



# Mobile Auctions: Will They Come? Will They Pay?

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## ABSTRACT

This study explores mobile auction adoption intentions amongst online auction users. A survey was conducted in a leading online auction website in Hong Kong to investigate the attractiveness of a variety of m-auction features, intention to adopt, and willingness to pay among active users. In this paper we present a preliminary analysis of the 981 responses. The findings indicate that online auction users favor informational features over transactional features and display a general unwillingness to pay for m-auction services. The analysis finds significant differences in preferences between buyers and sellers, high and low auction usage, and men and women.

## 1. INTRODUCTION

Online C2C auctions have extended the traditional location-specific auctions into cyberspace, enabling the vast global Internet audience access to an ever increasing supply of online auction sites. These auctions have demonstrated the success of the online auction business model by providing value to both sellers and buyers and reducing the overall transaction costs associated with governing auction transactions (Sashi and O'Leary, 2002).

To date, access to online auctions has been predominately PC-based. However, there has been some interest and experimentation in extending access to online auctions to the mobile platform. The mobile infrastructure provides customers anytime, anywhere access, the capability to pinpoint user locations for personalization and localization, and the functionality to access information at the point of need (Siau et al., 2001).

M-auctions, as part of the emerging world of mobile commerce, differ from online auctions in their underlying technology, services, business models, and customer base (Zhang and Yuan, 2002). M-auctions provide buyers and sellers continuous contact with the progress of an auction. In doing so, the m-auction provides a temporal richness that is lacking in online auctions, possibly bringing back some of the face-to-face richness of traditional auctions on a wide geographic scale. Through the use of software agents, auction participants can be notified of changes to bids, auction closure, or changes to the auction. There is the potential to provide users with anytime, anywhere access to auctions.

The potential payoff from mobile commerce has not yet appeared in spite of high expectations. This makes online auction providers cautious about costly ventures into mobile applications. The expectation failure of mobile applications raises questions for online auction providers. Are mobile auctions merely an extension of online auctions or do they differ in some substantive way? Which users from the existing online auction base are more likely to use a mobile interface? What mobile features are most attractive? And, will users pay for those features? There has been little systematic investigation of mobile auction adoption intention amongst the existing online auction user base. This research will contribute to the limited empirical research on m-auctions and m-auction adoption.

In this study we conduct a survey of mobile auction adoption in the population of existing online auction users at the leading online auction provider in Hong Kong. The survey yielded 981 valid responses. In this paper we present our initial findings that online auction users favor informational features over transactional features and display a general unwillingness to pay for m-auction services. The analysis also finds significant differences in preferences between buyers and sellers, high and low auction usage, and between genders.

The paper is organized as follows. In the next section we describe the features associated with three m-auction platforms and we present the context of this study in Hong Kong. We describe the research method and survey results in section 2 and 3, concluding with a brief discussion of the business issues for online auction providers in section 4.

### 1.1. Existing Mobile Auction Platforms

A mobile auction is an auction held using multicast wireless infrastructure (Varshney and Vetter, 2002). We compare the features offered by three major C2C auction platforms: eBay, Bonfire Media, and Yahoo! Japan.

#### *eBay*

eBay, the dominant player in online auctions, occupies 90% of the market share with more than 12 million items listed across 18,000 categories (Yin, 2004). Currently, mobile users is limited to simple text messages to the mobile devices when an auction ends or the item has been outbid. Users are informed when they are outbid or when auctions close with notification of "outbid" or "end" followed by a short description of the item, item number, and the amount bid. For example, "Outbid! - Snoopy PEZ dispenser - item #3536992432 - \$7.50." This feature is available to all eBay users and at this time eBay does not charge its users for the service, although most wireless providers charge for SMS (Short Message Service). Currently the users can access "my eBay" and search or browse through listings using mobile phones or PDAs. There are constraints to the service as SMS is very limited in the amount of information that can be transmitted and provides only minimal interaction (Barnes, 2002).

#### *Bonfire Media*

Bonfire Media, a member of eBay's developers program, provides a third-party service called "Pocket Auctions" for eBay users, enabling them access popular eBay features through Java-enabled mobile devices. These features include search, bid, viewing pictures, outbid alerts, and checking personalized "My eBay". Pocket Auctions is currently available on Sprint PCS, mMode, T-mobile, Media Net and is being extended to other carriers.

#### *Yahoo! JAPAN Mobile*

Yahoo! JAPAN Mobile allows bids on items in existing online auctions through Yahoo! Mobile Auctions. Yahoo! JAPAN mobile platform provides the most comprehensive features to its users. The m-auction

Table 1. Comparison of mobile auction platforms

Features	eBay	Bonfire Media*	Yahoo! Japan
SMS outbid and closing alert	Y	Y	Y
Mobile Internet browsing	Y	Y	Y
Mobile Internet searching	Y	Y	Y
Mobile Internet bid placement	N	Y	Y
Item image display	N	Y	Y
Upload image to auction	N	?	Y
Software agent automatic bidding	N	?	Y
Payment by mobile device	N	?	Y
Contact the seller or buyer	N	?	Y
Check bidding, buying and watching service	Y	Y	Y
Comparison of price	N	Y	Y

\*?=Unknown

platform enables users to search via keywords, product categories or specific item IDs. From the mobile device interface, users may view various auction information such as item ID, current price, number of bidders, end time, remaining time, item picture, description, and send questions to sellers. The m-auction platform adopts an "automatic bid" strategy. The user enters their highest bid amount and increment. If there is no bid which exceeds the bid amount by the auction end, the user becomes the successful bidder.

The Yahoo! Japan mobile auction platform is currently more advanced than either eBay or Bonfire Media. The success of other m-commerce applications such as i-mode, the penetration of mobile devices and infrastructure in Japan, and the longer experience of Japanese users with mobile transactions likely contribute to an environment for advanced m-auction platforms.

Table 1 summarizes features of the three m-auction platforms.

## 1.2. Research Background

Our study examines m-auction adoption intentions of users of an existing online auction in Hong Kong. Hong Kong has one of the highest penetrations of mobile devices in the world, with approximately six million post-paid mobile phone accounts in a population of nearly seven million, a penetration rate of 85% (Ure, 2003). Six mobile operators provide coverage in a highly competitive environment. In a saturated device market mobile device vendors emphasize fashion over function and points of differentiation are extremely important making m-commerce of significant interest for creating alternative revenue streams.

While the mobile infrastructure for m-commerce is in place in Hong Kong, adoption of m-commerce is low. This is consistent with low adoption of e-commerce. While the adoption of the Internet grew 113.7% from 2000 to 2004, online shopping remains low. The lack of trust in Internet transactions, and the resistance to changes in shopping behavior appear to be major contributors to the low penetration rate of Internet shopping in Hong Kong as well as other Asian countries (Lee and Cheung, 2004).

Hong Kong makes an interesting testbed for mobile auctions. Hong Kong is similar to both China and Western countries, has a mature mobile infrastructure, and successful online auction applications. The success of m-auctions in Hong Kong has implications for how auction providers might proceed in the vast China market.

## 2. RESEARCH METHOD

A survey method was chosen for this study as the most appropriate tool to investigate the research questions presented in section 1. The instrument development is described below.

### 2.1. Survey Design

Because there is limited information on mobile auctions, a short exploratory questionnaire with open-ended questions was used to solicit attitudes toward mobile auctions, covering general demographics, online auction usage, features of m-auctions, willingness to pay, motivations for adoption, and barriers to adoption. Respondents to this exploratory survey were graduate students in two universities in Hong Kong and staff in several companies. The intention of this small survey was to gather some initial insights into the online auction population and was used to inform the survey design.

Drawing upon prior literature and the exploratory survey a final questionnaire was designed. The survey contained four sections: current usage of online auctions, current usage of mobile handset and mobile services, attitude towards mobile auctions, and respondent demographics. Where possible previously validated measures were used, adapted to the particular context of mobile auctions where necessary.

The leading online auction site in Hong Kong is in Chinese. The questionnaire was first written in English and then translated to traditional Chinese. To check for consistency between the English and Chinese versions, the Chinese survey was translated back to English by a domain expert proficient in both English and traditional Chinese. Backward translation is used to ensure that traditional Chinese version is consistent with the original English version of the survey. The backward translation was consistent except for one question, which was discussed and then revised.

The survey was pretested with volunteers at the online auction firm. The final online survey was launched on the auction website in August, 2005. A popup request was placed on the main online auction page. 200 gifts

Table 2. Respondent demographics

	Seller Only N=146	Buyer Only N=288	Seller & Buyer N=547	Total N=981
<b>Gender</b>				
Male	42.5%	45.8%	34.4%	38.9%
Female	57.5	54.2	65.6	61.1
<b>Age</b>				
<18	23.3%	41.7%	36.4%	36.0%
19-24	30.8	29.9	32.0	31.2
25-34	37.0	18.8	25.6	25.3
>35	8.9	9.7	6.0	7.5
<b>Monthly Income (HK\$)</b>				
<3,999	39.0%	57.6%	50.8%	51.1%
4,000-7,999	14.4	15.3	15.7	15.4
8,000-14,999	30.8	16.0	23.0	22.1
>15,000	15.8	11.1	10.4	11.4
<b>Education</b>				
Middle School	6.9%	16.0%	12.6%	12.7%
High School	41.8	52.1	48.8	48.7
Prof. Training	21.9	14.9	19.0	18.3
Associate Degree	2.7	3.5	2.9	3.1
Bachelor's Degree	21.9	10.4	14.4	14.4
Master's Degree	4.8	2.1	2.0	2.5
Prof. Degree	0.0	1.0	0.2	0.4
Doctoral Degree	0.0	0.0	0.0	0.0
<b>Occupation</b>				
Student	37.7%	57.6%	52.8%	52.0%
Service and Clerical	18.5	15.6	17.2	16.9
Professional	14.4	6.6	9.9	9.6
Manager / Admin	8.2	5.2	4.0	5.0
Office Staff	7.5	2.4	4.0	4.1
Secretarial / Support	2.7	2.4	4.4	3.6
Non-technical Staff	0.7	2.1	1.5	1.5
Machinery Operator	0.7	2.4	0.4	1.0
Art	1.4	0.4	0.9	0.8
Fishing and Agriculture	0.0	0.0	0.2	0.1
Other	8.2	5.2	4.8	5.4

Table 3. Usage of online auctions in the past three months

	N	Mean Value of Items Sold (HKD)	Mean Value of Items Bought (HKD)	Mean No. of Items sold	Mean No. of Items Bought
Seller Only	146	1,849	--	54	--
Buyer Only	288	--	543	--	16
Seller & Buyer	547	1,199	662	17	12
Total	981	3,048	1205	71	28

(unspecified on the survey) were offered to the first 200 respondents to motivate participation. There were a total of 985 responses. 4 records were not complete or invalid, for a total of 981 valid responses.

### 3. RESPONDENT CHARACTERISTICS

#### 3.1. Online Auction Users' Profile

Key respondent demographics are provided in Table 2. Within the total sample of 981 respondents we find that 61.1% are female, 67.2% are under the age of 24, 51.1% earn less than 4,000HKD (515USD) per month, and 61.4% have high school education or less.

We partitioned the sample into three groups based on the nature of their auction participation: sellers only (15%), buyers only (29%), and both sellers and buyers (56%). Notably, sellers only are older than buyers only, of higher monthly income, and higher education level. The group of respondents that are both sellers and buyers is very similar to the total respondent profile.

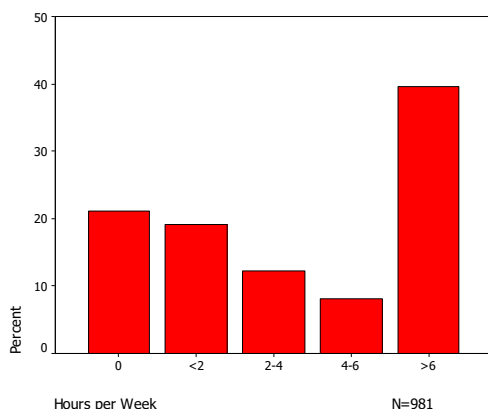
#### 3.2. Current Usage of Online Auctions

The online auction activity of respondents is shown in Table 3. Sellers are more active than buyers, indicating an average of 54 items sold with an average value of 1,849HKD (237USD) in the past three months. Buyers only purchased 16 items with an average value of 543HKD (69.6USD) in the same period. Those that are both sellers and buyers sold an average of 71 items valued at 3,048HKD (391USD), purchased 28 items valued at 1,205HKD (155USD). The most active group are those that are both sellers and buyers selling and buying items of higher value than sellers only or buyers only.

#### 3.3. Mobile Phone and Mobile Usage

73.7% of people paid less than 200HK\$ on mobile usage, including IDD (International Direct Dial) service and additional mobile service charge. 20.2% of people paid 200-400HK\$ per month on mobile usage service. The left 6.1% paid more than 400HK\$ per month.

Figure 1. Mobile Internet usage



87.2% of people own a mobile phone with color display and 71.2% of people have a mobile phone with a camera. Only 13.4% people have a 3G service now.

Respondents indicate a high penetration of mobile Internet with about 80% of respondents using mobile Internet every week (Figure 1). 39.6% of users are heavy mobile Internet user, using more than 6 hours per week. Such usage indicates that most respondents have the capability and experience to access Internet services for mobile auctions.

#### 3.4. Attractiveness of Features

A central question in this study is what mobile auction features might be attractive to existing online auction users. Respondents were asked to indicate the attractiveness of features on a scale of 1 to 7, with 7 being the most attractive. The results are shown in Table 4.

For the total sample, the three most attractive features are 1) checking auction status, 2) contacting the seller or buyer, 3) notification of being outbid or auction close, tied with software agents. The least attractive features are receiving an SMS for newly posted items, wireless Internet browsing and searching, and mobile payment.

We compared attractiveness across groups. First, we examine feature attractiveness across auction participation: sellers only, buyers only, and both sellers and buyers. The most attractive feature, checking auction status, is consistent across all groups and there is some slight change in rank order of other features. Using a between-groups means t-test we find that there are significant differences between groups. Buyers only prefer notification of new items over sellers only. Those that are both sellers and buyers find notification of being outbid and closing alerts less attractive. Mobile payment is less attractive to those that are both sellers and buyers.

Second, we compare attractiveness between high and low auction users. High and low usage was determined by totaling transactions for items bought for buyers only, items sold for sellers only, and bought and sold items for those that are both buyers and sellers. The lowest 1/3 of the transactions were considered the "low" usage group, the highest 1/3 the "high" usage group.

The most attractive features to high auction users are 1) checking auction status, 2) contacting seller and buyer, and 3) item image display tied with wireless Internet bidding and software agents. Low auction users found that SMS notification of outbid and closing, notification of new items, and item image display were more attractive than high users. High users were slightly more likely to prefer wireless Internet bidding.

Third, we compare responses between genders. This revealed more significant differences than across the previous categories. Men show a higher preference for SMS notification for outbid and auction closing, for SMS notification of new items, item display, wireless Internet bidding, software agents, input questions and answers, and contacting

Table 4. Multi-group analysis of attractiveness of features

	Attract iveness	Auction Status						Auction Usage				Gender			
		Seller Only	Buyer Only	Seller & Buyer	Between Groups T-test		Low Usage	High Usage	Between Groups T-test		Male		Female	Between Groups T-test	
					F	Sig.			F	Sig.				F	Sig.
Base N=	981	146	288	547			348	343			382	599			
SMS outbid and closing alert	4.8	4.9	5.0	4.7	3.663	**	4.9	4.6	5.248	**	5.0	4.7	8.055	***	
SMS ad of a new posted item	3.7	3.5	4.1	3.6	7.605	***	4.0	3.5	13.440	***	4.0	3.6	10.080	***	
SMS bidding	4.7	4.8	4.6	4.7	0.353		4.5	4.7	1.188		4.8	4.6	2.286		
Wireless Internet browsing and searching	3.8	3.8	3.8	3.7	0.178		3.9	3.6	5.887	**	3.9	3.7	5.615	**	
Image display	4.8	4.8	4.9	4.8	0.313		4.8	4.8	0.200		4.9	4.7	1.875		
Wireless Internet bidding	4.7	4.9	4.7	4.7	0.771		4.6	4.8	2.705	*	4.9	4.6	4.871	**	
Software Agent automatic bidding	4.8	4.8	4.8	4.7	0.390		4.6	4.8	2.413		4.9	4.7	3.519	*	
Check My Auction status	5.1	5.1	5.1	5.1	0.030		5.0	5.1	0.044		5.1	5.1	0.772		
Upload image	4.7	4.6	4.8	4.7	0.381		4.8	4.6	2.414		4.7	4.7	0.480		
Mobile payment to settle auction purchase	3.9	4.1	4.0	3.7	3.556	**	3.9	3.8	0.256		4.0	3.8	2.619		
Input questions or answers by mobile handset	4.5	4.5	4.6	4.5	1.080		4.5	4.4	0.807		4.7	4.4	4.060	**	
Contact the seller or buyer	4.9	5.0	5.0	4.9	0.499		4.9	4.9	0.031		5.1	4.8	4.345	**	

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5. *M-auction adoption intention*

Measurement Items	Negative Intention			Neutral	Positive Intention		
	1	2	3	4	5	6	7
<b>Total</b>	<b>34.1%</b>			<b>34.5%</b>	<b>31.4%</b>		
I intend to use mobile auctions in the future.	10.6	10.9	10.8	33.8	21.4	8.4	4.1
I expect that I will use mobile auctions in the future.	10.7	10.7	9.1	32.7	23.1	9.3	4.4
I expect to use mobile auctions frequently in the future.	14.3	12.7	12.5	37.0	13.5	6.8	3.2

Table 6. *Multi-group analysis for adoption intentions*

	Negative Intention	Positive Intention	Total
Base N=	372	373	981
<b>Auction Status</b>			
Seller Only	14.5%	16.1%	14.9%
Buyer Only	26.3	34.3	29.4
Seller & Buyer	59.1	49.6	55.8
<b>Usage of Online Auctions</b>			
Low usage	46.5%	53.3%	50.4%
High usage	53.5	46.7	49.6
<b>Willingness to Pay (HKD)*</b>			
0	67.7%	33.8%	48.7%
10	19.9	39.9	30.9
20	7.5	15.0	12.2
30	3.0	5.6	4.6
40	0.3	1.1	0.5
50	1.1	2.9	2.1
60	0	0	0
70	0.3	0	0.2
80	0	0.5	0.2
90	0.3	0	0.1
100	0	0.8	0.3
>150	0	0.3	0.1
<b>Monthly Income (HKD)</b>			
<3,999	54.6%	47.2%	51.1%
4,000-7,999	12.6	16.9	15.4
8,000-14,999	20.4	23.9	22.1
15,000	12.4	12.1	11.4
<b>Age</b>			
<18	32.3%	39.4%	36.0%
19-24	32.5	30.0	31.2
25-34	26.6	24.7	25.3
>35	8.6	5.9	7.5

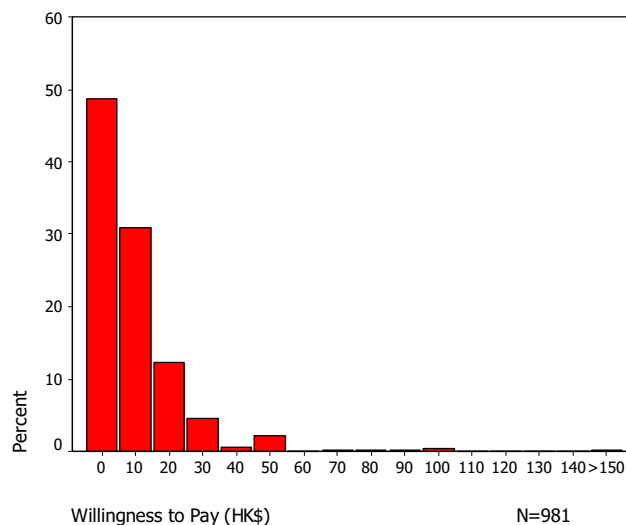
\* Rows 110, 120, 130, and 140 are omitted as all values are 0

sellers or buyers than women. That is, in general, women found 7 of the 12 features significantly less attractive than men.

### 3.5. Intention to Adopt

Intent to adopt mobile auctions is measured by three items in Davis (1989). Table 5 displays the distribution of responses. Using the average of the three items, 34.1% indicate negative intentions towards adoption, 31.5% are neutral, and 31.4% indicate positive intentions towards adoption.

We split the adoption intention into two groups by summing the scores of the three adoption items together. If the sum is larger than 12 (the sum score for "Neutral" group), then the respondent is classified in the "Positive Intention" group; if the sum is less than 12, then the respondent is classified in "Negative Intention" group.

Figure 2. *Willingness to pay for m-auction features (7.8HKD=1USD)*

Examining a comparison of the "Negative Intention" group with "Positive Intention" group across several dimensions in Table 6, we find that:

- The seller only or buyer only groups has a higher positive intention to adopt mobile auctions than the seller and buyer group. The groups of sellers only (16.1%) and buyers only (34.3%) have a higher percentage of positive adoption intention than that of the total sample (14.9% and 29.4% respectively), but the both seller and buyer group (49.6%) has a lower level of positive adoption intention than that of the total population (55.8%), and vice versa for negative intention group.
- Low usage users show greater intention to adopt mobile auctions than high usage users. Among the positive intention group, 53.3% are low usage users; among the negative intention group, 53.5% are high usage users.
- The positive intention group shows a greater willingness to pay. For the positive intention group, only 33.8% indicate they are unwilling to pay compared with 67.7% in negative intention group. Among the categories of willing to pay (10, 20, 30, 50, 80, 100, >150). The percentage of users willing to pay is higher in the positive intention group than in the negative intention group.
- The positive intention group generally has a higher monthly income and is younger.

### 3.6. Willingness to Pay

While mobile users might wish to have many features, what features are they willing to pay for? That is, can a mobile auction extension to a "free" online auction be monetized in any way?

Respondents were asked to indicate for each feature whether or not they would be willing to pay for that feature. Their response was not required. Overall, 474 respondents indicated any willingness to pay for any feature. Of those that responded, the most frequent feature was "SMS bidding" with 77 positive responses.

Respondents were also asked in a separate question how much they would be willing to pay for their preferred features. Their responses are shown in Figure 2. 48.7% of respondents indicated they wish to receive the preferred features for free. Of the 503 respondents willing to pay, 96% were willing to pay between 10 and 30HKD (1.28-3.85 USD) per month.

## 4. CONCLUSIONS

C2C online auction providers are extending their online auctions to the mobile interface. In doing so they are faced with questions about what



features to offer and whether users are willing to pay for the features. This study has presented some initial results of a study of mobile auction adoption. The major findings are:

- Respondents indicated that the most desirable features of mobile actions are informational –status information, contacting sellers and buyers for more information, notifications of being outbid or auction closing. These features are opposed to transaction features such as payment settlement and initiating new auction transactions.
- There are significant differences between subgroups in the sample: sellers/buyers, high/low usage and gender.
- Respondents indicate that they are in general unwilling to pay for features, or at most willing to pay on a nominal fee for mobile auction features.

With respect to the issues facing the development of mobile auction platforms for online auction providers these initial findings suggest several issues. Potential m-auction adopters appear to view m-auction features as an informational extension to online auction functionality. That is, while most users appear to have access to mobile Internet and are frequent users of mobile Internet, they do not perceive m-auctions as a replacement for online auctions. Rather, the m-auctions are perceived as a complement to, rather than a replacement for, online auction. Approaching m-auctions as a “killer app” for m-commerce is probably misguided at this time. Within the existing online auction population, m-auctions are unlikely to draw new users to auctions purely for mobile convenience. We note that attitudes towards m-auctions may reflect online auction users experiences with particular types of goods and services that are sold in online auctions. New types of goods and services might be offered that are only available on mobile platforms (such as the “guerilla auctions” in Japan), that might change perceptions of m-auctions.

Finally, from prior studies we know there are significant differences in cultural attitudes towards mobile commerce usage across nations (Kim, et al, 2004). This raises cross-cultural issues in the study of m-auctions and a caution for generalizing these results. That said, the Hong Kong m-auction population is probably more similar to Asian markets, in particular in Japan and China.

In further research we will examine antecedents of mobile auction adoption and explore a more refined subgrouping of the respondents in order to understand m-auction adoption intention.

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