the DANP, the weights of the determinants, indicates the prioritization of BMC implementation. Specifically, this prioritization is the order in which the determinants



Fig. 5. DANP Framework of the RegTech BMC.

should be executed early in the process. The top six determinants in their order of importance are 'Big Data analysis' (0.10592), 'system feasibility evaluation' (0.10590), 'long-term customization' (0.10286), 'data assessment and stakeholder descriptions' (0.09201), 'licensed global databases' (0.09094), and 'short-term projects' (0.08306). The remaining determinants are 'undisclosed enterprise databases of public institutions', 'AI search engine', 'court databases', 'avoid high-risk events', 'improve the efficiency of the know-your-customer inquiry for the financial sector', and 'enhance the security of the customers' capital chain'.

According to the abovementioned results, we find that the most important element of the RegTech start-up BMC is 'CR'. When discussing business model strategy optimization, RegTech start-ups need to focus on this element if they want to commercialize RegTech and enter the market. Enterprises in the financial sector are traditionally highly rigorous [69]. If a startup wants to introduce a new technology, it must first be recognized and trusted by customers [27]. The rankings of the relevant determinants of 'CR' are also high; for example, 'system feasibility assessment' ranks second overall. Whether internal teams or startups want to specify RegTech in the financial industry, they must implement a system compatibility strategy. This strategy is the firstpriority task for the RegTech business model. 'Long-term customization' and 'short-term projects' are necessary follow-up strategies for maintaining cooperative relationships.

In contrast, the 'key activities' element, which is second in importance, emphasizes the technological essence of RegTech. RegTech involves various leading-edge technologies that indicate the advancement of technology to enable prospective FinTech. Among the determinants of this element, 'Big Data analysis' and 'data assessment and stakeholder descriptions' rank in the top six. The development of RegTech leverages Big Data analysis as the main technology driver. Big Data analysis can reduce the current mistakes that result from continual manual monitoring, which causes a high rate of incorrect judgements in the financial sector [19]. By applying Big Data analysis, RegTech can assess data and accurately describe stakeholders to create a more efficient financial environment [44]. In the future, AI search engines will be able to expand to other FinTech applications and e-commerce-related fields to innovate such services [42].

The majority of the top six determinants have already been discussed in relation to the elements with which they are associated. The fifthranked determinant, 'licensed global databases', focuses mainly on the statutes of government institutions in following global trends for regulatory cooperation [6]. If RegTech startups want to develop more technologies in the FinTech, the connection between government institutions and global institutions plays an important role. Therefore, both global and governmental institutions should offer complete data.

Regarding the 'VP' element, the weight ranking may be lower as the financial sector already strictly controls the determinants of this element; therefore, it is not particularly significant in the research results. However, as RegTech matures, in addition to strengthening compliance with the law and allowing target customers to use it with trust, it could be adopted by international financial organizations (such as the Asia-Pacific Anti-Money Laundering Organization) to meet the expectations of the financial supervisory authorities [17]. Overall, the example of the RegTech start-up BMC can be employed as a business model for other FinTech start-ups to optimize their own strategies.

5. Conclusion

5.1. Summary

FinTech is in the midst of a development stage, as financial enterprises and startups are using technology to make convenient service innovations for financial markets. However, financial innovation may conflict with the law; thus, companies may fall behind and even suffer losses [69]. RegTech is an emerging technology that solves this issue by

Table 5

DANP Weights of the Elements and Determinants.

Element	Weight	Determinant	Original Weight	Final Weight	Ranking
Key Activities	0.271	Big Data analysis (KA1)	0.391	0.10592	1
		AI search engine (KA2)	0.269	0.07296	8
		Data assessment and stakeholder descriptions (KA3)	0.340	0.09201	4
Key Resources	0.242	Undisclosed enterprise databases of public institutions (KR1)	0.328	0.07953	7
		Licensed global databases (KR2)	0.376	0.09094	5
		Court databases (KR3)	0.296	0.07166	9
Value Proposition	0.195	Improve the efficiency of the know-your-customer inquiry for the financial sector (VP1)	0.344	0.06709	11
		Avoid high-risk events of the customers' capital chain (VP2)	0.347	0.06779	10
		Enhance the security by applying cloud computing (VP3)	0.309	0.06027	12
Customer Relationships	0.292	System feasibility evaluation (CR1)	0.363	0.10590	2
		Short-term projects (CR2)	0.285	0.08306	6
		Long-term customization (CR)	0.352	0.10286	3

** Saaty [63] considered that the consistency ratio measurement of a DANP analysis should have a consistency ratio measurement below 0.1; thus, the elements and determinants of this study are consistent and have validity.

combining regulations and leading-edge technologies to manage the various FinTech on the market and ensure regulatory compliance. RegTech uses Big Data, AI, and other technologies to meet financial regulatory requirements and improve the ability of the financial sector to detect, prevent, and resolve the financial risks that might exist across industries, markets, and financial sectors [10].

This research applies a BMC as the main research theory. First, we used the Delphi technique to select the elements and determinants of the RegTech start-up BMC; then, we applied the DANP approach to investigate experts to proceed to the empirical research. Based on the research results, we confirmed that 'CR' is the most significant element. In assessing the determinants, we found that 'Big Data analysis' (with a weight of 0.10592) was the most important. This finding indicates that RegTech can use Big Data analysis to determine whether the innovation activities of FinTech are in regulatory compliance [8]. This finding also shows that RegTech has high-level, leading-edge technological features. The weight of 'data assessment and stakeholder descriptions', which are associated with 'key activities', is 0.09201. This determinant can clarify the relationship between trading parties, avoid financial fraud, and prevent potential risks. The determinants relevant to 'key activities' have good weights, which indicates that the financial industry is looking to RegTech to solve the legal compliance issues that may occur in the future FinTech era [12].

'System feasibility evaluation' (0.10590), which is the relevant determinant of 'CR', ranks second. This finding shows that if a start-up wants to promote RegTech commercialization, it is necessary for the target customer to realize the additional value that RegTech can create for its current systems, especially in terms of compliance with the law as the financial industry has been rigorously required to obey regulations [13]. The other two relevant determinants of 'CR', namely, 'long-term customization' (0.10286), which is ranked third, and 'short-term projects' (0.08306), which is ranked sixth, both help an enterprise connect with customers, which again indicates that 'CR' is the most critical element of the BMC.

The fifth-ranked determinant, 'licensed global databases' (0.09094), reveals that the financial sector is facing the global financial cloud service trend. Relevant enterprises can share a database to cooperate and rely on RegTech start-ups, which will improve regulatory compliance and financial crime prevention [16]. In this way, the financial industry and global financial organizations are consistent, which creates a win–win situation.

5.2. Implications of FinTech

This section expands the empirical evidence of the study by further exploring the strategic optimization and implications based on the weights and NRM of the elements of the RegTech startup BMC and the relevant determinants. This evidence is also expected to enhance other researchers' comprehension of the subject of this research.

1 Customer Relationships

The RegTech business model is based on the question 'Why do you need to regulate financial transactions and money laundering transactions?' Because of the increasing frequency of online transactions and the acceleration of the globalization of the financial environment over time, the amount of international money laundering and financial fraud has also increased every year [12]. According to relevant reports, the amount of international money laundering transactions has grown to 1-2 trillion US dollars per year. Financial supervisory authorities must investigate suspicious transactions and incur very high prevention costs, but the actual effect is very limited [69]. As a result, RegTech is beginning to develop a new business model that serves the target customers. RegTech start-ups can use their expertise to help financial and insurance enterprises institute customer identification processes, handle complex data sources and interpret information. In addition, RegTech start-ups can help financial institutions fight ever-changing and crossborder money laundering activities to reduce losses incurred through money laundering and fraud.

System feasibility assessment is the best initial method of cooperation between RegTech start-ups and their target customer segments. Through a risk analysis system that uses AI assessment technology, RegTech provides customers with information on transactions, including identifying money laundering transactions, confirming fraudulent accounts, computing credit evaluations and then providing risk warnings [42]. In addition to presenting known information, AI technology explores unknown relationships and simultaneously reduces the transaction risk caused by human error while successfully improving administrative efficiency [44]. The development of CR in the BMC is carried out in two modes, specifically, short-term projects and long-term customization, so that good CR can be established and generate revenue streams [54].

RegTech plays a crucial role in improving customer relationships in the FinTech industry and other finance sectors. There are several ways in which RegTech contributes to improving customer relationships, including the enhancement of efficiency, security, transparency, and personalization. By automating compliance processes and leveraging advanced technologies, FinTech-related companies can better focus on providing excellent customer experiences while meeting regulatory requirements.

2 Key Activities

RegTech startups mainly apply Big Data analysis to assist in financial crime risk assessment. These start-ups can instantly respond to international information by portraying customer types, lists, social relationships, etc. Based on the analysed data, RegTech startups can provide customers with various risk indicators [14]. The target

customers quickly obtain assessment reports to facilitate their understanding of the overall risk situations through statistical information [17].

RegTech start-ups can also utilize the AI search engine and integrate a client's existing data, such as a bank's original customer information and transactions, to improve the system identification accuracy and automatically customize the parameter adjustments. RegTech start-ups can create a platform to automatically detect data quality and provide users with a deeper relationship between stakeholders and transaction information according to user feedback information. The future financial supervision mechanism will be continuously developed on the basis of the principle of confirming compliance with laws and regulations [15]. How to use these Big Data and AI search engines to improve realtime transaction control will be the key for the RegTech start-ups that apply cloud computing.

RegTech significantly improves key activities within FinTech industry by providing Big Data analysis and AI to develop advanced technological solutions, and then to manage regulatory compliance efficiently. RegTech enhances key activities within organizations by automating compliance processes, managing risks, improving data management, reducing operational costs, and providing valuable insights for decision-making. Adopting RegTech allows organizations to focus on their core business activities while maintaining a robust and compliant operational framework.

3 Key Resources

Compliance with laws and regulations is currently passively managed and cannot effectively prevent the continuous occurrence of fraud. The reason is that financial enterprises have considerable difficulty obtaining background information on both sides of each transaction. It is much more difficult to achieve high accuracy and high efficiency in the effective supervision of massive transactions by human operation; thus, the current situation may be immediately improved by cloud computing [16].

The KR of the RegTech startup BMC are to improve its database, integrate global databases, such as the Asia Pacific list database, and incorporate social relationship data for transactions, including company organization membership, mutual interests and overseas asset relationships. This approach can enhance the accuracy of KR. In addition, RegTech startups could create a database platform to incorporate the information of governmental regulatory agencies and to collect information from overseas databases [20]. In this way, they could graphically present the results through algorithms and then create a customized information service to create revenue streams.

In addition, RegTech startups not only provide their own risk assessment databases but can also use them to trade and exchange information with existing data providers through the cloud, such as Reuters and Dow Jones [26]. As the database can be applied to global trading markets, it could create additional revenue streams.

Conclusively, RegTech leverages key resources within organizations to streamline and enhance regulatory compliance processes. In other words, RegTech optimizes key resources by automating compliance processes, improving data management, enhancing personnel productivity, and facilitating access to real-time regulatory information. This efficient utilization of resources allows organizations to maintain compliance while focusing on strategic objectives and business growth.

4 Value Proposition

Under the threat of ever-changing financial crimes, the most effective way for the financial sector or competent authorities to eliminate financial crimes and reduce operational losses is to conduct effective risk management for high-risk customers [14]. How to effectively confirm customer information is the cornerstone of financial enterprise operational profitability. However, in reviewing the customers involved in complex share and interest distribution relationships, problems are generally encountered; for example, the data sources are complicated, and the collection costs are extremely high. Thus, the banking and insurance industries need to consider more using cloud computing for the prevention of financial crimes. Manual data collection is expensive and generates high costs for money laundering prevention [44].

RegTech is expected to use expertise to interpret and analyse information, conduct anti-money laundering activities, perform fraud and credit risk assessment, and identify potential risks early. Presently, financial crime prevention is based on post analysis. After the relevant issues have been clearly identified, a crime is tracked down. Because of manpower limitations, the relevant resources can be applied only in the top 20 % of such cases, which means that the remaining 80 % of victims are disregarded. In reality, the social cost is substantially greater for 80 % of victims than for the top 20 % of victims [19]. Cloud computing supposed to be one of best solutions.

The ideal RegTech should include internationally renowned largescale databases and public information, whether domestic or abroad. Through the AI search engine, Big Data analysis and cloud computing, RegTech can assist law enforcement agencies as a reliable third party to quickly collect evidence of crimes and can improve the efficiency of such investigations [8]. RegTech can reduce the losses caused by manual misjudgement.

RegTech enlightens the value proposition for organizations by providing solutions that go beyond mere compliance, offering a range of benefits that positively impact various aspects of business operations, especially agility and adaptability of new regulations, data security and integrity of compliance, and audit preparedness. In summary, RegTech enriches the value proposition by driving efficiency, mitigating risks, supporting strategic decision-making, enhancing customer satisfaction, and fostering a culture of transparency and accountability. Organizations that embrace RegTech can position themselves as forwardthinking, resilient, and capable of delivering sustained value to stakeholders.

5.3 Research Limitations

1 This study is designed mainly for people who are highly involved with RegTech applications to conduct empirical research. The purpose of the research at this stage is to establish a specific business model based on the research structure for certain emerging technologies with relevant determinants. The scope is not as large as the scope of the traditional research model that issues very large questionnaires. As the general public has different levels of understanding of RegTech, the Delphi expert questionnaire is rather limited. Nevertheless, we still attempt to process the research results so they can serve as an accurate reference for the relevant parties.

2 As RegTech is an emerging technology, the number of respondents in this study is limited. Despite this limitation, we made an effort to select respondents with professional competence in this field to increase the credibility of the research. Compared with other quantitative research methods, the Delphi technique and DANP are slightly subjective approaches. This study aims to use quantifiable data as evidence to contribute and derive useful implications of information integration.

Acknowledgements

The authors would like to thank the National Science and Technology Council, for the financial support under the contract: NSTC 111-2410-H-153 -037 -MY2.

Appendix A. RegTech BMC elements DEMATEL analysis

1 There are 5 questions in the DEMATEL questionnaire. Concerning the length, we only show the first question of DEMATEL questionnaire as the

instance.

Q1. The correlation between one element and the opposed one, please fill 0–4 to represent the influence of the two elements as shown. The options ranged from 0 (not influential) to 4 (very influential).

Element	Key Activities	Key Resources	Value Proposition	Customer Relationships
Key Activities	_	2	1	4
Key Resources	1	_	0	2
Value Proposition	1	1	_	1
Customer Relationships	2	2	2	_

2 To calculate the initial influence matrix (A), the elements/determinants are used in pairwise comparison to assess each respondent's perception of the degree of influence of the elements/determinants. The initial influence matrix (A) is obtained by adding the average of all respondents' matrixes.

Table A1

The Initial Influence Matrix of the BMC Elements of the DEMATEL Analysis (A).

Element	Key Activities	Key Resources	Value Proposition	Customer Relationships	Sum
Key Activities	0.000	1.191	1.052	1.538	3.782
Key Resources	1.369	0.000	1.587	1.311	4.267
Value Proposition	1.163	1.333	0.000	1.530	4.026
Customer Relationships	1.600	1.623	1.472	0.000	4.696
Sum	4.133	4.147	4.111	4.379	-

3. Through formulation (1) and (2) normalization, we can obtain the maximum (4.696) of the sum of all rows or columns in the initial influence matrix (A) and then can obtain the direct influence matrix (X).

X = sA, s > 0		(A.1)
$s = \min_{i,j} \left[1/\max_{1 \le i \le n} \sum_{j=1}^n a_{ij}, 1/\max_{1 \le j \le n} \sum_{i=1}^n a_{ij} \right],$	i, j = 1, 2,, n	(A.2)

Table A2 The Direct Influence Matrix of the BMC Elements of the DEMATEL Analysis (X).

Element	Key Activities	Key Resources	Value Proposition	Customer Relationships	Sum
Key Activities	0.000	0.254	0.224	0.328	0.805
Key Resources	0.292	0.000	0.338	0.279	0.909
Value Proposition	0.248	0.284	0.000	0.326	0.857
Customer Relationships	0.341	0.346	0.314	0.000	1.000
Sum	0.880	0.883	0.875	0.933	_

4. Through calculating formulation (3), we obtain the indirect influence matrix (ID).

$$ID = \sum_{i=2}^{\infty} D^i = D^2 (I - D)^{-1}$$
(A.3)

Table A3	
The Indirect Influence Matrix of the BMC Elements of the DEMATEL Analysis (ID)

Element	Key Activities	Key Resources	Value Proposition	Customer Relationships	Sum
Key Activities	2.777	1.983	1.950	2.099	8.809
Key Resources	2.160	2.940	2.179	2.238	9.517
Value Proposition	2.063	2.091	2.855	2.190	9.199
Customer Relationships	2.340	2.348	2.313	3.176	10.176
Sum	9.339	9.362	9.297	9.702	_

5 The total influence matrix (T) can be obtained by the self-multiplication of the indirect influence matrix.

Table A4

Total Influence Matrix of the BMC Elements of the DEMATEL Analysis (T).

Element	Key Activities	Key Resources	Value Proposition	Customer Relationships	Sum
Key Activities	1.777	1.983	1.950	2.099	5.710
Key Resources	2.160	1.940	2.179	2.238	6.279
Value Proposition	2.063	2.091	1.855	2.190	6.009
Customer Relationships	2.340	2.348	2.313	2.176	7.001
Sum	6.000	6.014	5.984	6.527	_

6. The columns (variables) of the total influence matrix are added to obtain the sum vector (d) of the columns, and the rows (variables) of the total influence matrix are added to obtain the vector of the transposition of the sum of the rows (r). The sum vector of the columns (d) is added to the vector of the transposition of the sum of the rows (r) to obtain the sum of the vector of columns and rows ($d_i + r_i$). The sum vector of columns(d) minus the vector of the transposition of the sum of the rows (r) is the vector difference of the columns and rows ($d_i - r_i$). The sum of vector of the columns and rows represents the total influence relationships of the total influence matrix (T). The value of ($d_i + r_i$) is higher, meaning that the element or the determinant i affects others more. The value of ($d_i - r_i$) represents the net influence relationships of the total influence matrix. If ($d_i - r_i > 0$), then the element (determinant) affects other elements (determinant) is affected by other elements (determinant).

Table A5

Comparison of the Total Influence of the BMC Elements of the DEMATEL Analysis.

Element	Sum of columns (d)	Sum of rows (r)	Sum of vector of columns and rows $(d + r)$	Difference of vector of columns and rows (d-r)
Key Activities	5.710	6.000	11.710	-0.290
Key Resources	6.279	6.014	12.293	0.265
Value Proposition	6.009	5.984	11.993	0.025
Customer Relationships	7.001	6.527	13.527	0.474

7 According to the calculations above, we can obtain Table 4 Net Influence Matrix of Analysis Elements and Fig. 4 NRM of the Selected BMC Elements in section 4.2.

Appendix B. The instance of DANP questionnaire

1 There are total 5 questions in the DANP questionnaire. Concerning the length, we only show the first question of DANP questionnaire as the instance

Q1. If you think that 'Key Activities' (the first evaluation sample on the left) is compared with the 'Key Resources' (the first evaluation criteria on the right), 'Key Resources' is greater important than that of 'Key Activities' and the degree is 'Extremely Important'. Please tick the box inside the column. On the contrary, please tick the column at left side.

The value of pairwise comparison	Absolutely Important		Extremely Important		Quite Important		Slightly Important		Equally Important		Slightly Important		Quite Important		Extremely Important		Absolutely Important	The value of pairwise comparison
criteria	9:1	8:1	7:1	6:1	5:1	4:1	3:1	2:1	1:1	1:2	1:3	1:4	1:5	1:6	1:7	1:8	1:9	criteria
																	V	Key Resources
Key Activities			V															Value Proposition
							V											Customer Relationships
V as Decompose												\checkmark						Value Proposition
Key Resources				\checkmark														Customer Relationships
Value Proposition									\checkmark									Customer Relationships

J.-S. Wang and Y.-T. Chen

References

- [1] Wang JS. Exploring biometric identification in FinTech applications based on the modified TAM. Financial Innovation 2021;7(42). https://doi.org/10.1186/s408 021-00260-2
- Verhoef PC, et al. Digital transformation: A multidisciplinary reflection and [2] research agenda. J Bus Res 2021;122:889-901. https://doi.org/10.1016/j. jbusres.2019.09.022
- [3] Shiau WL, et al. Understanding fintech continuance: perspectives from self-efficacy and ECT-IS theories. Ind Manag Data Syst 2020;120(9):1659-89. https://doi.org/ 10.1108/IMDS-02-2020-0069.
- Wang JS. Reconfigure and evaluate consumer satisfaction for Open API in [4] advancing FinTech. Journal of King Saud University - Computer and Information Sciences 2023;35(9). https://doi.org/10.1016/j.jksuci.2023.101738.
- [5] Zhao JS, et al. Riding the FinTech innovation wave: FinTech, patents and bank performance. J Int Money Financ 2022;122. https://doi.org/10.1016/j. imonfin.2021.102552.
- Frederik K, et al. Strategic alliances between banks and fintechs for digital [6] innovation: motives to collaborate and types of interaction. J Entrep Finance 2019; $21(1) \cdot 1 - 23$
- Johansson E, et al. Regtech-a necessary tool to keep up with compliance and [7] egulatory changes, ACRN Journal of Finance and Risk Perspectives 2019;8:71–85
- [8] Kurum E. RegTech solutions and AML compliance: what future for financial crime. Journal of Financial Crime 2023;30(3):776-94. https://doi.org/10.1108/JFC-04-2020-0051
- [9] Anagnostopoulos I. Fintech and regtech: impact on regulators and banks. J Econ Bus 2018:100:7-25. https://doi.org/10.1016/j.jeconbus 2018.07.003 Teichmann F, Boticiu S, Sergi BS. RegTech - Potential benefits and challenges for
- [10] businesses. Technol Soc 2023;72. https://doi.org/10.1016/j.techsoc.2022.1021
- [11] Freij Å. Using technology to support financial services regulatory compliance: current applications and future prospects of regtech. J Invest Compliance 2020;21 (2/3):181-90. https://doi.org/10.1108/JOIC-10-2020-0033.
- [12] Grassi L, Lanfranchi D. RegTech in public and private sectors: the nexus between data, technology and regulation. J Ind Bus Econ 2022;49:441-79. https://doi.org/ 10 1007/\$40812-022-00226-0
- [13] Buckley RP, et al. The road to RegTech: the (astonishing) example of the European Union. J Bank Regul 2020;21:26-36. https://doi.org/10.1057/s41261-019-00104-
- [14] Bolton M, Mintrom M. RegTech and creating public value: opportunities and challenges. Policy Design and Practice 2023;6(3):266-82. https://doi.org/ 10.1080/25741292.2023.2213059.
- [15] Akartuna EA, Johnson SD, Thornton A. Preventing the money laundering and terrorist financing risks of emerging technologies: An international policy Delphi study. Technol Forecast Soc Chang 2022;179. https://doi.org/10.1016/j. echfore.2022.121632
- [16] Becker M, Merz K, Buchkremer R. RegTech-the application of modern information technology in regulatory affairs: areas of interest in research and practice. Intelligent Systems in Accounting, Finance and Management 2020;27: /doi.org/10.1002/isaf.1479 161-7. https://
- [17] Lokanan ME, Sharma K. Fraud prediction using machine learning: The case of investment advisors in Canada. Machine Learning with Applications 2022;8. https://doi.org/10.1016/j.mlwa.2022.100269.
- [18] Weber RH. Regtech as a new legal challenge. Journal of Financial Transformation 2017.46.10-7
- [19] Kavassalis P, et al. An innovative RegTech approach to financial risk monitoring and supervisory reporting. J Risk Financ 2018;19(1):39-55. https://doi.org/ 0.1108/JRF-07-2017-0111
- [20] Kunhibava S, et al. Selected issues in the use of RegTech in the Islamic and conventional financial markets. Journal of Islamic Accounting and Business Research 2023; ahead-of-print. doi: 10.1108/JIABR-03-2022-0069.
- Barroso M, Laborda J. Digital transformation and the emergence of the Fintech [21] sector: Systematic literature review. Digital. Business 2022;2(2). https://doi.org/ 10.1016/j.digbus.2022.100028
- [22] David-West D, Iheanachor K, Kelikume I. A resource-based view of digital financial services (DFS): An exploratory study of Nigerian providers. J Bus Res 2018;88: 513-26. https://doi.org/10.1016/j.jbusres.2018.01.034.
- [23] Ghezzi A, Cavallo A. Agile Business Model Innovation in Digital Entrepreneurship: Lean Startup Approaches. J Bus Res 2020;110:519-37. https://doi.org/10.1016/j. busres.2018.06.013.
- [24] Hammerschlag Z, Bick G, Luiz JM. The internationalization of African fintech firms: marketing strategies for successful intra-Africa expansion. Int Mark Rev 2020;37(2):299-317. https://doi.org/10.1108/IMR-05-2019-0130.
- Senyo PK, Liu K, Effah J. Digital business ecosystem: Literature review and a [25] framework for future research. Int J Inf Manag 2019;47:52-64. https://doi.org/ 10.1016/j.ijinfomgt.2019.01.002
- [26] Breidbach CF, Keating BW, Lim C. Fintech: research directions to explore the digital transformation of financial service systems. J Serv Theory Pract 2020;30(1): 79-102. https://doi.org/10.1108/JSTP-08-2018-0185.
- [27] Arthur KNA. The emergence of financial innovation and its governance-a historical literature review. Journal of Innovation Management 2017;5(4):48-73. https:// oi.org/10.24840/2183-0606_005.004_0005.
- [28] Khraisha T, Arthur K. Can we have a general theory of financial innovation processes? A Conceptual Review Finance Innovation 2018;4(4):1-27. https://doi. org/10.1186/s40854-018-0088-v.

- [29] Agostini L, Nosella A. Industry 4.0 and business models: a bibliometric literature review. Bus Process Manag J 2021;27(50):1633-55. https://doi.org/10.1108/ BPMJ-03-2021-0133.
- [30] Osterwalder A, Pigneur Y. Business Model Genration: A handbook for visionaries, game changers and challengers. Hoboken, New Jersey: John Wiley and Sons; 2010.
- [31] Verhoef PC, et al. Digital transformation: A multidisciplinary reflection and research agenda. J Bus Res 2021:122. https://doi.org/10.1016/ ibusres.2019.09.022
- [32] Sjödin D, et al. Value Creation and Value Capture Alignment in Business Model Innovation: A Process View on Outcome-Based Business Models. J Prod Innov Manag 2020;37(2):158-83. https://doi.org/10.1111/jpim.12516.
- [33] Broccardo L, et al. How digitalization supports a sustainable business model: A literature review. Technol Forecast Soc Chang 2023:187. https://doi.org/10.1016/ i.techfore.2022.122146.
- [34] Bocken N, Snihur Y. Lean Startup and the business model: Experimenting for novelty and impact. Long Range Plan 2020;53(4). https://doi.org/10.1016/j. lrp.2019.101953
- [35] Tzeng GH, Huang JJ. Multiple Attribute Decision Making: Methods and Applications. Boca Raton, FL: CRC Press; 2011.
- [36] Hefny HA, Elsayed HM, Aly HF. Fuzzy multi-criteria decision making model for different scenarios of electrical power generation in Egypt. Egyptian Informatics Journal 2013;14(2):125-33. https://doi.org/10.1016/j.eij.2013.04.001.
- Senvo PK, et al. Moving away from trading on the margins: Economic empowerment of informal businesses through FinTech. Inf Syst J 2023;33(1): 154-84. https://doi.org/10.1111/isj.12403
- Wang JS. Verification Techniques in FinTech Compared from User Perspectives. [38] Soc Sci Comput Rev 2023;41(4):1438-55. https://doi.org/10.1177/ 08944393211058310.
- [39] Elomda BM, Hefny HA, Hassan HA. An extension of fuzzy decision maps for multicriteria decision-making. Egyptian Informatics Journal 2013;14(2):147-55. https://doi.org/10.1016/j.eij.2013.05.001.
- [40] Jamali, et al. Urban Resilience Assessment Using Hybrid MCDM Model Based on DEMATEL-ANP Method (DANP). J Indian Soc Remote Sens 2023;51:893-913. https://doi.org/10.1007/s12524-023-01670-8.
- [41] Amoozad Mahdiraji et al. Towards financing the entrepreneurial SMEs: exploring the innovation drivers of successful crowdfunding via a multi-layer decisionmaking approach. European Journal of Innovation Management 2023; ahead-ofprint. doi: 10.1108/EJIM-12-2021-0618.
- Wamba-Taguimdje SL, et al. Influence of artificial intelligence (AI) on firm [42] performance: the business value of AI-based transformation projects. Bus Process Manag J 2020;26(7):1893–924. https://doi.org/10.1108/BPMJ-10-2019-0411
- Khan WA, et al. Trust identification through cognitive correlates with emphasizing [43] attention in cloud robotics. Egyptian Informatics Journal 2022;23(2):259-69. https://doi.org/10.1016/j.eij.2022.01.003.
- Moro-Visconti R. Rambaud CS. Pascual JL. Sustainability in FinTechs: An [44] Explanation through Business Model Scalability and Market Valuation. Sustainability 2020;12(24):10316. https://doi.org/10.3390/su122410316.
- Wu X, Liang J, Study on trust evaluation and service selection for Service-Oriented [45] E-Commerce systems in IoT environments. Egyptian Informatics Journal 2023;24 (2):257-63. https://doi.org/10.1016/j.eij.2023.03.003.
- Ghallab H, Fahmy H, Nasr M. Detection outliers on internet of things using big data [46] technology. Egyptian Informatics Journal 2020;21(3):131-8. https://doi.org 10.1016/j.eij.2019.12.001.
- Zott C, Amit R, Massa L. The business model: recent developments and future research. J Manag 2011;37(4):1019–42. [47]
- [48] Spieth P, Laudien SM, Meissner S. Business model innovation in strategic alliances: a multi-layer perspective. R&D Manag 2021;51:24-39. https://doi.org/10.1111/ radm 12410
- [49] Scheaf DJ, et al. Measuring opportunity evaluation: Conceptual synthesis and scale development. J Bus Ventur 2019;35(2). https://doi.org/10.1016/ ibusvent 2019 04 003
- [50] Seyb KS, Shepherd DA, Williams TA. Exoskeletons, entrepreneurs, and communities: A model of co-constructing a potential opportunity. J Bus Ventur 2019;34(6). https://doi.org/10.1016/j.jbusvent.2019.105947
- Cantamessa M, et al. Startups' Roads to Failure. Sustainability 2018;10: [51] 2346-2364.
- [52] Balboni B, et al. Business model evolution, contextual ambidexterity and the growth performance of high-tech start-ups. J Bus Res 2019;99:115-24.
- [53] Amit R, Zott C. Crafting business architecture: The antecedents of business model design. Strateg Entrep J 2015;9:331-50.
- [54] Kiel D, Arnold C, Voigt KI. The influence of the Industrial Internet of Things on business models of established manufacturing companies - A business level perspective. Technovation 2017;68:4-19.
- [55] Klus MF, et al. Strategic Alliances between Banks and Fintechs for Digital Innovation: Motives to Collaborate and Types of Interaction. The Journal of Entrepreneurial Finance 2019;21(1):1-23.
- Niemimaa M, et al. Business continuity of business models: Evaluating the [56] resilience of business models for contingencies. Int J Inf Manag 2019;49:208-16.
- [57] Liu J, Gu B, Chen J. Enablers for maritime supply chain resilience during pandemic: An integrated MCDM approach. Transp Res A Policy Pract 2023:175. https://doi.org/10.1016/j.tra.2023.103777
- [58] Hsu CC, Sandford BA. The Delphi technique: making sense of consensus. Pract Assess Res Eval 2007;12(10):1-8.
- Wang JS, Liu CH, Chen YT. Green sustainability balanced scorecard-Evidence [59] from the Taiwan liquefied natural gas industry. Environ Technol Innov 2022:28. https://doi.org/10.1016/j.eti.2022.102862.

J.-S. Wang and Y.-T. Chen

- [60] Heiko A. Consensus measurement in Delphi studies: review and implications for future quality assurance. Technol Forecast Soc Chang 2012;79(8):1525–36.
- [61] Hsu IC, Shih YJ, Pai FY. Applying the Modified Delphi Method and DANP to Determine the Critical Selection Criteria for Local Middle and Top Management in Multinational Enterprises. Mathematics 2020;8:1396–417. https://doi.org/ 10.3390/math8091396.
- [62] Khan S, Haleem A, Khan MI. Risk management in Halal supply chain: an integrated fuzzy Delphi and DEMATEL approach. J Model Manag 2021;16(1):172–214. https://doi.org/10.1108/JM2-09-2019-0228.
- [63] Tripathy, et al. Drivers of lithium-ion batteries recycling industry toward circular economy in industry 4.0. Eur J Innov Manag 2023:179. https://doi.org/10.1016/j. cie.2023.109157.
- [64] Holey EA, et al. An exploration of the use of simple statistics to measure consensus and stability in Delphi studies. BMC Med Res Method 2007;7(52). https://doi.org/ 10.1186/1471-2288-7-52.
- [65] Wang JS. Exploring and Evaluating the Development of an Open Application Programming Interface (API) Architecture for the Fintech Services Ecosystem. Bus Process Manag J 2024. https://doi.org/10.1108/BPMJ-09-2023-0688. Online First.

Egyptian Informatics Journal 26 (2024) 100483

- [66] López C, Ishizaka A. GAHPSort: A new group multi-criteria decision method for sorting a large number of the cloud-based ERP solutions. Comput Ind 2017;92–93: 12–25.
- [67] Chen SH, Lin WT. Analyzing determinants for promoting emerging technology through intermediaries by using a DANP-based MCDA framework. Technol Forecast Soc Chang 2018;131:94–110.
- [68] Lin CL, et al. A service selection model for digital music service platforms using a hybrid MCDM approach. Appl Soft Comput 2016;48:385–403.
- [69] Arner DW, Barberis J, Buckley RP. Fintech, Regtech, and the reconceptualization of financial regulation. Northwestern Journal of International Law Business 2017;37 (3):371–414.

Jen-Sheng Wang is assistant professor at the Department of Business Administration, National Pingtung University. Now, his recent research interests include policy and industry analysis (especially in energy, semiconductor and FinTech), open innovation & high-tech services, technology assessment and national innovation system.

Yen-Tzu Chen is an assistant professor in Department of Information & Learning Technology, National University of Tainan, Tainan, Taiwan. She specialized in computerassisted teaching, digital learning, e-commerce, knowledge management.