Towards business identification modeling: A Taobao Case Study

Rong Zhang[1,2#], Yuyu Yin[1,2*], Meng Xi[3#], Hao Jiang[1,2]
[1]School of Computer, Hangzhou Dianzi University, Hangzhou, 310018, China
[2]Key Laboratory of Complex Systems Modeling and Simulation of Ministry of Education, Hangzhou, 310018, China
[3]College of Computer Science and Technology, Zhejiang University, Hangzhou, 310007, China
[*]corresponding author [#]co-first authors
1312898631@qq.com, yinyuyu@hdu.edu.cn, ximeng@zju.edu.cn, 344045838@qq.com

***Abstract*—With the appearance of new retail, e-commerce has broken the traditional pattern, different categories of goods have their own unique business attributes. Taking transaction business as an example, the traditional physical goods business needs to complete the transaction through the logistics, while the new electronic voucher business achieves that by involving shop verification and the transaction will be totally completed after the consumption of the virtual goods such as the QQ coin. Traditional integral modeling that describes all businesses through a process has been hard to meet such a scenario. In recent years, there have been a lot of studies on business process modeling. These methods mainly focus on the process and data level and do not support business modeling well. In this work, we construct a Business Identification Model(BIM) based on four business sources to handle unique complex business process. We develop a platform based on BIM and verify our model in the real processes of our cooperation company. In addition, BIM supports assembling and reusing in business-level in our case.**

Keywords- business model; business resourse; resue; new retail

I. INTRODUCTION

Due to the emergence of corresponding platforms, e-commerce is developing rapidly. Indeed, with the rapid development of globalization and intensification, these platforms must consider reusing the original resources to speed up the business development. E-commerce platforms must adjust their current business model if they want to remain competitive. However, in actual business development, random expression leads to shortage of logical compactness in that people with different business backgrounds may have different understandings. A new requirement needs to complete multiple docking processes, from demand to realization or vice versa. Since original business resources are not effectively combined and normalized, they cannot be reused. These problems result in a low reactivity to adapt business developments to frequently update requirements.

To solve these problems, the concept of "business modeling" has been put forward in recent years, and plenty of research results have been achieved. For example, Gomes J F [1] applied business models as the basis for analyzing learning environments and proposed three different business modeling options that further expand the scalability and feasibility of the business model. There is also a significant amount of research on business processes. Then, Chiara Di Francescomarino [2] modeled the process of sequence, conjunction and disjunction logic relationships, but these processes are not suitable for complex loop and nested process structures. Based on analyzing the weak termination of business processes in detail, Hee K M V [3] proposed a top-down method of business process by using the Petri network. Yu H [4] proposed a new modeling method that combines IDEF and UML together to achieve a full life cycle of enterprise modeling goals. On the basis of the model established by the Petri network, the process was analyzed to complete the business modeling through the reachable matrix using the Petri network [5].

To a certain extent, the emergence of the above business modeling technology solves the problems of slow development and inefficient interactions between new and old businesses caused by business confusion. However, as most business modeling techniques focus on the business design and implementation level, the conceptual level is ignored. In addition, e-commerce business is complex, and traditional business modeling methods cannot match with the e-commerce business; These models cannot express the business resources needed in the operation process.

Therefore, this article draws on the excellent part of the above business modeling methods, re-analyzes the e-commerce business model and proposes a business modeling method—Business Identification Model(BIM)for the e-commerce field. The model takes the process as the core, models the business resources of different granularity, abandons the traditional model of business custom development and realizes the development of business configuration.

The main contributions of this paper are as follows: (1) propose the Business Identification Model(BIM). Based on reusable models, new businesses can quickly find candidate models that satisfy personalized business personalized requirements. Personalized selection and configuration of business can be realized based on candidate models; (2) formally define business resources with different granularity. By defining a set of unified description criteria for businesses, the criteria are used to express the relationship between business concepts and business resources, which can reduce ambiguity and reduce communication costs between business people and developers.

This paper is organized as follows. Section two is the motivation case, which illustrates the current problems in

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nowadays business development. The detailed introduction and formalized definition of BIM are illustrated in section three. Section four discusses a case study and section five contains the comparison. Section six is related work and section seven is the conclusion.

II. MOTIVATION CASE

Business patterns are increasingly diversified, such as B2B, C2C, O2O and B2C. The types of goods sold on the platforms are also more diversified, from single physical goods to service goods and virtual goods. Taking the electronic voucher business as an example, customers purchase goods on the e-commerce platform, obtain the corresponding consumption vouchers, and obtain the corresponding service or merchandise in the physical store by vouchers. The business development process is shown in Fig. 1 below.

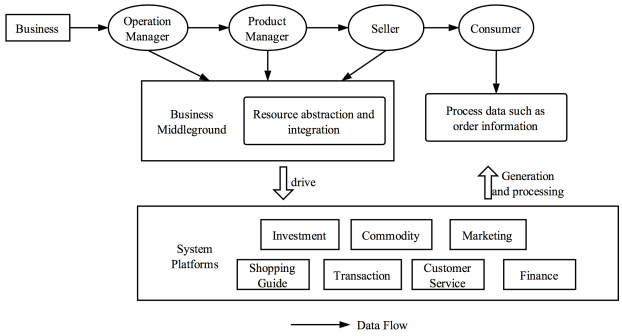

Figure 1. Development process diagram of the electronic voucher

After investigation and interview the actual business development in the Intermediate platform, we summarized the following three phenomena:

Phenomenon 1: A business may involve multiple teams. Taking the above electronic voucher business as an example, the following seven business teams are involved: Merchant Team, Commodity Team, Shopping Guide Team, Marketing Team, Trading Team, After-Sales Team and Capital Team. Due to the complexity of cooperation between business teams and the lack of strong business models, the overlapping of requirements of business teams can easily lead to logical conflicts and vulnerabilities.

Phenomenon 2: The requirement is not planned, and there is much concurrent and sudden requirement. As businesses diversify, requirement changes more frequently. The traditional custom development steps are as follows. First, the business people discuss the requirements, and then the developers develop the business. Without considering the reuse of the original resources, it is impossible to achieve high efficient development efficiency and achieve the vision of low cost trial and error.

Phenomenon 3: A lot of businesses in different scenes may be similar. The business of electronic voucher transaction completes the transaction through the verification of vouchers, while the business of physical transaction mainly relies on the logistics to complete the transaction. These businesses are very similar. For example, they all must experience investment, product launches, shopping guide, marketing, trading, sales and other sectors. The main difference is that the logistics link is turned into a physical store.

The differences among these three phenomena result in problems which exist ever in intermediate platforms. As the business grows and changes, the problems become more intractable and urgent in new business situations:

Problem1: The requirement response cycle is long. A simple requirement may involve multiple business teams. High communication costs and long waiting times seriously would affect the efficiency of business development seriously.

Problem2: Reuse of business-level resources is difficult. In an actual e-commerce system, the business logic and platform logic are coupled together that causes difficulties in reuse. In addition, there are many business resources in existing systems with no uniform specifications, such as requirements, process, which further causes difficulties in reuse.

III. BUSINESS IDENTIFICATION MODEL

The two problems have become increasingly severe in the actual business development as the Taobao business has evolved from a single-center simple process to a complex multi-center process. Supporting consumer products effectively through business modeling, realizing business reuse and expanding more business possibilities have become important issues in business development.

To solve these problems, this paper proposes a Business Identification Model. The model consists of four-layer with each layer defining a different granularity of business resources from the following: business process, page template, business service, and ability. The model manages these resources hierarchically. The business process is used to manage the activities in the business execution as well as the sequence and logic of the activity execution. A page template provides visual support for a business process that consists of multiple components. A component is also referred to as a business services. Business services encapsulate the business logic with a single portability. Decomposing business services to obtain the smallest logical unit is called ability. Ability does not involve business logic, and is the smallest size functional component. The UML class diagram of notions in SLM is shown in Fig. 2.

Next, we will introduce the BIM systematically. Here we provide our definitions of the nations in the BIM in a top-down manner. Below is the definition of a business identification (see Definition 1).

Definition 1. *A business identification of the BIM is a seven-tuple (ID, D, BPs, PMs, BSs, CAs, R), where ID is the identifier of business, D is the description of the business, BPs are a family of processes over ID, PMs are a family of Page templates with respect to BPs and ID, BSs are a family of business services with respect to PMs and ID, CAs are a family of abilities services with*

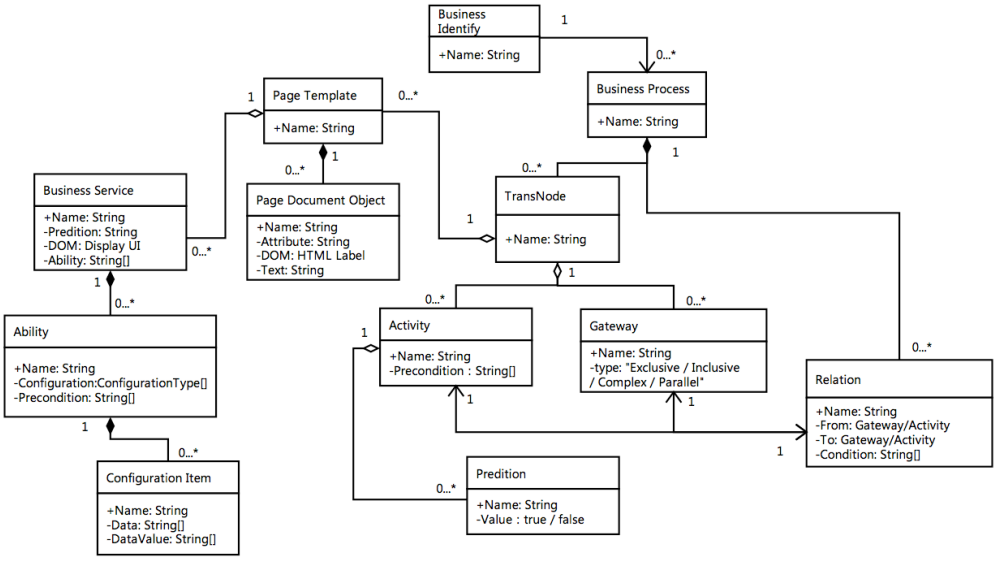

Figure 2. The UML class diagram of basic notions in BIM

respect to PMs and ID, R is the relationships between BPs, PMs, BSs and CAs.

A. Business Process

A business process is an abstract expression of activities and the logical sequence of execution in the process of business execution. The business process is composed of activity and gateway nodes and can facilitate the business staff to control the execution of the business at the macro level, allocate resources and reuse similar processes.

Definition 2. *A business process is a five-tuple (PID, PD, a, g, r), where PID is the identifier of the business process, PD is the description of the business process, a are a family of activities and g are a family of gateways and r are a family of the sequence relations of all nodes in the process.*

Definition 3. *An activity instance of the business process is a binary (a, Ca), where a is the identifier of activity and Ca is the precondition of the activity.*

Definition 4. *A gateway instance is a binary (g, type), where g is the identifier and type is either Exclusive / Inclusive / Complex / Parallel. The condition of the gateway is decoupling onto the relation condition behind it.*

Definition 5. *A relation is a four-tuple (r, from, to, c), where r is the identifier, from and to are the name of the activity or gateway, respectively, and c is the condition on this relation.*

B. Page Template

A page template is a visual support for a business process, and an active node or gateway node in a business process corresponds to one or more page templates. A page template consists of multiple components, and these components have a single portability.

Definition 7. *A page document object is a four-tuple (TID, V, DOM, Text), where TID is the identifier of the page document object, V is the attributes of the page document object, DOM is the HTML labels of the page document object, and Text is the text content of the page document object.*

Definition 8. *A document object attribute is a key value pair (k, v), where k is the identifier of the attribute and v is the value of the attribute.*

C. Business Service

The components on the page template are called business services. Business services encapsulate the logic of business operation, which can save the cost of page building, improve the efficiency of development, and realize the reuse of pages.

Definition 9. *A business service is a four-tuple (BID, BD, Cb, Dom), where BID is the identifier of the business service, BD is the description of the business service, Cb is the precondition of the business service configuration, and DOM is the display UI of the business service.*

D. Ability

Decomposing business services and obtaining the smallest functional units are referred to as abilities. Ability does not involve business logic, and it is convenient for developers to focus on developing basic functional units.

Definition 10. *An ability is a four-tuple (AID, FA, Ca, Cab), where AID is the identifier of the ability, Ca is the configuration item of the ability, FA is the data involved in the ability, and Cab is the precondition of the ability.*

Definition 11. *A configuration item is a four-tuple (EID, ED, K, Vs), where EID is the identifier of the configuration item, ED is the description of the configuration item, K is the data involved in the ability, and Vs is the range of values.*

Definition 12. *A precondition is a triple* (*PID*, *PD*, *Pv*), *where PID is the identifier of the precondition, PD is the description, Pv is the Boolean value that is true or false.*

By establishing the BIM, the application systems and business systems can manage the correspondence between the business standard and the various modules. This model can isolate business logic, distinguish business data, and realize the reuse of business, which is of great application value.

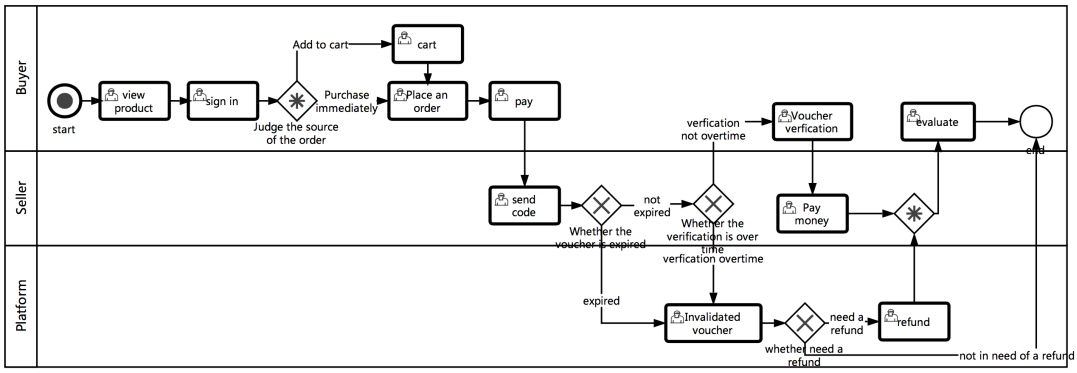

Figure 3. A trading process of the electronic voucher

IV. CASE STUDY

To illustrate the BIM, we applied it to an example of constructing a transaction business of electronic voucher. The transaction business of electronic voucher is a new transaction model in which users buy goods or services on an e-commerce platform and write off electronic vouchers provided by the platform in off-line stores. The development process of the business is discussed in the motivation case (see Figure 1 in section 2). We used the BIM to construct a simplified transaction business to illustrate how it works.

Construct business process. When building a new business, we must identify the activities involved in the business, define the performing roles of each activity, and then configure the gateway nodes according to the order of activities (see Fig. 3).

Example 1. In this example, a send code activity was used. First, we determined that the activity following a send code activity is a voucher verification activity. We then cleared the logic conditions between activities when and only when the voucher was not expired and the verification was not overdue. Finally, we configured the roles of the following two activities separately: the seller and the platform activities.

Construct Page Template. Each activity node or gateway node corresponds to one or more page templates designed by business personnel. The rationality and quantity of pages affect user experience and the commodity conversion rate.

Example 2. In this example, we used the activity of placing an order as an example to configure the page template corresponding to the activity. The activity corresponds to a detail page; The platform collects user information through the page, and displays the specific information of the order for user confirmation.

Construct Business Service. Business services are components of page templates, and page templates were obtained by configuring and reorganizing multiple business services. The design of business services affects the efficiency of page building.

Example 3. In this example, in order to configure the detailed page of placing an order, we designed three business services: user information, order information, and price information. The business service of personal information is presented in detail in Table I.

TABLE I. BUSINESS SERVICE EXAMPLE: USER INFORMATION

business service id	confirmation_personal_information
business service description	select personal information
pre_condition	true
show_UI	Dropdown box

Construct Ability. Ability refers to a functional unit with minimal granularity, which can be configured through a configuration item, and one or more abilities constitute a business service.

Example 4. In this example, we assembled abilities in the business service of order information and then configured each of the abilities. The business services consist of the following four abilities: display attributes, select goods, select preferential methods, and select freight insurance. The ability of selecting freight insurance is presented in detail in Table II.

TABLE II. ABILITY EXAMPLE: SELECT FRIGHT INSURANCE

ability_id	select freight insurance
business service description	can get indemnity if return goods
pre_condition	true
configuration item	amount of compensation: [9,12]

V. COMPARISON

In this section, we compare the BIM, BPMN2.0 and Artifact BPM as shown in table III, to illustrate the advantages of the BIM.

The e-TOM model has the following three large process domains: product process domain, operating domain, enterprise management domain. The three large process domains can be further decomposed into 23 process groups and a certain number of two-level, three-level, and four-level processes. Graphical elements are used to represent the execution behavior of a business in BPMN2.0. In Artifact BPM, the process that is called lifecycle, are working around one "artifact". The BIM divides the entire link of the e-commerce process into 11 sub-links, which not only regulates the e-commerce business operation mechanism, but also supports diversified business processes.

TABLE III. COMPARISON BETWEEN AND OTHER MODELING METHODS

business service description		eTOM	BPMN2.0	Artifact BPM	BIM
Field		Telecommunication	All	All	e-commerce
process		√	√	√	√
service		×	×	√	√
page template		×	×	×	√
ability	***data operations***	×	√	√	√
	data	×	×	√	√

The business process cannot be perceived by the end users. To describe the business operations process in a form that the end user can understand, business personnel defines processes by visual means. The traditional business modeling method lacks of intuitive traits and has a low degree of visualization. In the BIM, page template elements are added to support the show of business on different clients.

In different business models, services also have different meanings. The business service in the BIM is a combination of many abilities and represents a logical component with a special function. Business services are decoupled from each other, and we replace any business service will not affect the operation of entire system, greatly decreasing the system coupling degree.

In a traditional model, functions, interfaces, and services can all be called abilities. Abilities are often used in the management and maintenance at the code level, and only the program developers can understand the meaning of ability. In the BIM, every ability represents the operation of a data. We can get the data flow process in the whole life cycle of the business. Both developers and business people have a clear understanding of the use and applicable scenes of abilities, which play a very good role in fast building business.

VI. RELATED EORK

A. BPM

Business modeling is a modeling approach to describe the objects and elements involved in enterprise management and business, as well as the attributes, behaviors and relationships between them. In recent years, academic circles proposed many modeling methods toward process, organization, and domain. In 2004， White S A [6] formally proposed the concept of BPMN (Business Process Modeling Notation), which is as a symbolic standard for business process modeling. BPMN describes a business process with a series of graphical elements, for example, the rectangle represents activity, and the diamond represents the condition so that the reader can simply identify the basic types of the element to understand the graphics. Based on BPMN, Rodríguez A [7] summarized the extension for BPMN on how to modeling secure business process, and apply the approach to a typical health-care business process.

P Wohed [8] developed an evaluation framework using the Workflow Patterns, to examine the suitability of the Business Process Modelling Notation (BPMN) for business process modelling. To save the time of compliance checking, Awad A [9] translated Compliance rules to temporal logic formulae as input to checkers. Then, checkers can verify whether the business process model meets the compliance rules. Aiming at BPMN 2.0, Krzysztof Kluza [10] proposed rule-based pattern perspective for process models, described how to perceive rules in the business processes. However, the common BPMLS such as EPC or BPMN2.0 provides a set of common process modeling elements, but it does not allow modeling of domain specific concepts. To solve the situation, K Kluza [11] made an extension to different business process modeling languages with domain specific concepts.

Business Process Execution Language (BPEL) is another major standard. BPEL is a language that uses Web services to define and execute business processes. The main function is to combine existing services to define a new service [12], [13], [14]. To define choreographies, G Decker [15] proposed BPEL4Chor to extend BPEL. G Decker distinguished extensions from the following three aspects: participant behavior descriptions, the participant topology, participant groundings.

B. Artifact-centric BPM

As we all know, Nigam A et al [16] firstly proposed the concept of business artifact in 2003.Business Artifacts is used to record information in chunk that indivisible, identifiable, concrete, and self-describing. Then, Artifact-centric business process models were proposed and analyzed [17][18]. To deploy business artifacts, Joseph H R et al [19] proposed a

novel framework for integration of business artifacts. Estañol M et al [20] proposed using UML diagrams to specify business process that is artifact-centric to represent the dimensions of the artifact-centric approach.

Due to the advantages of business artifacts, both industrial and academic field are attracted by artifact-centric business process models. Considering flexibility of the business process, Truong T M et al [21] connected the behavior of business processes with business artifacts that is described conceptually, redefined process configuration and the context of process redesign. Then, to reuse business process components, Kabir M A [22] made an extension to BPMN and proposed a reusable process pattern and verified the applicability of the pattern. Besides, some further studies on improving reusability and flexibility of data-centric web services have been proposed [23].

VII. CONCLUTION

In this paper, we propose Business Identification Model based on a case study of the e-commerce industry. The Business Identification Model is a four-layer hierarchical model, which supports views of the following business resources: business process, page template, business service and ability. This model extends traditional process-centric or data- centric process models and integrates four resources with different granularity. The model can standardize resources uniformly, make business visualizations, facilitate the reuse of business resources, and realize the on-requirement configuration and rapid development of new business simultaneously. In the cooperative enterprise, we have applied some practical data and resources to verify the feasibility and effectiveness of the model.

In future work, we will further study the impact of rules on business and improve the Business Identification Model. In the future, we will have further cooperation with e-commerce companies to verify the reliability of the model with more real and complex e-commerce data and scenarios. In addition, we will optimize the model and realize the economic efficiency and the social efficiency goal through application of this model to the actual project.

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