User Experience Oriented Mobile Business Process Optimization

Dan CHANG[1], Baowei CHEN[2], Danqing LI[1], Xiaoying HAN[1]

[1] School of Economics and Management, Beijing Jiaotong University,
3 Shangyuancun, Haidian District, Beijing, 100044, China,
dchang@bjtu.edu.cn, 11120690@bjtu.edu.cn, 12120653@bjtu.edu.cn

[2] Junior College, Zhejiang Wanli University,
1519 Shengmo Rd, Jinzhou District, Ningbo, 315101, China,
Chenbaowei-gryx@163.com

Abstract: With the rapid development and wide use of mobile technologies, the mobile business application market has come a long way. The problems of low business collaboration rate and bad user experience in the traditional mobile business process have become a great concern of the academia. Grid management has been a new management philosophy in recent years. As a strong tool to integrate resources, Grid management has been applied and researched in public management of our country. This research is aimed at integrating social mobile business resources to optimize process and promote user experience and the grid management can exactly meet this requirements. Based on the traditional mobile electronic business basic process, this paper targets to promote user experience by building a user experience oriented mobile business optimization mode with the help of grid management theory, and will carry out an optimized verification in the incremental validity, cycle and resource utilization rate of optimized process through ASME (American Society of Mechanical Engineers) process evaluation method.

Keywords: Mobile e-commerce; Grid management; User experience optimization;

1. Introduction

In the past few years, mobile business in China has developed very fast and it has become an important research topic for academics. The researches of the recent years have focused on service and process of mobile business instead of the cognition of mobile business.

However, there is very little research that clearly clarifies the whole system structure of m-Business processes. To our best knowledge, most of the existing studies focus on logical optimization of certain processes, like payment [1] and authentication [2]. Very few have been found from the point of user experience. Therefore, we believe that research should focus more on how to optimize mobile business process, to improve user experience by providing users with convenient and faster processes, as well as with more reliable service provider, better supervision, and complete guarantee policies.

A grid management based process improvement research provides new solving ideas [3]. The modes of thinking deriving from the grid technology can be helpful in solving resource sharing and business collaboration problems in management. Meanwhile, the development of mobile grid technology makes the application of the grid management theory in mobile business process possible and makes mobile business become stronger, more convenient and better for supervision [4]. In the previous paper, the author dealt with difficulties in traditional m-commerce process, such as information sharing and business collaboration, analysis optimization ability of m-commerce process of grid management, and constructed a multi-participant (user, mobile business center, service providers, mobile payment center and logistics agency) grid m-commerce process based on grid management and business process re-engineering theory [5]. However, in that research, the author focused more on the improvement of grid m-commerce process which was compared with the traditional m-commerce process. Taking into account the user as the key participant in m-commerce, and the ultimate service consumers, one should admit that without a user-friendly experience any commerce process cannot obtain new customers and retain existing ones. Moreover it cannot lead to high conversion rate or contribute to business deal. Therefore, in this research, a great importance has been given to user roles, combining and improving the previous process. The experience effect of participant as user has been emphasized and a grid m-commerce process has been built aiming to maximize customer benefits.

In addition, the present analysis of mobile business process still stays in the qualitative stage and lacks powerful quantitative evaluation tools. So, with the help of ASME evaluation method, this paper takes time indexes of processes as evaluation object and analyzes processes from the perspective of time efficiency, to calculate quantitatively and evaluate the optimization of the process.

This paper takes B2C mobile business process as a research object, collates current mobile business process and analyzes problems in the process first and then aims to promote user experience, carry out analysis and optimization of mobile business process with the help of the grid management theory, adopting ASME evaluation method for quantum analysis on the process before and after optimization.

2. Theoretical Foundation

Grid technology

According to Foster and Kesselman [6], "grid is a new technology built in Internet. It makes high-speed Internet, high-performance computer, large database, sensor and remote equipment integrates and provides more resources, functions and inter-activities for scientific and technical personnel and people." That is to say, grid technology integrates all the resources at different physical locations on the Internet to form a "supercomputer" and realize the extensive sharing of all kinds of resources.

Mobile grid is the extension in wireless computing environment of traditional grid computing. It supports mobile users and resources in a seamless, transparent, safe and effective way. Mobile grid technology integrates mobile equipment with grid and forms a resource sharing network consisting of mobile nodes. As shown in Figure 1, mobile equipment can connect with the Internet through WLAN or remote cellular network. Mobile agent and service agent shall be respectively mounted on one side of mobile equipment and gateway. When mobile users submit tasks, these are actually submitted to the grid system by service agent in the gateway, after the interaction between mobile agent in the mobile equipment and the service agent in the gateway [7].

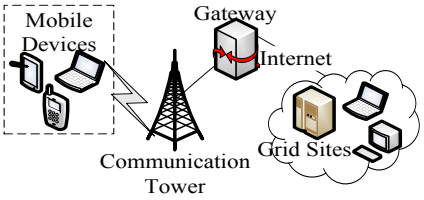

Figure 1 Mobile grid technology

Grid management

Grid management "divides the management object into several grid cells according to certain standards and coordination mechanisms among grid cells to realize effective communication among grid cells and transparent organizational resource, sharing it, so as to finally integrate organizational resources and improve management efficiency"[8].

The basic process of grid management can be abstracted into the following aspects [9]:

Business handling: handle all demand application from users within the grid on one platform and verify the demands.

Business assignment: subdivide the type of business related to node organization and assign the business to corresponding organizations on nodes for disposal.

Business processing: node organizations handle business and finish the business according to specific demands.

Service submission: embody information disclosure of grid management; task execution organizations directly feed task completion information or schedule information back to users, or to handling center to feedback to users.

Supervision and inspection: supervision department and users confirm and evaluate the received service results, to realize the supervision of business process and node organizations.

ASME evaluation method

The ASME assessment method derives from the ASME standard, which is established by the American Society of Mechanical Engineers. Its superior advantage is that it can indicate whether each activity within the process is value-added and displays where the non-value-added activities (NVAA) are [10]. The ASME is the manner of table records contribution from activities, time and operation to the whole process, where "operation" includes checking, delivering, delaying and storing.

The Value-added activities (VAA) therein are those creating value for customers directly, namely, fabricating products and providing service to their needs. Most of the necessary, but non-value-added activities are caused by non-value-added behaviors from the Support Department and some of them are necessary, while others are not. Checking is pertinent for quantity and quality; delivering for movement of personnel, material, documents and information; delaying for temporary storage, delay or stagnation between successive operations; storage for document filing, which does not belong to delay.

When applying ASME for analyzing process, an indicator (through put efficiency: percentage of time consumed by value-added activities in total process time) for its performance measuring can be used. If the throughput efficiency of process is very low, it indicates that non-value-added activities are excessive and takes up too much time, and it should be optimized.

Throughput efficiency = value-increasing activities time * total process time * 100%

3. Traditional Mobile Business Transaction Process Analysis

Traditional B2B, B2C, C2C mobile e-commerce processes are mostly the same. In traditional mobile e-commerce processes, enterprises or personnel access to e-commerce platform through the website identify authentication, browse demanded goods, then place business order, pay the price of goods through online payment agency and log off register, finally completing the mobile e-commerce process.

The Dynamic transaction process of traditional mobile business is established with Service Provider (SP), as its center core, and mobile business process of B2C, as its structure. Participants include one mobile user, *n* service providers, payment agency and logistics agency and the whole process is divided into four stages, as shown in Figure 2.

Traditional mobile business process specifications are as follows:

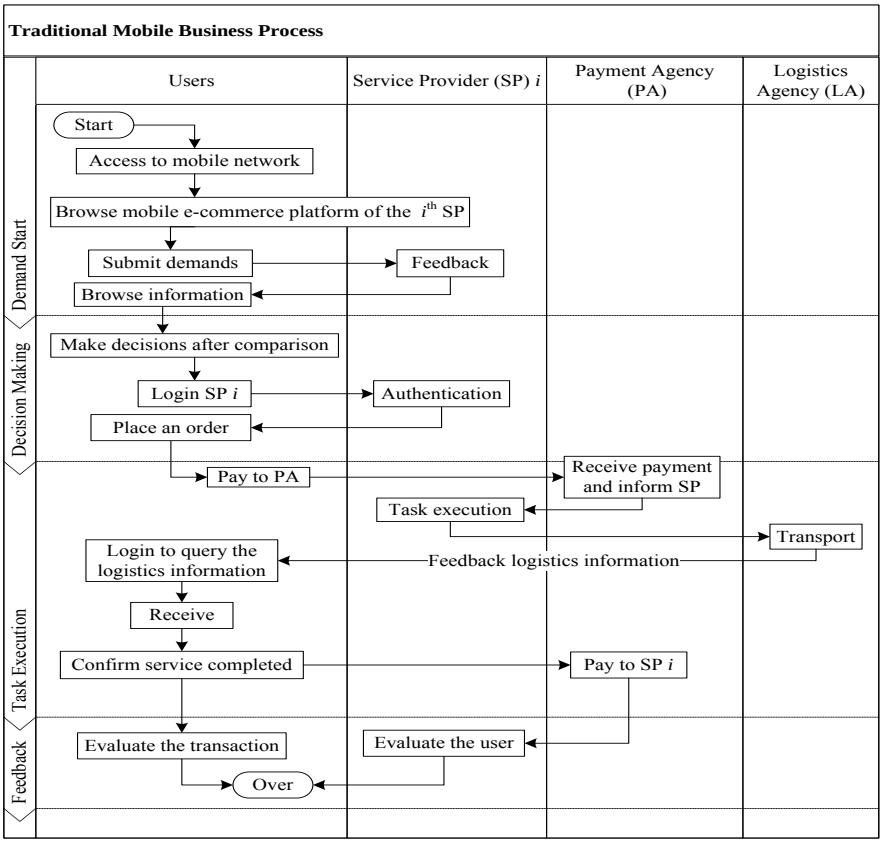

Figure 2. Traditional mobile business process

1. Demand start

The users who log in the corresponding mobile commerce platform through their mobile devices (mobile phone, PDA etc.) under communication networks smoothly running, can search for products and services according to their demands. Neither can required information be searched in a platform, nor is the information of a platform sufficient to help users make purchasing decisions. Then, only by submitting target product search information within multiple logging in various platforms will be possible to realize accurate match of user needs. However, due to different platforms have different interfaces. However, because different platforms have different interfaces, the same user access rights vary with platforms which lead to repeated login and exit.

2. Decision Making

When users access homogeneous matching information, they sort out the satisfactory results and place orders to corresponding commercial tenant, after making horizontal comparison in terms of price, quality, service etc. for products and service information on distinct platforms. A user has to fill out several orders in different business platform, as long as he wants to buy several goods sold by multiple commercial tenants simultaneously.

3. Task Execution

The commercial tenant checks confirmations of contents and security via SMS and, meanwhile, modifies inventory information, organizes sources, contacts logistic agency that delivers goods to users. Users select the most convenience ways from the alternative payment solutions provided by the commercial tenant to make payments. The logistics agency communicates with users through text messages or mobile business platform, informs them about the goods transporting and notifications for goods receiving and inspection. Similarly to the general e-commerce, if the user chooses COD, the customer will cash pay after receiving the commodity. If the user adopts the third-party payment, then the user confirms recipe without regrets and simultaneously confirms the payment, then a complete transaction is finished.

4. Evaluation Feedback

Both sides of the transaction evaluate the purchase/sale practice mutually, appraise commodity and the entire transaction process, the system records the evaluations and recommendations of both sides, the process is over.

Shortcomings of traditional mobile business process are as follows:

The improvement of the IT application and various infrastructures provides a favorable foundation for mobile business development. However, high-efficiency and high-benefit mobile business is rather difficult to be realized, if one only relies on information technology. A series of problems have occurred [11]:

1. Process at low cooperative degree, unpleasant user experience;
2. Uneven social resource distribution;
3. Lack of information integration, process of high repetitive rate;
4. Lack of government regulation.

4. Mobile Business Optimization Process Construction

Research idea of optimized mobile business process establishment

A good user experience of the process includes multiple aspects, but its core is the “customer’s benefit”. Therefore, the prime optimization target is to increase users’ satisfaction, simplifies users’ operation steps and shortens their operation time, which means the mission is to maximize customers’ benefit. Let’s assume that customers’ benefit consists of three aspects: 1) goods can satisfy customers and meet demands; 2) a shorter process period is favorable, so that time for waiting can be reduced; 3) customers are more likely to enjoy the mobile business with less necessary steps.

With research achievements related to grid management, the paper will redefine the task of existing process participants on the basis of the present mobile business process and establishes an integrative mobile business service platform and a payment management center for users, reaching the comprehensive target to realize unified management, resource sharing, pleasant service and effective supervision of mobile business process. It is available for users to access one platform to browse information, make comparison, place an order and make payment for multiple service providers, improve users’ experience and facility supervision and management of relevant governmental departments.

Constraints of grid-based mobile business process establishment

1. B2C mobile commerce process as optimization object.

The Grid-based mobile business process is such a process which takes mobile business center platform established by mobile network operators as the core. Moreover, user's mobile terminals are constrained to access the mobile wireless network, like smart phones, PDA. And take one customer and his once complete mobile business activities (that is, from logging in mobile commerce platform, to putting forward the requirements and receiving the goods finally) as the research object.

2. Establishment of a complete main flow

The Grid-based mobile business process, as well as the existing mobile business process has the same primary flow, namely, access to the mobile network, commodity browse, placing order, payment evaluation. Masses of abnormal processes lead to the suspension of the main process, such as sudden mobile devices offline. Canceling the order and the out of stock items takes place in the practical mobile business process. In addition, actual users demand contains, such as integral exchange, consultation, return and exchange for goods. To illustrate the process of the mobile business well, this research has deliberately set aside the interruption, simplifies the users demand to browse commodity and place orders and mainly focusses on elaborating the mobile commerce main process and mobile business center functions.

3. Adoption of third-party payment

Considering the purchase risk of mobile commerce, in this study a third-party payment has been adopted, a mobile payment center has been set up to integrate the mode of payment and assumed to be the role of the third-party payment at the same time. If the user chooses the third-party payment or mobile phone payment, mobile payment center will directly submit users' payment to these institutions. If the user chooses the credit cards or bank payment, the mobile payment center, as a third party, will submits users' payment to corresponding business tenants after the goods' receiving has been confirmed by logistic company.

4. Adoption of third-party logistics

In the grid based mobile business process, logistic pickup and delivery way have correlation with users' adoption [5]. In addition, digital products in e-commerce transactions occupy considerable share. However, to fully illustrate logistics, agency function and participation, the paper only considers barter, constrains logistics agency providing shipping schedule on time and informs payment center and payment notification.

5. Involvement of Government

In this study, the government is supportive to the basic information for mobile commerce center (like population information), social resources integration and relevant regulation designation. Therefore, this paper treats it as a significant participant (does not affect the main process, but it is involved in every step of the process), specifically, the government is involved in monitoring of business process and adjustment of business processes, policies, resource allocation on strategy.

Grid-based Mobile Business Process

The Grid mobile business process is adopted with a unified service concept. Participants in any grid mobile business process include users, a mobile business center, a Service Provider (SP), a Mobile Payment Center and a logistics agency, among which mobile business center and a mobile payment center are generated from the grid management adopted by the mobile business process. The basic process of the grid mobile business is shown in Figure 3.

By establishing a mobile business center, the new mobile business platform integrates heterogeneous service ports of system for each participant in the traditional process and the shields differences on platform and business rules of participants for users. The process starts when users access mobile business platform. The mobile business center authenticates users, confirms effective contact information and ensures smooth communication, making it available for users to interact only with mobile business center and completes the following process in accordance with presentation of mobile business center.

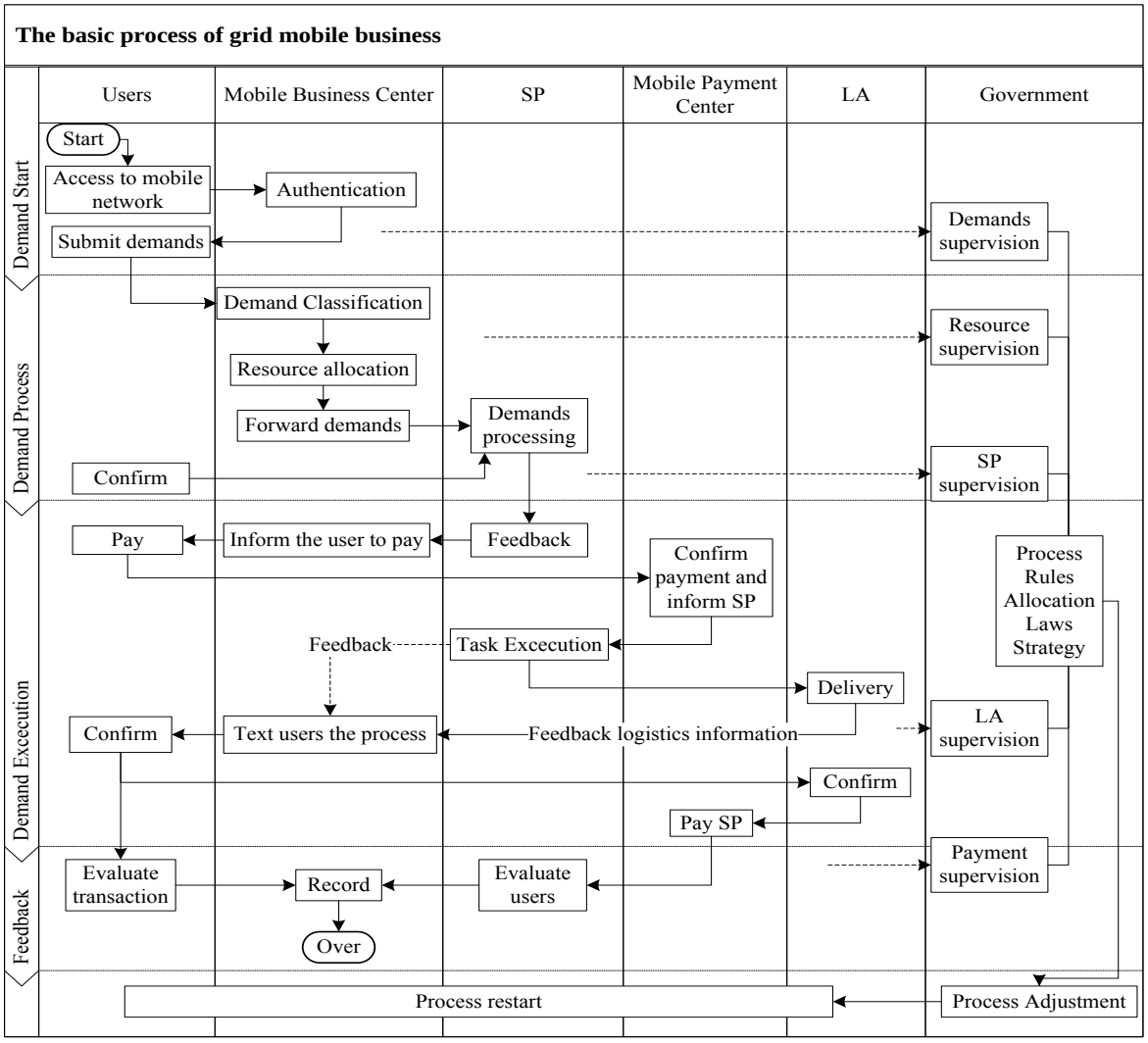

Figure 3. Basic process of grid mobile business

By establishing the mobile payment center which integrates all sorts of mobile payment methods, users can choose one mobile payment method at random, the one they are familiar with, without considering which methods are provided by the commercial tenant [5].

Architecture of Grid Process

Grid process architecture is the deep-going illustration of grid mobile business process. In the field of grid management, all process participants have their independent information system and database. The important information in the information system includes those at technical level, such as connector, middleware and system requirement, while the database includes information at business level, such as business processing rules, commodity information, users' information and order information.

Grid process architecture mainly consists of two major parts: one is the grid operation system; the other one is the distributed heterogeneous resource, data and server and the application system within mobile business field. The grid operation system herein includes mobile access layer, structural layer, connection layer, resource layer, convergence layer and application layer. All sorts of resources are applied in activities within business process, such as mobile agency, data processing, exchange of information, fund payment, safety control and management service of mobile activities. Resource utilization and the grid operating system crisscrossed and form a grid, the sub function grid in the process activity comes into being horizontally, and each sub function grid is realized by each layer of the grid operating system.

1. Mobile Agent Grid

The grid main function is connecting users' mobile devices to the gridding mobile

commerce domain. Submitting a demand means an interaction with mobile agent grid by mobile devices, then the mobile business center acquires a demand information submitted by the grid. In addition to submitting a mobile agent grid, as intermediate link, is also responsible for monitoring the flow of demand information, its temporary storage function can assure the user to continue to operate, even if he accidentally loses the internet connection.

2. Data Processing Grid

The data processing grid is similar to a buffer pool, different heterogeneous data gathered from all directions constitute a new large distributed system, like a super computer composed of all grid resources, in which all kinds of data outsourcing organization and business tenants want and commodities information will be integrated, recombined and reassigned.

3. Information Exchange Grid

The information exchange grid function processes and transmits all types of messages sent by users. Mobile users send various messages to the mobile business center in different ways through different terminals (such as keywords searching, classification retrieval, words questions etc.), the information exchange grid, as a processor between users and mobile business center, checks the integrity and authenticity of different formats and different types of messages, classifies the information, so as to transmit messages conveniently next step.

4. Funds Payment Grid

The Funds Payment grid is dedicated to the processing of user's mobile payment issues. It is put forward to become a full-time grid which needs handling all types of payment business, due to the importance and security of payment. The grid associated with payment providers integrate different interface to provide a comprehensive means of payment for users.

5. Security control Grid

The safety control grid provides the digital signature, the security certification, the users and the business tenant identity verification, integrates various types of security systems and credit mechanisms, monitors every step of the transaction, protects data and controls the safety and stability of the mobile business processes.

Management Service Grid

The main task of management service grid is to monitor and collect the process information in coordination with government. The grid commands grid resources, especially resource scheduling from a top and macro point, simultaneously gathers masses of process carrying out, through powerful computing capabilities, to complete statistical work, the grid will acquire statistical results that will be reserved, as a basis for supervision and management.

The Grid-based mobile business process specifications are as follows:

1. Demand Start

The Demand Start phase mainly realizes the inspectability of the logged-in users' identity authentication, requirement message being received, information integrity and information authenticity. The realization of the function requires the system to solve the user login information identification (mobile IP, phone number etc.), identity authentication information check, the inspectability of the demand information, so as to assure users submit demands conveniently, safely, efficiently and access to corresponding services, to make process convenient, quick and transparent. Concrete contents of requirement establishment phase include three aspects, namely, information channel design, user identity authentication and information specification and support.

2. Demand Process

The demand acceptance is mainly about preliminary processing to requirements, namely, business Reception Center of mobile business center realizes the function that contains types screening of user requirements, resources matching and communication with the submitter. The function realization is based on the premise that problems regarding the user information verification, the information transfer and the commercial tenant heterogeneity data are handled with the gird management. The Business acceptance phase tackles two issues, namely, the identification and the classification of what the requirement users have submitted, as well as the distribution related resources based on users' requirements until fully satisfying users' needs.

Since the mobile business center is an integrated, unified interface that has integrated

commodity information of distinct business tenants, the business tenant logical and physical information cannot be involved in the query results. Thus, when requests are sending from customers, the results obtained accordingly are likely to conclude commodity of one or more business tenants. The Mission allocation module classifies and sorts out the final demand information (such as new orders, application for return and exchange for a purchase submitted by customers). And call the business tenant register (including the business rules of the standard task execution instructions), transfer demand work units into standard task execution instructions for the respective business tenant, forward them to the corresponding merchants.

3. Demand Execution

All the participants, according to orders and tasks sent by mobile commerce center, execute orders processing, shipping, delivery payment, receiving and other activities, the realization of function relies on the participants functions and coordination and cooperation between the resources possessed by different actors. Contents include business tasks execution, payment execution, and logistics execution.

4. ACK

When customers acknowledge receipt of commodity or services and business tenants confirm the payment at the center, Mobile commerce evaluation feedback loop occurs. Two evaluation feedback links might be asynchronous. Through mobile commerce trading platform, the customer marks the product performance, service quality and logistics services, evaluates and proposes recommendations. Business tenants evaluate and marks the customer purchasing behavior. This part is mainly designed to realize mobile business internal supervision and promote service function, to further guarantee the security of mobile commerce with the aid of the evaluation system.

5. Government Branch Functions

The government participation is an important support for grid-based mobile business process, in addition to business process monitoring and feedback collection by mobile business center, fund monitoring by mobile payment center, mutual supervision work among business tenants, moreover, through government departments cooperating with mobile business center and mobile payment center establish overall monitoring of the grid-based mobile business process and the collection of process information, adjust and direct workflows on strategies of mobile business center and mobile payment center based on the operation monitoring results of key points.

5. ASME Evaluation of Grid-Based Mobile Business Process

ASME evaluation method modeling of grid-based mobile business process

1. Analysis and Assumptions

ASME Table shows that sub-activities arranges downward according to sequence and records time parameters into corresponding cells after classification. When the quantity of sub-activities is scarce, the direct accumulation method can be adopted to calculate the time of various activities. In order to make a general model, the matrix form can be cited to extend the problem, so that sub-activities can be calculated with computer when the quantity is large.

Because the research purpose for the problem is to maximize benefits of the customers, the parameters of other participants in the model can be reasonably assumed without loss of generality:

1) Assume that the business activities can be smoothly preceded and finally can be finished.

2) Assume that the whole process is from customers searching goods to SP finally receiving payment, regardless of anomalous event flows, such as refunding.

3) Except for customers switching on the mobile business platforms and searching goods information, SP providing and customers browsing goods information, other activities can be realized once.

4) In the traditional mobile business process, customers only choose the mode of third party payment for transaction.

2. Modelling

Break down the mobile business process into several sub-activities, and ASME method distinguishes their categories. The i-th activity takes the j-th project t_{ij} minutes, as shown in table 1 [12].

Table 1. ASME evaluation model

No.	Activity(Ac)	VAA	NVAA	Check	Deliver	Delay	Storage	Time	Handler
1	Ac1	t_{11}	t_{12}	…			t_{1k}	t_1	
2	Ac2	t_{21}	t_{22}	…			t_{2k}	t_2	
…	…	…	…	…			…	…	
j	Ac j	t_{j1}	t_{j2}	…			t_{jk}	t_j	

In this model, the vertical axis represents sub-activities arranged by business process, and the secondary axis shows activities of specific transactions, namely, value-added activities and non-value-added activities, inspection, transportation, delay, storage. Value-added activities directly create value for customers, namely producing commodities customers need, providing services customers want. Most of the non-value added activities take place in the non-value-added behavior of support departments, some are necessary, some are unnecessary [12]. Checking refers to the quantity and quality inspection, transportation refers to transfer of personnel, materials, documents and information , delay refers to the temporary storage, delay or stagnation among successive operations, storage means, for an instance, filing, this kind of storage does not belong to delay.

Here we have:

$$t_m = \sum_{n=1}^{k} t_{mn} \tag{1}$$

Activities matrix:

$$X_A = \begin{bmatrix} a_1 & a_2 & \dots & a_k \end{bmatrix}^T \tag{2}$$

The matrix represents the used time of each processor in the selected range, such as a_m=1 means activity m-th project time, and a_m=0 means no need to calculate the activity time of the project.

$$\text{Customer}: Y_C = \begin{bmatrix} c_1 & c_2 & \dots & c_j \end{bmatrix} \tag{3}$$

$$\text{Business}: Y_S = \begin{bmatrix} s_1 & s_2 & \dots & s_j \end{bmatrix} \tag{4}$$

1) Activity Time:

$$AT = \sum_{m=1}^{j} t_m \tag{5}$$

This indicator refers to the whole process time, as a parameter of current efficiency.

2) Value-added Time (VT):

$$VT = \sum_{m=1}^{j} t_{m1} \tag{6}$$

It refers to the sum of time of all value-added activities, the more value-added activities, the greater the contribution to the whole process.

3) Non Value-added Time (NT):

$$NT = Y_D AX_N = \sum_{m=1}^{j} t_{m2} \tag{7}$$

Non value-added time calculation is similar to value-added time and more non-value-added activities mean less contribution.

4) Order Completed Time:

$$OC = Y_C AX_2 = \sum_{n=1}^{k} \sum_{m=1}^{j} c_m t_{mn} \tag{8}$$

The time range between the customer choosing a product and receiving the product is called orders arrival time. This parameter measures the process of customer service level. The shorter the order delivery, the better the process of customer service, it's good to save time for customers.

5) Sales Cycle:

$$SC = Y_S AX_2 = \sum_{n=1}^{k} \sum_{m=1}^{j} s_m t_{mn} \tag{9}$$

Sales cycle is similar to the order completed time. It is the sum of the time that every service providers participate in an entire transaction process. In certain situations, the shorter the sales cycle is, the better the process of customer service is.

6) Circulation Efficiency:

$$CE\% = \frac{VT}{AT} \times 100\% = \frac{\sum_{m=1}^{j} t_{m1}}{\sum_{m=1}^{j} t_m} \times 100\% \tag{10}$$

Circulation Efficiency measures the process appreciation. The greater the circulation efficiency, the higher the proportion of value-added activities and the lower the proportion of non-value-added activities in the entire mobile business process.

7) Frequency of Consumer:

$$FC = \sum_{m=1}^{j} c_m \tag{11}$$

The frequency with which a customer participates in a process is also a measure of customer service level, corresponding to the order complete cycle. In the premise of guaranteeing product quality, the lower the frequency of consumers is, the higher level of customer convenience can be reached. This could then attract more customers, and promote the mobile commerce to develop.

8) Frequency of Seller:

$$FS = \sum_{m=1}^{j} s_m \tag{12}$$

This is an indicator of the SP's service level, corresponding to sales cycle. Improving the convenience of suppliers/sellers to participate in the mobile e-business can also promote the development of mobile commerce.

ASME validating of two kinds mobile commerce

With plenty of researches and several months of online testing, we have found that users browse 10 shops on average. Therefore, we have N=10, namely a customer enters the mobile business platform, screens goods from 10 shops and selects one for transaction. Other data are reasonably assumed according to the level of modern mobile network technology, manual operation, balanced consideration and ASME method is used for calculation example analysis on typical transaction process of current B2C mobile business, as shown in Table 2.

Table 2 shows the link of value-added activities accounting for half of the entire process, while waiting for third-party logistics business to pick up belongs to non-value added activities. The total time consumed is longer and the transaction flow circulation is inefficient.

Table 2. Traditional mobile commerce ASME form

No	Activity(Ac)	VAA	NVAA	Check	Deliver	Delay	Storage	Time (min)	Handler
1	Access to the mobile network		*					0.1	C
2	Enter *i-th* SP's platform and submit requirement		*					0.3	C
3	Return info				*			0.03	S
4	Browse info		*					4	C
5	Compare & Decision					*		7	C
6	Login service provider *i*		*					1	C
7	authentication			*				0.1	S
8	Place the order	*						2	C
9	Payment to the agency	*						0.6	C
10	Receive payment notification				*			0.5	P
11	Task executive	*						2	S
12	Delivery				*			50	L
13	Checking logistics info		*					1	C
14	Receiving			*				5	C
15	Confirm service complete		*					2	C
16	Pay to the service provider *i*						*	1	P
17	Evaluate the trade				*			0.5	C
18	Evaluate user						*	0.4	S
	Total number of activities	3	20	2	11	1	2		
	Total time	4.6	47.1					116.5	

* C means Customer; S means Seller; P means Third Party Payments; L means Logistics Agency.

Table 3. Grid-based mobile commerce ASME form

No	Activity	VAA	NVAA	Check	Deliver	Delay	Storage	Time (min)	Handler
1	Access to mobile network		*					0.1	C
2	Authentication			*				0.1	M
3	Submit demands	*						0.3	C
4	Demand classification			*				0.2	M
5	Resource allocation	*						0.1	M
6	Task forward	*						0.2	M
7	Confirm requirement			*				0.2	C
8	Requirement processing	*						2	S
9	Feedback results		*					0.5	S
10	Inform the user to pay	*						0.1	M
11	Pay	*						1	C
12	Confirm payment& Inform SP				*			0.2	P
13	Task execution	*						5	S
14	Delivering				*			50	L
15	Text users the process	*						0.2	M
16	Confirm results			*				5	C
17	Confirm receiving				*			0.5	L
18	Pay to the SP	*						1	P
19	Evaluate user						*	0.4	S
20	Evaluate transaction						*	0.5	C
21	Record						*	0.5	M
	Total number of activities	9	2	4	3	0	3		
	Total time	9.9	0.6					79.2	

* The meanings of C,P,L,S refer to Table 2, M means Mobile Business Centre.

Use ASME evaluation method for calculation example analysis on the transaction process of optimized B2C mobile business. See Table 3.

Model calculate comparison

According to the ASME model formula, after calculating the data of both processes, the ASME data of two processes obtained are shown in Table 4.

The analysis on data comparison shows that the total mobile business time largely decreases during the grid mobile business process, VT increases and NT largely lowers. Although the sales cycle is longer, the goods arrival cycle of customer's order largely shortens, the circulation efficiency increases and the process participation of both the customer and the merchant reduces. Finally, the basic target of the mobile business process has been realized, namely, taking customers as service objects and realizing the optimization of customer benefits. The Grid management for the mobile business process realizes the process optimization, improves the service level for customers and promotes the development of mobile business process.

Table 4. The traditional process and grid-based process calculation results comparison

	Traditional	Grid-based
AT	116.6	68.1
VT	4.6	9.9
NT	47.1	0.6
OC	62.2	7.1
SC	2.8	7.9
CE%	3.95	14.54
FC	11	6
FS	4	4

6. Conclusions

The paper uses unified management concept to construct mobile business process based on the grip management and abstracts the process into four parts by integrating grip management concept with mobile business process.

Participants of the process include users, a mobile business center, a service provider, a mobile payment center and a logistics agency, among which the mobile business center and the mobile payment center are generated from the grid management adopted by the mobile business process.

Meanwhile, the required time for six types of sub-activities within the process before and after optimization which are value-added activity, non-value-added activity, checking, delivering, delaying, storing are compared with the ASME evaluation method, getting the total time of different types of activities and the total process time. It is proved that grid management of mobile business process with customers as its service objects can definitely optimize the process, that is to say, customers benefit optimization. As a result, the service level of service objects of the process gets enhanced and this may then promote the development of mobile business process.

Acknowledgments

This research has been supported by the Laboratory of Logistics Management and Technology, and the Natural Science Foundation of China (Grant No. 713900334). Financial assistance has also been received from Research and Demonstrate on DSS for Top-level Design of Integration of Informatization and Industrialization (Z121100000312093) and Research Fund for Beijing Municipal Science and Technology Commission.

REFERENCES

1. YANG, M., R. T. ZHANG, H. L. YANG, **Analysis and Improvement of Advantages and Disadvantages of C2C E-business Trade Flow**, Commercial Times, no. 4, 2009, pp. 161-164.
2. LIU, L. Z., Y. H. JIAO, **Analysis of Process of Physical Distribution in E-commerce Environment**, Logistics Technology, vol. 28(12), 2009, pp. 36-39.
3. CHI, Z. R., **Research of Urban E-government Process Based on Grid Management Theory and Information Distance Theory [D]**, Shanghai: Shanghai Jiaotong University, 2008.
4. DU, L .J., Z. W. YU, **Development of Mobile Grid**, Computer Engineering and Design, vol. 31(6), 2010, pp. 1166-1169.
5. LI, D. Q., D. CHANG, **Construction and Arena Simulation of Grid M-Commerce Process**, Journal of Electronic Commerce in Organizations (JECO), vol. 10(4), 2012, pp. 1-18.
6. FOSTER, I., C. KESSELMAN, S. TUECKE, **The Anatomy of the Grid: Enabling Scalable Virtual Organizations**, International Journal of Supercomputer Applications, vol. 15(3), 2001, pp. 1-24.
7. CHANG, D., **An Optimization Research of M-Commerce Process Based on Grid Management [D]**, Beijing: Beijing Jiaotong University, 2013.
8. ZHENG, S. Y., H. XU, H. C. WANG, **A Survey of Grid and Grid Management**, Systems Engineering, vol. 23(3), 2005, pp. 1-7.
9. YUAN, T. W., H. C. WANG, D. X. MA, **Research on the Model and Principle of Griddized Management**, Information Science, vol. 25(3), 2007, pp. 456-461.
10. REN, G. L., **Research on Product Development Process Reengineering [D]**, Southwest Jiaotong University, 2005.
11. KOUROUTHANASSIS, P. E., G. M. GIAGLIS, **Introduction to the Special Issue Mobile Commerce: the Past, Present, and Future of Mobile Commerce Research**, International Journal of Electronic Commerce, vol. 16(4), 2012, pp. 5-17.
12. CHANG, D., W. LIAO, **ASME Evaluation on Grid Mobile E-Commerce Process**, Journal of Electronic Commerce in Organizations, vol. 10(3), 2012, pp. 27-43.