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1.1. Introduction:

Micropayment is an e-commerce transaction type with a low financial amount. Micropayment are typically used to purchase online products and services such as e-books , music , memberships, an application download or web-based content .Micropayment also can be define as anything less than 75 cents and can be as low as a fraction of a cent (0.0001 US$) . A special type of a system is required for such payments, which are too small to be feasible for processing through credit card companies.

While micropayments were originally envisioned to involve very small sum of money, practical systems to allow transactions of less than 1 USD have seen little success .Many companies like IBM and Compaq had micro transaction divisions and research on micropayments but all their effort doesn't successes. One problem that has prevented the emergence of micropayment systems is a need to keep costs for individual transactions low, which is impractical when transacting such small sums even if the transaction fee is just a few cents, and other problems such as technical problems, communication problems and the fact that micropayment is a new technique and users through the internet in Sudan still not familiar with it and doesn't feel secure enough to use it ,in fact not all of the e-commercial sites provide the micropayments services to their costumers (internet users) which make the users uncomfortable with using such a technique and feeling that they are out of their comfortable zone , specially Sudanese people they more suspicious about such new techniques by their nature .

We have to make micropayment systems more popular and guarantee that they offered all the features costumers and users seeking for, and making them feeling satisfied .Companies also must be encouraged to adopt micropayment technique so they can be able to supply costumers with products and services with low prices and making them more familiar to deal with the micropayment systems. In order to achieve all of these objectives we will work on build a frame work that will be suitable for our community needs and that can be applied to all micropayment systems in Sudan in the future.

1.2. Problem Statement:

Although micropayment technique has been exhibit since early nineties but we yet haven't took full advantage from it neither the internet users (costumer) nor the services provider .The existing micropayment systems suffering from a lot of problems that make the costumers avoid to use them, and feel unsecure and uncomfortable when deal with them .This technique is still unknown and unfamiliar for a large number of internet users (costumers) in Sudan ,In addition to all of that costumers get used to have such services (e.g. download an application or e-book) for free, and because that Sudan was prohibited in terms of information from such services .

Our main problem is to introduce micropayment systems to Sudanese people and figure out the required features they wanted in such systems to make micropayment systems very popular ,familiar and easy to use and make their experience when using them very delight able and useful . Because of that I would like to create a new framework that can be applied to improve the use of micropayment systems in Sudan.

1.3. Research Hypotheses:
- ➢ Know the obstacles that face micropayment technique in Sudan.
- ➢ Know the factors that will encourage users to use micropayment systems and make those systems wide spread.
- ➢ Specify the required characteristic that users in Sudan seeking for in micropayment systems according to efficiency, reliability, responsibility, safety and security.

1.4. Research Importance:

We want to make micropayment systems very popular and trusted to the internet users in Sudan so we have to know what they really want, need and expect from this new technique that doesn't exist in the current available systems, and making users feel the difference between the free products and services and those ones provided by micropayment systems.

In this research I will work on building a new framework that can be use to improve the use of micropayment systems in Sudan, help in introducing this amazing technique to the largest number of Sudanese people, and make micropayment systems perfect from the users point of view and make users feel no sorry for spending a little amounts of money for such products and services.

I'm doing this research because the world still can't came up with a perfect micropayment system that satisfy the majority of users and encourage them to use this useful technique until now .

1.5. Research aim and Objectives:
- ## Aim:
Our main concern is to create a new framework depending on users views showing what users really want and need to improve the use of micropayment systems in Sudan and apply this framework in the micropayment systems around the country, in order to introduce it to large number of Sudanese users and make this technique more spread and trader in Sudan.

- ## Objectives:
1. Know all the obstacles that face micropayment systems in Sudan and work on creating a frame work solving them.
2. Know the desirable requirements that will help us to improve micropayment systems In Sudan.

3. Make the internet users (costumers) feeling familiar and comfortable to use micropayment systems and guarantee the high quality of the provided product and services.

4. Encourage Sudanese people to use micropayment systems .
5. Encourage the services provider companies to use micropayment systems and give them the opportunity of gaining great profits.
6. Give users the opportunity to buy such exclusive and high quality services by very low price from anywhere in the world at any time throws the internet.

1.6. Research scope:

In this research I will depend on what internet users in Sudan really want (users from different ages) , and on their opinions about the existing micropayment systems and I will make a survey to know all the problems that facing this technique In our country (what encourage Sudanese users to use micropayment systems and what make them not interesting in using such systems), so at the end we can came up with suitable and customized frame work that can be applied on micropayment systems in Sudan .

1.7. Research structure:

 In this research we have 4 chapters. Chapter one content two parts , part one is all about providing an overview about micropayment technique and the problems that facing this technique ,research hypotheses ,importance of the research ,aim and objectives ,research scope , methodology and research structure .Part two contain previous studies about micropayment systems .

In chapter two we speak about e-payment systems their types and methods. Micro commerce and micropayment systems types, advantages and disadvantages and how does it work.

Chapter three is contain tow parts .Part one the analysis of the data that gathered from the questionnaire part two results that came up from the previous data.

In Chapter four we wrote our conclusion, recommendations and references, and then there are our appendices.

2.1 Part 1 : Introduction:

Micropayments were initially devised as a way of allowing the sale of online content and as a way to pay for very low cost network services. They were envisioned to involve small fractions of a cent, as little as US$0.0001 to a few cents. Micropayments would enable people to sell content on the Internet and would be an alternative to advertising revenue. There is two generation of micropayment systems:

2..1 First generation :

The first generation of micropayment systems started in 1994 and ended in the late 1990's. Companies and individuals were searching for methods to generate profit from the web-based content and information available online. The two methods found as the result of their exploration was to either charge a fee for advertising spaces or to create user paid subscription fees. Developers of the first generation primarily aimed to introduce forms of electronic cash however, the use of credit cards became the dominant form of payment .**example of the first generation systems are the follow:**

2..1.1 Millicent:

Our goal for Millicent is to allow for transactions that are inexpensive yet secure. We achieve this by using accounts based on scrip and brokers to sell scrip.

A piece of scrip represents an account the customer has established with a vendor. At any given time, a vendor has outstanding scrip (open accounts) with the recently active customers. The balance of the account is kept as the value of the scrip. When the customer makes a purchase with scrip, the cost of the purchase is deducted from the scrip's value and new scrip (with the new value/account balance) is returned as change. When the customer has completed a series of transactions, he/she can "cash in" the remaining value of the scrip (close the account).

Brokers serve as accounting intermediaries between customers and vendors. Customers enter into long-term relationships with brokers, in much the same way as they would enter into an agreement with a bank, credit card company, or Internet service provider. Brokers buy and sell vendor scrip as a service to

customers and vendors. Broker scrip serves as a common currency for customers to use when buying vendor scrip, and for vendors to give as a refund for unspent scrip. (Jari Kytöjoki, 2000)

Figure 1 :Millicent System Model
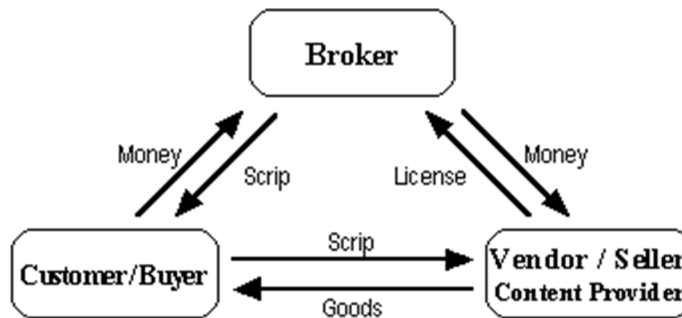
2..1.2 CyberCash (Cyber Coin):

CyberCoin is a quite new proposal from CyberCash. It is meant to compete as a micropayment protocol. Their first scheme, named CyberCash is an electronic credit card scheme. The scheme as such, however, seems to be not feasible from the viewpoint of the utilization in the micropayment systems, since the transaction costs cannot perhaps be pushed to a tolerable level by just applying the methods designed originally for credit card handling.

To be able to purchase an item, the buyer first sends a payment order to the merchant who forwards it to CyberCash Gateway Server for verifying. Both buyers and merchants have an electronic wallet of their own. The wallets are required for bookkeeping the financial information of the parties but no actual value, such as the account balance, is stored in the wallet - this is a big difference between CyberCoin and other payment models. The funds are held in escrow in a proxy account set aside for the particular buyer at Cyber Cash's bank in Virginia, USA. The processing of the transactions does not require inter-bank clearing. The wallet system supports both CyberCoin and CyberCash. (Jari Kytöjoki, 2000)

Figure 2 :CyberCoin System Architecture
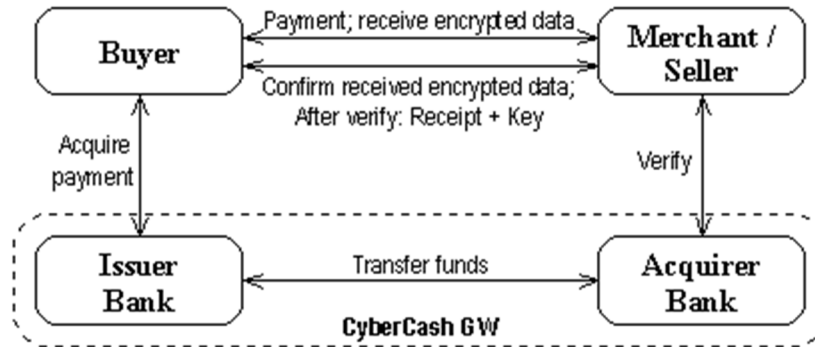
2..1.3 Micro Payments from IBM :

International Business Machines Corporation (commonly referred to as IBM) is an American multinational technology and consulting corporation, with corporate headquarters in Armonk, New York. IBM manufactures and markets computer hardware, middleware and software and offers infrastructure, hosting and consulting services in areas ranging from mainframe computers to nanotechnology.

The micropayment system proposal from International Business Machines Corporation (IBM) was previously named as MiniPay **(Mpay)**. The IBM's implementation is a registered payment system in the working draft, Common Markup for micropayment per-fee-links from the W3C group.

Mpay is intended for very small payments. The system has been in internal tests and is also available to anyone in the Internet for testing purposes. The system version 1.3 was released in October 1999. Mpay system implementation is very similar to the normal billing mechanism of the third party value added services of the phone networks. Mpay would not be very suitable for high-priced purchases because the design of the whole system is aimed for selling inexpensive information and other similar services which are usually delivered on-line.

To be able to use Mpay the buyer must connect every day to the server of the access provider who will send a daily certificate to the buyer. The signed certificate states that the buyer has an account and tells the recommended offline limit for the daily purchases. The protocol is shortly presented in the next Figure. (Amir Herzberg,Hilik Yochai , n.d.)

Figure 3 : Micro-Billing System Architecture
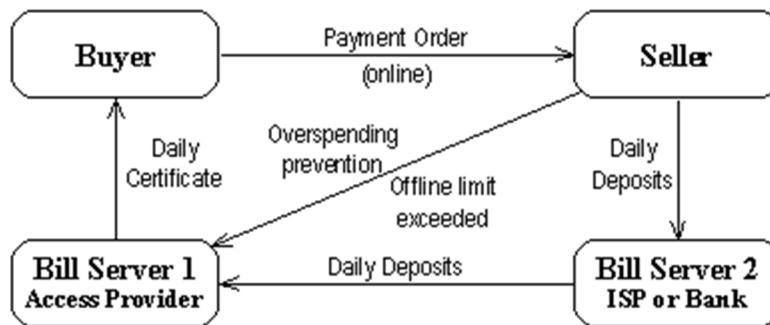
Table (2-1): a compression between the first generation of micropayment systems

System / Characteristic	CyberCoin	Millicent	IBM Micro Payments
Independence	**No**, PC is the only solution. Limited by the regulation in the U.S. where it can only be used. Interacts with the actual banking network.	**No**, PC is the only solution.	**No**, PC is the only solution. Wallet: Windows 95/98/NT Servers: AIX or Win NT
Design	**Centralized notational**	**Centralized token**	**Distributed token**
Security	**High**, CyberCash performs checking, clearing and recording of transactions, thus offering strong security.	**Medium**, based on light encryption issuer specification. Small values make light encryption secure enough to prevent infringement.	**Medium**, in order to keep system simple and efficient several security goals have been left out. Public key certificates are used.
Privacy	**Low**, neither anonymous nor private. CyberCash records identities, exchanged amount and time of a transaction. Buyer's information is hidden to the merchant. Purchased item is not necessarily known by CyberCash.	**Medium**, the broker knows who and where but not what. The vendors know what but not who.	**Low** has not been one of the design goals. While the same accounts are used, all actions are linkable by any observer. Privacy is not guaranteed and anonymity is not supported [10].
Trust	**None**	**Buyer trusts** broker and merchant	**None**
Transferability	**Low**, no way to move money to someone else's account. Payment orders are related to a specific merchant only.	**Medium**, scrip can be transferred freely but only used at specific sites.	**Low**, not transferable between customers. Designers are planning to support peer-to-peer transactions.
Divisibility	**High**, since it is a notational system, the cash is fully divisible. Transactions between $.25 and $10.00.	**High**, micropayment from a fraction of cent even near infinite towards the lower bound and at above $1000 at the upper bound. Very low transaction costs.	**Very high**, The value of the transaction is given as text and can thus be infinitely large or very small. Accuracy according to the lowest denomination of real currency used.
Multi currency	**No**, only one currency $.	**No**, must match with scrip.	**Yes**, converts
Ease of use	**Medium**, easy to use. The ease of installation not known.	**Medium**, complicated to set up, easy to use.	**High**, according to IBM trivial to install, easy to use. Real 'pay per click', see what you pay.
On-line / off-line	**On-line**, only. The merchant must contact CyberCash for checking within every purchase	**On-line**, only.	**Off-line**, is partly possible within recommended offline limit

First generation micropayment systems were difficult to use due to unfriendly user interfaces and management. They were also inconvenient as users can only have access to the software through computers that stored their tokens. Token-based micropayments did not achieve major success and failed considerably due to many factors. Administering, issuing and validating tokens and e-coins were expensive for the whole system. It also took a long period of time for transactions to be completed as the each one would have to go through a broker in order to validate and authorize the payment . Moreover, users were restricted to the amount of vendors that accepted micropayments and micropayment systems were often incompatible with other systems. All these factors contributed to the failure of the first generation of micropayment systems.

3.1.1.   Second generation :

The second generation micropayment systems began to develop in the late 1990's and early 2000 as the first generation failed to succeed. Unlike the first generation, most systems were account-based. Account-based systems were comprised by users who are connected to a profile with their personal information as well as bank or credit card information. A significant amount of personal information is required to fight against fraud. **Example of the first generation systems are the follow:**

2..2.1   Flattr:

Flattr isn't quite like other payment systems. This isn't a donation of a fixed amount - with Flattr you put money into a tip jar on a monthly basis, and go round "Flattring" things.

The act of a Flattr is kind of like a Facebook like - it can be public, which is why they call it "social micropayments". People can wander along to my profile and see what I've Flattred. If I chose to allow it, they could even see the amounts. There's also an option to simply hide all your activity as well - including past activity. The company is run by Swedish folks, who seem to understand privacy.

The clever bit is that at the end of each month, Flattr takes your monthly allowance and divides it equally amongst all the things you Flattred. So you don't get to determine the amount - it's just taken care of you. (philip, 2012)

2..2.2 PayPal:

PayPal Holdings is an American company operating a worldwide online payments system. Online money transfers serve as electronic alternatives to traditional paper methods like checks and money orders. PayPal is one of the world's largest Internet payment companies. The company operates as a payment processor for online vendors, auction sites and other commercial users, for which it charges a fee.

Established in 1998 PayPal had its IPO in 2002, and became a wholly owned subsidiary of eBay later that year.

In 2014, PayPal moved $228 billion in 26 currencies across more than 190 nations, generating total revenue of $7.9 billion (44% of eBay's total profits). The same year, eBay announced plans to spin-off PayPal into an independent company by mid-2015 and this was completed on July 18, 2015. On July 20, 2015, PayPal had its second IPO that valued the company at $46.6 billion.

When you sign up for micropayment through PayPal, you are charged 5 percent plus 5 cents. This applies to all the PayPal solutions like Express Checkout, Buy Now Buttons, Website Pro and Send and Request Money. The merchant rate, for example, if you have a payment of $2, would cost you 15 cents with micropayment solutions, and 100 payments costs $15. Using the regular merchant rate with a $2 payment size, you would pay out 36 cents—$36 for 100 payments. You save more than half the fees you are usually charged when you accept PayPal micropayment solutions. (paPal, 2014)

2..2.3   Zong mobile payment:

Zong is a mobile payment company that allows users to make micropayments on the Internet if they have a postpaid mobile phone. The payments are charged to their mobile phone bills by the mobile operator. The company was acquired by eBay in 2011.

Zong payments are only accepted by online games and social networks and the service can be used to purchase virtual goods.

Zong was awarded the 2009 Frost & Sullivan Best Practices Award for New Product Innovation in the Mobile Payments category. (wikipedia, n.d.)

-   Conclusion:

Some successful examples of second generation micropayment systems include Flattr, NTT DoCoMo's and the widely known Paypal. Through major improvements in technology as well as learning from previous mistakes that occurred in the first generation of micropayment systems, the second generation of micropayment systems has definitely reinvented itself with some even achieving success.

2.2. part 2: Introduction :

Provision of content is one of the main attractions and benefits of the Internet. Today the intangible goods and services on the Internet - information and other immaterial resources - are given away for 'goodwill', most likely because the existing payment mechanisms are not seemingly suitable for charging sub-penny amounts of money. Many solutions have been offered to solve the problem but only a few of them have survived in the business.

The emergence of micropayments in the e-commerce market has long been anticipated. Defined as any online transaction up to $10.00, micropayments allow for such services on the web, replacing alternative subscription models that demand larger upfront payments. Today, users can pay an upfront cost for certain products, such as an access pass to paid content. The system of micropayments seeks to simplify such schemes of e-payment. However, the reason micropayments have yet to catch on in industry is because of the various implementation issues. Micropayment schemes need to make their systems fully reliable, secure, and easy to use. Not only is the billing method a technical challenge, but so is the user interface. Downloading software, authenticating bank accounts, and constantly monitoring charges make the implementation of micropayment schemes difficult at best.

Aside from the implementation challenges, more interesting points arise when assessing the economic and social impact of this concept on the Internet. Most immediately, micropayments facilitate payment to intellectual property owners who do not get paid when files are shared illegally and help consumers itemize their purchases. But what happens when services that are currently free, like digital newspapers, start charging for their services? Does this inadvertently cause a change in usage for those who could once access online material and can no longer due to an additional cost? Micropayments also pose greater concern for user anonymity. Security is a major priority, but when companies can keep track of your personal information, every transaction can make consumers apprehensive of making online purchases. Such social and economic dilemmas are what make implementing micropayment systems complicated. By assessing the technological, social, and economic challenges in current micropayment schemes, we hope to

present a convincing justification as to why micropayments are not as beneficial as initially hoped.

- E-Payment system:

E payment is a subset of an e-commerce transaction to include electronic payment for buying and selling goods or services offered through the Internet. Generally we think of electronic payments as referring to online transactions on the internet. (Anon., 1996)

- Types of E- payment system:

a) Credit scheme:

Typically, this type involves card payment system. The peculiarity of this type of electronic payment system is the presence of the card regulator (VISA, MasterCard, Maestro, Delta etc.) during the payment processing. In a nutshell, the funds arrive in the merchant account, and the processing center is responsible for the money transaction and the card data processing.

b) Debit scheme :

This type includes payment systems that use electronic checks. Electronic checks have the same functions as the paper ones: it is an obligation of a bank to transfer money from the payer's account to a payee. The only difference is the electronic form of a check and digital signature.

There are some payment systems that work with electronic checks like **NetCash, NetChex, NetBill etc**.

c) The system of electronic wallets :

When it comes to this type of electronic payment system, you can successfully avoid the red tape, since each particular electronic payment system combines the operation of several types of organizations: responsibility, control and conditions of payment processing depend on the one payment system. Although there are certain legislative regulations

regarding the operation of payment systems, this type of electronic payment system is still the easiest one to implement for e-business.

The examples of the electronic wallets are **QIWI, Webmoney, Perfect Money, PayPal, Okpay, Paxum etc.** (Anon., 2016)

d) Electronic Fund Transfer:

It is a very popular electronic payment method to transfer money from one bank account to another bank account. Accounts can be in same bank or different bank. Fund transfer can be done using ATM (Automated Teller Machine) or using computer.

Now a day, internet based EFT is getting popularity. In this case, customer uses website provided by the bank. Customer logins to the bank's website and registers another bank account. He/she then places a request to transfer certain amount to that account. Customer's bank transfers amount to other account if it is in same bank otherwise transfer request is forwarded to ACH (Automated Clearing House) to transfer amount to other account and amount is deducted from customer's account. Once amount is transferred to other account, customer is notified of the fund transfer by the bank. (Anon., 2016)

- Methods of E- payment:

a) Net banking :

This is a system, well known in India that does not involve any sort of physical card. It is used by customers who have accounts enabled with Internet banking. Instead of entering card details on the purchaser's site, in this system the payment gateway allows one to specify which bank they wish to pay from. Then the user is redirected to the bank's website, where one can authenticate oneself and then approve the payment.

Net banking main advantage that It is typically seen as being safer than using credit cards, with the result that nearly all merchant accounts in India offer it as an option. (amarit, n.d.)

b) PayPal :

PayPal is a global e-commerce business allowing payments and money transfers to be made through the Internet. Online money transfers serve as electronic alternatives to paying with traditional paper methods, such as cheques and money orders. It is subject to the US economic sanction list and other rules and interventions required by US laws or government. PayPal is an acquirer, a performing payment processing for online vendors, auction sites, and other commercial users, for which it charges a fee. It may also charge a fee for receiving money, proportional to the amount received. The fees depend on the currency used, the payment option used, the country of the sender, the country of the recipient, the amount sent and the recipient's account type. In addition, eBay purchases made by credit card through PayPal may incur extra fees if the buyer and seller use different currencies. On October 3, 2002, PayPal became a wholly owned subsidiary of eBay. Its corporate headquarters are in San Jose, California, United States at eBay's North First Street satellite office campus. The company also has significant operations in Omaha, Scottsdale, Charlotte and Austin in the United States; Chennai in India; Dublin in Ireland; Berlin in Germany; and Tel Aviv in Israel. From July 2007, PayPal has operated across the European Union as a Luxembourg-based bank

c) Payment wall :

An e-commerce solutions providing company launched in 2010, offers a wide range of online payment methods that its clients can integrate on their website.

d) Google Wallet :

Was launched in 2011, serving a similar function as PayPal to facilitate payments and transfer money online. It also features a security that has not been cracked to date, and the ability to send payments as attachments via email

e) Mobile Money Wallets :

In undeveloped countries the banked population is very less, especially in tier II and tier III cities. Taking the example of India, there are more

mobile phone users than there are people with active bank accounts. Telecom operators, in such geographies, have started offering mobile money wallets which allows adding funds easily through their existing mobile subscription number, by visiting physical recharge points close to their homes and offices and converting their cash into mobile wallet currency. This can be used for online transaction and eCommerce purchases. Many payment options such as Airtel Money and M-Pesa , ATW are being accepted as alternate payment options on various eCommerce websites.

- Microcommerce:

Microcommerce is a field of commercial business where each payment may be inexpensive, only tiny amount of money. From the viewpoint of the microcommerce the micropayments can be seen as one possible solution to allow the low-value payments for purchasing news articles. The World Wide Web is a useful content delivery mechanism for especially on-line merchandise which may offer great opportunities for the emergence of the microcommerce.

- Content Providers in Microcommerce:

Table (2-2): The intangible goods offered by the content providers of the microcommerce

Traditional Content Providers	New Content Providers	Individual Content Providers
• Newspapers	• Applet developers	• e-zines
• Magazines	• Search engines	• Personal essays
• Directories	• Rating services	• Subject indexes
• Book publishers	• Micro-gambling	• How-To Guides
• Newsletters	• Interactive games	• Cookbooks
• Photo libraries	• Software add-ons	• Annotated bookmark files
• Music publishers	• Shopping agents	• Personalized filtering
• Clip-art	• Buyer or Seller brokering	• Other access to some shared resource
• Stock Quotes	• Currency conversion	

- ## Micropayment systems:

A micropayment is an e-commerce transaction involving a very small sum of money in exchange for something made available online, such as an application download, a service or Web-based content. Micropayments are sometimes defined as anything less than 75 cents and can be as low as a fraction of a cent. A special type of system is required for such payments, which are too small to be feasible for processing through credit card companies called Micropayment systems.

- ## The way micropayment systems work:

With a prepaid system, cash, check, or credit payment is made to the online company sponsoring the micropayment system, your online account is then credited with a commensurate sum. You may then purchase goods or services online using this account. Often the purchases are digital in nature, and include, artwork, photos, images, audio, and video clips, privileges, perks, virtual goods, and titles.

When you first setup your account, your contractual agreement, sensitive financial, and personal account information, is transferred to the company you wish to do business with via an encrypted link.

At the time you are setting up your account, your account information is scrambled using a cipher code uniquely designed to protect that information and that information is then transmitted encoded to the online company that is sponsoring the micropayment system... There, your sensitive financial information is decoded, and your account is setup. That is the way micropayment accounts are supposed to work.

Once your account is setup, you may then make micropayments at any time, simply by selecting an item or payment option, and confirming your choice. This also usually occurs in a secured online environment setup by the company sponsoring the micropayment system, and often involves the purchaser verifying his or her identity prior to the purchase using a password, access code, or a digital or physical key of some sort. (Dirk Collins, 2014)

- **There are three participants in a micropayment scheme:**

  a) Customers (or users):
  Are the people who intend to make small online purchase and desire the convenience of a micropayment implement to help them pay for their purchases.

  b) Vendors (or merchants):
  Are the companies or web sites that want to sell their low-cost products/services online and are willing to accept a micropayment for their products/service.

  c) Brokers (agents and financial institutions):
  Are the companies that are the middlemen between customers and vendors, Brokers facilitating micropayment transactions. Generally, brokers are the hosts or administrators of the micropayment system. (Jari Kytöjoki, 2000)

- **Advantages of micropayment systems:**
  a) **Anonymity:** Setting up an online account with a micropayment service provider allows one to conduct financial transactions online with some anonymity.
  b) **Speed:** Micropayment accounts allow for quick and convenient purchase of real and virtual goods and services.
  c) **Scalability:** Micropayment systems can grow easily to accommodate additional trades, and new products, or services.
  d) **Security:** Fewer online transfers of actual payment leads to fewer opportunities for actual   theft or abuse. Further it is much easier to contain the scope of theft or abuse using a micropayment system. (Dirk Collins, 2014)

- ## Disadvantages of micropayment systems:

a) **Insecure Data:** If sensitive account information is compromised, the account holder is left vulnerable to more than just the losses from the investment in the account, often secondary or tertiary accounts may be compromised as a result.

b) **Micropayment Vendor/Processor Dishonesty:** Account holders may lose their investment in the micropayment system if the payment processing company is dishonest, or otherwise deceptive.

c) **Excessive, Taxes, Fees, and Charges :** Individual transactions end up costing the buyer more over the long term as individual taxes, fees, and charges, when combined and compared with a single larger purchase, reveal that the purchases actually cost more than if a single large purchase was made.

d) **Excessive Maintenance Costs:** With the explosion in the sheer number of micro transactions, actually auditing or reviewing such transactions quickly becomes extraordinarily expensive. Proportionally the number of customer disputes over failed or undesired individual purchases increase as well. (Dirk Collins, 2014)

- ## Dimensions of micropayment systems:

There are four dimension of micropayment systems requirement that should be considered:

4. Technological dimension :

Technological dimension consists of requirements for micropayment systems whose fulfillment is mainly an issue of proper technical implementation:

a) **Security:** Security of the micropayment systems is partly an issue of the security of the technology used. For instance, failures of the underlying technology - software or hardware - can substantially decrease the trust on the payment system.

b) **Scalability:** In micropayment systems, a scalable distributed design is required to prevent the possible bottlenecks that may emerge if the

system cannot respond to the requirements set by the potentially rapid increase of the transaction traffic through it .

c) **Reliability:** The micropayment system must serve customers 24 hours in a day and seven days a week, having no point of failure in the system at any time.

d) **Latency:** This is a very important requirement for an on-line oriented micropayment system - even at peak times the response times must be bearable.

e) **Interoperability:** Interoperability in the technological dimension means that the currencies like digital cheques and tokens applied in different micropayment systems are fully interexchangeable between the systems and protocols .

f) **Hardware independence:** For instance, to prevent double spending, credit card systems rely on hardware protection which produces additional costs. An ideal micropayment system should not depend on the underlying hardware or the lower network levels.

5. Economic dimension :

Economic dimension consists of the non-technical economic questions.

a) **Transaction costs:** These are the costs the merchant must pay to be able to perform the final payment-committing transaction. The costs can be divided into direct losses - the cost for executing transaction itself - and indirect losses - e.g. rent losses .

b) **Atomic exchange:** This requirement resembles very much the atomicity issues .

c) **Customer base:** The feasibility of the micropayments systems relies heavily on the size of the customer base. With no customers and no previous experience on the electronic payment business, the merchants may have significant startup problems .

d) **Convertibility:** Currencies used by different micropayment systems must be exchangeable which means that they must be

exchangeable also to and from the currency the bank uses - thus the currency applied in micropayment systems must have monetary value.

6. Social dimension :

Social dimension handles the issues that are mainly a concern of the customers.

a) **Anonymity:** Anonymity is defined as the protection of the identity of the parties participating in the protocol.

b) **Flexibility:** The flexibility requirement means that different payment models can be used concurrently, depending on the guarantees (e.g. digital receipts confirming that the party has shown a valid identity and is allowed to buy the product) needed by the parties of transactions. It should be noted that the extension of flexibility may implicate the degradation of the level of anonymity, since the different models offer different features and set varying requirements on the payment mechanism. For instance, credit card transactions often offer only partial anonymity.

c) **Peer-to-peer payments:** Peer-to-peer payment requirement states that everyone should be able to use micropayment mechanism with any other valid party, not just asymmetrically with the merchants.

7. Legal dimension:

Legal dimension handle area where law and information security concerns intersect. (Stanford University, 2011)

3.1. Introduction:

The purpose of this study is to analyze the current status and strategies of micropayment systems in Sudan, and discussed the factors that will help to improve the use of micropayment systems in Sudan.

This chapter contain a definition about how we collect our data ,the tools used in analyze this data and the results that came up from this analysis . We also identify the causes and factors that limit the spread of micro-payment systems and specifications required to be provided in micro-payment systems to encourage users to use them. We also evaluate micro-payment systems characteristic (efficiency, dependence, responsibility, security and privacy) from user's perspective (Sudanese users from different ages).

3.1.1. Data collection methods:

Methodology is concerned about both the ways in which the research is carried out , There are two approaches to data collection on researches (Alike, n.d.):

   i.   Quantitative - based on the methods used in the natural sciences
   ii.   Qualitative - based on methods which are said to be humanistic

In my research I used qualitative method. I wrote a questionnaire and used Google forms and normal printed paper to distribute my questionnaire .I distribute it to random number of Sudanese users (70 user) from different ages so I can used from their opinions in my study then I used statistical program (SPSS) to help me in analyzing the gathered data and came up with results and conclusions helped me to create a new frame work.

3.1.3. Study tools:
- ### Questionnaire:

A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information

from respondents. We distribute our questionnaire to random number of Sudanese users from different ages and try to answer our research hypotheses throw it (I used Google forms and normal printed paper to distribute my questionnaire). (wikipedia, 2016)

- **SPSS Package for the Social Sciences):**

    SPSS is a Windows based program that can be used to perform data entry and analysis and to create tables and graphs. SPSS is capable of handling large amounts of data and can perform all of the analyses covered in the text and much more. We used SPSS to analyze our questionnaire. (wikipedia, 2016)

3.1.3. How to ensure the validity and consistency of the study:

The questionnaire is intended to consistently give the same results if the questionnaire was re-applied several times in succession, and shows consistency on the consistency of the results, meaning that if a researcher repeated measurement and get the same results. There is also three ways help us to make sure that our study results are reliable (kheder, 2016):

a) **Sincerity of the arbitrators:** By reference to a person with expertise in the field and rely on his opinion (I went to Dr.alrazy Mohamed Ahmed – Kerma Technologies Co).

b) **Find Sincerity of experiment:** Means the extent of the scale association with a specific standard, so the test is successful if the stake truthful in revealing what brought him stake.

c) **Krnbach alpha:** One of the most common and in which they can measure the validity and reliability, it is the way (Cronbach alpha), which is based on internal consistency, and give an idea of the consistency of the questions with each other, and with all the questions in general.

- On my questionnaire I used **Krnbach alpha** (education, 2016) way to check the validity and consistency of the results ,and the results have been as the follow :
- **Note:**

Table (3-1): Krnbach alpha means

Krnbach alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

1. Factors that doesn't encourage users to use micropayment systems In Sudan:

Table (3-2): Measuring the sincerity of the questionnaire and the factors and constraints that affect the spread of micro-payment systems

#	Statement	Scale Mean if Item Deleted	Scale Variance total Deleted	Corrected item- if item Correlation	Alpha if Item Deleted
1.	Costumers doesn't have enough aware about micropayment system technique.	22.0484	79.8501	.8510	.8952
2.	Users prefer free product and services on that one need to be pay for even if the quality is different.	22.0484	86.7353	.7051	.9062
3.	Fear of use such new systems.	21.7742	83.6531	.8218	.8980
4.	Users fears to use the Internet in the purchasing process	21.9839	85.6555	.7305	.9045
5.	Non-availability of Internet services by the provider	21.9839	92.2129	.5733	.9145
6.	Users have no-trust in micropayment systems.	22.2097	88.4963	.7709	.9029
7.	There is no enough companies that provide micropayment systems services in Sudan.	22.0323	84.6875	.7503	.9030
8.	The purchasing value of intangible good such as information is hard to be estimated.	22.3871	97.7493	.3487	.9276
9.	Informational Prohibition in Sudan limiting the spread of micro-payment technology.	22.1129	84.2329	.7919	.9001

Source: prepared by the researcher from the field study 2016

Reliability Coefficients

N of Cases =   62.0   N of Items = 9

Alpha =   .9158

2. Factors that help to make micropayment systems popular In Sudan:

Table (3-3): Measuring the sincerity of the questionnaire and factors that make micropayment systems popular

#	statement	Scale Mean if Item Deleted	Scale Variance total Deleted	Corrected item- if item Correlation	Alpha if Item Deleted
1.	Customer support supplied by the companies provide micropayment services	22.4355	108.4466	.8287	.9421
2.	The possibility of using micropayment systems at anywhere and at any time.	22.2742	105.1859	.8979	.9381
3.	The product and services provided by micropayment systems distinguished by its high quality.	22.4516	111.7927	.8660	.9408
4.	No Expiration date encourage the use of micropayment systems.	22.0323	117.8022	.6115	.9528
5.	Micropayment systems shouldn't require from the user to re-login each time he/she make a purchase.	22.4516	111.7927	.7522	.9461
6.	Users can check how much money they have spent in micropayment purchasing processes.	22.4032	113.8511	.7703	.9452
7.	The ability of having your information and articles offline after you have paid for it (you can download it and save it to your device).	22.3710	105.7454	.8870	.9388
8.	What you want is what you pay for and what you get.	22.3387	110.0637	.8140	.9429
9.	Product and services provided by micropayment system's companies distinguished by its low prices.	22.1452	111.3065	.7746	.9449

Source: prepared by the researcher from the field study 2016

Reliability Coefficients

N of Cases =   62.0   N of Items = 9

Alpha =   .9496

3. Characteristics to evaluate micropayment systems from the user's perspective:

a) Efficiency:

Table (3-4): Measuring the sincerity of the questionnaire for the efficiency factors

#	Statement	Scale Mean if Item Deleted	Scale Variance total Deleted	Corrected item- if item Correlation	Alpha if Item Deleted
1.	High quality of Product and services provided by micropayment system	16.4603	56.6718	.8138	.9447
2.	Save time and afford	16.5238	53.5438	.8970	.9376
3.	Subscription procedures in micropayment system are simple and easy to understand	16.4762	54.7051	.8783	.9392
4.	User only pay for what he/she want	16.4762	57.3180	.8191	.9444
5.	Micropayment systems are easy to use	16.3492	55.7471	.8228	.9440
6.	micropayment system should prevent double spending in the case of hardware failure	16.2857	54.9493	.8533	.9414
7.	different micropayment models can be used concurrently	16.4762	59.7051	.7467	.9501

Source: prepared by the researcher from the field study 2016

Reliability Coefficients

N of Cases =   63.0   N of Items = 7

Alpha =   .9509

b) Dependency:

Table (3-5): Measuring the sincerity of the questionnaire for the Dependence factors

#	Statement	Scale Mean if Item Deleted	Scale Variance total Deleted	Corrected item- if item Correlation	Alpha if Item Deleted
1.	Micropayment systems can be rely on to provide product and services with high quality	13.2813	30.6181	.7793	.8700
2.	Micropayment system companies provide customer support services	13.4375	31.9960	.8012	.8676
3.	Replacement of free goods and services to goods and services provided by micropayment systems	13.4844	32.4759	.7348	.8772
4.	Currencies used by different micropayment systems must be exchangeable	13.5000	38.4127	.4001	.9204
5.	Ease of dealing with micropayment systems by different kind of users	13.3125	29.9325	.8263	.8619
6.	Micropayment process doesn't effected by hardware , software or network failure	13.2188	30.7450	.7945	.8674

Source: prepared by the researcher from the field study 2016

Reliability Coefficients

N of Cases =   64.0   N of Items = 6

Alpha =   .8972

c) **Responsibility:**

Table (3-6): Measuring the sincerity of the questionnaire for the responsibility factors

#	Statement	Scale Mean if Item Deleted	Scale Variance total Deleted	Corrected item- if item Correlation	Alpha if Item Deleted
1.	Speed of performance	8.1111	21.9713	.9282	.9552
2.	Micropayment systems can be used at any place	8.0000	20.9355	.9537	.9478
3.	Micropayment systems can be used at any time	8.0794	22.1710	.8982	.9637
4.	Micropayment systems allow the undoing of any payment process if something went wrong	8.1429	22.5438	.8998	.9632

Source: prepared by the researcher from the field study 2016

Reliability Coefficients

N of Cases =   63.0   N of Items = 4

Alpha =   .9679

d) Security and privacy :

Table (3-7): Measuring the sincerity of the questionnaire for the security and privacy factors

#	Statement	Scale Mean if Item Deleted	Scale Variance total Deleted	Corrected item- if item Correlation	Alpha if Item Deleted
1.	Guarantee the confidentiality of users data	5.2188	4.7768	.7199	-.0083
2.	Ensure the safety and security of banking transactions	5.2656	4.8331	.7143	.0053
3.	users accept the degradation of the security level to be able to purchase goods easily	**5.1719**	**10.4938**	**-.0007**	**.9805**

Source: prepared by the researcher from the field study 2016

Reliability Coefficients

N of Cases =   64.0   N of Items = 3

Alpha =   .6106

- We notice that the Cronbach's alpha consistency is excellent in all questions except the last question about the security and privacy the Cronbach's alpha consistency is questionable but acceptable.

4.1. Introduction:

Part1: data analysis:

- Analysis of the characteristics of the study sample:

The total number of the questionnaire samples is 77,seven of them was un returned , three of them returned with un complete information and three is considered corrupted ,the rest of the samples is 64 sample and it has been analyzed as the follow :

Table (4-1): Distribution according to sex

Distribution according to sex

	Frequency	Percent
Male	35	54.7
Female	29	45.3
Total	64	100.0

Source: prepared by the researcher from the field study 2016

We notice from table (4-1) that 54.7% of those who answered the questionnaire are female and 29% are male.

Distribution according to sex
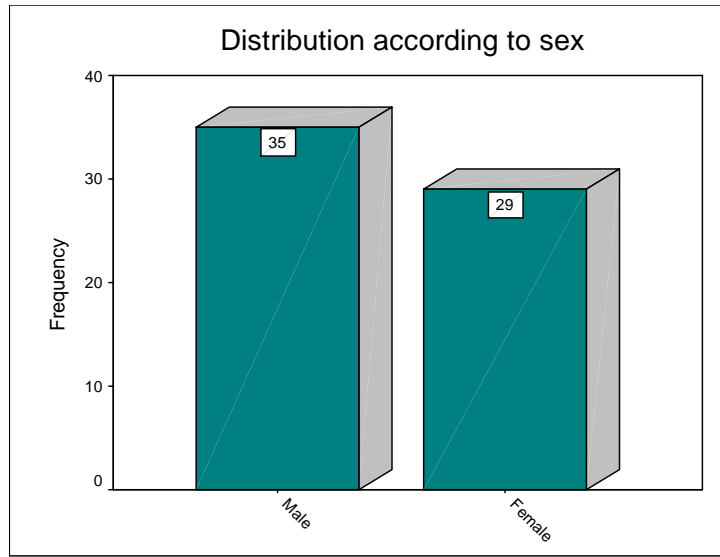
Source: prepared by the researcher from the field study 2016

Figure 4 : Distribution according to sex

Table (4-2): Distribution according to age

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Age in complete years	63	45	20	65	28.60	8.251

Source: prepared by the researcher from the field study 2016

We notice from table (4-2) Most of users of the micropayment systems between the ages 20 and 65.

Table (4-3): Distribution according to Educational Level

Distribution according to Educational Level

	Frequency	Percent	Cumulative Percent
High school	2	3.1	3.1
University	41	64.1	67.2
Post graduate studies	21	32.8	100.0
Total	64	100.0	

Source: prepared by the researcher from the field study 2016

We notice from table (4-3) that 3.1% of the Sudanese users who answered the questionnaire are secondary school graduates, 64.1 are university graduates and 32.8 are post graduates.
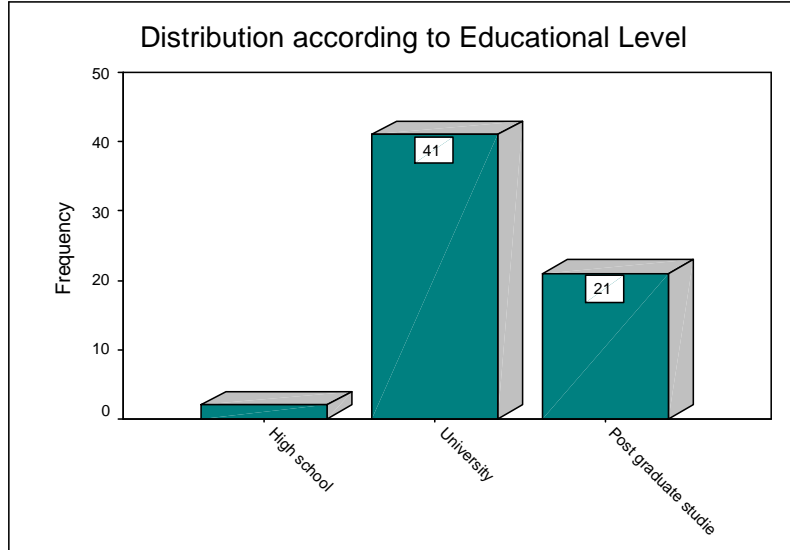
Source: prepared by the researcher from the field study 2016

Figure 5 :Distribution according to Educational Level

Table (4-4): Frequency of internet use

Frequency of internet use

		Frequency	Percent	Valid Percent
Valid	Every day	57	89.1	90.5
	every week	1	1.6	1.6
	When I need	5	7.8	7.9
	Total	63	98.4	100.0
Missing	Not determined	1	1.6	
Total		64	100.0	

Source: prepared by the researcher from the field study 2016

From Table (4-4) 89.1% of respondent's responses rate was they use the internet daily, 1.6% say they use the internet every week and 7.8% answered the use it when they need.
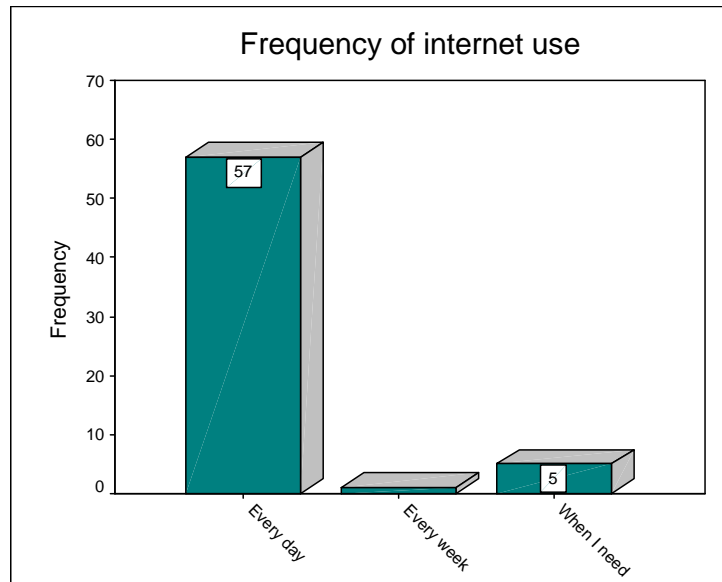
Source: prepared by the researcher from the field study 2016

Figure 6 : Frequency of internet use

Table (4-5): The purpose of using the internet

The purpose of using the Internet

	Frequency	Percent
Social	59	39.6
Academic	52	34.9
Commercial	38	25.5
Total	149	100.0

Source: prepared by the researcher from the field study 2016

We notice from table (4-5) that 39.6% of the people who answered the questionnaire are using the internet for social purposes, 34.9% using it for academic purposes and 25.5% are using it for commercial purposes.
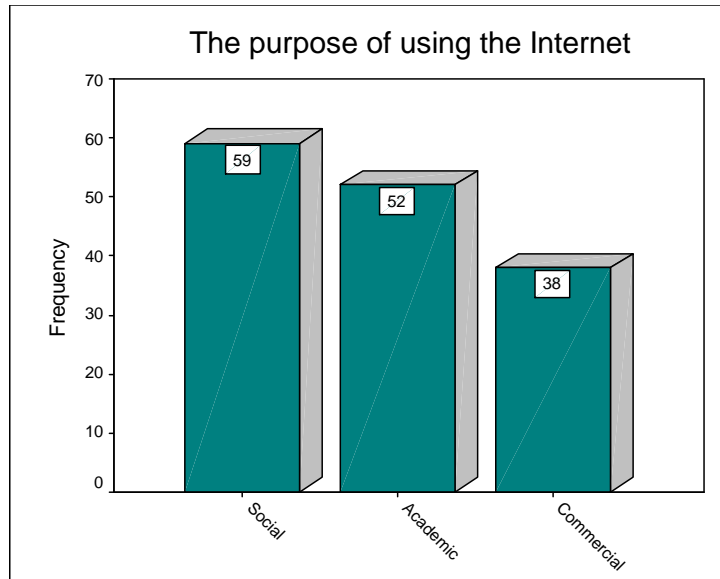
Source: prepared by the researcher from the field study 2016

Figure 7 : The purpose of using the internet

Table (4-6): The purposes we use micropayment systems for

You mostly use micropayment systems to:

	Frequency	Percent
Download books and articles	42	27.5
Download music	30	19.6
Download games	32	20.9
Download an app	41	26.8
Lectures	3	2.0
Did not use	5	3.3
Total	153	100.0

Source: prepared by the researcher from the field study 2016

We notice from table (4-6) that users use micropayment systems for different reasons .27.5% of people answered they use micropayment system to download books and articles, 19.6% to download music, 20.9% to download games, 26.8% to download apps and 2.0% to take online lectures.
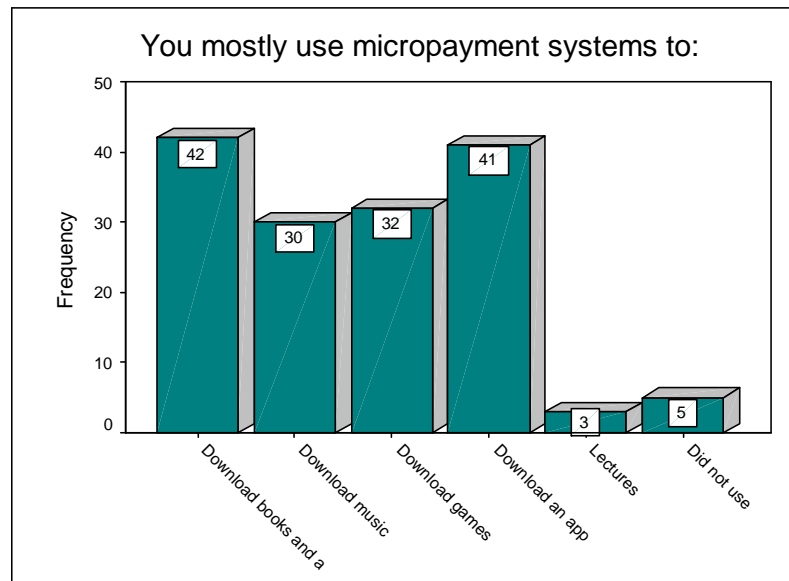
Source: prepared by the researcher from the field study 2016

Figure 8 : the purposes we use micropayment system for

- **Test study hypotheses:**

a) **The first hypothesis:** The reasons why micropayment technique isn't very known and not very much adopted in Sudan, why Sudanese people still until now not aware enough about such amazing technique .we try to know those Obstacles by answering the following nine questions on table (4-7).

Table (4-7): Sample of field study

Factors that doesn't encourage users to use micropayment systems In Sudan

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Costumers doesn't have enough aware about micropayment system technique.	Count	21	18	1	4	20	64
	% Percent	32.8%	28.1%	1.6%	6.3%	31.3%	100.0%
Users prefer free product and services on that one need to be pay for even if the quality is different.	Count	15	20	7	8	14	64
	% Percent	23.4%	31.3%	10.9%	12.5%	21.9%	100.0%
Fear of use such new systems.	Count	14	15	7	12	16	64
	% Percent	21.9%	23.4%	10.9%	18.8%	25.0%	100.0%
Users fears to use the Internet in the purchasing process	Count	16	18	5	11	14	64
	% Percent	25.0%	28.1%	7.8%	17.2%	21.9%	100.0%
Non-availability of Internet services by the provider	Count	11	18	14	8	11	62
	% Percent	17.7%	29.0%	22.6%	12.9%	17.7%	100.0%
Users have no-trust in micropayment systems.	Count	13	22	12	10	7	64
	% Percent	20.3%	34.4%	18.8%	15.6%	10.9%	100.0%
There is no enough companies that provide micropayment systems services in Sudan.	Count	18	15	8	8	15	64
	% Percent	28.1%	23.4%	12.5%	12.5%	23.4%	100.0%
The purchasing value of intangible good such as information is hard to be estimated.	Count	21	15	14	7	7	64
	% Percent	32.8%	23.4%	21.9%	10.9%	10.9%	100.0%
Informational Prohibition in Sudan limiting the spread of micro-payment technology.	Count	20	13	8	11	12	64
	% Percent	31.3%	20.3%	12.5%	17.2%	18.8%	100.0%

Source: prepared by the researcher from the field study 2016

To test the hypothesis we calculate the percentages of the study sample answers and associated constraints affecting the spread of micro-payment systems and the result came as it shown in the table above.

We note that most people agreed that the most obstacles that prevent the spread of micro-payment systems those Sudanese users don't have enough knowledge and aware about micropayment technique so 61% of them agreed on that. And 56.2% of users feel that intangible goods such as information are hard to be appreciated and estimated. Also 51.6% agreed that information prohibition in Sudan limiting the spread of micropayment systems and it reduces the chances of awareness of people with similar techniques. There is also another cause that affects the spread of micropayment technique but little affect such as non-availability of internet services by the provider where 46.7% agreed on that.

b) **Second hypothesis:** What are the required features that will encourage users to use micropayment systems and make them wide spread? , We try to know the required features, properties and specifications that Sudanese users want and need so we can came up with a micropayment system satisfied their needs; so we wrote the following nine questions in table (4-8).

Table (4-8): Sample of field study

Factors that encourage users to adopt micropayment system technique and help it to be popular

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Customer support supplied by the companies provide micropayment services	Count	24	8	11	6	15	64
	% Percent	37.5%	12.5%	17.2%	9.4%	23.4%	100.0%
The possibility of using micropayment systems at anywhere and at any time.	Count	21	12	6	6	19	64
	% Percent	32.8%	18.8%	9.4%	9.4%	29.7%	100.0%
The product and services provided by micropayment systems distinguished by its high quality.	Count	16	17	9	14	8	64
	% Percent	25.0%	26.6%	14.1%	21.9%	12.5%	100.0%
No Expiration date encourage the use of micropayment systems.	Count	14	10	12	15	13	64
	% Percent	21.9%	15.6%	18.8%	23.4%	20.3%	100.0%
Micropayment systems shouldn't require from the user to re-login each time he/she make a purchase.	Count	19	17	7	5	15	63
	% Percent	30.2%	27.0%	11.1%	7.9%	23.8%	100.0%
Users can check how much money they have spent in micropayment purchasing processes.	Count	16	16	10	12	9	63
	% Percent	25.4%	25.4%	15.9%	19.0%	14.3%	100.0%
The ability of having your information and articles offline after you have paid for it (you can download it ~~~~~~~~~~)	Count	20	17	3	4	19	63
	% Percent	31.7%	27.0%	4.8%	6.3%	30.2%	100.0%
What you want is what you pay for and what you get.	Count	19	11	13	6	15	64
	% Percent	29.7%	17.2%	20.3%	9.4%	23.4%	100.0%
Product and services provided by micropayment system's companies distinguished by its low prices.	Count	15	14	10	8	17	64
	% Percent	23.4%	21.9%	15.6%	12.5%	26.6%	100.0%

Source: prepared by the researcher from the field study 2016

We notice that 58.7% of users preferred to have the ability of downloading articles and lectures and saving them on their devices after see them so they can return back to them whenever they want. 50% agreed that customer support supplied by the companies that provide micropayment systems encouraged users to use their systems and product, because users can feel these companies are interested to meet our demands and solve our problems in more personal way with direct communication. 57.2% of users also agreed that micropayment systems shouldn't require from user to re login each time he want to make micropayment transaction, also There are another factors that encourage the use of micropayment systems but small number of people agreed that no expiration date to your micropayment account is considered important (only 37.5% agreed on its importance).

c) **Third hypothesis:** characteristic of micropayment systems (efficiency, dependence, responsibility, safety and security).

a) **Efficiency:**

Efficiency can be evaluated according to many things such as the high quality of the products, system should perform exactly as required ease of understand and use and so on as in table (4-9).

Table (4-9): Sample of field study

Characteristics to evaluate micropayment systems from the user's perspective: Efficiency

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
High quality of Product and services provided by micropayment system	Count	16	14	16	8	10	64
	% Percent	25.0%	21.9%	25.0%	12.5%	15.6%	100.0%
Save time and afford	Count	19	20	0	15	10	64
	% Percent	29.7%	31.3%	.0%	23.4%	15.6%	100.0%
Subscription procedures in micropayment system are simple and easy to understand	Count	18	15	7	14	9	63
	% Percent	28.6%	23.8%	11.1%	22.2%	14.3%	100.0%
User only pay for what he/she want	Count	16	14	15	12	7	64
	% Percent	25.0%	21.9%	23.4%	18.8%	10.9%	100.0%
Micropayment systems are easy to use	Count	14	20	5	14	11	64
	% Percent	21.9%	31.3%	7.8%	21.9%	17.2%	100.0%
micropayment system should prevent double spending in the case of hardware failure	Count	15	13	15	7	14	64
	% Percent	23.4%	20.3%	23.4%	10.9%	21.9%	100.0%
different micropayment models can be used concurrently	Count	12	19	17	9	7	64
	% Percent	18.8%	29.7%	26.6%	14.1%	10.9%	100.0%

Source: prepared by the researcher from the field study 2016

We notice in table (4-9) that the majority of users seeking for systems that save time and afford so 29.7% of users agreed on that 60.2% agreed that subscriptions procedures in micropayment systems should be simple and easy to understand so users from different educational levels will be able to use micropayment systems and enjoy by the services and services provided by them. Also about 47% of users agreed that high quality of product and services provided by micropayment systems is something important so users can feel the different between free product and those products. Also 46.9.0% agreed they should only bay for what they want, so companies should be honest about the information that they provide to their customers in order to gain their trust and loyalty.

b) Dependence:

It means system can be reliable, flexible and confidence, table (4-10) show what dependence features those users in Sudan seeking for.

Table (4-10): Sample of field study

Characteristics to evaluate micropayment systems from the user's perspective: Dependence

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Micropayment systems can be rely on to provide product and services with high quality	Count	16	19	5	12	12	64
	% Percent	25.0%	29.7%	7.8%	18.8%	18.8%	100.0%
Micropayment system companies provide customer support services	Count	17	14	17	9	7	64
	% Percent	26.6%	21.9%	26.6%	14.1%	10.9%	100.0%
Replacement of free goods and services to goods and services provided by micropayment systems	Count	17	19	11	9	8	64
	% Percent	26.6%	29.7%	17.2%	14.1%	12.5%	100.0%
Currencies used by different micropayment systems must be exchangeable	Count	11	27	11	10	5	64
	% Percent	17.2%	42.2%	17.2%	15.6%	7.8%	100.0%
Ease of dealing with micropayment systems by different kind of users	Count	19	13	9	12	11	64
	% Percent	29.7%	20.3%	14.1%	18.8%	17.2%	100.0%
Micropayment process doesn't effected by hardware , software or network failure	Count	17	11	13	12	11	64
	% Percent	26.6%	17.2%	20.3%	18.8%	17.2%	100.0%

Source: prepared by the researcher from the field study 2016

As we notice in table(4-10) almost 60% of users agreed that micropayment systems support handling with multi currency, 50.1% of Sudanese users from the study sample agreed that micropayment systems should be easy to use by different kind of users to. We notice that 43.8% agreed that micropayment systems shouldn't be affected by hardware or software failure so they guarantee that the process will perform in correct way, also 54.7% agreed that micropayment system companies should provide customer support systems and many another features.

c) Responsibility:

System responsibility can be evaluated according to system performance, and system should be reachable from anywhere and anytime. From table (4-11) we can see micropayment systems responsibility from user's perspective.

Table (4-11): Sample of field study

Characteristics to evaluate micropayment systems from the user's perspective: Responsibility

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Speed of performance	Count	21	16	4	7	15	63
	% Percent	33.3%	25.4%	6.3%	11.1%	23.8%	100.0%
Micropayment systems can be used at any place	Count	23	11	3	9	17	63
	% Percent	36.5%	17.5%	4.8%	14.3%	27.0%	100.0%
Micropayment systems can be used at any time	Count	22	13	5	8	15	63
	% Percent	34.9%	20.6%	7.9%	12.7%	23.8%	100.0%
Micropayment systems allow the undoing of any payment process if something went wrong	Count	22	13	8	6	14	63
	% Percent	34.9%	20.6%	12.7%	9.5%	22.2%	100.0%

Source: prepared by the researcher from the field study 2016

We notice that 54% people from the Sudanese study sample agreed that micropayment reachable from anywhere and 55.5% agreed it should be available at anytime and should allow process if anything went wrong, and 58.7% agreed of course on the importance of speed of perfo

d) Security and privacy:

The most important thing that users seeking for in e-payment system , is to guarantee con information and ensure that their bank accounts and transactions are safe. As it shown in t

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Table (4-12): Sample of field study

Characteristics to evaluate micropayment systems from the user's perspective:Securi

		Strongly agree	Agree	Neutral	Disagree	S c
Guarantee the confidentiality of users data	Count	26	10	5	9	
	% Percent	40.6%	15.6%	7.8%	14.1%	
Ensure the safety and security of banking transactions	Count	28	7	7	9	
	% Percent	43.8%	10.9%	10.9%	14.1%	
Users accept the degradation of the security level to be able to purchase goods easily	Count	19	15	9	11	
	% Percent	29.7%	23.4%	14.1%	17.2%	

Source: prepared by the researcher from the field study 2016

We notice that 43.8% of Sudanese users agreed that systems must ensure the safety and se transactions that show most of users doesn't trust such systems to keep their account safe from t make very safe and secure systems to encourage users to adopt such systems.

Part2: Results:

After analyzing the gathered data we came up with the next results:

- There are many factors that affect the spread of micropayment systems in Sudan, the most important factor that there's no enough aware about such systems and about their benefits and uses, 61% of the Sudanese users who answer the questionnaire agreed on that, a lot of them also thing that such on line purchasing systems are hard to be trusted .They say intangible goods and services are hard to be estimated; so they preferred free good and services even if the quality is lower.
- We can encourage the use of micropayment systems in Sudan by providing systems that give users the ability of saving and download any goods(information ,articles, etc) they bayed for, good and services provided by micropayment systems should distinguished by its high quality, companies must provide customer support services and make these systems available at anywhere and anytime.
- We notice that the non availability of internet services is not an effective factor on the spread of micropayment systems in Sudan and so the fear of using new systems. Users also doesn't mind if there is an expiration date for their subscriptions and they don't want to know how much money they spend after each micropayment process.
- From analysis results we notice that Sudanese users doesn't like to try new systems especially for on line purchasing, they prefered to use Traditional commercial systems.
- We notice in the evaluation of micropayment characteristic that micropayment systems save time and effort, It is easy to subscribe and use, micropayments systems ensure the completion of operations properly.
- Micropayment systems save user's confidentiality, and guarantee the safety and security of banking transactions, 53.1% of Sudanese users agreed on reducing the level of security to make it easy to deal with micropayment systems.

Table (4-13): The study results

Hypotheses	Related questions	Results
Factors that doesn't encourage the use of micropayment systems in Sudan	1. Costumers doesn't have enough aware about micropayment system technique.	-There are many factors that affect the spread of micropayment systems in Sudan, the most important factor that there's no enough aware about such systems and about their benefits and uses. -Sudanese users don't trust online purchasing systems. -A lot of users prefer free product and services because they thing intangible goods and services are hard to be evaluated and estimated. -Information prohibition doesn't encourage users to try those systems.
	2. Users prefer free product and services on that one need to be pay for even if the quality is different.	
	3. Fear of use such new systems.	
	4. Users fears to use the Internet in the purchasing process.	
	5. Non-availability of Internet services by the provider.	
	6. Users have no-trust in micropayment systems.	
	7. There are no enough companies that provide micropayment systems services in Sudan.	
	8. The purchasing value of intangible good such as information is hard to be estimated.	
	9. Informational Prohibition in Sudan limiting the spread of micro-payment technology.	

Hypotheses	Related questions	Results
Factors that encourage the use of micropayment systems in Sudan and help us to make them wide spread	1. Customer support supplied by the companies provides micropayment services.	-The ability of downloading and saving articles and news papers to return to them again at any time encourages users to use micropayment systems.
	2. The possibility of using micropayment systems at anywhere and at any time.	
	3. The product and services provided by micropayment systems distinguished by its high quality.	- Companies must provide customer support services and make these systems available at anywhere and anytime.
	4. No Expiration date encourage the use of micropayment systems.	
	5. Micropayment systems shouldn't require from the user to re-login each time he/she make a purchase.	-The non availability of internet services is not an effective factor on the spread of micropayment systems in Sudan.
	6. Users can check how much money they have spent in micropayment purchasing processes.	
	7. The ability of having your information and articles offline after you has paid for it (you can download it and save it to your device).	-Users doesn't mind if there is expiration date to their subscription in micropayment systems, and most of them doesn't like to re login each time he/she wants to make micropayment process.
	8. What you want is what you pay for and what you get.	
	9. Product and services provided by micropayment system's companies distinguished by its low prices.	- Micropayment systems provide goods and services with high quality and low prices.

Hypotheses	Related questions	Results
	Efficiency	
Characteristics to evaluate micropayment systems from the user's perspective	1. High quality of Product and services provided by micropayment system.	-Micropayment systems are easy to use and subscribe, save time and flexible.
	2. Save time and afford.	
	3. Subscription procedures in micropayment system are simple and easy to understand.	-If anything went wrong during the process micropayment system prevent double spending problem from occurring.
	4. User only pays for what he/she wants.	
	5. Micropayment systems are easy to use.	
	6. Micropayment system should prevent double spending in the case of hardware failure.	
	7. Different micropayment models can be used concurrently.	
	Dependence	
Characteristics to evaluate micropayment systems from the user's perspective	1. Micropayment systems can be relying on to provide product and services with high quality.	-Reliable Micropayment systems have the ability to deal with different currency to make it easy for the users to by goods and services from different countries.
	2. Micropayment system companies provide customer support services.	
	3. Replacement of free goods and services by goods and services provided by micropayment systems.	
	4. Currencies used by different micropayment systems must be exchangeable.	-Micropayment transactions work in an efficient way without affected by any kind of failure and so is users account balance.
	5. Ease of dealing with micropayment systems by different kind of users.	
	6. Micropayment process doesn't effected by hardware, software or network failure.	

Hypotheses	Related questions	Results
	Responsibility	
Characteristics to evaluate micropayment systems from the user's perspective	1. Speed of performance.	-Micropayment systems are available at anywhere and anytime with high performance ability and avoid mistakes property.
	2. Micropayment systems can be used at any place.	
	3. Micropayment systems can be used at any time.	
	4. Micropayment systems allow the undoing of any payment process if something went wrong.	
	Security and safety	
Characteristics to evaluate micropayment systems from the user's perspective	1. Guarantee the confidentiality of user's data.	-Micropayment systems keep user's information and their bank accounts safe and secure.
	2. Ensure the safety and security of banking transactions.	
	3. Users accept the degradation of the security level to be able to purchase goods easily.	

5.1. Conclusions:

- Only a small number of internet users in Sudan know about micropayment technique.
- There are no providing companies for micropayment systems in Sudan.
- We need to increase the awareness about the capability of this new technique to encourage people in Sudan to use it.
- Micropayment systems introduce users to better services and products with high quality level and low prices.
- Micropayment technique is providing a new way for services provider companies to gain huge profits.
- This new technique will give users the opportunity to have the most updated information and the latest news and articles.
- Most of Sudanese people don't trust online purchasing systems and preferred the traditional way.
- Internet services availability are no longer an effective factor on the non prevalence of micropayment technique as a result of the evolution that has occurred in this area in the last period of time in Sudan.
- Users preferred free online product and services even if the quality of these product and services are low.
- Micropayment systems must be reliable, flexible, and easy to understand by different kind of users.
- Different micropayment systems should be able to handle multiple currency transactions and have the ability to work concurrently.
- Micropayment systems are very safe and secure in doing banking transactions and guarantee keeping users information safe from fraud.

5.2. **Recommendations**:

- We have to aware Sudanese people about the value and importance of the intangible goods and encourage them to adopt new technologies to help our country to keep up with the technological development around the world.

- We have to aware people about micropayment systems and there benefits, and encourage them to replace free product and services online with ones with high quality.

- Companies must focus on providing customer support services to encourage users to adopt these systems and to increase their profits.

- Sudan National Telecommunication Corporation must work on solving the problem of information prohibition.

- There is still a lot to do in respect of building a working micropayment system, both from the technological, usability-related and commercial points of views.

- The micropayment approach requires that the users can freely move from a site to another, buying items that cost only a couple of cents, without the bother of registering again to attract newcomers.

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