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Consumer Readiness for Microtransactions in Digital Content Business Models

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Abstract: As digital content increasingly moves away from free access, microtransactions may provide an alternative. There is a need for research on microtransactions as a general digital content payment mechanism. Businesses can capitalize on this technological advancement by expanding their paid digital content offerings without resorting to subscription-based services. This study examines a taxonomy for microtransactions based on consumer buying behavior, presents business models for microtransaction payment processing, and examines issues with its implementation. Data collected from 180 consumers were analyzed using quantitative and qualitative analyses to assess the receptiveness and perception of microtransactions. The results indicate that consumers are receptive to the concept of microtransactions and are willing to spend on five distinct digital content categories. This study concludes with a discussion of issues that consumers foresee with digital content microtransactions and implications for interested businesses.

Keywords: microtransactions; business models; digital content

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1. Introduction

The Internet is an effective and efficient information exchange medium with a broad reach. At the same time network bandwidth has increased, the richness of information that flows through it has also increased. As an information exchange medium, the value proposition of the Internet stems mainly from transforming physical flows into universally accessible information flows. This has led to a proliferation of digital goods. For example, paper books replaced with eBooks that can be read on an electronic medium like Kindle and other book readers, and check deposits replaced with capturing an image of the check on a mobile banking app. In the case of financial transactions, information exchanged securely does away with the need for any physical exchange of paper and currency. In e-tailing, the need for customer presence at a brick-and-mortar store is removed by providing rich information on the products through a graphical user interface. For many products, the information provided through the Internet is sufficient to initiate a purchase, thereby reducing the need to examine the physical product.

The commercial value of the Internet for the delivery of digital goods has been amply proven. Examples include entertainment subscription services like Netflix and Amazon Prime. Most of this information is free. However, it is becoming increasingly apparent to users that the content is not free. There are associated costs such as erosion of privacy, profiling, and constant tracking. The Cambridge Analytica incident involving Facebook [1] has made it apparent that the cost of 'free' information is loss of privacy and individual profiling, primarily for advertising and marketing purposes. Users are beginning to understand that the vast infrastructure that underlies all the information-based products and services and the flows that deliver these to customers have associated costs, and someone somewhere must pay for it. End users typically pay for the content through advertisements and, at times, through subscription services. However, a vast majority of end users do not pay for the content and services they consume, though it has been understood for a

long time that such content is not free [2,3]. A prime example is YouTube, which is free. Subscription for special content is available with services like Netflix, Pandora, YouTube Premium, etc. Many newspaper and magazine outlets have successfully transitioned to a subscription model (e.g., Wall Street Journal, New York Times). Wired magazine recently transitioned to a paywall and reported success with that model [4]. However, the pitfalls of the subscription models are apparent. It restricts content and services to a particular content provider. It limits a consumer's choice, perhaps violating Stewart Brand's famous dictum that "information wants to be free" [5]. A counter to paying for a subscription from a single vendor is aggregation—services like Apple News+ that aggregate contents from various sources. However, provisioning of such a service is perhaps only an option for big content providers who can negotiate favorable agreements with different parties to keep the prices low. Unfortunately, this approach typically leads to the exclusion of small and niche content providers.

An alternative to paying for digital content through subscription or aggregation services is paying for content through micropayments, which can be as small as a fraction of a cent. The user pays for each piece of digital content with a micropayment. Figure 1 shows a payment model in a microtransaction-enabled Internet which can span from free and ad-supported, to a combination of ad-supported and micropayment-based, to an ad-free micropayment-based, micropayment and subscription-based, and lastly, to subscription-based. As more money has poured into online advertising, most online services have sustained their free content model. This model may suffer as more users have become aware of privacy compromises, use new tools like ad-blockers, and use 'do not track' browser options. There is also pressure for governments to catch up to privacy regulations like the American Data Privacy and Protection Act (ADPPA) in the US [6]. Rather than content disappearing behind subscription paywalls or being shown on heavily ad-supported pages, microtransactions for digital content can provide a source of revenue in conjunction with traditional online advertising approaches. As such, further examination of the phenomenon is warranted.

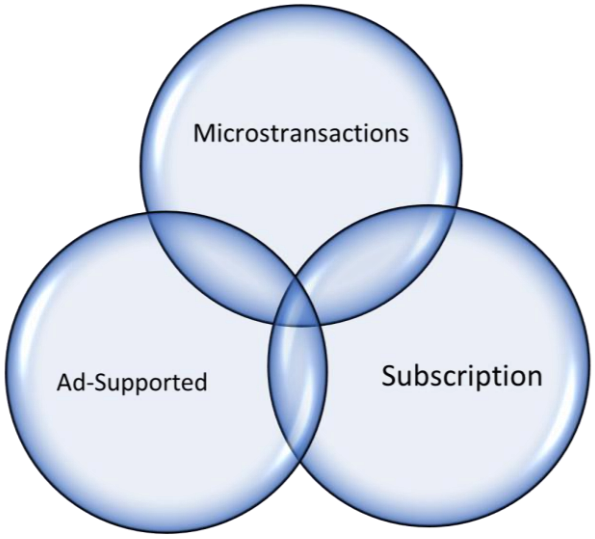

Figure 1. Digital content revenue models.

Providers are trying to figure out how to work out their subscription models and put content behind paywalls to maximize their revenue. Limited peer-review research suggests that customers subscribe to content based on the perception of convenience, essentiality, added value, service quality, and service usage rate [7]. Subscriptions thus hold value for certain portions of the population and specific purposes. They, however, can only fulfill some needs. It does not fit most people's general and casual information consumption model. Most people read a variety of news articles from a variety of sources. In such

cases, the subscription model severely limits the variety of sources that the consumers have become accustomed to. As has been the case with online streaming providers like Netflix, Disney+, Hulu, and others, content is on the way to being increasingly fragmented behind different subscription paywalls, thereby increasing customer costs. Paywalls or subscriptions may also not be the complete answer to the income/revenue problem. Myllylahti [8] found that newspaper paywalls provide roughly 10 percent of media companies' publishing/circulation revenues. Paywalls are softening, and prices, in some cases, are decreasing as news corporations fight for new digital subscribers and revenues. The argument here is that the revenue generated by paid online news content is not substantial enough to make paywalls a viable business model in the short term [8] for all providers. The use of subscriptions through aggregators like Apple News+ may provide another answer. However, the trends, especially from streaming services, seem to point in the other direction.

Microtransactions or transactions of small monetary value may provide another answer or a complete answer in some cases. The value proposition of microtransactions is that they allow for charging a small fee for an online product and/or service to the consumers without a subscription and subjecting users to privacy-intrusive measures. How small is this value? The lower limit of a transaction that existing technologies can support is as low as a fraction of a cent [9–11]. The payment can be termed a micropayment, and the transaction using this micropayment is a microtransaction. Theoretically, this limit can be as low as possible within the constraints of the processing costs and associated technologies. The business models and the regulatory environment can impose artificial constraints [12]. The research questions examined in this study are the following: What is the viability of and use of microtransactions as a revenue model for information-based services and products? And what are the different kinds of products and services amenable to microtransactions?

The rest of the paper is organized as follows. The Section 2 provides the conceptual background of the microtransaction model, which includes a taxonomy of microtransactions based on consumer buying behavior. The Section 3 provides the research method which details how the data were collected and analyzed. The Section 4 provides a detailed account of the results and findings. This is followed by a discussion of the findings and its implications to the literature in the Sections 5 and 6. The Section 7 concludes the paper by summarizing the research within the context of digital content in business models.

2. Conceptual Background

Microtransactions have been around for more than 20 years [13–17]. There is a wide variety of research on various aspects, mainly on payment models and their technical characteristics. Yet, there is a paucity of research on consumer perception of microtransaction payment models. It was predicted that they would revolutionize the online information market as far back as the late 90s [15–17]. Jupiter Communications [15] predicted that the growth in the Internet online transaction market would be fueled in the future by a microtransaction market designed for small-value purchases using emerging electronic payment systems. When microtransactions appeared as a new phenomenon, the content was still primarily on print or physical media. The Internet as a content distribution mechanism was in its nascent stages, and most content was free; commercialization of the Internet was starting; the bandwidth was limited, etc. As consumers have become accustomed to consuming content on the Internet, content providers have increasingly started charging for quality of content. Consumers are increasingly willing to pay for content (this is also validated using a consumer survey in this research). The advancement of technologies in conjunction with the maturing of the Internet indicates that it may be the time to introduce microtransactions into the content revenue model. This is validated by the fact that in video games, one-half of the total revenue of big video game publishers comes from microtransactions [18].

The prime value proposition of microtransactions is the ability to disaggregate or unbundle products and services so that they can be consumed at a rate suitable for various

classes of customers without resorting to any subscription or bundling. The key point here is to ensure that the price is so low that the consumption of the disaggregated product or service is perceived as a value option compared to a subscription or a bundled product. An excellent example is the concept of singles or a single song that may cost 99 cents instead of an album with 14 songs costing $13.99. This disaggregation also allows for price differential on individual songs. This implies the ability to read an article of interest for as low as 1 cent or use software for web page authoring for about $ 1.00 a day without buying a yearly subscription. Markopoulos et al. [19] proposed a model of selling detailed product information through microtransactions that increases consumer and seller welfare.

For this study, we define microtransactions as transactions valued in a fraction of a cent which may not necessarily have a lower limit. We qualify that this fraction may lower itself as technology becomes more advanced, and it may also increase to multiples of a cent due to inflation in the future. Tufekci [20] envisions such a system as being as seamless as browsing, dispensing pennies or fractions of a penny to read news and fiction and supporting artists and writers without going through an elaborate process of creating an account. A microtransaction-based business model enables merchants to offer services covering the whole spectrum of free to subscription-based information goods and services. It provides the flexibility to offer any price effectively. From the consumer perspective, this moves the needle from a fixed cost model with limited choice to a variable cost model with a wide variety of choices. For suppliers, this translates to a revenue model that can be used with a larger number of consumers than a subscription model. In addition, it may offer an alternative between a truly free and subscription-based model. It can sit somewhere in the middle. This middle ground may be content with limited advertisements or advertisements that do not track customers. The revenue model for such transactions is based on large transaction volumes (something that the Internet can aptly provide). It is worthwhile mentioning that for providers which do not have a large customer base, the existing models supported by advertising may still be employed. While the word microtransaction implies the use of micropayment or small monetary value, there have been few agreements on what this value is. It is obvious that this small value is a function of several things like the available technology, consumer behavior, transaction processing costs, etc.

Though the model has been successfully employed in the gaming industry, the implementation is through selling micro content using accumulated value with the content provider or the gaming company. A microtransaction business model generates more revenue from a game after the initial purchase. Gamers can buy guns, magical powers, etc., to advance in the game without prior skill or knowledge [21]. The current study explores a more general model of microtransactions that could be implemented using accumulated balances, digital wallets, or otherwise, and which can be used seamlessly across multiple content providers. It considers all digital content, including gaming.

2.1. Nature of Microtransactions

Relevant to the context of microtransactions is planning for purchase. The reason for this is that the amounts are tiny. Hence, this planning process is neither elaborate nor time-consuming. The need is strong enough to elicit the purchase and compensate for the absence of elaborate planning. We identify three kinds of purchases: impulse, habitual, and ad-hoc, based on the kind of need and absence of elaborate planning.

All of us engage in buying things of small value in real life. This small value can be agreed upon as little as a few cents. This purchase may sometimes be out of pure impulse, like grabbing a candy when checking out at the cash register at a supermarket; or it may be something regular or habitual, like buying a newspaper from the vending machine every Sunday morning; or it may also be to satisfy some immediate ad-hoc need, like satisfying hunger with a bar of chocolate from the vending machine in between classes. Due to the small value of all these purchases, they may be characterized as microtransactions in the physical world. A typical purchase process is fast, and the whole process is completed within a few seconds. One can envision similar microtransactions

of digital goods and services. In the e-commerce world, where physical goods are also transacted, microtransactions in physical goods and services happen when these goods are bundled with another high-value purchase (to overcome the constraints of shipping and handling costs). An important enabling factor for any microtransaction would be business models and technological capabilities such that the cost of processing the transaction is smaller than the transaction's value, resulting in a monetary benefit to the seller of the good or service. For digital goods, the marginal cost of producing a copy and its distribution may be near zero [22]. Hence, the transaction cost may be the primary determinant of feasibility.

Some examples of e-commerce microtransactions may be greeting cards, online games, detailed stock analysis, phone number and address lookup, complete articles, especially long-reads, pictures, single edition of the newspaper (without the need to subscribe to the service for the entire year), chapters of a book (instead of buying the whole book), renting of software (many people require the use of some software only occasionally such as when modifying the personal web page), charges for email storage when the user quota is exceeded, and so on. Unbundling of the bigger products and services to finer granular levels can spawn a plethora of goods and services amenable to microtransactions. These unbundled products and services would enable the consumer to realize a better utility for their money (e.g., buying a single song as already enabled on services like iTunes) by widening the options available.

2.2. Taxonomy of Microtransactions

As stressed earlier, a microtransaction is defined as a small ticket or small value item that may range in a fraction of a cent. For a transaction of such small monetary value, one may hypothesize that the perceived risks and costs of making such a transaction are low and may be the key factor that may induce the customer to pay for otherwise free content. For unplanned purchases, a wrong decision would not lead to negative normative evaluations of the buying behavior [23] and this may positively influence the propensity of carrying out an individual microtransaction. However, post-hoc evaluations of the cumulative transaction amount over a period of time and the evaluation of the utility of the transactions may influence this positive propensity. For planned purchases, the small value may not negatively affect the propensity to conduct microtransactions. The small monetary amount would dictate a low level of effort in carrying out such transactions that would maintain what economists call a base level of utility for the customer. Under the hypothesis of low perceived risk/cost, no negative influence on the propensity to carry out a microtransaction, and transaction satisfying a base level of utility, three different kinds of microtransactions may be identified. They differ in the nature of the need they satisfy, the amount of planning accompanying the buying behavior, and the transaction frequency.

Extant research has examined how consumers engage in purchasing behaviors based on different goals, such as hedonic, normative, or gain goals [24,25]. Building from this foundation, we examine microtransactions from three perspectives: impulse, habitual, or ad-hoc microtransactions. Impulse microtransactions result from impulse purchase decisions (unplanned purchases) where there may be no perceived need for making such a transaction as it is to satisfy a want or desire (hedonic). Habitual microtransactions may happen due to a habit or ritual (planned purchase) (normative). The value attached by a customer in these transactions is akin to the hygiene factor (successful culmination may not result in significant levels of satisfaction, but denial may result in significant dissatisfaction), where maintaining some base level of utility would be extremely important. Lastly, ad-hoc microtransactions may occur to satisfy some essential need (gain).

2.2.1. Impulse Microtransactions

An impulse purchase may be categorized [26] as pure, reminder, suggestion, or planned impulse buying. These different types of impulse buying are centered on the absence/lack of planning surrounding the purchase. The customer does not go through an elaborate search process for the product in question being bought. In this study, we catego-

rize impulse microtransactions as purchases that are pure impulse, reminder impulse, or suggestion impulse. Planned impulse purchases are branded as habitual microtransactions (also in agreement with Rook's definition) [27].

Impulse purchases are also characterized by the pleasure principle [24–27], aiming at immediate gratification [24,25] through immediate or near-immediate consumption. Impulse buyers also see themselves as more emotionalized [28] and may be highly involved in the purchase even though the monetary amount involved may be small. Impulse microtransactions offer the greatest revenue opportunities for e-businesses with their small monetary value, immediate gratification through the transfer of content over the Internet, and high emotional involvement. They can take advantage of the serendipitous shopping habits of consumers by providing low-cost impulse purchases [17] and be a significant source of revenue for merchants on the Internet. Though one should be careful as to branding products as impulse or non-impulse [27] as any product may be bought on impulse, one may still look at some products that may be amenable to an impulse purchase with the awareness that impulse buying does vary across product lines [29]. In the e-commerce scenario, some examples of impulse microtransactions may include playing games at the next level [30], an argument for which has been made based on the theory of ego-depletion [31]; magazine articles and greeting cards, amongst others.

2.2.2. Habitual Microtransactions

Habitual purchases can be classified as routine/repeated purchases that are typically considered low in importance and involvement [24,25,32]. The primary goal of these repetitive and relatively unimportant decisions is not to make an optimal choice but a satisfactory choice while minimizing the cognitive effort [32]. In economic terms, we may see this as a maximization of the utility of the decision-making process. The decision-making for a repeat purchase for such transactions matures over several trials (what is referred to as the choice tactic), and the decision-making criteria may be based on several parameters that reduce the cognitive effort apart from price [32]. For example, the customer may visit known sites for purchase. However, if the known site does not provide the merchandise, the customer may either settle for a substitute or abandon the buying decision instead of going to a different site or merchant.

While a subscription-based model may be considered viable for habitual purchases, microtransactions can enable habitual purchases without locking customers into a merchant. Thus, one may buy an electronic version of the newspaper infrequently or maybe just the weekend edition on a tablet device habitually without subscribing to the newspaper. Habitual microtransactions provide choice to the customer while still satisfying his/her needs. The choice is important from a customer's viewpoint since the Internet offers similar services from various vendors.

2.2.3. Ad-Hoc Microtransactions

Often, one may feel the need for something important for which the person is willing to spend a small amount. For example, people may pay 25 cents for a telephone number inquiry and pay extra for a movie ticket reservation. Ad-hoc microtransactions are characterized by some amount of planning for purchases since they are need-based [24,25]. They occur in an ad-hoc fashion without any regular pattern. Sometimes, they may be a temporary step to a more permanent and satisfying solution. For example, snack purchases from a vending machine may temporarily satisfy hunger until the person eats a full meal. It is hypothesized here that the decision-making criteria (for purchase) may be based on several parameters that reduce the cognitive effort apart from price. Since a realized need exists, the buying behavior may be price inelastic within some limits.

The amount and variety of information available on the Internet is vast. It has been documented in various practitioner studies that consumers use the Internet to satisfy their ad-hoc information needs, like seeking information on a pre-owned vehicle, contact information of a person who needs to be contacted, etc. Such information requirements are

apt for ad-hoc microtransactions. Other services, like using a specialized software from an Application Service Provider (ASP) or Software as a Service (SaaS) provider for an hour, extra disk quota for an email account to receive a large attachment, or buying processing power on the cloud, can also be made viable.

2.2.4. Taxonomy: Utility and Implications

The taxonomy presented before can serve as a basis for further analysis of microtransactions. This analysis is summarized in Table 1. This taxonomy can be used to analyze the enabling mechanisms that need to be implemented for enabling microtransactions. For example, a user is likely to go to known sites for habitual transactions, though he/she may have many options. This is in line with the choice tactic aimed at reducing cognitive effort. The implication for e-businesses would be to create brand equity to create a top-of-the-mind recall position for the website. Another implication is the ease of transaction, which may cover facets like interactivity, single-click shopping, etc. For impulse microtransactions, technology may provide options for inducing impulse purchases; for example, in an online game, depending upon the score, the bonus may include the option of buying additional life for a small payment.

Table 1. Taxonomy of Microtransactions.

Microtransaction Type	Characteristics	Frequency	Example Products
Impulse (pure, reminder, and suggestion impulse)	The need is not realized or explicit but is intense and emotional.	No regularity.	Music, games, greeting cards, desktop wallpapers, etc.
Habitual (including planned impulse purchases)	Realized and Explicit need. Use of choice tactics to lower the cognitive effort involved in the purchase.	The transaction occurs at regular intervals, and some base frequency may exist.	Newspapers, stock details, journal articles, games.
Ad-hoc	Realized and Explicit need. Planned purchase. Purchase behavior aimed at decreasing cognitive effort.	Ad-hoc with no regular frequency.	News Articles, Journal Article Reprints, Computing cycles, Software use from an application service provider or the cloud, Cloud space.

2.3. Microtransaction Technologies and Business Models

Microtransactions, though having the intuitive appeal of a viable business model, have not been used as a general mechanism for paying for digital content. Currently, they are mostly restricted to gaming. Microtransactions are common in online games where users play the games for free and upgrade their persona by buying different paraphernalia within the game [33]. In mobile games, in-game purchases have also seen success with microtransactions [34].

One possible reason for the absence of the use of microtransactions as a general content payment mechanism is due to the absence of business models and mechanisms to support such business models. Enabling technologies, combined with a viable microtransaction service, can offer various products and services from various providers. Many such enabling technologies are in existence. These technologies are examples that can be utilized with the right business model to meet customer needs.

2.3.1. Enabling Technologies

Several enabling technologies for microtransactions have been in existence since the Internet's early days of commercialization. In 1999, an Aberdeen Group report provided a profile of 21 vendors with available technology of some kind for microtransactions. Some of these technologies are still relevant. The work on patents and technologies to enable microtransactions has been going on throughout the years [35–39]. These enabling

technologies may alleviate the concerns about the technical feasibility of implementing the microtransaction model. Recently, a company named Coil [38] has implemented a technology for microtransactions that works across multiple content providers. Coil's business model is similar to the one proposed in this research. The subscriber pays a monthly amount to Coil, and Coil pays money to the various other companies and creators whose work one reads or watches. The Coil subscription service is already available on https://imgur.com/ (accessed on 24 January 2024) and some other sites [40].

In the presence of several enabling technologies, one may conclude that lack of standardization, competition, and incompatibility may be the biggest reasons why any of these existing technologies have not become mainstream. It is often conjectured that a true microtransaction market can only be feasible in the presence of electronic cash coupled with an electronic wallet. This would take some time. The existing technologies use scrips from a consortium of brokers and not real cash. It may be argued that these scrips, when backed by prominent e-commerce content providers, may provide a viable mechanism for microtransaction payment in the absence of CBDCs.

A promising new technology for microtransactions could be cryptocurrencies like Bitcoin, Ethereum, and other digital coins. These cryptocurrencies stored in an e-wallet can act like digital cash. However, the block creation time of 10 min in Bitcoin and 45 s in Ethereum, along with the provisions of incentivizing miners to include the transaction in the block, make transacting using micropayments infeasible for most cryptocurrencies.

These technologies and companies like Coil indicate that technical feasibility may not be an issue, and there may be a need for a consumer-favored business model. Consumer behavior, at most times, is difficult to pin down and, hence, may need to be studied.

2.3.2. Consumer Perception & Readiness

As has been discussed before, microtransactions through micropayments is an existing idea with several enabling technologies that have been in existence for some time (since the 1990s). Current consumers are used to free content on the Internet supported by advertising, though there has been an increase in subscription-based services, especially for brands with good brand equity. Consumers have become profoundly aware of constant tracking profiling, which is one of the costs of free services [41]. The Facebook fiasco with Cambridge Analytica put the cost of privacy when using free Internet services out in the open. There has been a recent trend for quality content moving behind paywalls and subscriptions due to the decline of print media and print advertising and digital content becoming the primary source of revenue. These include content from the New York Times, Wired, Popular Mechanics, and others. These only offer five to six free articles per month supported by ads and then require a subscription.

Though the microtransaction model with micropayments makes sense, the question of customer perception and receptiveness has only been explored to a limited extent. The obvious question is whether the consumers will adopt it. There has been some research in gaming [42], but it is very limited in the context of all content and general consumers. To gauge the general consumer perception and readiness, short consumer interviews were conducted. The consumers were free to pick any product of their preference in an open-ended fashion, and the content choice was not restricted to gaming.

3. Research Method

The data were collected in 2021 from 180 respondents using short interviews (10–15 min) conducted with respondents who are general consumers. Data were collected on issues that consumers might have with the microtransaction model, products and services that the interviewee would be willing to pay for using the microtransaction model, and a numerical rating of 1 to 10 on whether the model was a good idea. Conducting interviews allowed the researchers to explain the concepts of microtransactions as a model for consuming digital content and services. A survey-based instrument would have proved challenging as many respondents may not comprehend the model. Interviews were split between face-to-face

(40%), phone (30%), and Zoom interviews (30%). Demographics were recorded, then the concept of microtransactions was explained along with the possible benefits (disaggregation of any bundled product and the ability to consume them granularly using micropayments, alternative to subscription, preservation of privacy).

Respondents were recruited through students enrolled in an executive MBA class and were selected based on their varied demographic profiles. The respondents were relatively equally distributed between males (46.7%) and females (53.3%). Respondents were satisfactorily distributed across ages, with more respondents aged 25–35. There was a wide range in the time spent on the Internet on free browsing, ranging from 0 h to 60+ h per week, with a peak between 10 and 20 h. Figure 2 represents the age distribution and Figure 3 shows the distribution of time spent on the Internet.

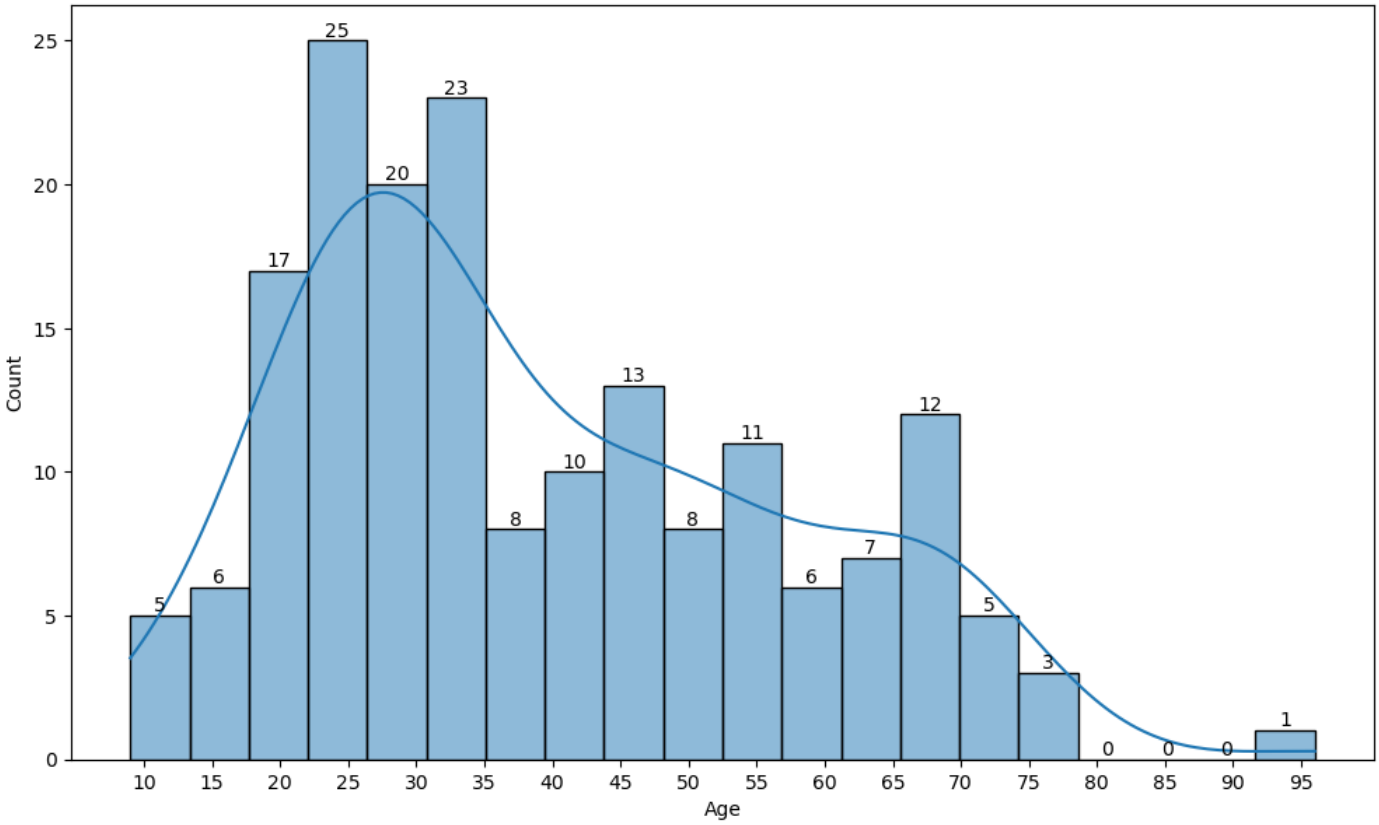

Figure 2. Respondent age distribution with kernel density estimator line (Mean 39.33, Std Dev: 17.692).

SPSS statistical software version 28 and Anaconda python distribution (for charting) were used to analyze the results of the quantitative variables. Qualitative analysis was done to examine consumers' perceptions of this model. Individual responses to a question were combined in a single document. This yielded a document with all responses to a question. Each document was then analyzed to develop categories that can facilitate future examination. Responses were coded into different categories, and new categories were formed as the analysis proceeded. Categories were further refined at the end of the document analysis. In the second round of examination, the movement of items from one category to another was less than 10%. While this was done by the primary researcher, in the third round, another researcher was requested to validate the categories and the associated placement of items in those categories. The agreement on item classification was about 95% on "product and services" and is sufficient for purposes of reliability [43] of the categorization.

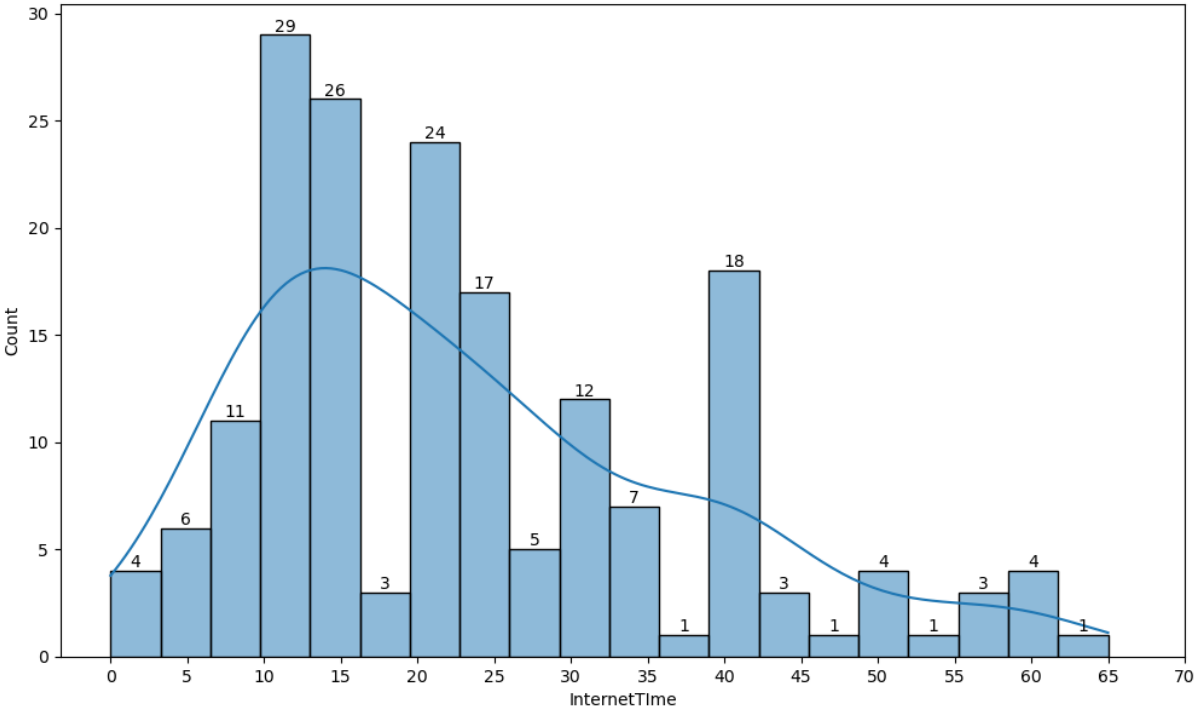

Figure 3. Distribution of Internet time (hours/week) spent on free content with kernel density estimator line (Mean: 23.26, Std Dev: 14.314).

4. Results

Figure 4 highlights the ratings of microtransaction models by consumers. More consumers were receptive to the idea, with 71.1% of the ratings at 5.0 and above, which may indicate that given the maturity of the Internet and the movement of content to the subscription model, consumers appear to be more receptive to the microtransaction model.

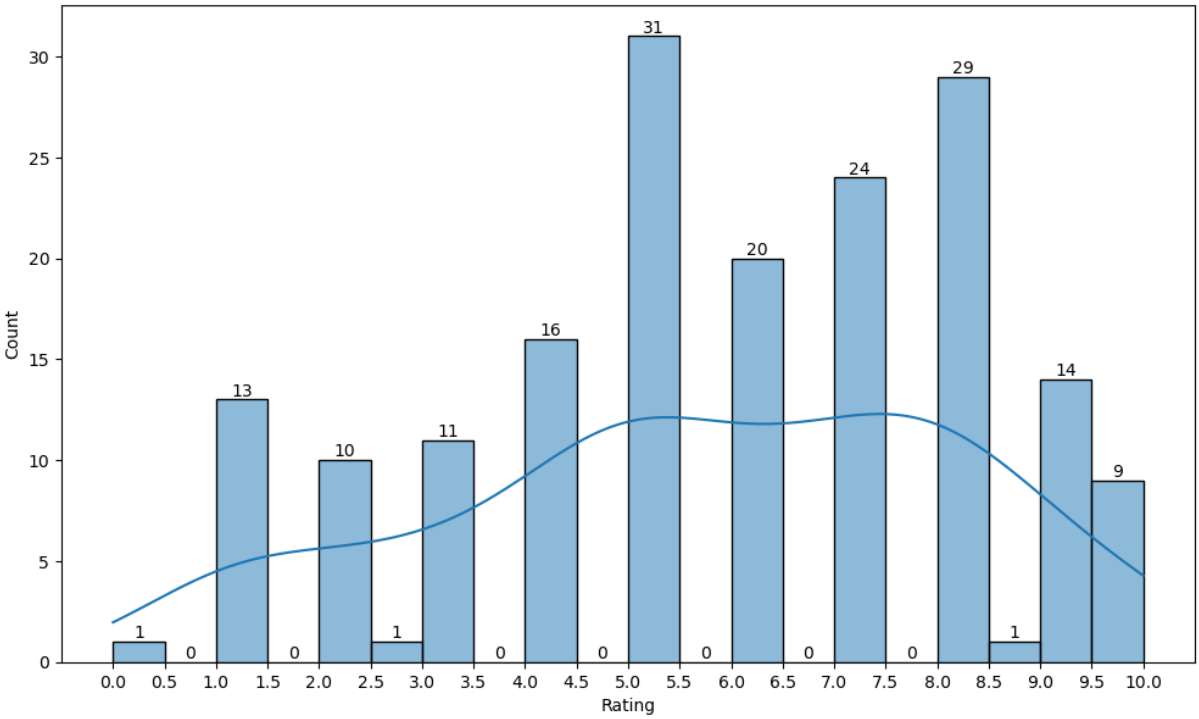

Figure 4. Rating of the microtransaction model with kernel density estimator line (Mean: 5.73, Std Dev: 2.513).

To analyze the characteristics of the consumers more receptive to this model, a cluster analysis was run on age, time spent on the Internet, and rating of microtransactions (Tables 2 and 3). Two distinct clusters emerged (based on the maximization of the differences in clusters using F tests as outlined in Table 3). This exercise was more exploratory rather than to draw any conclusive inferences on customer segmentation due to the relatively modest sample size. Though the cluster centroids differed in age and internet usage, the difference in rating of the microtransactions was not that far apart, though all differences are statistically significant. The cluster analysis may support the hypothesis that younger consumers who spend more time on the Internet are more likely to be receptive to the concept of microtransactions as compared to older consumers who spend less time on the Internet. However, the difference is not that large. Figure 5 shows the cluster map.

Table 2. Consumer clusters.

Final Cluster Centers		
	Cluster	
	1	**2**
Age	29	60
Internet Time	28	14
Rating	6.0	5.2
Distance	33.375	33.375

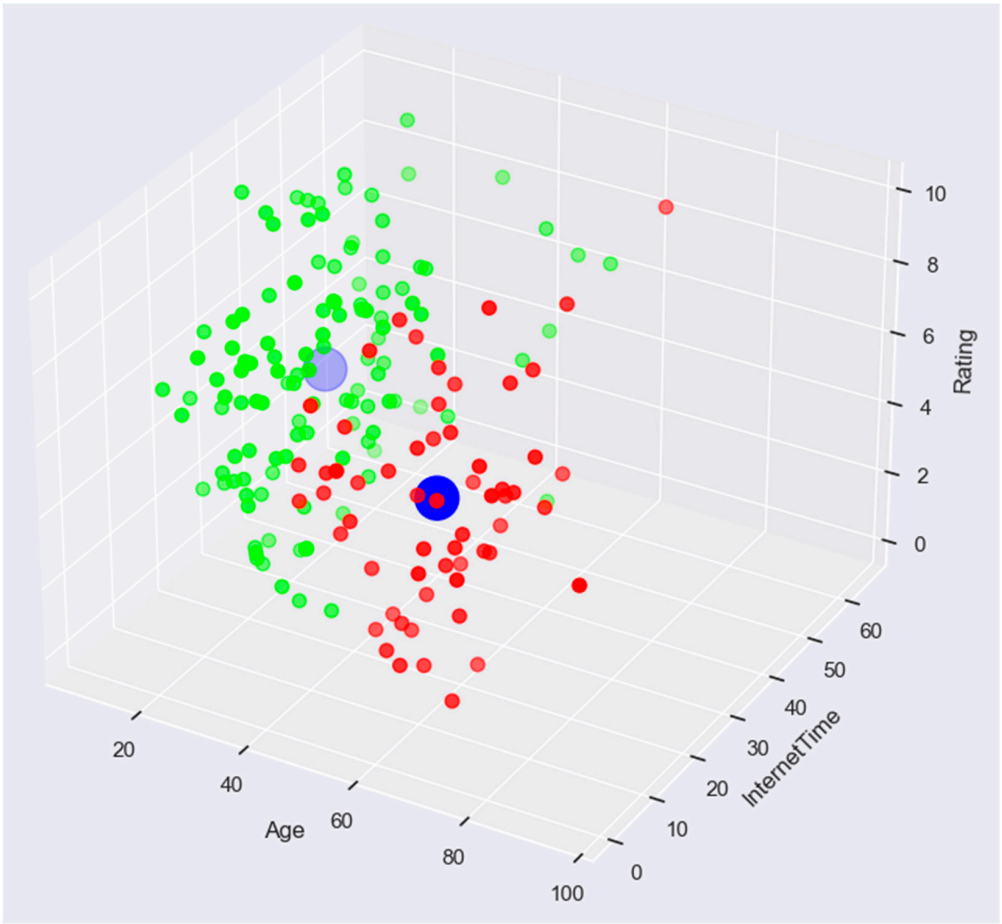

Figure 5. Cluster map for two clusters (red and green small dots distinguish between the two clusters; blue large dots show the centroids).

Table 3. ANOVA tables for clusters.

ANOVA						
	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Age	38,460.669	1	98.691	178	389.708	0.000
Internet Time	7031.336	1	166.544	178	42.219	0.000
Rating	28.900	1	6.190	178	4.669	0.032

NOTE: The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

5. Qualitative Analysis

5.1. Products and Services

It is evident from the products and services mentioned in the survey that consumers are ready to consume digital content with microtransactions. Consumers are looking for an alternative to the subscription model and the advertisement-supported content provision model. The biggest driver of microtransactions from the consumer perspective appears to be the disaggregation of the bundles (including subscriptions) and the ability to consume whatever the consumers desire to consume, at will and at a small cost. Some of this was also extended to the physical world, where two respondents mentioned paying for gyms using this model. Table 4 lists products from the survey that consumers are willing to microtransact in. The numbers in square brackets indicate the number of consumers who mentioned the product or service. The categorization is at a coarse level, and alternative classifications may exist. The analysis can be further refined, and future research using text-mining software will attempt to do that. There are nuances in each category and item. For instance, for sports, consumers want to watch either a specific team, wrestler, or a specific sports event like the Superbowl or Cricket World Cup final.

Table 4. Products consumers may transact using microtransactions.

#	Category	Description (Consumer Numbers in Square Brackets)
1.	Streaming media	1. YouTube [11] 2. General streaming [7] 3. HBO [1], Disney+ [1], ESPN [1], WWE [1], Netflix [1], Amazon Prime [1] 4. Educational Videos [7] 5. Movies [6] 6. Sports [7] 7. Podcast [3] 8. TV shows & news [9] 9. Music [19] 10. Exercise & fitness [8]
2.	News and Information	1. Newspapers like New York Times, Washington Post, Wall Street Journal, etc. [31] 2. Detailed studies and analysis like stock analysis, sports analysis, etc. [19] 3. Scholarly work and journals [11] 4. Magazines [20] 5. Specialty articles (cars, recipes, fantasy football, DIY, etc.) [39] 6. Academic materials (textbooks, Chegg, etc.) [17]

Table 4. *Cont.*

#	Category	Description (Consumer Numbers in Square Brackets)
3.	Technology Services	1. Software (Adobe Photoshop, Identity-theft, etc.) [17] 2. Texting [1] 3. Circuit schemas and add-ons [1] 4. Online fax services [1] 5. Additional email quota for travel [1] 6. Analytics data [1] 7. Banking [1]
4.	Gaming	1. Gaming (add-ons, guides, etc.) [34] 2. Gambling [2]
5.	Websites	1. Cooking websites [1] 2. Craft websites [3] 3. Social media (Facebook, Instagram, Tinder, etc.) [12] 4. Wikipedia [1] 5. Google [3] 6. Blogs [2] 7. Others (auction, coupons, etc.) [15]
6.	No products (opposed to the idea)	Will never use microtransactions [18]
7.	All possible uses	Will use for everything [1]

From Table 4, it is apparent that there is consumer willingness to pay for content if there is an appropriate microtransaction model in place. Further insight into consumer behavior in fine-grained fashion can be achieved through detailed analysis in future studies.

5.2. Perceived Issues with the Microtransaction Business Model

The respondents were asked about the issues of a microtransaction business model. The authors validated and agreed upon categories and classification of the issues presented by respondents (Table 5). Due to issues spanning multiple categories, respondent counts are not presented in this table.

Table 5. Issues with the microtransaction business model.

#	Category	Issues
1.	Monetary Issues	• Unwillingness to pay above and beyond paying the ISP. • There is no reason to pay for something currently free unless there is an urgent need. • Satisfaction with the current model of exploratory browsing and content consumption. • Microtransactions restricting the use of content. • Use of hacks to circumvent microtransactions. • Rising costs. • Highly variable cost of using the Internet.
2.	Nature of Charges	• A large number of small-valued transactions are difficult to track. • 'Nickle and dimed' by vendors. ○ Disaggregated consumption costs more than the bundle. ○ Content does not meet quality requirements after payment. ○ Microtransactions on top of subscription, like in games today. ○ Amounts can be run up by children in games and other ways without active monitoring. ○ Charging for everything. • Mechanisms for refund of charges. Increased consumer risk. • Excessive buying and spending due to the ease of impulse purchases, including buying things not needed, especially when amounts seem tiny.

Table 5. *Cont.*

#	Category	Issues
3	Payment Mechanisms	• Need for a new payment mechanism (not everyone has Apple Pay). • Purchasing needs to be fast, easy, and risk-free. • Need to secure digital wallets. • No-friction purchase, silent and smooth. • No perceptible time is needed for purchase. • Decentralized payment processing.
4.	Consumer Issues	• Consumers' unwillingness to engage and go back to the old ways of consuming information. Requires a significant shift in mindset. • Consumers may focus on a narrow set of sources and ignore others. It may reduce the variety of online content. • May spend less time online. • Increase in time spent on online games. • Remove the challenges from games. • Human nature will make consumers migrate more to free sources of information. • Initially, a big reward for small payments will attract customers, but it will soon lose novelty, making customers reluctant to pay. • Customers should decide whether to make a micropayment for ad-free content or look at content with ads and tracking. • People without the ability to have stored value mechanisms cannot consume information.
5.	Security, Trust, and Privacy	• Requires stored payment mechanism and so can only be used securely on personally owned devices. • More tracking with each payment and easier to build a profile. • Credit card information is stored in multiple places with a high risk of compromise. • Identification of fraudulent charges and redressal. • Clickbait frauds. • Consumers may be reluctant to transact with newer and unknown parties due to trust issues and the small amounts involved. • Sites may not provide accurate information on charges. Slight variations can happen. • Security of the payment mechanism and bank details and credit card details. • Need for regulations and a regulatory framework.
6.	Technical	• Lack of standard payment mechanisms across different parties. • Transaction processing time. It should not interrupt smooth browsing. • Microtransactions exist along with free content side by side. • One-click payment process with a one-time setup that is simple for non-tech-savvy folks. • Use of a mechanism other than a credit card. • Content-expiration issues of purchased content across time and different devices. Mechanisms to have long-term access to purchased content and mechanisms to share content with family members.
7.	Philosophical Issues	• Restricts free flow of information by limiting readers to a small focal area. • Prevents discovery of new information brought about by casual free browsing. • May make it harder for students to find information by limiting their choices to specific providers. • All video games will become pay-to-win, thereby deskilling level progression. • The information gap will increase and mirror the socioeconomic gap experienced in the pandemic. Lower socioeconomic folks will be disadvantaged. • Like gambling, addicted game players, especially children, may spend more money than needed.

Table 5. *Cont.*

#	Category	Issues
8.	Business Model	• Pricing models of how much the content and service costs and other features like static vs. dynamic (increase price with an increase in demand and vice versa), time-based degeneration of cost (article free after some time), fixed vs. variable costs. • May work for big sites with large volumes. For others, advertising and tracking may still be the best option. Many sites will not break even since they may not attract volume on the microtransaction model. • Independent content creators cannot monetize their content to an extent done now using advertisements (on YouTube). Content may not be discovered and may not go viral. • The model may only work for content that serves instant gratification and the younger generation. It may not break out of the gaming industry. • How is paid content made superior to free content in terms of quality and accuracy? • May increase online advertising costs. • Erases customer loyalty that comes from subscription-based models.

Some respondents had no issues with the microtransaction business model. Some respondents relied more on printed media and did not consume much information online. Other respondents used their free quota on subscription-based sites and used other sites to read articles related to what they are interested in when such content is on the paywall sites. Some respondents found unbundling and paying for products and services as needed attractive.

6. Discussion

Content providers will have to help consumers understand the unique aspects of a microtransaction business model. In examining the results of this study, we found that while some respondents tried to think more deeply and comment on things like ease of use and minimal cognitive efforts when engaging in microtransactions, many were still envisioning a payment model using credit cards. Further, many of the issues with the microtransaction business model stem from visualizing the payment model to be the same as existing models using credit cards or other electronic cards. Hence, most consumers may not be forward-thinking in terms of technologies that are up-and-coming and could be used. It is possible that customers may need to be educated about the new models like Interledger (www.interledger.org) and their capabilities. For content providers, adopting a new emerging technology may pose another challenge in their quest to implement a microtransaction model.

Having a revenue model that allows consumers to consume information for a tiny monetary amount in a disaggregated fashion without being locked into a subscription model and, in turn, preserves their privacy through either the absence of advertisements or not-so-intrusive advertisements may be highly desirable. An excellent example of disaggregated and choice consumption is the case of streaming services. Streaming services have distinguished themselves through their exclusive content, resulting in requiring consumers to subscribe to multiple services to access this exclusive content. As a result, the monthly billing amounts for consumers are reaching the same levels as those of traditional cable services. An alternative microtransaction model may be to give users the option to watch selected shows at an affordable price. This could be built on top of a base subscription model and/or through syndication, as in the case of Apple News+, which shows content from different providers for a monthly subscription fee. However, subscription, whether through individual providers or a syndicator, still removes the choice from the customer to consume content in a completely disaggregated and at-will fashion based on a variable cost model. In addition, it provides the option of preventing undue privacy intrusion. The microtransaction model is already widely adopted in various games like Fortnite, PUBG, Roblox, etc.

The main difference is that microtransactions in these cases are tied to the subscription model or the stored value model, where the user account has a stored value that can be used for microtransactions on the provider's platform. Here, even the gaming providers have not experimented with or implemented a model that provides transferability—allowing stored value from one provider's game in another provider's game.

As with all research, there are limitations to this study. Some respondents were not aware of what microtransactions are and how they are used in business services. Additionally, there were some consumers who would not engage in microtransactions, regardless of the business model. To alleviate the limitations, this study resorted to interviews where the respondents could be made aware of the concept, which could be explained in a limited fashion. However, the researchers are aware that such first-time exposure to the concept may still not alleviate the limitations of the unfamiliarity with the concept.

Future research areas can explore how digital currencies can be employed as a payment mechanism. However, the clearing of the payment must be instant, and the current mechanisms of 'proof of work' in Blockchain will not work. Even the recently implemented 'proof of stake' in the Ethereum blockchain may not suffice. Solving this using a decentralized or federated authority may be an avenue for future research. A consortium of reputable content providers may be able to implement the model and tweak it as has been done with the subscription model over several years. The success of Wired, the Wall Street Journal, and the New York Times provides some evidence that the Internet has matured, and so has consumer behavior and willingness to pay for content on the Internet. This is especially true of the content that consumers attach some value to, like good journalism. While consumer behavior is still primarily oriented toward free content, just as the subscription model has gained traction, so will the microtransaction model. Future research can also explore and build upon the products and issues gathered from the consumer survey. The best way forward could be to pilot test the concept through a concept website. A comprehensive set of requirements can inform the feasibility of a technical solution that can be implemented to generate revenue and determine the lower threshold of the content price, which can be achieved in such a business model.

7. Conclusions

This paper proposes microtransactions as a general digital content mechanism with the lowest possible floor on the value. It then provides a taxonomy of microtransactions. It then examines enabling technologies, possible business models, consumer readiness, and consumer-related issues. It appears that an impulse purchase-based model with delayed aggregation may prove to be a viable model. The potential applications of microtransactions are wide and may have the capability of enabling a whole stream of e-commerce applications. The customer interviews point to readiness on the part of the consumers to adopt this model, an area where much research may be conducted.

Based on consumer interviews, it is evident that several consumer issues need to be addressed. While the microtransaction model can offer a solution to the consuming content that seems to be increasingly going behind subscription paywalls, some significant issues will need to be addressed. The most important is a secure and frictionless payment mechanism that works universally across a variety of content providers. At the same time, the payment mechanism cannot be used to create a profile of the customers and may need to allow for a limited number of refunds. E-commerce microtransactions will form an essential part of the future e-commerce business models. The sole reliance on advertisement-based revenue and selling customer information may not be optimal for content providers. As such, exploring other avenues for revenue generation, such as microtransactions for digital content, should be a priority for businesses.

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