A classification of mobile business models and its applications

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Abstract

Although there have been a lot of studies on mobile business, it is hard to find ones in which an integrated perspective of mobile business based on both customers' and companies' needs is suggested. This research develops a mobile business model classification scheme and applies it to analysis of current status in mobile business. In the first case study on 65 firms in Korea, mobile solutions are categorized based on the classification scheme in order to analyze an overall market environment of mobile business. In the second case study on mobile service trend analysis, a set of evaluation indices including four general indices, ten effectiveness indices and 13 measurement indices were developed to analyze mobile service environment in the perspective of B2C (business to customer). For the second case study, 200 mobile heavy users were questioned on the mobile service-related issues.

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1. Introduction

Worldwide wireless Internet users are expected to rise from the current 96 million (2001) to more than a billion in 2006 (ARC Group, 2001). In spite of the widespread use of mobile services, previous research on business model-based mobile business classification has hardly been found. Similar to the research on Internet business, mobile business model classification needs to be researched in order to provide an overall framework and perspective of mobile business.

In this research, a mobile business classification scheme and an analysis framework are suggested based on both wireless service categorization schemes and research on an Internet business model classification. For B2C models, analysis by each model is also suggested.

2. Previous research

2.1 Research on Internet business classification schemes

The Internet business model means a set of strategies for corporate establishment and management which includes a revenue model, high-level business processes, and alliance (Leem, 2002). Internet business model has had various forms and current business models are changing or being merged as time goes on. Table I shows the previous research on Internet business model classifications.

2.2 Previous research on mobile service classification

Unlike the Internet business model classifications, mobile business has been categorized roughly by its service model based on mobile characteristics as well as Internet business characteristics.

Mobile business classification schemes are summarized in Table II.

As shown in Table II, previous research has been focused on service categorization. ARC Group categorized mobile business into timeliness, remote access, location based (ARC Group, 1999). Ovum Group suggests five forms of mobile services based on promising services

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Table I Research on Internet business model classification

Perspective	Internet business model categories	Researcher(s)
Enterprise value chain	E-shop, e-procurement, e-mall, e-auction, trust services, info brokerage, value chain service provider, virtual community, collaboration platform, third party marketplace, value chain integrator	Timmers (1998)
	Seller-driven market, buyer-driven market, neutral market	Berryman and Harrington (1998)
	E-broker, manufacturer, auction	Jutla *et al.* (1999)
	User: e-commerce, content aggregators, market makers, service providers Communication service providers: backbone service providers, ISP/OSP, last mile provider	Afuah and Tucci (2001)
Hierarchy	Native Internet business model: library model, freeware model, information barter model, digital delivery model, access provision model, Web hosting model Transplanted real-world business model: mail-order model, advertising based model, subscription model, free trial model, direct marketing model, real estate model, incentive scheme model	Bambury (1998)
Business type	Brokerage, advertising, informediary, merchant, manufacturer, affiliate, community, utility, subscription	Rappa (2000)
Key features of business model	Physical – digital, general – special, manufacture – intermediary	Yoon *et al.* (2001)

Table II Mobile business (service) classification schemes

Category	Service
ARC Group (1999)	
Timeliness	E-mail/fax, stock information, news, sports information
Remote access	Intranet access, integrated messaging, banking/trading, reservation, e-commerce, sales support
Location based	Traffic information, weather information, vehicle location, navigation, entertainment
O'Loughlin (2000)	
Personal communication	Messaging, personal directory, community
Infotainment	Weather, news/sports information, catalog, mobile broadcasting
Mobile commerce	Ticketing, usage fee, coupon, banking/trading, auction
Business application	Conference support, intranet, e-mail, file transfer, DB
Remote control	Information appliance application, automobile application, navigation tracking, emergency service
Lehman Brothers (see Yoon et al., 2003)	
Communication	SMS (short messaging service), chatting, integrated messaging, e-mail
Information	News, city guide, directory service, traffic and weather
Transaction	Banking, brokerage, shopping, auction, reservation
Entertainment	Music, game, graphic, video

and/or applications such as personal communication, infotainment, mobile commerce, business application, remote control (O'Loughlin, 2000). Lehman Brothers (see Yoon *et al.*, 2003) take a view of user intention to categorize mobile service into communication, information, transaction, and entertainment.

In summary, mobile business categorization so far has been focused on service categorization based on promising service/application or user intention.

2.3 Limitations

Previous research on mobile business classification has a couple of limitations to suggest a general perspective on mobile business.

First, previous classifications are mainly focused on mobile service not the mobile

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business model. A business model approach is needed in order to suggest a business perspective of mobile business.

Second, the previous (service) categorization schemes are mainly dealing with services in B2C (business to customer) business model. B2B (business to business)/B2E (business to employee) perspectives are not reflected in the previous research.

Third, it is hard to use the existing Internet business model classification schemes in mobile business because wireless Internet channel has its differences from wired Internet business such as channel characteristics, usage patterns, industry maturity, etc. (Kim, 2001; Lee *et al.*, 2001; Kim *et al.*, 2002).

Accordingly, a new mobile business model classification scheme which is based on a business model perspective and includes B2B/B2E categorization is needed.

With the review and limitations of previous research mentioned in this section, a new mobile business classification scheme is presented and its differences from previous research elucidated in section 3. In sections 4 and 5, applications based on the suggested classification scheme are described with its result analysis. Section 4 provides a *status quo* of mobile business solutions based on B2B/B2E business model classification scheme. In section 5, mobile B2C business model classification framework is applied to 200 mobile heavy users in order to analyze its business environment and service level.

3. Mobile business model classification scheme

Mobile business is positioned in a business ecosystem consisting of mobile telecommunication companies, content providers, mobile solution providers, customers (firms or individuals), etc.

Among the business players in a mobile business ecosystem, the "customer" has an immense influence on the mobile business model. Service type, applied mobile technology and network infrastructure, participating contents providers, etc. – all differ by what customers (firms or individuals) a mobile business is targeting.

In this research, the target customer is the first level criterion to divide mobile business models. Therefore, mobile business models are divided into B2C (business to customer) and B2B/B2E (business to business; business to employee). So far mobile B2B/B2E model classification has been hard to find in the literature. But, wireless technology has vertical (B2B/B2E) and horizontal B2C applications (Yen and Chou, 2000). B2B/B2E models are subdivided based on value chain perspective (Porter, 1985) and B2C models are divided in the perspective of customers' purpose on supplied value.

Based on both mobile channel characteristics and business model perspective, a mobile business model classification is suggested as shown in Figure 1.

For the first level categories, B2C and B2B/B2E, a couple of descriptions are summarized in Table III.

As shown in Table III, mobile business has its differences in perspective, purpose and value proposition by general categorization (B2C, B2B/B2E).

The previous research has focused on wireless technology. But, business (or managerial) issues are more important than technical issues in telecommunication (Willems and Ketler, 1999). Therefore, mobile business model classification has an important meaning in the wireless environment. Furthermore the previous classification schemes are mainly focusing on B2C-oriented categorization and application. But, the greatest growth in

Figure 1 Mobile business model classification

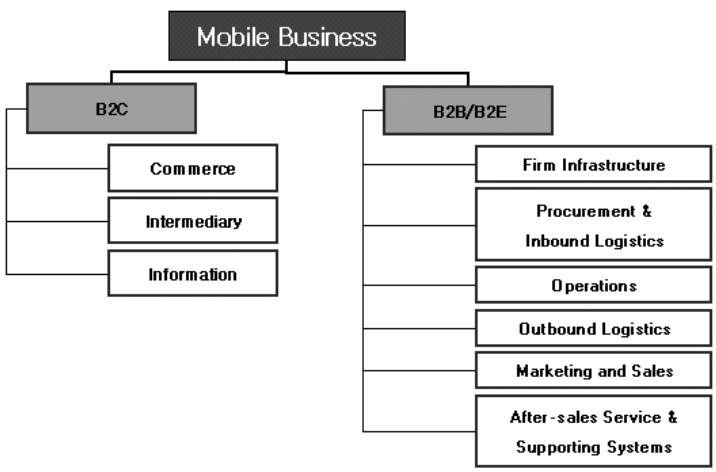

Table III Descriptions on mobile business model classification scheme

Mobile business model			
Business model	**Classification perspective**	**Main purpose of business model**	**Value proposition**
B2C	Characteristics and type of supplied value	Service level enhancement, value proposition for various interests of individuals	Product (digital, physical) information and service, information/entertainment, digital/physical
B2B/B2E	Use scope in enterprise value chain	Enterprise business process enhancement, cost reduction	Information exchange in intra/extra net, process redesign

e-commerce will be in the area of B2B (Duffy and Dale, 2002). The new classification scheme suggests an overall classification perspective which includes B2B/B2E as well as B2C.

3.1 Mobile B2C business model

The mobile B2C business model is subdivided into commerce, intermediary and information models:

- A commerce model provides mobile contents and/or services for direct commercial transaction.
- An intermediary model delivers mobile contents and/or services from other sources to customers.
- An information model provides personalized information to customers' mobile terminals generally on a push basis.

Subcategories of B2C models represent the current outstanding mobile business models, not including potential business models. The B2C model and its subcategories are described in Figure 2.

Each B2C category and its examples are listed in Table IV.

Commerce refers to a business model which provides transaction-based service and/or content such as ticketing, reservation, download, music, etc. The digital model delivers intangible values – game, mp3, ebook, etc. – through a mobile channel. The physical model deals with marketing and sales of physical goods – electronic appliances, books – on the mobile channel, including offline logistics. The service model supplies communication and/or reservation, etc.

Figure 2 Mobile B2C business model

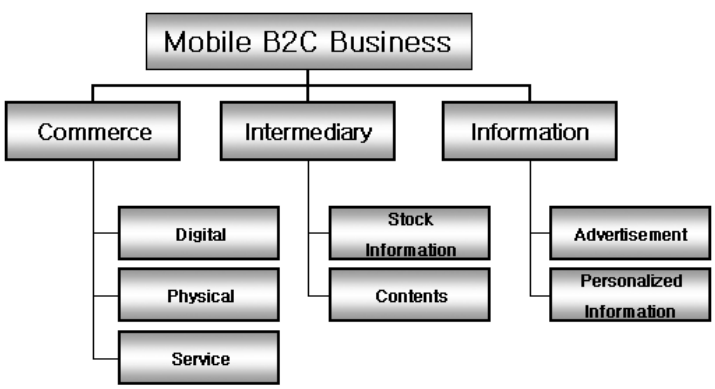

Table IV Mobile B2C business model and its examples

Category	Example
Commerce	
Digital	Game, MP3, ebook
Physical	Electronic appliance, books
Service	E-mail, banking, ticketing, community
Intermediary	
Stock information	Stock-related sites
Contents	News, weather, entertainment, information
Information	
Advertisement	SMS, coupon, banner
Personalized information	Location information, stock information

The intermediary model delivers content and/or services from other sources to customers such as stock-related sites, news, weather information, etc.

The information model provides personalized service/content to customers or pushes mobile advertisements.

3.2 Mobile B2B/B2E business model

Mobile B2B/B2E models are suggested based on value chain perspective – the scope of mobile business or mobile solution in a firm's business process (Porter, 1985; 2001). Firm infrastructure refers to a mobile business or solution supporting a firm's general decision making and information sharing, and other categories are based on primary activities of the value chain.

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The B2B/B2E model is subdivided into six representative models (see Figure 3). A description of each category is suggested in Table V.

3.3 Differences from the previous research

The mobile business model classification scheme suggested above has a couple of differences from the previous research. First, the classification is based on a business model perspective: previous mobile business classifications have been focused on service categorization, not representing the way business is run on the mobile channel. Service categorization has its own limitations to express mobile business. The new mobile classification scheme is based on a business model perspective. Second, the inclusion of B2B/B2E mobile business model classification: even the previous service categorization has been mainly based on B2C perspective (mobile service for individual customers). This research provides a B2B/B2E model classification to be used in explaining inter/intra enterprise mobile business.

4. Case study 1: Mobile business solution mapping in the B2B/B2E model classification scheme

In many cases, B2B/B2E mobile business is realized with mobile solutions rather than with internal development (Choi *et al.*, 2001). Therefore, mapping current mobile solutions to B2B/B2E models delivers practical insight on the B2B/B2E mobile market situation.

A total of 65 mobile solutions from Korea mobile start-up companies are mapped with the suggested B2B/B2E classification scheme. Among B2B/B2E models, after-sales and system support is omitted because of its lack of a business solution in the current market. Table VI shows the mapping result.

In firm infrastructure, mobile solutions are mainly supporting internal information management for mobile intranet.

In procurement and inbound logistics, most solutions concentrate on inventory asset and order management to be used in B2B logistics.

Figure 3 Mobile B2B/B2E business model

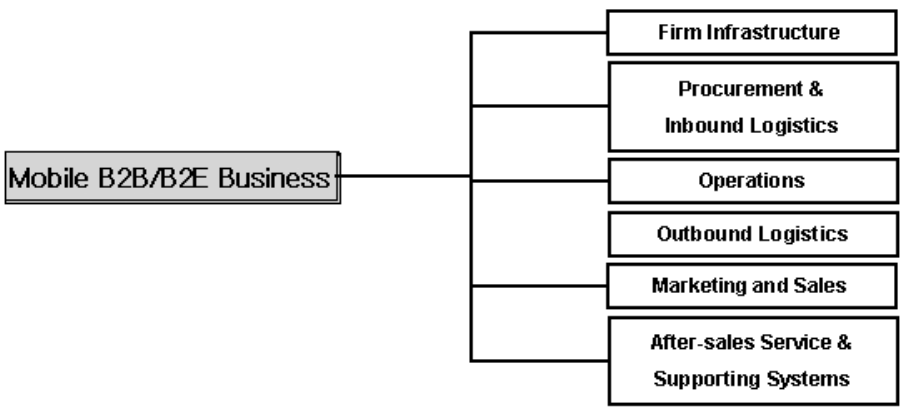

Table V Mobile B2B/B2E business model and its description

Category	Description
Firm infrastructure	Not confined within in a specific primary activity, this BM is used in general decision making and information sharing
Procurement and inbound logistics	Mobile business or solution supporting firms' inbound logistics and aiming to work efficiently
Operation	Mobile business or solution used for firms' internal operation
Outbound logistics	Mobile business or solution supporting and dealing with outbound logistics
Marketing and sales	Mobile business or solution mainly used to support firms' marketing and sales activities
After service and system support	Mobile business or solution which facilitates and supports after sales and system support

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Table VI Mobile B2B/B2E model and corresponding mobile solutions

Business model	Details	Mobile company (URL)
Firm infrastructure	Accounting and internal information	www.futec.com www.ainet.co.kr www.biteck.co.kr www.oneclick.co.kr
Procurement and inbound logistics	Inventory and order	www.modia.co.kr www.futec.co.kr
Outbound logistics	Logistics	www.ainet.co.kr www.oneclick.co.kr www.modia.co.kr
Marketing and sales	Firm internal information	www.biteck.co.kr www.oneclick.co.kr www.modia.co.kr www.intromobile.com
	Transaction/payment	www.ainet.co.kr www.oneclick.co.kr
	Sales information	www.oneclick.co.kr www.modia.co.kr
	Character/music	Home.airi.co.kr www.ainet.co.kr
	E-mail	www.intromobile.com www.feelingk.com www.intromobile.com
	Communication	www.ainet.co.kr
	Game	www.electricisland.com
	Stock	www.ainet.co.kr www.mobile.co.kr
	Ticket	www.infoart.com www.ainet.co.kr
	Location information	www.ainet.co.kr
	Product information	www.ainet.co.kr
	Personal information	www.isoft.co.kr
	Vehicle information	www.carmagic.co.kr
	Medical information	www.ehealth24.com
	Multi media	www.infohand.co.kr

Mobile solutions supporting outbound logistics are positioned as a part of SCM, integrating intra/extranet and enhancing both speed of logistics and location tracking capability.

Mobile solutions supporting a marketing and sales model take the biggest portion in mobile solution market, varying in function and business areas.

Based on the mapping table suggested above, general trends of mobile business solutions are as follows.

First of all, in a firm infrastructure model, corporate-accounting-system-oriented mobile applications are dominant, supporting internal information flow and being aligned with the existing information systems.

Second, a couple of promising mobile business solutions such as mobile commerce and PIM (personal information management) are entering and enlarging the mobile market.

Third, the most prominent mobile business application area is marketing and sales, divided into a variety of sub-areas.

5. Case study 2: Mobile B2C business model trend analysis

A framework for measuring and analyzing a B2C business model is suggested. The framework is based on four perspectives – use environment, interface, perception and information, which are shown in Figure 4.

5.1 A survey for mobile B2C business model trend analysis

In a use environment, factors related to general customer satisfaction include the mobile service data transmission level, pricing level, and utility level (So and Sohn, 2001). The interface index consists of interaction, information representation, contents and a system to measure customer satisfaction on the mobile interface (Chin *et al.*, 1989). Perception is divided into easiness and usability, considering how easy or usable a customer feels when he or she uses a mobile service (Davis, 1989). The information index is intended to measure quality of mobile information and service. A total of four indices – use environment, interface, awareness and information – comprise the representative indices.

Table VII describes each representative index of the analysis framework.

The four representative indices can subsequently be subdivided into effectiveness indices and measurement indices. Effectiveness indices and measurement indices are listed in Table VIII. Including question design, the Table shows overall structure of a questionnaire for B2C model *status quo* survey. Questions for each measurement index are differentiated according to business model (commerce; intermediary; information).

On the basis of the fact that end users who use the Internet as a source of information and procurement cannot help but judge

Figure 4 A framework for measuring mobile B2C model *status quo*

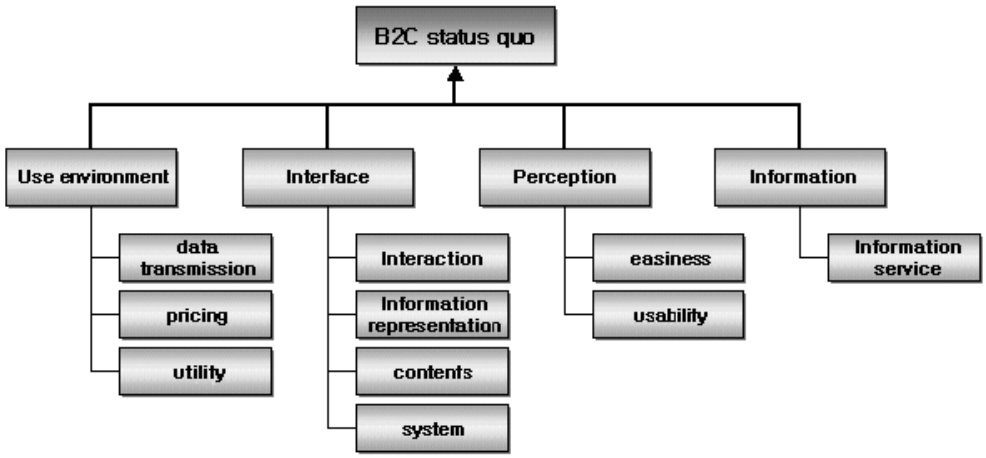

Table VII Representative indices for B2C model *status quo*

Representative indices	Description
Use environment	Measurement for general satisfaction of mobile service
Interface	Measurement for customer satisfaction on mobile interface
Perception	Measurement for mobile service easiness and usability
Information	Measurement for mobile information and service quality

Table VIII Analysis structure for survey on mobile B2C model

Representative indices	Effectiveness indices	Measurement indices	Questions
Use environment (E)	Data transmission (T)	Data transmission level (T)	01 (Com), 02 (Int), 03 (Inf)
	Pricing (P)	Pricing level (P)	01 (Com), 02 (Int), 03 (Inf)
	Utility (U)	Variety of service (V)	01 (Com), 02 (Int), 03 (Inf)
		Convenience of service (C)	01 (Com), 02 (Int), 03 (Inf)
		Handheld device firmness (F)	01 (Com), 02 (Int), 03 (Inf)
Interface (I)	Interaction (I)	Use flexibility/suitability (F)	01 (Com), 02 (Int), 03 (Inf)
	Information representation (P)	Information readability/harmony (H)	01 (Com), 02 (Int), 03 (Inf)
	Contents (C)	Contents consistency (C)	01 (Com), 02 (Int), 03 (Inf)
	System (S)	Network speed (S)	01 (Com), 02 (Int), 03 (Inf)
Perception (P)	Easiness (E)	Easiness level (E)	01 (Com), 02 (Int), 03 (Inf)
	Usability (U)	Usability level (U)	01 (Com), 02 (Int), 03 (Inf)
Information (I)	Information service/product (P)	Exactness (E)	01 (Com), 02 (Int), 03 (Inf)
		Update (U)	01 (Com), 02 (Int), 03 (Inf)

manufacturers and channels based on their Web sites (Lightfoot and Harris, 2003), a survey on mobile end users was conducted to measure overall status of mobile business. This survey was conducted on 200 mobile heavy users in Seoul, Korea from 12-14 November, 2002.

In section 5.2, overall customer satisfaction on mobile service is analyzed in commerce, intermediary, and information models respectively. Differences between the results on each model are suggested and analysis on measurement and effectiveness indices level is described. In section 5.3, analysis on representative indices result is suggested.

5.2 Analysis on each business model

General analysis results on each mobile B2C model is as follows.

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Commerce
In the commerce model, users showed the highest level of satisfaction in use environment index, while showing the lowest in perception index. In the effectiveness index level, usability had the most positive influence in use environment.

From these results, users are found to be somewhat ignorant of commerce-related mobile services. However, those who commercially used the mobile channel find it very pragmatic and convenient.

Intermediary
Mobile users are found to be most satisfied with information-related functionality in the intermediary model, while showing a very low level of perception. In information indices, exactness and update indices have the most positive influence on users' satisfaction level. On the other hand, readability and harmony indices in the interface index were greeted very positively by mobile users.

Information
The information model has much in common with the intermediary model, showing a similar satisfaction level in four representative indices. The information model is positively received in the information and interface indices. Mobile devices used by mobile customers in Korea are found especially suitable in using the wireless Internet.

In each B2C model, survey results are shown by representative index in Table IX.
In conclusion, some significant results of B2C mobile business model are suggested:

- The commerce model turned out to be a more familiar mobile business model than the intermediary and the information models.
- For the intermediary and information models, users showed very little difference in satisfaction level.
- Two representative indices – interface and perception – in the commerce model showed comparatively low satisfaction level compared to other indices.
- Current mobile B2C models turned out to provide the most satisfactory services in the information index.

Table IX Result on each business model by representative index

Representative indices	Affirmative response by each business model		
	Commerce (per cent)	Intermediary (per cent)	Information (per cent)
Use environment	35	12	14
Interface	24	14	13
Perception	24	10	13
Information	30	19	22

5.3 Analysis on each index

General analysis
In general, the overall level of current B2C mobile business model turned out to be unsatisfactory. Some general results are as follows.

First of all, the general use environment is analyzed to be unfamiliar and not satisfactory to mobile users.

Second, users who have been accustomed to a wired Internet interface found it hard to use the mobile interface generally offered by handhelds or cellular phones.

Third, compared with other indices – use, interface, perception – the information index is found to have a high satisfaction level.

On four representative indices, the most influential affirmative/negative measurement indices are listed in Table X with their response ratio.

The use interface showed the highest negative response. Especially, more than half of mobile users are complaining about mobile network speed. Meanwhile, the information readability/harmony has a rather high level of satisfaction.

On the information index, a measurement index – exactness – received the highest satisfaction level (37 per cent), indicating that there is little difference between customer satisfaction and complaint level.

Use environment
In the use environment index, the commerce model showed a 35 per cent affirmative response and a 33 per cent negative response from mobile customers.

In the intermediary model, negative response was 52 per cent, far greater than the 12 per cent of affirmative responses.

In the information model, 48 per cent of respondents were negative while only 14 per cent were satisfied with the mobile use environment.

In general, the intermediary and information models show lower satisfaction levels than the commerce model.

Interface
In the interface index, network speed and information readability showed a relatively low satisfaction level.

In the commerce model 40 per cent of respondents reported negative experience and 24

Table X Analysis result on each representative index and its most influential measurement indices

Representative indices	Most influential indices: Affirmative	Most influential indices: Negative
Use environment	Variety of service (26.5 per cent)	Convenience (50 per cent)
Interface	Information readability/harmony (20 per cent)	Network speed (52 per cent)
Perception	Usability (17 per cent)	Easiness in use (48 per cent)
Information	Exactness (37 per cent)	Update (26 per cent)

per cent showed affirmative experience especially on the information readability/harmony.

On the other hand, in the intermediary and information models only 13-14 per cent of respondents were affirmative while 36 per cent and 45 per cent were negative, respectively.

More than half of respondents were not satisfied with their experience on use flexibility/suitability and network speed in the intermediary and information models.

Perception

In the commerce model, 39 per cent were affirmative and 24 per cent negative in their mobile business experience. While users are dissatisfied with ease of use, they are comparatively satisfied with usability of the commerce model.

Only 10 per cent affirmative, 53 per cent of respondents are dissatisfied with their experience in the intermediary model, especially in usability.

Showing 47 per cent negative response, the information model received only 13 per cent affirmative response, being worse in ease of use.

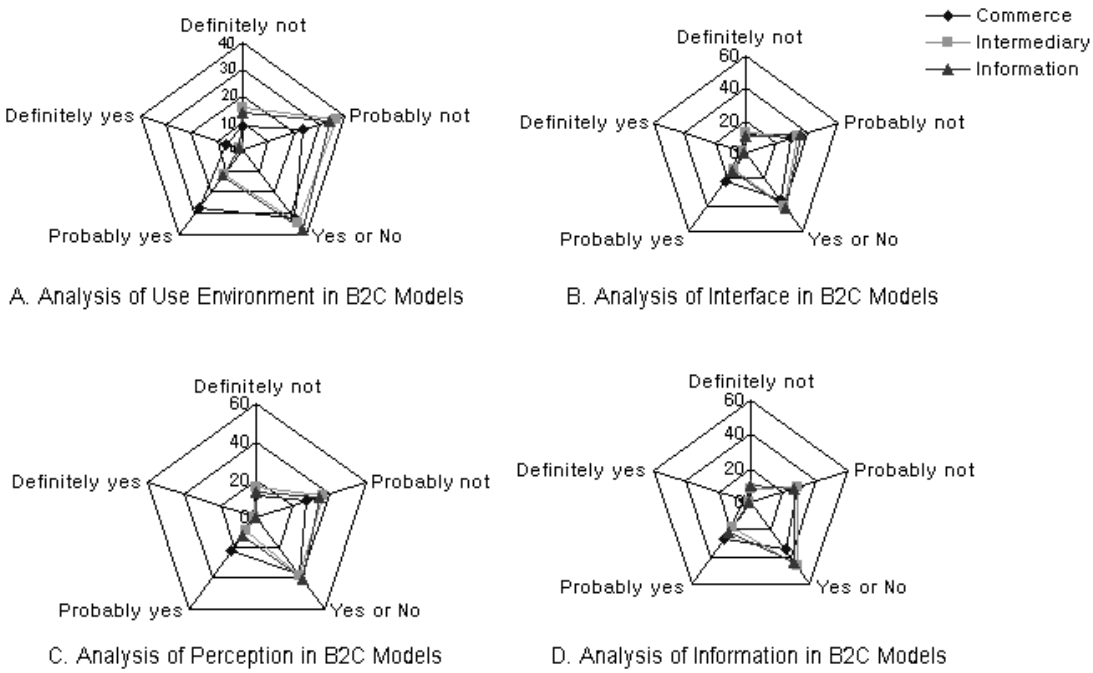
Information

In the information index, the three business models did not show a substantial difference in their satisfaction level. The commerce model, however, showed a comparatively higher satisfaction level. On the other hand, in the intermediary and information models, user response concentrates in the middle, showing there is little concrete evaluation on this area.

Major results on each representative index are suggested in Figure 5.

In conclusion, among B2C models, the commerce model is the one most familiar to mobile users and received a higher satisfaction level in all representative indices. However,

Figure 5 Analysis results on each index



overall B2C model satisfaction level is somewhat low, especially in the use environment and mobile interface.

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