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Micropayment business in Finland- forming the basis for development of micropayment methods and business

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Micropayments provide companies and individual persons a way to obtain potentially a great deal of revenue for the digital content (such as music, games). At the moment lot of digital content is either not provided at all or is provided for free. The micropayment business has a great revenue potential in future. So far only few companies have managed to reach considerable success. Mobile test bed countries such as Finland have the entire infrastructure needed in micropayments and a very high utilization rate of Internet and mobile phones. Despite of this, micropayments are not very popular. The purpose of this paper is twofold. First it aims at discovering and comparing different micropayment methods proposed. Second, it outlines the current status in Finland and proposes avenues that should be taken in order to make the micropayment business more attractive and profitable.

Keywords: Micropayments; Methods

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Abstract

Micropayments provide companies and individual persons a way to obtain potentially a great deal of revenue for the digital content (such as music, games). At the moment lot of digital content is either not provided at all or is provided for free. The micropayment business has a great revenue potential in future. So far only few companies have managed to reach considerable success. Mobile test bed countries such as Finland have the entire infrastructure needed in micropayments and a very high utilization rate of Internet and mobile phones. Despite of this, micropayments are not very popular. The purpose of this paper is twofold. First it aims at discovering and comparing different micropayment methods proposed. Second, it outlines the current status in Finland and proposes avenues that should be taken in order to make the micropayment business more attractive and profitable.

1. Introduction

Wide use of Internet makes tempting for companies to charge for digital content that is now available for free. Payment system is a collection of laws, technologies, protocols and customs that make it possible to pay money between companies and people (Kniberg 2002). The payment systems have three main dimensions: technological aspect, economic aspect and social aspect. The technological aspect includes system's expandability, efficiency and security in transaction handling, its complexity to adapt and compatibility with other payment systems. Security prevents and detects attacks on a payment systems and fraud attempts, and protects sensible payment information. The economic aspect means that building, running and maintaining a payment system must be economically feasible and it has to be clear who is responsible of the financial losses. The economic aspect includes for example anonymity and user friendliness. Social aspect denotes fulfilling the social needs of end-users concerning trust and acceptance. In addition to the above mentioned aspects, payment systems are influenced by regulatory aspects, i.e. it has to conform regulations of the countries where is operates. (Lee et al. 2001)

Micropayments are Web- or mobile phone -enabled transactions in which consumers can purchase digital content (or services) for small amounts (Hinds 2004). Micropayment system is a practical realization of a micropayment and micropayment method a systematic way of doing micropayments. Terms micropayment system and method are used in this paper concurrently. The current micropayment systems are considerably easy to use, i.e. they require two or three interactions with customers to process payments and use web interfaces. Only few current micropayment systems allow anonymity of the user towards the payment systems and service providers. The current micropayment systems use transparent security techniques and HTTPS (Hyper Text Transfer Protocol Secured)- protocol that requires authentication of the communicating parties encrypts and decrypts data. The interoperability between various micropayment systems is not solved yet and there are no micropayment standards. The trust towards micropayment systems is adequate due to current extensive legislation. The mi-

cropayment systems have a high coverage because the current customers are used to work on the Internet. The majority of current systems are pre-paid, which limits the fraud possibilities by guaranteeing the payments to providers. The range of payments varies from 0,01 euros (minimum) to 10-1000 euros (maximum). Most micropayment systems support a single currency, but not multiple currencies. (Párhonyi et al. 2005)

Succeeding in micropayment arena is not easy and most of the micropayment systems emerged in the last years have failed to become very successful due to various reasons. The micropayment systems have so far been difficult to use (Kettunen and Filenius 1998) and the cost of acquiring registered customers has been high (Marlin 2005). Lack of universal acceptability (Párhonyi et al. 2004, Lee et al. 2001, DNX 2005) and services, and non-convincing or non-existing security (Kettunen and Filenius 1998) have also prevented wide success of micropayment systems. Additionally the current payments methods rely solely on credit card based payments (Hinds 2004, Song et al. 2002, Párhonyi et al. 2004), which hinders the ability to perform an impulse-purchases. It has been argued that legislation varies from country to country and thereby sets many challenges to micropayment methods. The laws and regulations require the service providers to collect detailed customers information and to generate also the audit information. Furthermore legislation require defining obligations, certain security level from the systems, the right for privacy, etc. (Párhonyi 2005) To gain the "Big Bucks" advertised in (Marlin 2005), the micropayment systems should be easy to use and join, fast to handle, easily usable in various situations and be supported between all service providers and customers on all devices (Song et al. 2002). To be profitable a micropayment-system has to be based on huge amount of transactions and keeping the transaction costs low (Papaefstathiou and Manifavas 2004). To save costs, some micropayment service providers aggregate payments from one customer to save transaction costs (Marlin 2005). The most known actor in micropayment arena has so far been an American service provider called Paypal that has at the moment 96.2 million accounts worldwide (Paypal 2006).

Despite of these challenges, the importance of micropayment will increase in the future because 1) the amount of potential users, mobile phones, wideband Internet-connections and content providers increases, 2) the acceptance of small payments by banks and credit card institutions increases, 3) the operators pursue in the area, and 4) there is still a lot of business potential left that will be capitalized anyhow by someone.

1.1 Scope of the study

In this study micropayment means purchasing digital content at a price between 1 to 10 euros. This paper focuses on the following micropayment methods: charging the payment via credit card, normal bank transfer, pre-paid account, phone bill and user-id based charging. Other micropayment methods such as electronic cheques listed for example in (O'Mahony et al. 1997) are not commonly used in Finland, and therefore fall out of the scope of this research.

This paper is based on a literature review and interviews of seven Finnish companies working in the area. Finland has been selected as the target country of this research, because although the country has the infrastructure needed in micropayments (i.e. extensive coverage of mobile phones (Tilastokeskus 2004) and wideband Internet connections), and great majority of the Finnish companies have Internet-sites (Tilastokeskus 2005), the micropayment business in Finland is just on its starting phase.

The companies participating to this research were selected based on 1) their existing involvement in micropayment business and 2) their role, i.e. the aim was to find 1-2 companies/role. We claim that the status of micropayment business in Finland provides a good start-

ing point for analysing the current state and future of micropayment business in other countries as well.

1.2 Goal and outline

This paper aims at identifying the current state of the micropayment business in Finland to find out needs and provide guidelines for further development of micropayment methods. It will be argued that a good micropayment method enables small content providers to sell their content easily, and takes into account various business actors and their requirements both from technical and financial perspective. This paper focuses on analyzing the views of different parties functioning in the arena.

The paper is composed as follows. Section two presents the related research after which the key players and content of Finnish micropayment arena are identified. This is followed by a review and a comparison of the commonly used micropayment methods. Section five outlines the views of Finnish companies on micropayment business. The paper is concluded by an outline of future research topics.

2. Related research

In general the micropayment arena has been researched from many different points of view and thus the scope of topics on related research is wide; see (Lee et al. 2001, Schmidt and Muller 1999, Jakobsson et al. 1999, Odlyzko 2003, Párhonyi et al. 2005). Lee et al. (2001) focus on building an agent-based micropayment system for e-commerce and security. Schmidt and Muller (1999) propose an evaluation framework for a micropayment system. Their framework consists of microeconomic, technological and social dimensions. Jakobsson et al. (1999) illustrate the state-of-the-art and future directions of electronic payments. They focus in different forms of electronic payments like credit card payments and electronics cheques. Odlyzko (1999) describes factors that function against micropayments like resistance to anonymity. In spite of the many preventing factors Odlyzko (1999) admits that there are certain needs that micropayments are suited to fill. Párhonyi et al. (2005) present in their paper first and second generation micropayment systems and compare their key characteristics.

The Finnish micropayment arena has not been researched to a large extent. Lukkari (2004), Mallat et al. (2004) and Tuominen (2003) have studied this aspect. Lukkari (2004) discusses micropayment and remote payment systems and examines the market conditions for micropayment services. According to his results free services and content of the Internet is the biggest competitor of micropayment. Mallat et al. (2004) present existing and emerging mobile financial applications including mobile payments and banking services. They conclude that in the future the amount of service users will increase and the mobile payments will become faster, easier to use, have low transaction fees, wide availability and standardized technologies. Tuominen (2003) has analyzed in his survey current state and future of mobile near payments in Finland. He concludes that the current payment systems are limited and favour only one party namely the operator.

3. Key players of micropayment arena in Finland

This section presents the key players of micropayment arena in Finland. It is argued that the key players in the Finnish micropayment business are banks, content providers, network operators and service providers.

Banks have had strong position in this field as in the role of central payment and banking services –provider (Mallat et al. 2004). In micropayment arena the strength of banks lies in the mediation of the payments and managing account-based payments. In the future the banks could additionally have role as content creators and providers (Mallat et al. 2004). In Finland there are three banks that are active in the micropayment business: Osuuspankki that opened in 2001 its 'Digiraha'-service, Sampo and Nordea who both opened in 2003 its 'Mobiiliraha'-service.

Content providers aim at providing value-added content that is attractive to the end-users. Large record companies are a type of content provider that also possesses a direct contact with the end-user. They charge the customers for their content directly. It has been shown that the variety of content has been central to DoCoMo's (i.e., large Japanese content provider) success. The role of content in micropayment business should also not be underestimated (Sharma and Nakamura 2003).

Network operators manage the mobile communication infrastructure and enable mobile telephony and data communications. They are natural candidates for providing payment services as they are already involved in billing services (Ondrus 2003). It should be noted that they also provide technical infrastructure and a billing channel by the aid of a telephone bill. In Europe the financial markets are pressuring the network operators to take a large part of the value in the content market to compensate for their heavy investments in 3G licenses (Sharma and Nakamura 2003). In Finland, there are currently around 10 network operators that have a customer interface and that bill the customers for using their services. The network operators mainly deliver content that can be downloaded to mobile phone like pictures, games, icons and ringing tones (Lukkari 2004).

Service providers bring buyers and sellers together and charge a fee for each transaction they enable between the two parties (Kallio 2001). In addition to the "traditional" service provider's role, in micropayment field there is demand for technical service provider as well. The technical service provider acts as an intermediary between banks and network operator, and between network operators and service providers. The need for technical service providers exists mainly due to lack of missing standards. This causes a lot of laborious tailoring when implementing each service individually. (Ondrus 2003) The Finnish market has currently some small service providers, but none of them have managed to create even a nationwide standard and are functioning in their small niche-areas.

Figure 1 summarizes the key players of micropayment business in Finland and the roles of the players; in the figure an end-user can denote both private persons and business users.

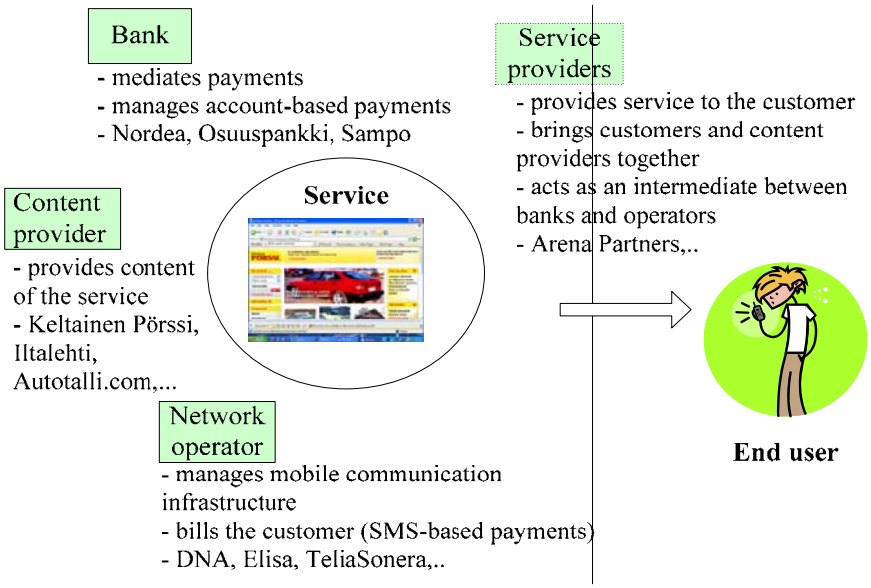

Fig. 1. Key players of Finnish micropayment business.

In the future the division of the roles is not necessarily as clear as large multinational content providers sell their content without any intermediaries. Minimizing the costs and optimizing the profit in micropayment business requires creating an open payment system that involves all actors. The literature claims that current micropayment solutions do not have enough significant players to secure national coverage of the solutions. (Tuominen 2003)

4. Comparison of different payment methods

This section presents the most commonly used micropayment methods in Finland and compares them in relation to various aspects.

Table 1 presents digital content purchased by micropayments and the activation and delivery channels of this content. The service for downloading and using the content is either: 1) delivered and activated over Internet, 2) activated over Internet and used via mobile phone or 3) activated by using SMS (Short Message Service) and delivered over Internet. In some cases -like when browsing ads- the advertiser or service provider pays access to the content.

Table 1. Digital content purchased by micropayments in Finland.

	Service activation channel	Service delivery channel	Service billing method
Browsing ads Example	Internet www.autotalli.com	Internet	Service provider/ advertiser pays
Buying tickets Example	Internet Internet www.plusdial.net www.blue1.fi	Mobile phone Internet	Mobile phone bill Credit card payment
Gambling Example	Internet www.veikkaus.fi	Internet	Pre-paid account
Ordering reading time Example	SMS Internet www.kaleva.fi www.iltalehti.fi www.iltasanomat.fi www.keltainenporssi.fi	Internet Internet	Mobile phone bill Separate bill

4.1 Current payment methods

The most commonly used micropayment methods in Finland are:

- credit card payments,
- payment via Internet bank,
- pre-paid accounts,
- charging on phone-bill (activating by SMS or voice call), and
- user-id based.

On a credit card based micropayment system, the purchase is billed on a credit card. Credit cards do not suit to very small micropayments due to the high transaction costs.

In payments based on the use of *(Inter)net bank*, the payment is made when accessing the content. For having access to the Net bank -system the user must have agreement with bank about the Net bank access.

In prepaid-accounts like in 'Digiraha' (Digiraha 2005), 'Mobiiliraha' and DNX the money is loaded into different virtual account by using 1) Net bank-based account transfer and/or 2) transfer via mobile phone. In transfers via mobile phone, the charge is added to the phone bill. The advantage of prepaid account is possibility to limit the amount of money consumed. The disadvantage of a prepaid account is the existence of so-called "dead money", i.e. if the prepaid-account is not used, the money on that remains unused. Being unused for an extensive amount of time, there is a danger that inflation eats the value of the account. Another disadvantage of the prepaid-accounts are the high commissions the banks charge for micropayments (even hundreds of euros) (Lukkari 2004). All of the current prepaid-concepts are national solutions. (Tuominen 2003) Thus, they rely solely on Finnish market base for attracting customers. 'Digiraha' is a payment method where the customer creates a virtual wallet over the Internet and then transfers money from his bank account to the wallet. The money on the ´Digiraha'-account can be used for making purchases via Internet or mobile phone. 'Mobiiliraha' is a payment method where customer can transfer money from his bank account to his mobile wallet and then purchase via mobile phone services provided by service providers (Nordea 2004). DNX (2005) is a virtual mobile account that can be used via mobile

phone or Internet. Money is downloaded to the DNX-account via normal bank account transfer.

Micropayments can be added to the phone-bill of the user as the service is activated via SMS or voice call. SMS is used for purchasing 1) digital content like ring tones, logos, information and games, 2) small purchases in shops and kiosks and 3) in self-service purchases of soda, parking tickets, car wash etc. (Mallat et al. 2004). Voice call is based on activating the service by calling to a certain service number.

User-id based payments are based on 1) registering as a user of a service by giving personal information, and after registering 2) buying access to the content by using credit card, phone or bank transfer.

In itself user-based payment is not a separate payment method, but it is included to this comparison, as it enables easy impulse purchases after registering. This kind of payment method is useful when users are wanted to provide one access point.

4.2 Rationale for the comparison criteria

This section describes the criteria used when comparing different payment methods. The criteria is collected from the respective literature, i.e. (Lee et al. 2001, Abrazhevich 2001), Dai et al. 2001, Schmidt and Muller 1999).

Anonymity of the user suggests that it is not possible to define user's identity or monitor his spending patterns (Abrazhevich 2001). Some services are intimate and therefore anonymity of the user to the service providers is a significant advantage for the end-user (such as guidance in illness, chat lines, legal sex services). From a service provider's point of view the anonymity is not necessary an advantage as it makes tracking the spending behaviour of an individual end-user more difficult (Schmidt and Muller 1999).

In a service that is easy to use payments are automated and done in an easy, seamless way and users have minimum factors that distract them (Abrazhevich 2001, Neumann and Medvinsky 1999). Easiness of use means in this context that the number of steps, input fields and extra devices needed to make the payment is low.

Real-time processing of the payments determines if the end user has to pay for the content right away or is he billed afterwards like in the case of credit cards. The attitude towards paying on real-time varies depending on the person. The purchases made by a credit card and the amount of purchases can be traced.

Impulse purchase possibility determines the amount of effort the end user encounters when he wants to buy content without long hesitation or planning. This ability has been found as a decisive factor in determining the success of a micropayment system (Kniberg 2002). Thus, two levels of impulse purchase-possibilities exist: 1) in case the impulse purchases are possible, making them is easy or requires only small effort and customer is very likely to make them, and 2) in case the impulse purchases are not so possible, making them is difficult and possibly because of this reason, the customer most likely skips them.

Specific requirements define what specific operations are needed accomplishing the payment transaction. For example owning a credit card is a specific requirement. In addition to the above aspects Table 2 includes specific advantages and disadvantages of the handled micropayment methods.

4.3 Comparing different payment methods

This section compares different micropayment methods to find out their advantages and disadvantages and future development needs. Table 2 presents comparison of the methods in relation to the defined criteria/aspect.

Table 2. Comparison of different micropayment methods*.

Credit card	Internet bank	Phone bill Pre-paid account	SMS	Voice Call	User-id based
Anonymity of the user to service provider					
Yes**	Yes**	Yes**	Yes**/ Always on prepaid SIMs (Subscriber Identity Module)	Yes**	No (some services require only name and activating e-mail address)
Ease of use					
Easy	Easy (strongly depends on usability of the Net bank service system of the banks)	Easy	Easy	Easy	Easy (strongly depends on usability of the registration path made by service provider)
Real-time processing of the payments					
No	Yes	Yes	No	No	Yes/ No
Impulse purchase possibility					
Possible, if the end user has a credit card available- otherwise not so possible	Possible, if the end user has a net bank access & separate paper based key-number list available- otherwise not so possible	Possible, if the end user has a pre-paid account- otherwise not so possible	Possible, if the end user has a mobile phone available- otherwise not so possible	Possible, if the end user has a mobile or fixed phone available- otherwise not so possible	Not so possible, user id and password is service provider specific
Specific requirements					
Credit card ownership	Service agreement about Net bank access must be activated	Service agreement must be activated	No specific requirements	No specific requirements	One time registration to the service required
Specific advantages					
Easy to use- only a credit card is needed.	The system is secure- based on user id and password and separate key-number list.	Mobile prepayment allows using company phones (separate charging)	Easy to use -only mobile phone is needed.	Easy to use- only phone is needed.	Computer independency (service usage control is based on user id, not cookies)
Specific disadvantages					
Young people can not apply a credit card; unwillingness to give credit card number via Internet	Young people do not have Net bank access	Need of the user to manage account and dependency on certain operator/ bank	Possible SMS message delay and risk that someone else uses the phone.	No specific cons	Need for one more memorable and manageable user id & password combination to the end user.

* = based on methods used at the moment of reporting the results of this study. Other methods may appear in the future.

** = the information can be found out on special cases, i.e. on criminal investigation.

From Table 2 it can be concluded that as all micropayment methods have advantages and disadvantages, defining superiority of a method is customer-dependent. All methods are according to the study easy to use, but there is still missing a solution that would be both easy to use and enable impulse purchases without many preceding user actions. Flexibility of selecting between different payments methods is limited by the fact that most of the payment solutions are tied to being customer of certain bank/operator, being registered to the service etc. Additionally the current payment methods have some issues to solve considering ease of use, security and anonymity of the user.

5. Key players' viewpoints

This section presents state-of-the-practice of the micropayment arena in Finland currently based on the interviews of seven companies functioning in the micropayment business. The interviewed companies were selected based on their role in micropayment business, i.e. the aim was to find at least one company per role. The interviewed persons were sent beforehand a list of questions which they were asked in the interview that lasted 1-1.5 hours depending on the interview. The interview questions concern the following main topics: current state, future and revenue logic of micropayments and role of their company in micropayment business. Table 3 summarizes the basic information of the companies/ persons interviewed.

Table 3. Basic information of the companies/ persons interviews.

Role of the company	Amount of persons interviewed	Position of the person interviewed
Bank	One	Product manager (netpayments, ebusiness)
Content provider	One	CEO
Network operator	Four	R & D manager Research manager Business manager (mobile services) Department manager
Service provider	One	CEO

Table 4 presents summary of the interviews by analyzing different aspects of the micropayment business and the roles of the companies in it.

Table 4. Summary of the interviews of Finnish companies in micropayment business.

Bank	Content provider	Network operator	Service provider
View about micropayment business in general			
Faith in this	Is interesting	Interesting, they want to be involved	Is useful and needed
Their role			
Current role is ok. Service provider pays bank per transaction 3 % of the price of the service, or at least the minimum fee of 0,34 €. The bank does not participate into the technical implementation of the service.	Current role is ok. Content providers produce content to the service.	Current role is ok. Network operators do not accept billing data provided by third parties due to risk of "ghost" bills & want to be sure that customer gets what he has ordered.	Current role is ok. Service provider works as an integrator between bank-content provider and between network operator-content provider
Charging methods			
Many charging methods are needed	No data	Accept charging other value added services on phone bill	Does not collect billing data or charge the end customer and do not want to collect charging data
Lower limit for profitable payments			
1 €/ transaction	No data	1 €/ transaction	1 €/ transaction
Regard as challenge			
Bank vs. service provide → who is responsible about the customer service	Making current charging methods more flexible. The fact that around half of the income goes to other parties is also a challenge.	Using company mobile phones in SMS payments due to legislation; currently difficult payment methods and increased amount of service charges may decrease income from voice calls.	Working with network operator and content providers difficult (technical solutions, contractual differences) and service environment, e.g. service has to be always on.
Prospects and needs for the future			
In future there is need for technical service provider. Possibility to use several payment methods has future potential.	One potential new service would be selling newspaper archives and small ads	In future there is need for technical service provider, for making the service simpler for all parties and for a way to make impulse purchases.	In future a technical service provider/ integrator is important and needed.
Other comments			
Starting a service is reasonably priced. So far e-payments have been very secure. Banks are open to all kinds of service providers	Producing content is cheap in some cases → leads to low price.	As they take the credit risk (20 % of the value of the service), they need to be paid for it.	Operator does not prevent implementation of micropayment, but achieving large user amounts is necessary to make the business succeed

The principal findings from the interviews are:

- All parties regard their current role suitable for them and do not want to function in other roles. The companies presented in the interview have focused on functioning in

certain role and want to continue in the same role also in the future; thus achieving the whole value chain is realized as co-operation of several companies.

- All parties want to be involved in the business as it increases customer satisfaction. The interviewed persons regard offering the same assortment of goods as the competitors do, as a prerequisite for surviving in the competition, i.e. although offering a certain service is not their core business, leaving it out from the selection may lead the customer to select another company.
- The field is scattered and banks and network operators do not co-operate with each other and therefore standardized solutions will not emerge. Especially network operators do not -due to hard competition- easily co-operate and this has lead to the fact that for example global roaming is still not politically possible although technically it is. To be able to develop a functional system, standardized solutions and interfaces would be needed.
- Service providers have difficulties to gain access to the payment services of network operators or banks. Network operators and banks have been pretty protective towards their payment services and they are still not willing to open them to service providers.
- Gaining high user volumes and amount of transactions is important. As the revenue received per each micropayment transaction is very small (some cents), making money has to be based on high volumes.

It was also found that there is need for 1) technical service providers and more qualitative service providers, 2) simple payment methods that enable impulse purchases and from which the customer can choose from, and 3) a method for service providers for facilitating the production and billing operations of the content. Technical service providers would take care of the technical details of providing a service. In micropayment systems, the end-user communicates with the service provider.

6. Conclusions

The ability to purchase digital content has offered significant business opportunities for small and clearly for large content providers. Micropayment is an enabler for this type of business. So far, the success is yet to be achieved. This paper has contributed in the area by identifying, reviewing, comparing and interviewing the key players in the market in Finland. The findings yield some opportunities.

In specific we find that the main players of Finnish micropayment field are banks, content providers, network operators and service providers and that the current micropayment methods in Finland include paying services via mobile phone, credit card, prepaid-accounts, bank transfer or some combination of these. This study also finds that companies regard micropayment business important and want to be involved in it, but at the moment field is scattered and therefore standardized solutions are not likely to emerge. Currently large part of the service's price goes to other parties than content providers. Finally we find that all payment methods have their advantages and disadvantages, and none of the current micropayment methods enable impulse purchases without preceding actions of the user.

Based on the results of this research it can be argued that there is need for more services and more consumers to keep the price low. There is also need for a micropayment method that enables easy impulse purchases without preceding user actions and that the content provider can easily add to his sites. A technical service provider that functions between payment institutes-service providers and network operators-content providers by enabling service's easy use and payment is also needed on micropayment arena. According to the interviewed companies there are already some technical service providers on the market, but none of them has received a position as standardized payment system provider. Furthermore, according to

the findings of this study there is need for a concept that is highly automated to keep the expenses of the infrastructure as low as possible. Finally the users should become aware of the fact that that not everything is for free on Internet.

Countries similar to Finland i.e. that has high penetration of mobile technology- and Internet should pay attention to the need identified above. In further research it is important to develop a concept that can be applied as is or with modifications to countries or continents with large user base and an increasing penetration of micropayment infra-structure.

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