

Service-Centric Business Model in Cloud Environment

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Abstract—The development of Cloud Computing drives the change of value creation towards services and creates a new networked economic structure for challenging organizations to adapt their existing business models. Despite agreement on that the transformation of business model is importance to an organization's success, the evolution of business model enabled by Cloud is still fuzzy and vague within many research fields including both Management Strategy Theory and Information Systems. This paper, following a review of existing works and a series of case studies from several typical industries, employs a deductive reasoning method to investigate the influence of cloud computing on business model evolution and presents a specific service-centric business model. First, the evolution of business model in cloud environment is developed. Second, by analyzing business model innovations on business model nine building blocks in cloud environment, the element of service-centric business model is defined. Then, an ontological framework which includes value, service, and business model dimension for service-centric innovative business model is proposed. Finally, several industrial cases validate that this paper provides a comprehensive framework of organization's business model which can properly reveals an organization's complex nature of business logic and operation management in cloud environment.

Keywords—cloud environment; business model; innovation; service-oriented; services centric; value;

I. INTRODUCTION

The business model (BM) generally refers to how a firm runs its daily business to produce a proposition of value to customers [1]. Under the influence of technology trends, most importantly cloud computing, current organizational business models (BMs) are being questioned, and companies are faced with the challenge of business model evolution [2]. As the adoption of cloud services and cloud platforms takes hold, an enterprise tends to run its whole business in the cloud environment [3]. Organizations are gaining profit from not only the potential benefits of cloud computing [4], but the practical opportunities induced from cloud environment to adapt their existing BM for satisfying all the customers' demands. However, how cloud is driving an existing BM innovation and what kind of BM should be adopted in cloud environment by firms remain virtually untapped.

Having realized the high significance of cloud computing for promoting business model innovations (BMIs), there has been increasing interest in investigating the innovation trend of current BMs and providing further understandings. The majority of research has been referred the cloud technology

as an Information Technology (IT) solution to reduce fixed cost, store and share information, efficiently process supply chain integration and collaboration [5] [6]. Other researchers have discussed that cloud computing is a classic disruptive technology [7] [8] and provides several key technological attributes or cloud business enablers being used to power BMIs by reinventing customer value propositions, industry value chains [9], and business processes integration [10]. Many studies have demonstrated convenient service-oriented BM of cloud service platforms (such as cloud manufacturing [11], cloud supply chain [12] and cloud business intelligent [13]) in support of firms' supply chain operations [14] [15] and resilience [16] [17] to enable lots of transformations in relevant industries [18] for gaining profitability [19] and competitive advantages. Meanwhile, the IBM Institute for Business Value has concluded that inspired by the feature of basic technologies of cloud, financial firms can adapt their existing BMs to cloud enabled BMs with essential features, such as, service standardization, efficient aggregation and sharing of business resource, and information transparency.

Despite agreement on cloud computing has the power to accelerate the evolution of firms' traditional BMs, but it's potentially technological and business capabilities for driving BMIs have not been fully developed. And relative literatures on BM concept and conceptualization [20] [21] [22] reveal that the way of conceptualizing companies BM is not consensus. The BM evolution mechanism and the new BM conceptualization in cloud are still 'murky'. This murkiness could be because of the following three main reasons:

- 1) There are unilateral understandings on BM evolution in cloud environment by treating cloud computing as a new business model or an IT technology solution.
- 2) Studies on BM innovation of cloud service platform cannot completely reveals the evolution mechanism of BM in a complex business ecosystem in cloud environment.
- 3) The conceptualization of BM is not consensus.

In order to address these issues, this study aims to investigate how the BM evolves in cloud environment and explores a comprehensive framework to conceptualize the new BM in the cloud. The knowledge of the mechanism of BM evolution is fragmented. Meanwhile, the BMIs on firms traditional or existing BM refer to the BM nine building blocks [23] or nine elements in cloud environment are rarely clarified. Hence, a systematic review on the evolution of BM and the BMIs in cloud environment can help to further analyze element of new BM and conceptualize it with a comprehensible framework.

The rest of this paper is structured as follows: Section II introduces the evolution mechanism of BM in the cloud environment. A contrastive analysis of the BMs on its nine components in cloud environment is outlined in Section III. A comprehensible ontological framework of cloud enabled BM is shown in Section IV. Section V gives some case studies for verifying the proposed ontological framework and the conclusion is drawn in Section VI.

II. THE EVOLUTION OF BUSINESS MODEL IN CLOUD ENVIRONMENT

The BM as an enterprise's foundation is often used to describe the key components of an existing business [21] and offers efficient way to understand, analyze, and manage strategic-oriented choices among businesses and technology stakeholders on how to gain value. The BM also regarded as a tool which uses the transformational approach to address changes and innovations in the logic of business or in the components of model itself [22]. The nature of BM evolution or innovation is a phenomenon of new BM emerge for replacing the old one or adapt an existing BM to a new one under particular technology and market circumstance. In order to explore the evolution mechanism of BM in cloud environment, some definitions should be given below.

Definition 1 (Business Model): A Business model is a simplified and aggregated specification of business logic of an enterprise to produce products/services or create value to customers by means of designing and operating its value-added components/elements. Business model can describe as a 2-tuple $BM = \langle A, C \rangle$, where A is a set of business features of BM, C is a set of building blocks or elements of BM.

Definition 2 (Cloud Environment): Cloud environment is a cloud computing based, cloud services or cloud platforms represented, and multi-technology (value network, Web service, virtualization, servitization, etc.) supported internet commerce environment (hereafter referred to as "cloud").

Definition 3 (Business Model Evolution): Business model evolution describes that an old BM gets obsolete in favor of new BM for some reasons, such as technology disruptions, commoditization, and Competition. Give two BMs BM_n and BM_f . Business model evolution can denote as $BME = BM_n \rightarrow BM_f$, which presents BM evolution from the old or existing one BM_n to the new one BM_f (see Fig. 1).

Definition 4 (Cloud Business Model): Cloud Business Model (short for CBM) is the cloud enabled BM which describes the relatively stable logics of enterprises to do their business to create value for both customers and themselves in the new business ecosystems based on cloud environment.

When companies decide to adopt a new BM or change an existing one, capturing and visualizing this new mode will help organizations easily improve the planning, change and implementation of their core businesses.

It is much easier to go from one BM to another, when a firm can exactly understand, say and describe what elements may change [23]. In this regard, studying both A_n and C_n for how a firm changes over time to the CBM with A_f and C_f for obtaining value is the first objective of this research. Hence, what features are included in A_f is analyzed in the follow.

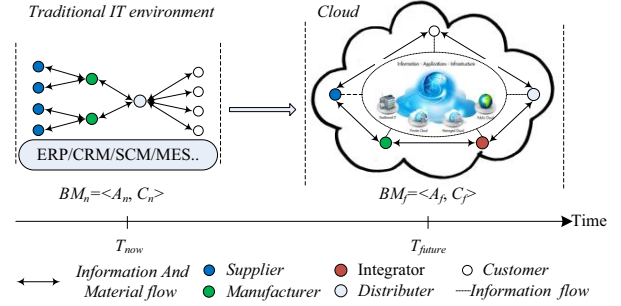


Figure 1. Example of business model evolution.

A. Business evolutions enabled by cloud

The cloud becomes a mainstream in current the business ecosystem for organizations not only to enhance internal and external efficiencies and cost reduction, but also to target more strategic business capabilities. From the perspective of the relationship between IT and business operation, cloud has six essential technological advantages or cloud business enablers being used to power business model innovation [9]. These technological advantages enables firms' make several business innovations (see Table I) which are unreal under the limit of traditional IT solutions.

TABLE I. BUSINESS EVOLUTIONS ENABLED BY CLOUD

Technological advantages of cloud	Business evolutions
Cost flexibility	• Optimized cost structure: By utilizing cloud-based IT services, companies can reduce the amount of capital investment they require to operate and to grow.
Business scalability	• Efficiently access business capability: Computing capabilities which is needed by an organization to perform core business functions can be elastically provisioned and released, to scale rapidly outward and inward commensurate with demand.
Market adaptability	• Quick response to the change of market demands: Companies can create new delivery channels/markets.
Masked complexity	• N/A
Context-driven variability	• Intellectualization information processing: Companies can analyze user behaviors, historical data to find solutions to improving products/services.
Ecosystem connectivity	• Realizing multi-party cooperative and collaboration: Companies can facilitate collaboration with partners and customers, which can lead to improvements in productivity and increased innovation.

As table I show, these technological advantages of cloud have already driven BM innovations which mainly in five significant aspects. These innovations can vastly facilitate an organization to easily generate additional revenue streams by enhancing, extending and inventing new customer value propositions and industry value chains.

B. Opportunities and inspirations derived from cloud

As a critical set of enabling technologies with the thought of that everything as a service, cloud which has five essential characteristics [24] is prominently changing the way that industries and enterprises do their businesses by means of

providing dynamically scalable and virtualized resources as services over the Internet. The emergence of increasingly cloud-based BMs, such as cloud manufacturing platform [11] is inspired by cloud characteristics and the features of the set enabling technologies of cloud. Hence, in order to reveal the complexity of business model evolution of the new business ecosystem in cloud, innovative opportunities and inspirations which derived from cloud characteristics (see Table II) and the features of the set enabling technologies of cloud (see table III), used for adapting companies existing business logic should be detailed analysis. This analysis shows that what innovative inspirations and opportunities inspired by the feature of cloud and its basic technologies can be mentioned to affect existing business logics, as well as what characteristics of the CBM should be contained.

Table I, II and table III show that, inspirations and opportunities derived from cloud are expected to drastically break traditional business logic of commercial society, drive BM transformation, reform industry value chain and industry resources structure, and optimize revenue structure in the end. Meanwhile, with these inspirations and opportunities, firms' sale ideas, operation and collaboration patterns, organization structure, resource utilization manners, and profit models can be reinvent. The CBM with several significant features (as shows in Table I to table III) in A_f will emerge.

TABLE II. OPPORTUNITIES DERIVED FROM CLOUD FEATURES

<i>Cloud features</i>	<i>Innovative Opportunities</i>
On-demand self-service	• Self-service: Users are self-help for gaining related services provided by firms as needed automatically.
Broad network access	• Immediate service: Services are available at any time and any place according to network access. • Information transparency: Participants and users can provide their real-time information for realizing collaboration and resource aggregation.
Resource pooling	• Efficient aggregation and redistribution of resources: All kinds of business resources, such as raw material, manufacturing capabilities, half-finished goods and knowledge can be dynamically assigned and reassigned according to consumer demand.
Rapid elasticity	• Business elasticity: Resources and capabilities can be elastically provisioned and released to scale rapidly outward and inward commensurate with demand
Measured service	• Service monitoring: Service implementation can be monitored, controlled, and reported. Information transparency for both the providers and consumers.

In short, benefiting from cloud technological advantages and business properties, firms' existing BMs will be adapted to the CBM. Table I, Table II and table III indicate the essential features of the CBM. The process of organizations' existing BM change to the CBM is the evolution mechanism of the CBM, which can be defined as follow.

Definition 5 (BM Evolution Mechanism in the cloud): It is a natural or established process by which organizations use cloud technological advantages, innovative inspirations and opportunities inspired by cloud to constantly adjust their existing BMs for maintaining profit up to the CBM appearance.

Table I, Table II and table III also manifest that the CBM is a service centric BM. Firms will provide differentiated

services to satisfy user's needs by aggregating and utilizing distributed network resources efficiently and conveniently.

The aforementioned discusses indicate that the firm's product-centric BM is transforming into a service-centric, value-oriented, and customer-based BM along with the BM evolution in trends of the cloud and servitization application. The CBM accelerates the appearance of the new networked business ecosystem and forces enterprises to redesign their existing business logics to improve their running businesses. By understanding the differences between a firm's existing BM and the CBM on the expression of BM, such as the BM nine building blocks, insights on core element, operational logic, and strategical goal of the CBM will be explicit. Based on these insights, the CBM can be conceptualized for helping companies to step into new market with new value propositions, redefine their existing industry value chain, and adapt the reconfiguration of resources, products, services, and service composition. Hence, analysis of how the existing BM changes or the CBM innovations on BM nine building blocks can display the real difference between firms' existing BM and the CBM.

TABLE III. INSPIRATIONS DERIVED FROM CLOUD BASIC TECHNIQUES

<i>Basic technologies of cloud</i>	<i>Innovative Inspirations</i>
Virtualization	• Resource release and optimization: Companies can optimize the use of its internal and external business resources to support its daily business, and reallocation these business resources through business requirements.
Distributed computing	• efficient aggregation and sharing of Resource: All kinds of distributed business resources, such as raw material, manufacturing resources, and knowledge resources, are real-time and efficient aggregation and collaboration in a cross-organizational environment.
Utility computing	• Variable pricing model: Enterprises and customers can be charged based on consumption - buyers "pay-per-use" or "Pay-As-You-Go".
Internet/Web service	• Multi-organizational coordination: Boundaries among organizations had been broke, firms can efficiently gain the internal/external collaboration, information sharing, and realize distributed co-creation.
SOA	• Servitization: Enterprises can provide more services and value-added services in standardized ways, and their sale ideas change from product sales to service delivery. • Service standardization: Enterprises can standardize their business ,services, and operation process. • Service composition and scalability: Enterprises can leverage different combinations of standardized services or business process to rapidly expand service ability for addressing business demands and provide more valuable customization services in the plug-and-play approach.

III. THE BUILDING BLOCK OF CLOUD BUSINESS MODEL

The CBM expresses a more efficient and flexible way of doing business and can make enterprises create new revenue streams by enhancing and extending their value propositions, and improving and transforming industry value chains, it also can enable other BM building blocks innovation and further results in shifting firms' whole business logics which refer to who creates value, and how the value is created, delivered and captured. Hence, this is important to deliberate differences between existing BM and the CBM based on BM

nine building blocks (see table IV). And then what elements should be contained in the CBM will be discussed.

TABLE IV. FEATURES CHANGE ON DIFFERENT BUSINESS MODEL

Element of BM	Differences	
	Previous BM	CBM
Value proposition	<ul style="list-style-type: none"> •Products provision •Sell ownership •Pursue short-term profit •Demand-driven •Product or utility-oriented 	<ul style="list-style-type: none"> •Standardized service delivery (everything as a service) and value-added service •Sell right to use •Pursue long-term value •Forecast-driven •Service value-oriented
Target customer	<ul style="list-style-type: none"> •Designated customer segments 	<ul style="list-style-type: none"> •Individuals/groups who can access the cloud •Competitors, customers and partners interconversion
Distribution channel	<ul style="list-style-type: none"> •Distinct channel 	<ul style="list-style-type: none"> •Uniform online and offline channel based on cloud
Relationship	<ul style="list-style-type: none"> •One-off transaction 	<ul style="list-style-type: none"> •Long-term interaction with the life cycle of products or services
Value configuration	<ul style="list-style-type: none"> •Local resources and capabilities •Discrete business activities 	<ul style="list-style-type: none"> •Distributed resources and capabilities •Well-integrated process
Core competency	<ul style="list-style-type: none"> •Integrative (non-core /core) business competency 	<ul style="list-style-type: none"> •Core business competency specialization
Partner network	<ul style="list-style-type: none"> •Value chain (simple) •Disunity supply chains •Fixed roles of firms in supply chain •Run single supply chain •Inefficient coordination •Close coupling partnership and game mutually •Relationship-oriented 	<ul style="list-style-type: none"> •Value network (complex) •Service supply chain •Variable roles of firms in supply chain •Involve various supply chains •Efficient coordination •Loose coupling partnership and alliance mutualism •Transaction-oriented
Cost structure	<ul style="list-style-type: none"> •Capital expenditure 	<ul style="list-style-type: none"> •Operational expenditure
Revenue model	<ul style="list-style-type: none"> •Cost-driven 	<ul style="list-style-type: none"> •Value-driven

Table IV shows that, the CBM is significantly different from the previous BM with these nine elements, especially in value proposition, customer segments, value configuration, and partner network. In addition to these aforementioned differences, there are lots of invisibly critical discrepancies between the CBM and the previous BM, such as the different meaning of value concept before and after servitization, the different productive processes between products production and services delivery, and different operation ways around supply chains coordination, resources configuration and so on. The conceptualization of the CBM as a profiling tool should describe the essential logic of how firms design value and service and how firms operate to realization value and service delivery. Hence, the building block of the CBM should include value, service, and relevant BM dimension [22]. Based on the BM nine building blocks and the key aspects of the design of a business model [25], the BM dimension of the CBM is identified with four dimensions: value proposition, value configuration, value network, and value architecture. The building block of the CBM can be defined:

$$C_f = \langle \text{value}, \text{Service}, \text{BM Dimension} \rangle$$

Where *value* is the goal of an organization to runs their business. The *Service* describes the tangible and intangible commodity which a company deliveries to customers. The *BM Dimension* generally explains the operational elements included in the CBM to create value and deliver service.

Capturing and visualizing the CBM with its elements will help organizations to greatly enhance abilities to understand the complicated business logic and seize the first opportunity to remain growth and strengthen.

IV. THE ONTOLOGICAL FRAMEWORK OF CLOUD BUSINESS MODEL

The rise of service-centric BMs which enabled by cloud has transformed the way of enterprises to do works. In this case, organizations offer standard services to the customers for creating value, their target of core logic is the generation of service and by the means of value-oriented operational dimensions to gain value. Striving for value and keeping the promise of services are companies' main objectives. The conceptualization of the CBM will make organizations to successfully understand value, service, and relative operation elements by detailing how it delivers products and services profitably and how it plans to do so in the long term. In light of the ontology of BM providing a semantic description of BM for participants successfully understanding relevant business logic [22] [23], this paper also adopts ontological framework to conceptualize the CBM. Fig. 2 shows the top level of the CBM ontology.

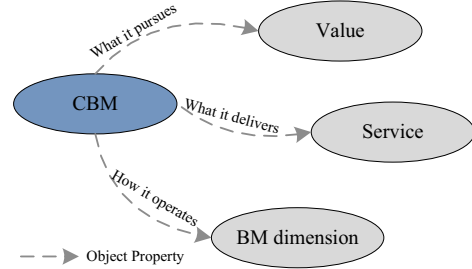


Figure 2. Top level of the CBM ontology.

A. Value ontology

The value is a term that includes all forms of value that determine the health and well-being of the firm in the long run [26]. It mainly includes firm's economic value and customer perceived value in this paper. The creation of value is the core purpose and central process of doing business and economic exchange. However, there is a gap on the concept of value between products sale and service delivery. In previous BM, enterprises get economic value by one-off transaction and selling product's ownership. The customer perceived value shows in the assessment of the utility of a product based on perceptions of what is received for what is given. In the CBM, enterprises are not only pursuing the economic value, but also getting more extra benefits from their partners. The customer perceived value is an evaluation in a specific situation of their purchase or use in a real service, Fig. 3 shows the ontology of value in the cloud. The customer perceived value partly depends on a tradeoff of the

salient between give and get. However, customers mostly trend to pursue customizations and good user experiences in the cloud, so the user satisfaction that related to the decision making about service repeated purchase cannot be ignored any more. The perceptions of what is received for what is given must satisfy customer expectation. Hence, the customer perceived value depends on value realization and the overall customer evaluation on its expectation contrast to the value realization which includes customer's sacrifice, the quality of service and other attributes what the customer received from a service. The customer perceived value can be formulated as follows:

$$V_C = f_c(\text{Get}, \text{Sacrifice}) + s_c(\text{Expectation}, f_c)$$

Where f_c is a function which is the tradeoff of get and sacrifice, s_c is the satisfaction function that is the tradeoff of customer's expectation and f_c .

Firm's economic value is an economic measure reflecting the market value of a whole business. However, in the analysis of value creation, economic value generally denotes a financial benefit that is realized when the amount of revenue gained from a service exceeds the total cost needed to sustain the service realize. In the CBM, enterprises have a relatively complicated value network and get more extra benefits by well working with partners. The knowledge and capability of partners may offer more opportunities for firms to satisfy customer demands or cope with the market fluctuation for gaining more benefits. Meanwhile, customer perceived value impacts the potential profit by influencing the decision of repetitive purchase or spreading the reputation of the service. Hence, enterprise value is the sum of multiple benefits parts enclosed with the service delivery; its formulation shows as follow:

$$V_E = w_1 * f_e(\text{Revenue}, \text{Cost}) + w_2 * E(b) + w_3 * a * V_C$$

$$\sum_{i=1}^3 w_i = 1 \quad i \in [1, 3]$$

Where w_i are the weight depend on firm's attributes. f_e is the profit of an organization gains from a business service. $E(b)$ is the extra benefit of an enterprise gains from its partners. $a * V_C$ is the potential profit relate to the realization of service value and $a \in [0, 1]$ is parameter depends on s_c . A higher s_c leads to a higher a .

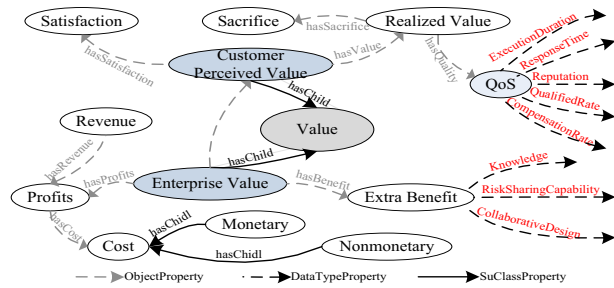


Figure 3. The sub elements of value ontology.

B. Service ontology

The services are the main economic goods exchanged in the CBM. It denotes a robust, cost-effective, and web-based virtual service which is virtualized from real world service, capabilities, and other resources by using the X-as-a-service model [27] and virtualization technology. Conceptualizing a

service can offer an organizational perspective of abstract for the service which enables real world services, resources, and capabilities to be accessed in "plug and play" approach. Inspired by web service ontology, virtual service ontology for virtual service is show in Fig. 4. Service Profile, Service Model, and Service Grounding are three typically subclass of service ontology. Each instance of service has the details of profiles, models, and groundings which are the essential characters distinguish one service from another.

The service profile is similar to the profile of web service that tells "what the service does", in a way that is suitable for a customer or a service-seeking agent (or matchmaking agent acting on behalf of a service-seeking agent) to determine if the function of service satisfy its needs [28]. This form of representation provides the essential information, such as input and output, type, and limitations on service function and applicability for customer or service-seeking agents to discover a service. But, the difference is that the description of service profile only represents what is done by the service and does not include quality of service. Except the properties of function description, the service profile also includes the historical evaluation of reputation of service supplier.

The service model tells a client or an agent how to realize a service, by detailing the outcomes, quality of service, and, where necessary, the step by step subservice, processes and activities which lead to these outcomes. That is, it describes how to carry out a service. This description of service model can be used by a customer or a service-seeking agent in at least four ways: (1) to perform a more in-depth analysis of if a service satisfy its need; (2) to realize a service composition from multiple services to perform a specific service task; (3) during the course of the service action, to coordinate the activities of the different suppliers; and (4) to monitor the execution of the service.

The Service grounding specifies the details of how a customer or an agent can access a service. This specification mainly includes two parts. One is the details of information system or web service which manage or exchange data for a service. This part specification contents a communication protocol, message formats, and other service-specific details such as port numbers used in contacting the system or web service for exchanging data elements. Another part is the description of service executive, mainly includes the contact information of firms, the contact details of manager, and the way of complaints.

C. BM Dimension ontology

Having identified the primary operational dimension of the CBM, their constituent elements also need to be figured out for exactly showing that how an organization operates to deliver services. Designing a service that user required should make a balance of different and conflicting design requirements presented within the four dimensions and their sub elements. Fig. 5 gives an overview of these dimensions, based on value proposition; organizations could determine its targeted value customers as well as their wants and needs in relation to its offerings. The feature of the provided services is highly correlated with the value configuration which is not only dependent on the company's internal resources but also

[illegible]

The value proposition class with four elements describes what the value is delivered by organizations to customers. It implies a description of the services that organizations offer, or will offer, along with their related information about the nature of customer and market along with their preferences. This dimension also relates to strategic changes on customer relationships, target market segments, and products/services design. Changes on each of its four elements may reform an existing value proposition. In cloud, higher uncertainty and customization are the main features of market demands; organizations should provide better service by classier design and better marketing than their competitors, and get value in terms of reduction in cost of development, decreasing time to the market, and improving quality and customer satisfaction.

social and technical resources, or core competencies which are used to sustain a service. The activities model is a structure of core activities that use resources or competences referred to the resources model. Organizations have to align distributed resources along with its existing resources, and allocate these resources in processes and activities which should be controlled to deliver higher value propositions than their competitors. Hence, organizational alliance design based on RBV is a key enabler of combinative capabilities which are important in producing rare, valuable, difficultly imitate, and non-substitutable products and services.

The last recognizable component is the way in which an organization generates revenue and distributes profits with partners. The main purpose of value architecture is strongly connected with the financial design within organizational alliance. The cost model represents how organizations plan cost arrangements around enactment service with respect to the revenue generation. The revenue model is a framework for generating revenues, mainly includes a clear plan of how to generate revenues, a specification of which revenue source to pursue, and the description of target of revenue strategy. The pricing model depicts pricing formats related to profit distribution within partners. The price setting decision is extremely complex in a relative complicated value network and also relates to the stabilization of value network, cost arrangements and revenue streams. Hence, the pricing model is the most important element in this dimension for holding together a long-term and stable collaboration alliance.

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well as adjust their financial plan to provide appropriate service to the appropriate customer for tremendous value.

V. CASE STUDY

In order to illustrate the reasonableness of the proposed framework, companies from different industries in china are selected as the cases to be studied. First one is Webank, the internet banking for individuals and small medium enterprise (SME) with the online process of application, Identification, credit assessment, and loan based on cloud. It represents a newly emerging BM in the field of financial world. Different from the present banks, it handles its whole businesses in an online virtual account within seconds without storefronts and bank cards. Second is Haier, one of the biggest electronics

product manufacturers, is providing specialized one-stop services and commercial manufacturing solutions recently. Last, Suning, which used to be one of the biggest electronics products retailers, has adapted its traditional BM in the cloud. Now, Suning professionally engages in the sale of electronic products, the supply of services and commercial solutions. We analyze these companies' BM (the CBM) using BM nine building blocks (see Fig.6) to show that many companies from different industries have started to change their traditional BM. And then we offer an example of proposed framework for the Webank's SME loans service (a simple case) to prove that the proposed framework is more reasonable than the former (see Fig. 7) on describing the essential business logic for business managers and designers.

Company	Value proposition	Target customer	Distribution channel	Relationship	Value configuration	Core competency	Partner network	Cost structure	Revenue model
Webank	1. Rapid deposit and loan business (sub-millisecond online service) 2. Virtual credit card 3. Financial Solutions	1. Individual 2. SME	Online communication	Co-creation	Activities: 1. Business application 2. Identification 3. Credit assessment 4. Loan Resources: 1. Monetary resources 2. Information resources	Rapid service delivery	1. Public Security Department 2. Bank 3. E-commerce company	1. Human cost 2. Information costs 3. Information system costs	Interests
Haier	Individual customers: 1. One-stop service 2. Extended after service 3. IT device remote service 4. Solutions for central air-conditioning, washer, cold cupboard, Television, Computer, Water Purifier Commercial customers: 1. Solutions for central air-conditioning, washer, cold cupboard, television, computer, water purifier, central heating and dedusting system, smart home 2. Solutions for lighting system, conference system, security system, information and intelligent systems	Store based region customers	Online To Offline communication	Co-creation	Activities: 1. Storage 2. Transportation 3. Install 4. Maintain Resources: 1. Warehouse 2. Transport machine 3. Manpower resource	Service delivery	1. Logistics company 2. Technical staff company	1. Warehouse costs 2. Transportation cost 3. Installation cost 4. maintenance costs	1. Profit of sales 2. Profit of installation 3. Profit of maintenance
Suning	Individual customers: 1. One-stop service 2. New trial 3. Personalized customization 4. Differentiated service 5. Price protection Commercial solutions: 1. Central air-conditioning 2. Washer, Cold cupboard, Television, Computer, Water Purifier 3. Biomedical instrument	Retailer based region customers	Online To Offline communication	Co-creation	Activities: 1. Design 2. Production 3. Transportation 4. Install 5. Maintain Resources: 1. Raw material 2. Manufacturing capacity 3. Transport machine 4. Manpower resource	Manufacture and service delivery	1. Suppliers 2. OEM 3. Logistics company 4. Retailer 5. Technical staff company	1. Manufacturing costs 2. Warehouse costs 3. Transportation cost 4. Installation cost 5. Maintenance costs	1. Profit of sales 2. Profit of production 3. Profit of maintenance

Figure 6. Example of companies new BM.

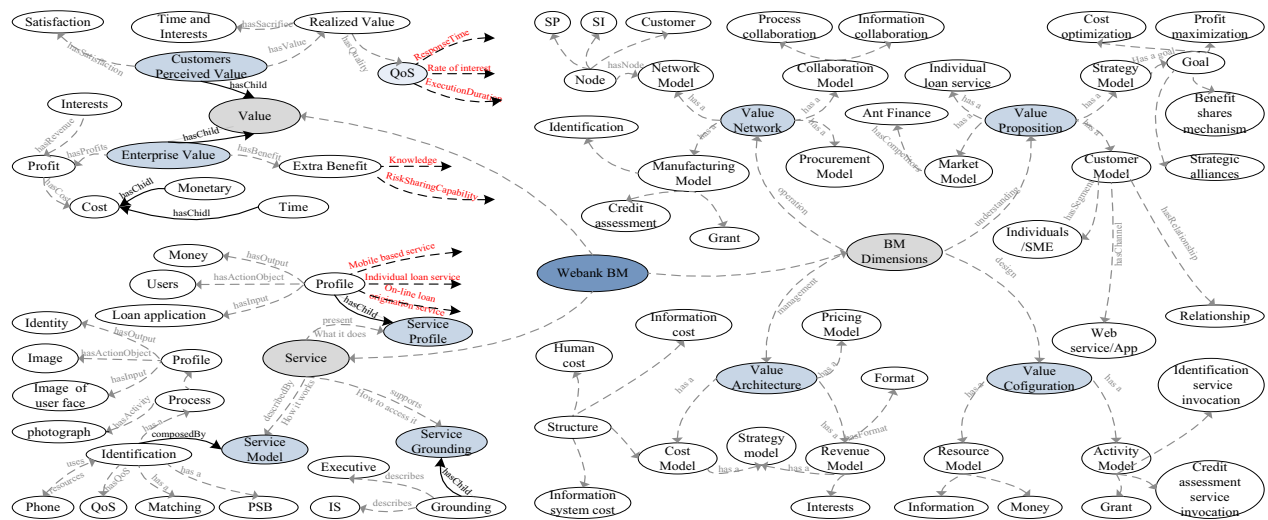


Figure 7. The ontological framework of Webank's SME loans service.

As Fig. 6 shows, firms offer more professional service and solutions. Some elements, such as value configuration, partner network, and cost structure are relatively complex. However, the value system, the details of service, and the complexity partner network aren't embodied in the BM nine elements. On the contrary, these details are best illustrated by

Fig. 7. As Fig. 7 shows, this framework can well reflect the complex nature of business logic and operation processes. In part of value, the interests and time are the key elements which determine the customer perceived value. At the same time, the profit of the company also depends on loan interests paid by customers. Hence, how to design the loan

interests and reduce service execution duration is the primary task for the company. In the part of service, the structure and behavior of a service is well described. This part will help designers to understand or define the service more quickly. In the last part, BM dimension can well embody the complicated operation logic of the company. In general, we can conclude that the proposed framework is more reasonable according to the above comparison and analysis.

VI. CONCLUSION

This paper first gives definitions and then studies the evolution mechanism of BM in the cloud. Then we analyze the BIMs on BM nine building blocks and summarize the building blocks of the cloud business model. We also provide a complete ontological framework of cloud business model showing that value ontology, service ontology, and BM Dimension ontology. Finally, we use several industrial cases to validate that this ontological framework of the cloud business model can properly reveal the complex nature of business logic.

The BM evolution mechanism and the ontological framework of cloud business model discussed in this paper will help stakeholders to improve their existing BMs for adapting the business logics in the cloud environment.

ACKNOWLEDGMENT

This work has been supported in part by the research projects the Seventh Framework Programme of the European Union PIRSES-GA-2011-295130 and National Nature Science Foundation of China 71171066.

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