AN ANALYSIS OF FACTORS INFLUENCING THE IMPACT OF PDA UTILIZATION ON THE OPERATIONAL EFFICIENCY OF BANKING AND FINANCIAL INSTITUTION IN MALAYSIA

BY
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APPROVAL SHEET

This dissertation entitled "**AN ANALYSIS OF FACTORS INFLUENCING THE IMPACT OF PDA UTILIZATION ON THE OPERATION EFFICIENCY OF BANKING AND FINANCIALS INSTITUTION IN MALAYSIA"** was prepared by GAYATHRI A/P MAGESWARAN and submitted as partial fulfillment of the requirements for the degree of Master of INFORMATION SYSTEM at Universiti Tunku Abdul Rahman.

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ABSTRACT

The market for PDA's and handheld devices is booming given the ability to purchase devices with low costs, Internet access on the move and ease of use. The global market for these devices is exposed back to mankind to generate strategic opportunity to sustain business and growth for future with new technologies leading to migration of innovative business offering products through m-commerce. Mobile banking allows the users perform transactions and information processing anytime regardless of location identification via PDA's or mobile phones. At present banks and financial institutions are competitively pressured in two main areas; customer services and operation efficiency. Mobile banking has been well explored and adopted extensively in developed countries like US and UK. However, for Malaysians though the customers has initiated good progress using the mobile banking services the impact on operation efficiency to improve productivity within the financial and banking institutions' are yet to be explored.

The contribution of this study is to provide a better understanding on the factors that influences the impact of PDA utilization on banking and financial institutions operational efficiency in Malaysia. A research model is formulated and used in creation of questionnaires to test various hypothesis regarding consumers' adoption of the mobile banking system by identifying the various factors that is relevant towards PDA usage in optimizing operational efficiency. The results from the questionnaires are used to determine the viability of the proposed hypothesis and an analysis of these results and their relevance to the current research in this area is conducted. Directions for future work will be identified as well.

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CHAPTER 1

1. Introduction

The need to process and receive information in real time has being an impetus for the rapid progression of computing and mobile technology. Today, telecommunication services and devices have many functionalities that have been added to ease the processing of information and ensuring this information reaches to the destination with little cost and time effectiveness. Besides that, the various value added services on offer from the main mobile service providers have enhanced the attractiveness of the PDA (Personal Digital Assistant) as one of the devices that can been used to enhance business processes. This has prompted organizations to examine its usage in more detail from the viewpoint of how it could improve their business operational efficiency.

Majority of people today owns a technology based tool, either to support communication or to carry out their daily routine task. These tools can range from laptops, mobile phones and also Personal Digital Assistant (PDA), and many others as well. Statistics indicate that more than 13 Million phone purchases were made in Malaysia in 2005, Llyod (2005).

PDAs are used to ease communication as well as support the user to get their job accomplished without being at the office, which simply means user does

not have to worry about geographical location issues in getting their job done. This concept has been researched and termed as the nomadic information environment, Singh et. al. (2010).

1.2 Background of the study

Globally economic pressure is forcing organizations to continuously integrate and automate their business operations, mainly organization's processes like order processing, procurements, claims processing, payments and administrative procedures. Turk Ekonomi Bankasy, one of the leading banking institutions in Turkey has a joint venture with BNP PARIBAS, the European leader in global banking and financial services group. This joint Venture in the Turkish market has already implemented 'Mobile Collection and Payment System', BNP PARIBAS (2009), using existing mobile phone technology and offering companies with mobile sales teams an alternate, low cost, flexible collection method. Another partnership by BNP PARIBAS and France Telco Orange launched innovative mobile banking services, BNP PARIBAS (2009). In Malaysia, there are organizations that utilize this mobile technology to achieve improved business efficiencies and better customer services.

Various motivating factors for the organizations in Malaysia to utilize PDA technology to improve operational efficiency were revealed by the collaborative study conducted by Vodafone Group Foundation and the UN

Foundation Partnership, Trends In Mobile Use by NGOs by Kinkade and Verclas (2008). This study identified that the perceived benefits of NGO mobile use are enormous. The outcome of their survey reveals the following key benefits of mobile technology:

- Time Savings to accomplish task and communications 95 percent
- ability to quickly mobilize or organize individuals 91 percent
- reaching audiences that were previously difficult or impossible to reach 74 percent
- ability to transmit data more quickly and accurately 67 percent
- ability to gather data more quickly and accurately 59 percent

It has been also concluded that 76 percent of the NGO users are likely to increase the use of mobile technology in the near future.

Another example is the Technology Implementation Award offered by the Asian Banker (2009), which seeks to encourage the banking industry to continue with business process and operation efficiency improvements. An award of Best Core Banking Project/Honorable special mention for most innovative entry was given to Jibun Bank Corporation, Japan. The core banking project was initiated to realize the vision of turning the lender into a virtual bank with the mobile phone as the primary channel. This award can be seen as motivating factor for encouraging wider adoption of technology to enhance the efficiency of business processes, not only within the banking sector but also in the wider industry.

There has been existing research done on identifying the level of acceptance of mobile technology in Malaysia for example, Parveen and Sulaiman (2008), indicates that 80% of respondents in his study use the Internet, 91% use mobile phones, but only 32.6% use mobile Internet. However, there is still a lack of research carried out on the specific issues that are involved from organization themselves to implement these mobile phone based services and applications for their users.

1 .3 Statement of Problem

The use of the PDA in supporting or enhancing the operation efficiency and the business process infrastructure is a value added advantage to the organization that is adopting this technology towards this end. There are a plethora of factors that motivate the use of PDAs, as well as numerous areas in an organization where its use will impact on. However, the prime directive for the vast majority of organizations is to increase operational efficiency via the cutting of organizational costs, and this motivation is no different as well when it comes to the application of PDAs and PDA-related applications. Cost cutting is frequently, although not always, achieved by using PDAs and PDA-related applications to speed up and enhance communication processes that facilitate key decision making aspects of an organization's activities which are critical to generating its profit margin. At the current point of time, the use of PDAs for this purpose in the Malaysian business context has been in a rather ad-hoc fashion, and there has yet to be clear, quantitative evidence that delineates the specific enhancement that the utilization of PDAs offer towards operational

efficiency. A study that produces some data along these lines would go a long way towards guiding organizations in making accurate cost benefit analyses when deciding whether or not to incorporate the use of PDAs more extensively within organizational operational behavior.

Recent research shows that despite the rapid diffusion of mobile devices and mobile Internet banking services application made available in the developing countries like US and Japan, here in Malaysia the deployment is not adopted extensively, where perceived difficulties of use and conceptual discussion of which banking transactions using handheld devices that fall under the term "Mobile Banking" is scarce, Laukkanen (2007).

Mobile technology can help financial institutions to optimize their internal processes and services by allowing added flexibility to access information regardless of location and time, Yankelevich et. al (2004). Hence allowing business application implementation on PDA's devices forces simplification of business process and data. In addition, the proliferation of applications and devices promotes standardization, which maximizes the return on investment (ROI), Saccocia and Egan (2006).

The success of adopting mobile technology for the financial institution may vary depending on the business process model adopted by the financial institution and to what extent the demand on mobilizing the operational functionality has been considered with the financial institutions. Certainly there are some financial institutions that would consider mobilizing job functionality up to many field personnel while others might have less usage. For example; Maybank has introduced mobile functionality allowing customers to access and

check account balances, transaction history and online money transfer. However, this is adequate for customer services process only; as compared with financial institutions like Jubin Bank of Japan that manages the customer's base and handles business operations via website Kobayashi and Ruane(2009).

Being part of the financial industry, it is important for all financial institutions to understand mobile trends and how mobilizing business operations can affect the business process efficiency and competitive standing.

With this in mind, this project will seek to undertake a detailed study to analyze the various factors influencing the impact of PDA utilization on the operational efficiency on a certain sector of businesses in Malaysia, namely the banking and finance sector. This sector has traditionally relied on cutting edge technological processes to facilitate the automation of many of their key business activities, hence providing an ideal background for a study of this nature. The results of the study will be useful in understanding future trends underlying commercial application of PDAs in the Malaysian context, as well as providing useful guidelines to banking and financial institutions that wish to augment that wish to move in this direction. This is to encourage Malaysian organizations to improve business productivity with the use of available technology to stay competitive with other developing countries that are more advanced in the utilization of technology to carry out business processes. This ensures that the organizations do not stagnate and are able to later integrate with their international customers to perform business functions and cut down the operational costs simultaneously.

1.4 Aim and Objectives

With this in mind, this project will seek to undertake a detailed study to analyze the various factors influencing the impact of PDA utilization on the operational efficiency of financial institutions in Malaysia.

1.4.1 The objectives of the study are to:

1. Understand and examine the factors contributing to increasing operational efficiency in banking and financial institutions and how this is achieved using existing approaches
2. Study how PDAs and PDA-related applications are typically employed in business organizations in general, followed up with a detailed survey on a select group of banking and financial institutions to obtain a detailed understanding of how PDAs and PDA-related applications are currently employed within them.
3. A combined analysis of the previous surveys using an appropriate data analysis methodology to identify the various factors that is relevant towards PDA usage in optimizing operational efficiency. Such factors may encompass technical issues such as physical infrastructure, device characteristics and security, as well as social / organizational issues underlying user adoption and utilization.
4. A general pattern representing the underlying trend in mobile phone usage can be formulated from the prior analysis in the specific area of optimizing operational efficiency, and this can be used in a predictive

manner to show how PDAs can be utilized in the banking and financial institutions in the future.

1.5 Research Questions

As part of the successful completion of this study, the following relevant research issues are addressed to identify the relevance of these factors in supporting the effective deployment of PDA technology to improve the organizational operational efficiency

1. The business requirements and supporting infrastructure. This can be subdivided into barriers to using the device and physical architecture for supporting device usage.

2. The security features that would be necessary to guard the system as well as the data processed within it.

3. Identification of the various potential issues (staff, management, budget, resources) faced by the IT managers in implementing the use of PDA technology to improve business operations. These issues include

- Perceived ease of usability by target audience
- Perceived impact on mobile work productivity
- organizational support for mobile business projects
- financial viability of mobile business projects
- network connectivity quality and other network related issues
- management of IT departments

1.6 Scope of Study

The research would focus primarily on the 3 major issues in adopting the PDA as a technology that can support the improvement of operation efficiency for organizations. The scope would be on:

a. Device characteristics and physical infrastructure that is required to support the technology.
b. Security infrastructure that the organization would require to reduce the fear of internal and external threats to business operations
c. Factors such as social / organizational issues underlying user adoption and utilization

The scope of the above mentioned study will be restricted to banking and financial institutions. These institutions have the largest potential of benefitting from wider spread usage of the PDA technology to improve operational efficiency, as well as reaching out to new markets and customers. It is noted that most financial institutions have wireless technology utilization to some extent. However, whether these financial institutions have implemented the requisite technology to cut down operational costs and improve business operations is still a question that needs to be investigated.

1.7 Significance of the study

The need and use of the PDA technology is not consider established in Malaysia as compared to many technology oriented countries like the United States, Australia and others. Although the use of mobile and PDA has been

much discussed in the health care and banking industries, its deployment to improve the business operation efficiency of other industries in Malaysia has yet to be explored. This study will contribute by providing a detailed analysis of the various factors that can potentially contribute to the successful deployment of PDA services within the banking and financial industries in Malaysia. It will also outline a general guideline to aid the existing organizations in these industries to further augment their adoption of PDA-based technology in a seamless and non-disruptive fashion to their existing business organizations.

1.8 Limitations

To successfully complete the research on time and to obtain the contributions as specified above, the following limitations will be applied to the study:

- Study will be based on a limited number at least 10 banking and financial institutions that are currently using the PDAs as a tool to improve their operational efficiency. Prior to their willingness to participate in the research.
- The participants are confined to the staff that would be directly involved in the use of the technology while interacting with the business process system.
- The data collection method will be based on the use of survey and self-administered questionnaires.

1.9 Definition of Terms

- **Mobile Business Process:** A specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs: a structure for action, Köhler & Gruhn (2004).
- **Mobile Banking:** Mobile Banking means a financial transaction conducted by logging on to a bank's website using a cell phone, such as viewing account balances, making transfers between accounts, or paying bills.
- **Mobile Technology :** a device, such as a PDA or smart phone, that can store, access, create, allow to modify, organize, or otherwise manipulate data in various forms from a location without being required to be tethered to any particular spot, Regas T. (2002).
- **Mobile business process infrastructure:** Mobile Service Infrastructure is a software framework that enables the creation and delivery of mobile applications across all lines of business to mobile customers and employees, Broadbeam (2010).
- **Mobile commerce:** M-commerce (mobile commerce) is the buying and selling of goods and services through wireless handheld devices such as cellular telephone and personal digital assistants (PDAs).

1.10 Organization of the report

There are about five chapters in this report.

The first chapter is an introduction to the study which covers several sections such as background of the study, problem statement, aim and objectives, research questions with sub-questions, scope of the study, significance of study, definition of terms, organization of thesis report and conclusion.

Second chapter focuses on literature review. This chapter provides background coverage on mobile technology environment, mobile business process, physical architecture and security consideration, benefits earned from the implementation and usage of mobile business process. A review on the previous research models and factors that has been considered for similar research by many other authors is also performed.

Chapter three provides detailed information on selection of factors and formation of the research model that generates the hypothesis to be tested against the variables identified for this study. The process is then continued to select the right research design and instrument that can be used to perform data collection and analysis.

The fourth chapter discusses and analyzes the results of the questionnaire, and appropriate conclusions drawn and suitable recommendations proposed.

The fifth chapter concludes the study and provides recommendation for future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

As computers have its own evolution from big gigantic hardware to super slim PDA, the software technology, physical infrastructure and architecture to support the hardware technology have evolved drastically. Mobile technology has made an outstanding performance from allowing communication between two individuals to being able to have conference calls, SMS, MMS, going online with mobile, financial transactions support and to enhance daily life and business processes. Mobile technology optimize organization internal processes and services with the ability to access information from anywhere at any time Rutburg & Co. (2012)**,** implementation of mobile technology services act as an opportunity to generate competitive advantage among organizations.

2.2 Personal Digital Assistant (PDA)

The PDA is a portable electronic hand held device just like any other mobile phones. However a mobile device that is being utilized for communication and SMS services is different compared to the PDA that provides personal organization. PDA provides touch screen input services, removable storage, calendar, address book, addition application capabilities and business software.

2.3 Nomadic Information Environment Support

The use of PDA helps the organization to cater for nomadic information environment support which is, currently a hot topic in many foreign countries such as Hong Kong, America and Germany. Hong Kong has been recognized to initiate mobile Internet market in 2003, Vuolle M. et. al.,(2008). Figure 2.1 demonstrates the necessary attributes of a nomadic information environment which has been given by Lyytinen (2001);

- high levels of mobility
- consequent large scale services and infrastructures
- diverse ways in which data are processed and transmitted—often called digital convergence

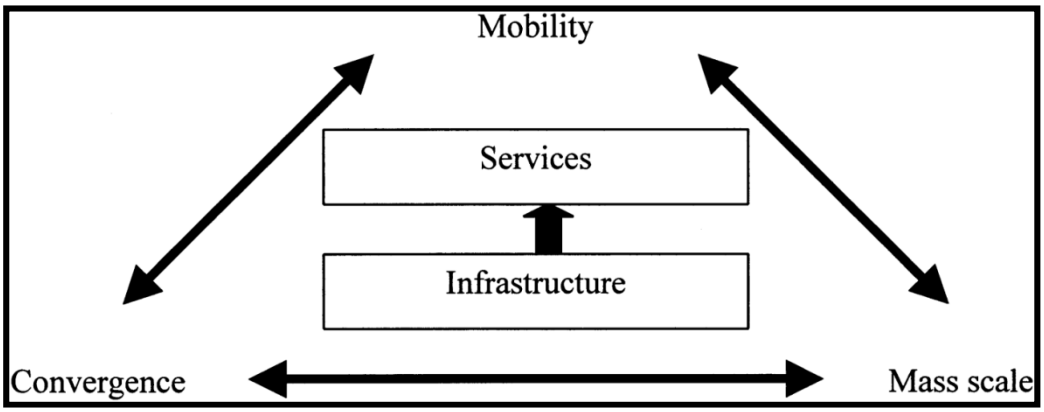


Figure 2.1: A framework of nomadic Information Environment
Source: Lyytinen K., & Yoo Y., (2001), A framework of nomadic Information Environment, Research Commentary: The Next Wave of *Nomadic* Computing

According to Lyytinen (2001), the model that she has defined here provides the scope for technological specification, standards and protocol together with the technical implementation that would be required to support the three key points that have been included in the diagram (mobility, convergence and

infrastructure) . The next question is if there is a need for this sort of technology and how to integrate software, hardware design with the principles of industrial design and ergonomics.

2.4 Mobile Technology

Rutburg & Co. (2012), Table 2.1 demonstrates mobile device consumer market which shows an impressive increase in the purchases and usage of the mobile devices. By the end of 2011 4.5 billion mobile subscription amounting 79% of global subscription. However, due to infrastructure (low, erratic and expensive bandwidth, low end device), device (screen size, battery capacity, processing power…etc), and social (illiteracy, organization culture, novice ICT users), Dorflinger J., (2009) and Vuolle M. et. al. (2008), have suggested that continues innovation is required to improve the current situation. Contrary to the use of workstation or personal desktop, users are comfortable screen size, gigabytes of memory, GUI environment that allows performing multiple activities simultaneously and comes with complex technology. These users would have the similar expectation (simplicity, reliability and functionality), Vuolle M. et. al., (2008) when performing task on the mobile. All these factors collectively contribute to the implementation, usage, acceptance and success of the mobile application services in an organization.

Table 2.1: Mobile subscribers; global mobile handset and smartphone market share; world's top five operators

Source: Rutburg & Co. (2012), Global mobile statistics 2012: all quality mobile marketing research, mobile Web stats, subscribers, ad revenue, usage, trends. http://mobithinking.com/mobile-marketing-tools/latest-mobile-stats#subscribers

Key Global Telecom Indicators for the World Telecommunication Service Sector in 2011 (all figures are estimates)									
	Global	Developed nations	Developing nations	Africa	Arab States	Asia & Pacific	CIS	Europe	The Americas
Mobile cellular subscriptions (millions)	5,981	1,461	4,520	433	349	2,897	399	741	969
Per 100 people	86.7%	117.8%	78.8%	53.0%	96.7%	73.9%	143.0%	119.5%	103.3%
Fixed telephone lines (millions)	1,159	494	665	12	35	511	74	242	268
Per 100 people	16.6%	39.8%	11.6%	1.4%	9.7%	13.0%	26.3%	39.1%	28.5%
Active mobile broadband subscriptions (millions)	1,186	701	484	31	48	421	42	336	286
Per 100 people	17.0%	56.5%	8.5%	3.8%	13.3%	10.7%	14.9%	54.1%	30.5%
Fixed broadband subscriptions (millions)	591	319	272	1	8	243	27	160	145
per 100 people	8.5%	25.7%	4.8%	0.2%	2.2%	6.2%	9.6%	25.8%	15.5%
Source: International Telecommunication Union (November 2011)								via: mobiThinking	

2.5 Bring Mobile Workforce into Business

The mobile workforce has been classified into the following by Gumpp and Pousttchi (2005);

- Employees, mobile on the premises (e.g. in-house technicians, warehousemen)
- Employees, mobile outside the premises (e.g. members of the sales force)
- Employees and executives in companies with mobile operations (e.g. postal services, transportation, vending machines, building and construction)
- Decision makers

Moxie Software (2011), companies will be able to create competitive advantage using social analytics, conversations and interactions which gives a new context in loyalty and connections are perceived as measurable assets, where past behaviors are used to predict future interactions, and return on investments can be calculated as consumer actions are tied to payments on mobile platforms. Moxie software Planned deliverables includes:

- Mobile Social Media: Influencing Customers at the Point of Impact - Broadcast-centric strategies at the point of impact are extremely effective on platforms like Twitter and Facebook. Presenting data via mobile applications provides customers with what they are looking for via new types of loyalty programs and social media ROI.
- From Mobile Payments to Social Payments
- The Mobile Mindset: Transforming Business Processes
- Mobilizing the Technology Architecture for Mobile Business –The shift to the mobile platform has led to an order of magnitude increase in the number of users and devices, across a complex array of platforms, devices, and carriers. Practically that means that IT leaders must reconsider their architectural designs and make decisions that will seamlessly enable mobile services to be delivered on demand.

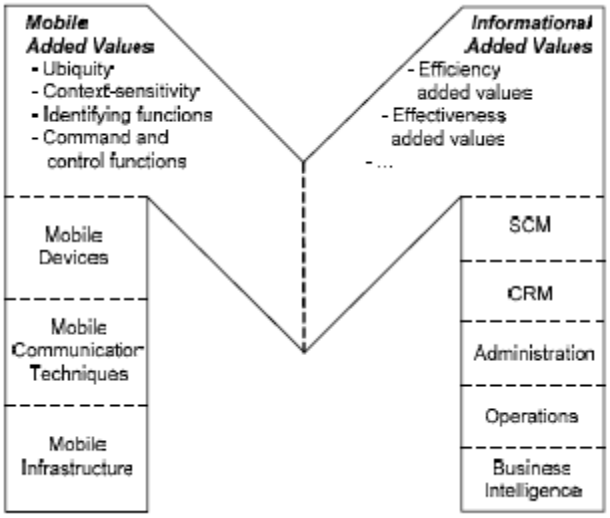


Figure 2.2: The "Mobility-M"-framework for Application of Mobile Technology in Business Processes.

Source: Gumpp & Pousttchi (2005) The "Mobility-M"-framework for Application of Mobile Technology in Business Processes. http://mpra.ub.uni-muenchen.de/2922/1/MPRA_paper_2922.pdf

Gumpp and Pousttchi (2005) model is depicted in Figure 2.2, where they have combined the different aspects of the mobile technology and processes to business application domains in the form of "M" to indicate mobility. This model is specific for organizations whose core businesses is mobile, dealing with logistic service provides firefighters and more. This arrangement was made to demonstrate the possibilities and benefits organizations can take advantage of by combining different mobile business processes.

2.6 Mobile Business Process Infrastructure

Planning to implement the PDA technology to make the business processes mobile, requires, the organization to consider the communication that need to be supported between the wired and non - wired environment for

data transmission, the integration between heterogeneous systems that might exist in the organization, telecommunication partnership, the architecture that would be required to support the computer resources, IT infrastructure and also the cost that would be involved in placing all the necessity hardware, software, technology and governance in place. In reference to Figure 2.3, the implementation architecture to mobilize business process by Aneiba et. al (2004)**,** looked at the implementation from the following perspectives:

- front-end, wireless networks that is required,
- middleware to support the communications between wireless and wired infrastructure,
- internet technology to support web based businesses and IT infrastructure to support the Internet technology in place, and
- the back - end IS infrastructure supporting the CRM, ERP – business process.

Lyytinen (2001), has specified mobile infrastructure consideration as follows;

- Integration and maintenance of heterogeneous systems
- Partnerships in services
- Maintenance of geographically dispersed computing resources
- IT services governance
- Enterprise architectures
- Pricing and control of IT resources

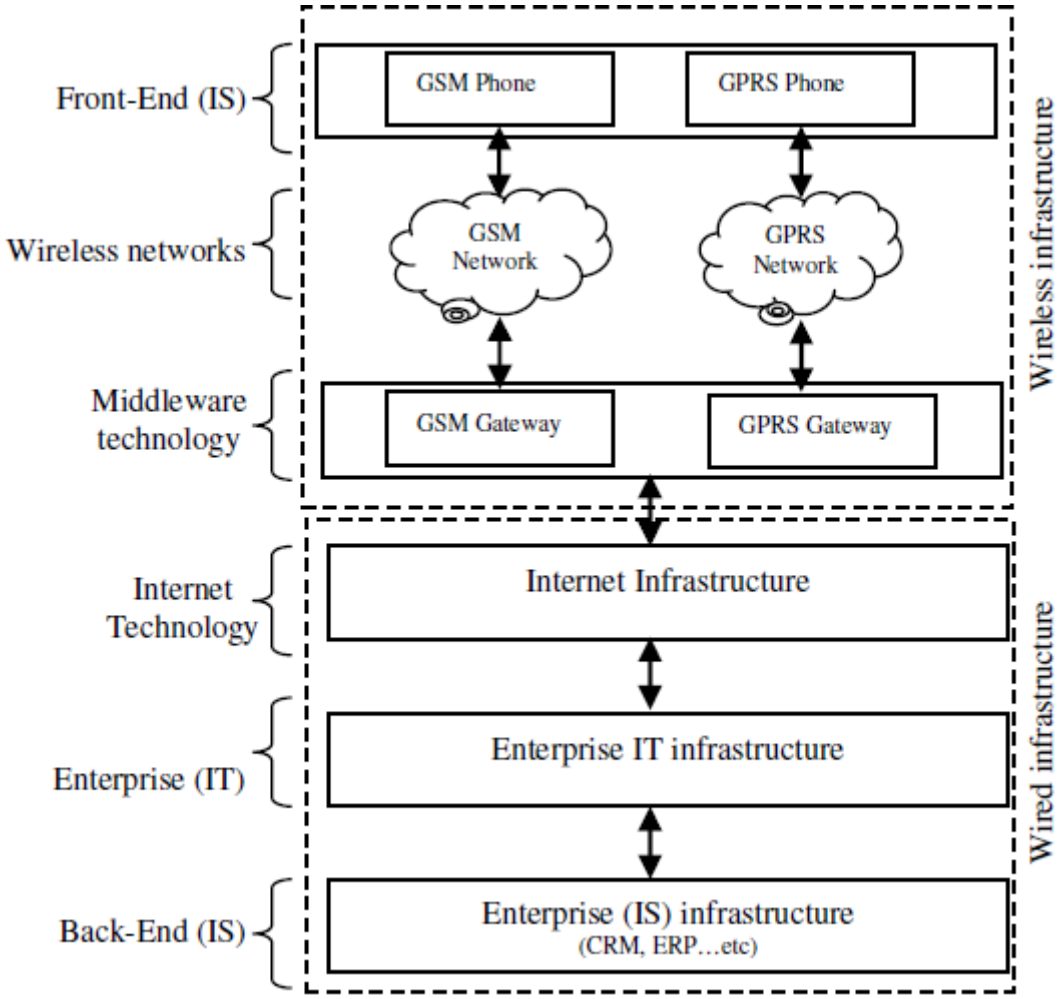


Figure 2.3: An Architecture for Mobile Web Business System: Applied to the Healthcare Sector.

Source: Aneiba A., Hanlon S., & Shah H., (2004). An Architecture for Mobile Web Business System: Applied to the Healthcare Sector, Proceedings of the Third International Conference on Mobile Business, M-Business 2004

The SAP AG (2003) Mobile infrastructure helps mobilize the workforce by providing open standard based platform for multichannel access to information, data and business process. The mobile infrastructure is built and embebded with SAP NetWeaver to cater the mySAP Business Suite.

According to SAP AG (2003) the Figure 2.4 illustrates the mobile infrastructure is built on open industry standards Java, XML (eXtansible Markup Language) and SOAP (Simple Object Access Protocol), and also

supports a a platform that works with a large variety of devices (PDA, laptop, computers and smartphones) and networks (LANs, wireless network, Bluetooth and GPRS). This system has allowed application such as CRM and Supply chain management to be mobilized using SAP or non-SAP application components. The organization is now able to adopt SAP application with the mobile infrastructure without worrying about the application that is being used by their customer or supplier to allow communications or information processing.

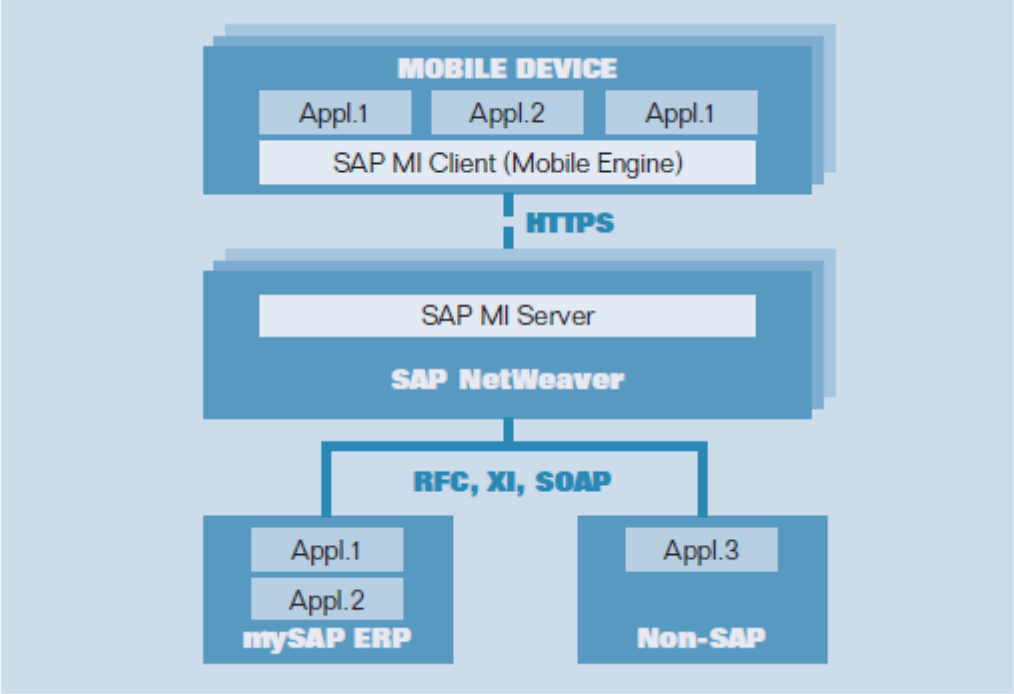


Figure 2.4: SAP Mobile infrastructure

Source: SAP AG, (2003), SAP ® Mobile Infrastructure An Open Platform for Enterprise Mobility, SAP Technical Brief.
http://www.sap.com/platform/netweaver/pdf/BWP_mobile_infrastructure.pdf

2.7 Mobile Commerce

Mobile banking is one of the most value added mobile commerce application that is available. It has been noted that majority of the mobile commerce users are part of the social network community, whom have

frequent interactions with family and friends via the social network. Their decisions on technology acceptance are influenced by; individual perceptions, opinions and actions, where people tend to provide recommendations on services that they utilize, Lyytinen and Yoo (2005). Today, M-commerce allows organization to foster economic growth and sustain development, Dorflinger J., (2009) by providing required services for both the front liners in organization to carry out daily operations and customers to perform their transactions regardless where they are, with wireless Internet connections. The major contribution of M-commerce is marketing or branding exercise. M-commerce is growing and expanding it potential customer. Morales-Aranda et al (2004), developed M-Modeler a framework implementation for modeling M-Commerce applications. Figure 2.5 demonstrates the framework which is designed based on business rules and processes that are catered for mobile technology based applications that describe all the work flow processes which include documents, information and tasks that are carried out for a specific mobile commerce application.

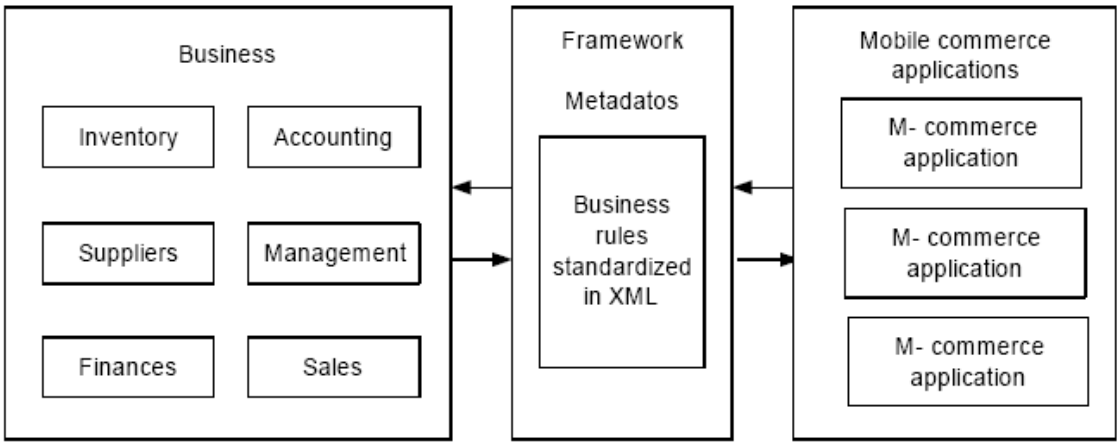


Figure 2.5: Proposed M- Modeler for the software tool.

Source: Morales –Aranda A., Mayora-Ibarra O., Negrete-Yankelevich S. (2004), M-Modeler: A Framework implementation for Modeling M-Commerce Applications. ICEC'04, 6Th International Conference on Electronic commerce .ACM 1-58113-930-6/04/10

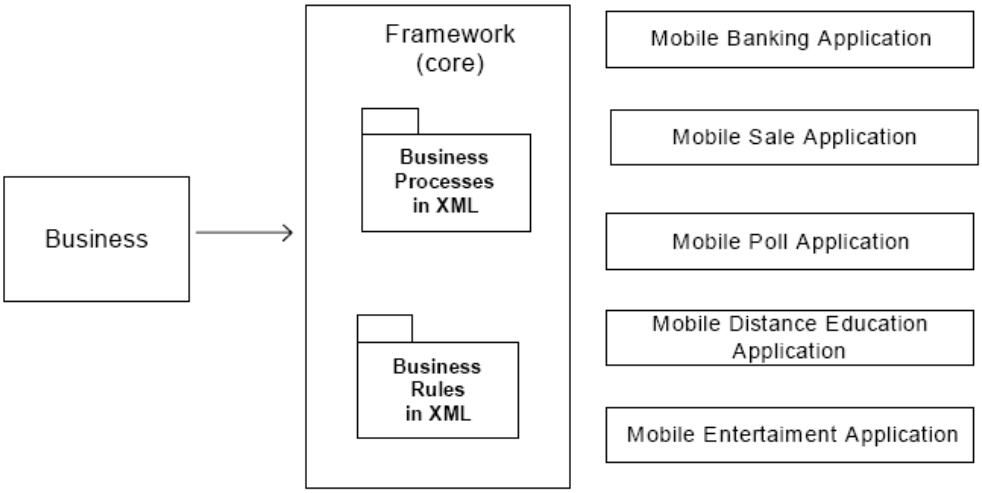


Figure 2.6: Proposed model for the software tool.

Source: Morales –Aranda A., Mayora-Ibarra O., Negrete-Yankelevich S. (2004), M-Modeler: A Framework implementation for Modeling M-Commerce Applications. ICEC'04, 6Th International Conference on Electronic commerce .ACM 1-58113-930-6/04/10

Figure 2.6, The M-commerce framework is divided into 3 areas; business, framework and a general schema that consist of wide range of m-

commerce application. The business box composed of complete processes that initiate to study the business domain to generate macro model of the business and then supported with a model of mobile commerce. The Marco model is further refined into a number of decomposed activities to clearly identify the main rules and processes involved in creating a basic pattern to represent the structure of the business. Once this process is complete, it is then associate with the main characteristics' of mobile commerce application (framework box).

2.8 Mobile Banking

'Anywhere, anytime banking', Infogile (2007). Mobile banking services resembles the financial services banks offer through the mobile or PDA devices. Some financial institutions have described mobile banking simply as services for customers on the move; allowing them to access the normal Online Banking Service via their mobile phones or PDA (Personal Digital Assistant) with in-built web browsing capabilities. The main players that involve in implementation of PDA or mobile based applications are the banking sectors, credit card companies, mobile operators and retailers, BNS PARIBAS (2011).

The mobile services offered by most of the banks to customers are to view account statement, transfer fund between accounts and check summary transaction took place. This mainly surf the purpose to increase higher ratio for customer satisfaction and acquiring for customer retention with increased loyalty. However, very less study and discussion have been released on the

applications and mobiles services that are available for the bank workers to perform their daily task.

2.9 Introduction of Mobile to Business Process

The elementary function of PDA is to assist the workers with the ability to perform task efficiently contributing to process improvement for the organization to benefit the implementation of PDA and its services. According to Microsoft Customer Solution, (2008), Chevron, an oil and gas manufacturing industry that has implemented PDA's services offered by Windows Mobile software, the initial goal of the project was to improve efficiency and reduce cost with estimation saving of 3 million dollars to 5 million dollars annually for the company. The great support from the services offered, Chevron managed to;

a. Increase refinery operating reliability – available as Chevron has integrated real time field date with core business data that allows the workers to access the expert advice to resolve problems

b. Reduce maintenance cost, improved availability and earned cost effective regulatory compliance, as this process makes the workers smart and on time decision makers.

c. Improve safety and environmental compliances -provide ability to measure and track equipment status and measure workers observation, readings and actions are time-stamped.

d. Knowledge retention

2.10 Security over Mobile Business Services With Utilization of PDA Devices

The only factor that makes the organization ensure 24 hours system reliability and security is to guard and protect the system, which is required to be in place for the financial and banking institutions. According to Santos (2009), some of the key trends that will have impact on the financial organisations ICT security market includes:

- Increase in user awareness
- Security risk management
- Growth of broadband internet access

According to Radack (2008), Table 2.2 illustrates summarised security threats to mobile handheld devices include the following;

Table 2.2: Summarized Security Threats & NIST Recommendations for Improving the Security of Cell Phones and PDAs

Source: Radack S. (2008). Security of Cell Phones and PDAS. NIST Special Publication (SP) 800-124, *Guidelines on Cell Phone and PDA Security: Recommendations of the National Institute of Standards and Technology*

Security threats identified	**NIST Recommendations for Improving the Security of Cell Phones and PDAs**
1. Loss or theft	• Analyze risks to identify vulnerabilities and threats then take steps to manage assessed risks by reducing them. • Develop an organization-wide security policy. • Conduct security
2. Unauthorized access	
3. Delivery of malware to handheld devices.	
4. Cell phones and PDAs are subject to spam.	
5. Electronic eavesdropping on phone calls, messages, and other wirelessly transmitted information	

6. Electronic tracking services allow the location of registered cell phones to be known and monitored.	awareness and training activities. • Configuration control and management should be applied to ensure that systems are protected against the introduction of improper modifications before, during, and after system deployment. • Certify and accredit systems.
7. It is possible to create a clone of certain phones.	
8. Server-resident content, such as electronic mail maintained for a user by a network carrier as a convenience, may expose sensitive information through vulnerabilities that exist at the server.	

2.11 Financial Institution Direction

Financial institutions work towards customer retentions; this is where most financial institutions focus on strategies together with the role of information technology being incorporated to sustain the business. Generally it's less costly to retain existing customer as compared to acquiring new customers. One of the heaviest users of this technology is worldwide financial institutions , whose continuous customer services improvement incorporates allowing customers being able to a conduct secured mobile monetary transactions.

The financial industries started working very hard since 1999 to ensure all their services moved online and in fact even the customers were using the bank's online services to trade shares as well as to get their insurance and

loans, via a mobile phone browser. Financial institutions aim is to generate a single channel communication with the end user by providing the right service at the right time regardless of any communication platform and devices.

Rutburg & Co. (2012), wireless finance was also beginning to be used on a widespread basis in America in 2003 and now it is implemented and functioning, to the extent that banks are able to facilitate customers to bank in scanned pictures of their cheques using their financial mobile phones services.

Table 2.3 presents summary of some case studies illustrating successful adoption of mobile technology by banks that have been compiled via journals and publications.

Table 2.3: Summarized Case Studies on Successful adaptation of Mobile Technology by Banks.

America	In 2007, Bank of America launched its mobile banking applications which had rapid acceptance from the customers, Field, T., (2009),. In less than a year, it reached 2.6 million customers on mobile by June 2009 which represents 12% of online banking base. According to Doug Brown, the man responsible for mobile banking at Bank of America, the early 1 million adopters are the young technology savvy and generation-Y users.
Africa	M-PESA is a mobile text service introduced by Vodafone's subsidiary, Safaricom, in 2007. Within a year, one in five Safaricom users were using M-PESA to make payments, and one in 10 Kenyans had used the service. By June 2010, M-PESA had become the world's biggest mobile money service with had been taken up 9.5 million Kenyans as an alternative to carrying cash, Vodafone adds (2010).
Japan	Jibun Bank (also known as My Bank)

	was launched in Japan in June 2008, as a a multimedia-rich, mobile-only bank. The bank gained 500,000 account openings in just eight months and won The Asian Banker IT Implementation Awards, which ranks amongst the financial services industry's most prestigious awards, recognizing best practices that emerge from banks' strategic use of technology, Kobayashi & Ruane (2009) and Harma & Dubey (2009).

Many financial and banking institutions have implemented the mobile technology to ease the customer to conduct transactions without having to worry daily road traffic getting to the bank or to think of getting to the desktop or laptop to access the web portal to conduct transactions. There might be people whom are not keen possessing own desktop or laptop at home to carry out transaction, but chances of not owning a mobile phone will be definitely low . Now with the mobile application availability customer does not have to think about the hardware and connectivity that is required. However there are many other consideration that need to be considered with the mobile technology taking over other services or tools that has been used previously to conduct daily transactions. Connectivity to access internet becomes an issue.

Dennis Risinger, CIO of FCS Financial, Risinger D. (2010), has stepped forward to move his investment on building a loan application that can help in the processing of individual loan via mobile, this application is being specifically catered for the use and the users of the iPad. The progress of FCS Financial is the big view of what would be expected to be implemented in the near future, based on the interview release in the Bank Systems & Technology it is believed that the Risinger's move is much influenced by the stability of the

mobile platform and infrastructure and confidence level that is being recognized from the users.

2.12 Malaysian – Financial Institutions Direction

However in Malaysia the motivation is still at a stage of increasing confidence amongst customers in using online services to conduct their financial transactions. Although many have become accustomed to using these services, the question on security and risk of fraud remains a hindrance that prevents users from considering more advanced functionality. Moving the functionality to mobile based is a whole new move as experienced years back when we have started using web to conduct transaction, however many believe that with physical computers information are stored and well presented as compared to tiny PDA mobiles.

Table 2.4 indicates the measure of technical efficiency, purely technical efficiency, and scale efficiency using data envelopment analysis (DEA) using Malmquist Index approach to measure the evaluation of productivity and efficiency of Malaysian banks from over 2003- 2007 based on the Banks annual report five-year period since 2003 to 2007. Variables that have been considered for the study are:

- operating expenses - are expenses incurred for running the bank's operations that includes personnel costs (represents a bank's expenses for its regular activities and daily operations such as salaries and wages of the bank's operating staff), establishment

costs (expenses that are contributed to the rental of premises, equipment, repair and maintenance of machines and premises an depreciation), marketing expenses and also administrative and general expenses.

- interest expense - is the expense that the bank pays out in interest on loans (interest expense is the cost of the bank's loans or cost of borrowing money includes deposits from customers and other financial institutions, loans that are sold to Cagamas1, subordinated notes and bonds).

Table 2.4: Malmquist Indices of Individual Banks, 2003 – 2007

Source: Abd-Kadir H. Et. al. (2010), Productivity of Malaysian Banks after Mergers and Acquisition. European Journal of Economics, Finance and Administrative Sciences. ISSN 1450-2275 Issue 24 (2010). http://www.eurojournals.com

Individual Malmquist Indices for 9 Anchor Banks, 2003 – 2007					
Bank	**Technical Efficiency Change**	**Technological Change**	**Pure Technical Efficiency Change**	**Scale Efficiency Change**	**Total Factor Productivity**
Affin	0.966	1.000	0.992	0.973	0.966
Alliance	1.009	1.017	1.000	1.009	1.026
AmBank	1.594	0.975	1.137	1.402	1.555
CIMB	1.016	1.241	1.000	1.016	1.261
EON	1.021	1.177	1.000	1.021	1.202
Hong Leong	0.578	1.353	0.829	0.697	0.783
Maybank	0.939	0.919	1.000	0.939	0.863
Public Bank	1.000	1.326	1.000	1.000	1.326
RHB	0.655	1.736	1.189	0.551	1.137
MEAN	**0.940**	**1.171**	**1.012**	**0.929**	**1.101**

Table 2.5 provides the view of financial institutions in Malaysia, demonstrating the number of foreign banks and local banks that operates in Malaysia till August 2009 whilst Table 2.6 represents list of Insurance Associations of Malaysia in 2011.

Table 2.5 : List of Foreign and local financial institutions' in Malaysia (Aug 2009) from Bank Negara Malaysia website.
Source: http://www.bnm.gov.my/

http://en.wikipedia.org/wiki/List_of_banks_in_Malaysia

No	Commercial Banks	Owner-ship	No	Investment Banks	Owner-ship
1	Affin Bank Berhad	L	1	Affin Investment Bank Berhad	L
2	Alliance Bank Malaysia Berhad	L	2	Alliance Investment Bank Berhad	L
3	AmBank (M) Berhad	L	3	AmInvestment Bank Berhad	L
4	Bangkok Bank Berhad	F	4	CIMB Investment Bank Berhad	L
5	Bank of America Malaysia Berhad	F	5	ECM Libra Investment Bank Berhad	L
6	Bank of China (Malaysia) Berhad	F	6	Hong Leong Investment Bank Berhad	L
7	Bank of Tokyo-Mitsubishi UFJ (Malaysia) Berhad	F	7	Hwang-DBS Investment Bank Berhad	L
8	CIMB Bank Berhad	L	8	KAF Investment Bank Berhad	L
9	Citibank Berhad	F	9	Kenanga Investment Bank Berhad	L
10	Deutsche Bank (Malaysia) Berhad	F	10	Maybank Investment Bank Berhad	L
11	EON Bank Berhad	L	11	MIDF Amanah Investment Bank Berhad	L
12	Hong Leong Bank Berhad	L	12	MIMB Investment Bank Berhad	L
13	HSBC Bank Malaysia Berhad	F	13	OSK Investment Bank Berhad	L
14	J.P. Morgan Chase Bank Berhad	F	14	Public Investment Bank Berhad	L

Table 2.6 : List of Insurance Associations of Malaysia (2011) Annual Report, from Bank Negara Malaysia website.

Source: http://www.liam.org.my/pdfs/annual2011.pdf

No	Insurances Institutions'
1	Allianz Life Insurance Malaysia Berhad
2	CIMB Aviva Assurance Berhad
3	American International Assurance Bhd.
4	Etiqa Insurance Berhad
5	AmLife Insurance Berhad
6	Great Eastern Life Assurance (Malaysia) Berhad
7	AXA AFFIN Life Insurance Berhad
8	Hannover Life Re, Malaysian Branch
9	Hong Leong Assurance Berhad
10	Manulife Insurance Berhad
11	MCIS ZURICH Insurance Berhad
12	ING Insurance Berhad
13	Prudential Assurance Malaysia Berhad
14	Malaysian Assurance Alliance Berhad
15	Tokio Marine Life Insurance Malaysia Bhd.
16	Malaysian Life Reinsurance Group Berhad
17	Uni.Asia Life Assurance Berhad

Prudential (M) Sdn. Bhd., (2004), proved mobile palm technology creates real business efficiency for the organization. The implementation, in the organization was able to achieve 15% growth in sales in last six months from system deployment in 2004 and again seamlessly achieving growth of 24% in 2005, during negative market situation. Table 2.7 illustrates the advantages recognition by the organization being able to move the some of the agencies business processes using Palm technology.

Table 2.7: Advantages realized by Prudential Malaysia upon deployment of mobile technology to assist in their business operations.

Source: Prudential moves agency force to the next level with Palm Technology. http://www.hpwebos.com/asia/pdf/cs_prudential.pdf

Streamlined communication	Mobile e-mail access enables agents to send and receive e-mails while on the go and receive updates and news instantaneously.
Improved productivity and efficiency	Agents save time by being able to produce quotations and convey client information at the point of meeting
Enhanced point of meeting capability	Financial needs analysis tools, calculators and quotation generators sales allow agents to make a sale at the point of meeting
Improved customer service	Agents are able to retrieve policy and product information immediately, reducing client's waiting time for the answers to their enquiries
Better client management	Contact and client management functions allow agents to easily schedule appointments, reminders and meetings with clients

Malaysia government initiatives based on economic report 2010/2011 from the Ministry of Finance Malaysia has spelled out that ICT as the key driver higher value added source of growth. The use of ICT is said to improve productivity and competitiveness. Today many banks have implemented the web portal for information access conducting monetary payments and transfer and improving operation efficiency using mobile business process. The first

bank to establish web portal to assist users conduct transaction online in Malaysia is Maybank Berhad, and suvsequently more and more banks have followed this move in order to stay competitive and provide better services to their customer base

In 2010, Maybank stepped out again to establish the mobile portal with two basic functions to get the customers start using the mobile to perform transactions; seeing mobiles as an effective gateway to reach customers. This move will enhance the ease of users making payments from anywhere in the world via a PDA, even without access to an internet connection.

2.13 Benefits of Using PDA Technology to Support Business Process

Rio, R., (2009), has provided its fully integrated wireless Real Time Management of Mobile Recourses for many manufacturing organization in USA. The implementation and their finding indicates the following benefits of mobilizing business process;

- Business processes become more inclusive and responsive
- Mobile resources (people, equipment, inventory) are better managed
- New opportunities to remove waste (lean manufacturing)
- Access to data (six sigma)
- Better management of mobile asset and people
- Real time resources via dashboard to staff

There are a large group of users of this technology existing in USA, United Kingdom and many other countries. This technology is being widely used in the banking industries, to facilitate customer services and also managing high volume business processes and transactions and managing complex business process, including organizations outside Malaysia. An example is AmBank, which has utilized the Ionnex mobile solution, for some of their business processes and mobile banking, the services targeted to improve the operation efficiency which includes :-

- A platform that allows integration between the ATM machine and the center for fault reporting, which will alert the engineers to be notified with SMS if there were any issues with the ATM machine functionalities.

- Customers can register for different types of accounts via SMS, which then the bank staff will contact the customer for further information via service portal..

- Mobile banking

Based on Gartner PC forecast, by 2013, mobile phones will overtake PCs as the most common web access device worldwide, Stampford C. (2010). The technology realization is not only common among the finance and banking sectors, however it is widespread across different business sectors that include telecommunications, marketing, telematics, enforcement (logistics), reservations systems, and many more. ISACA (2010) has stated that mobile devices is one way to keep employees connected regardless of locations, and

the benefits stated below is only realized if the organization manages the technology effectively;

- Increased workforce productivity.
- Improved customer services.
- Response to customer problems and questions at any time.
- Improved turnaround times for problem solutions.
- Increased business process efficiency – speed up information processing.
- Employee safety and security – allow employees to travel to and from remote locations while staying in touch and connected.
- Employee retention

2.14 Implication Towards The Study

By understanding the mobile business services requirement on infrastructure and, nature of mobile business process framework, mobile business process, and the benefits using PDA or mobile device technology to support business process will provides an excellent picture on how the PDA or mobile based technology can offer diverse functionalities to ease and assist organizational business processes. However, from the study it is also noted that banking and financial sectors are competitively moving towards ICT implementation to assist customer on real time and managing the internal processing using PDA or mobile devices. The benefits realized from the Ralph AT & T, Ionnex mobile solution, and ISACA indicated the PDA devices used over mobile business process has demonstrated improved operation efficiency. Therefore, there is a necessity to investigate if banking and financial sectors in Malaysia will be able to realize the benefits of improvement on operation efficiency using PDA devices over organization business process.

2.15 Summary of Model studied on factor influencing The Adoption of Technology & its Implication

Authors	Discussion	Implication to Study
Davis (1989)	– Technology Acceptance Model has been widely used for theoretical background, describes the consumer's willingness to use technology. – The model has five constructs; perceived ease of use, perceived usefulness, attitude toward use, intention to use and actual use.	Factors to be considered: • Perceived ease of use • Perceived Usefulness
Davis et. al – (1989)	– Proposed that technical support is the key variable which likely to affect perceived usefulness and perceived ease of use.	
Wang et. al (2010)	– The TAM model has been successfully applied to exploit consumers' adoption of a wide range of high-tech products, such as B2C mobile commerce, multimedia messaging services (Wang et al. 2008), smart phone systems (Park and Chen 2007) and medical services (Shelton et al. 2002) and also mobile technologies and mobile commerce (Teo and Pok 2003, Luarn and Lin 2005, McKechnie et al. 2006, Amin 2007).	Success of TAM being experiment for technology based system which can be used for this research.

Gu et.al (2009)	– Validated determinants of intention to use mobile banking by unifying the extended TAM and the trust-based TAM	Intention / Adaptation of technology factors
Liang et. al (2007)	– Build a measurement instrument to access the fit and viability model to access to access the fit viability model (FVM) in adopting mobile technology. Mangers will be able to utilize this model to measure the fitness and viability to implement mobile technology.	Factors Considered: • Task requirement • Technology characteristics • Viability: Project Budget , physical assets, Expertise. • Brand specific • Uncertainty • Frequency • IT infrastructure • Data Management • Competence of IS staff • Organization support • User competence • Top management support and • Performance

Lee (2005)	– Studies on perceptions of user control, responsiveness, connectedness, ubiquitous connectivity, and contextual offer have a significant effect on customer trust in MC. – Emphasizing on - ubiquitous connectivity and contextual which has direct positive effect on transaction intentions in MC.	Factors considered: • User control • Responsiveness • Personalization • Connectedness • Ubiquitous Connectivity • Contextual Offer
Chung & Kwon (2009)	– Supports are augmented only in relation to a mobile banking experience whose critical attributes can be assessed adequately by the characteristics of technical support. – The results from prior studies indicate that a customer's experience is important in understanding a customer's perceptions, attitudes, and behavior in online environments	• Technical support effect on Intention to use. • Without the proper technical support, users might be left trying to address issues. • Without proper technical support, technology use may deleteriously affect intention to use mobile banking
Herzberg (2003)	– focuses on the challenges and opportunities involved in banking and making payments using mobile or PDA's. – Mobile phones and PDA's - These devices are effective for authorizing and managing payment and transactions, offering security and	Factors considered: • Cost • Usability

	convenience advantages compared to online payment via personal computers.	• Convenience • Security • Privacy
Lee and Chung	– Explored factors affecting trust in and satisfaction with mobile banking by applying three quality factors based on research done by DeLone and McLean's model — system quality, information quality, and interface design quality	Factors considered for Trust & Satisfaction: • System Quality • Information Quality • Interface Design
Tarasewich and Nickerson (2002)	– The service characteristics include limited bandwidth, network connectivity, transactional cost, privacy etc	Network Connectivity Quality
Misra and Wickamasinghe,	– All adoption studies are based on technology, services, characteristics and its use. – The technological characteristics of mobile devices are; limited memory, limited user interface and low computing power.	
Gebauer J. et. al. (2004)	His study focus on factors that would impacts of mobile business applications.	Consideration of factors include; • Technology Characteristics

	Addressing 3 major questions: (1) What is the impact of mobile technology characteristics on system usage? (2) What is the impact of tasks characteristics on system usage? (3) What are the benefits related with system usage?	• Task Characteristics • Impact – effectiveness and efficiency
Theory of Planned Behavior (TPB)		
Sripalawat et. al (2011)	– The objectives of their study is to combine positive factors — constructs from TAM and the theory of planned behaviour (TPB), with negative factors — the consumer resistance factors, to compare effects of those positive and negative factors on mobile banking, behavioural intention and the actual use.	Consideration of factors include; • Device barrier • Perceived risk • Lack of information • Perceived financial cost • Subjective norms • Perceived usefulness • Perceived ease of use • self-efficacy • Behavioural intention and the actual use.

Theory of Reasoned Action - behavioural Intentions (TRA)		
Fang et al (2006)	– The user intention to adopt wireless technology has different determinants for different types of job tasks like general tasks, gaming tasks and transactional tasks.	Factors considered: 1. User intention to perform general tasks that do not involve transactions and gaming is influenced by: • perceived usefulness • Perceived ease of use 2. User intention to play games is affected by: • Perceived playfulness 3. User intention to transact is influenced by: • Perceived usefulness • Perceived security
Wang et al (2008)	In the study of understanding the acceptance of mobile service by individuals it is identified that; perceived usefulness, credibility, self-efficacy and financial resources have positive influences on behavioural	Factors considered: • Perceived usefulness • Credibility

	intentions	• Self Efficacy • Financial Resources
Measuring Mobile Business Services (MOBIS-Q)		
Markova et. al 2007	Identified 10 success factor or themes from existing literature, questionnaires and case studies: – Ease of installation, learnability, ease of use, efficiency, effectiveness, user satisfaction, factors related to mobile content, safety, support, and mobile work productivity.	Factors classification: • Perceived usability • Fit for mobile working context • Perceived impact on mobile work productivity
Vuolle et. al 2008	1. Primary contribution is Evaluation tool is called the (MOBIS-Q). 2. Worked on evaluation of experiences that includes perceived usability & perceived fit for mobile working content productivity and perceived impact for mobile business services experiences.	Factors classification: (as Markove et. al 2007 - continuation study) • Perceived usability • Fit for mobile working context • Perceived impact on mobile work productivity (as Markove et. al 2007 -continuation study)

Benefit Cost Framework		
Shen Y. C. Et. al. (2010)	1. Primary contribution is focused on the benefit-cost framework to explore the key benefits and cost that conclude the adoption of the mobile banking system as well as the previous circumstances of the benefit and cost. 2. Concluded that consumer adoption of new technologies is complicated phenomenon that requires more than a single model to clarify the various facets of the phenomenon.	Factors considered: • Self - Efficacy • Expertise • Technology anxiety • Perceived behavioural control • Behavioural introspective • Trust in telecommunication services • Security • Convenience • Adoption Intention

2.2 Conclusion

The mobile business process among the Malaysian financial institutions and banking is no longer a fresh new technology. The technology has been adopted to increase the front-end support for customers. In line with the move of having ICT progress and implementation, financial and banking sectors have been moving very competitively into moving their workforce to adopt the mobilized business operation to realize the benefits of operations efficiently. While this has been the move many physical architecture, device barrier, security and IT managers perspective has to be considered to ensure smooth adoption of the technology to assist the transmission process from the tradition business process to move into mobile business process. Upon learning the outcome of many researches, it is understood that Technology Acceptance Model by Davis is not the only model that can be used to study the technology acceptance, besides there are more model like Theory of Planned Behaviour and Theory of Reasoned Action that has been improvised from TAM to study different factors. These factors are some positively associated and there are some factors like financial support and device barriers that have negative association with the implementation of the mobile business process. By analysis and understanding the overall mobile business process, its implementation environment, and the factors which demonstrates impact on operation efficiency, gives the author a better scheme to generate the research model and hypothesis for the study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This section of the report discusses the research design and methodology used to study on the factors influencing the impact of PDA utilization to improve operations efficiency of banking and financial institutions in Malaysia. The aim of this chapter is to demonstrate decisions made on research method, the selection of the research instrument, and collection of related data. Figure 3.1 indicates the phases involved with the selection of the research methods and design of the selected tools for data collection. Upon data collection all the data will be analyzed using the appropriate matrix and will be presented in the form of report findings.

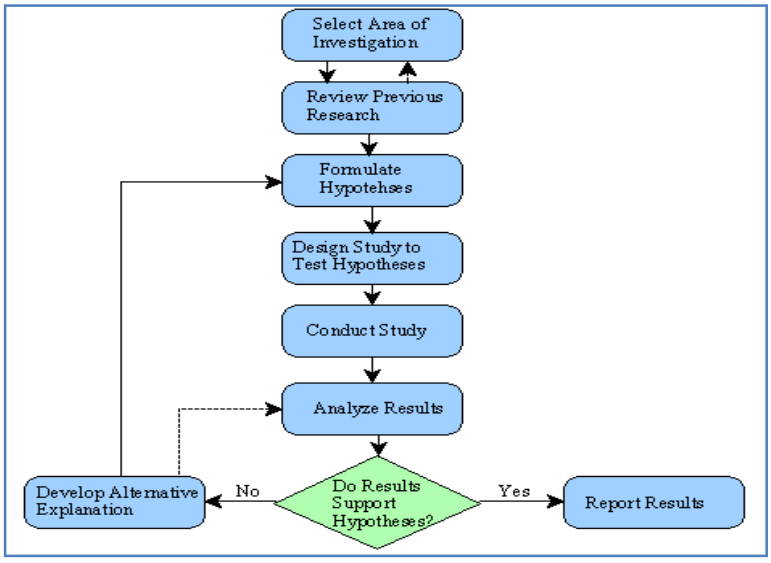


Figure 3.1 Summary Research Design

Source: BOEHM, V. R. (1980), RESEARCH IN THE "REAL WORLD"—**A CONCEPTUAL MODEL. Personnel Psychology, 33: 495–503**

3.1.1 Brief Contents of Each Stage of The Life Cycle

i. Theoretical framework - focus on the theory building

ii. Research Design – selection of the investigation method for descriptive research and design of the tool that has been selected to ensure the design is made based on non – biased information collection.

iii. Research Instrument – the selection of data collection method adopted in this study

iv. Data collection is the process of identifying collection of primary and secondary data from the participants or methods that has been selected to be used.

v. Data Analysis – data will be analyzed using SPSS to compute graphical representation information. Data that has been analyzed will be interpreted in the form of reports that represents the outcome of the findings that has been carried out on the research area.

vi. Refinement of Theory - to refine the outcome, that plays the role of conclusion to agree with the outcome or to introduce new research area that needs to be considered.

3.2 Theoretical Analysis

This part of the research is dedicated to theory building and will:

- Examine issues related to device characteristics, physical infrastructure, security requirements which are necessary requirements to have a good platform to support the use of PDA over the business process infrastructure, as well as some history or evolution of this technology supporting the business processes.

- Investigate social / organizational issues underlying user adoption and utilization factors that is relevant to PDA usage to improve operation efficiency, and examining the users perspective towards usability of the PDA technology to be utilized in order to support the business processes. This investigation will benefit the organization in terms of reporting on the cost benefit analysis to the organization as well as highlighting to the organization the true hindrances and benefits that users see towards the acceptance of the technology.

With this in mind, the various factors have been carefully chosen based on a range of theories that have been discussed by research that has been summarized in the literature review.

3.3 Research Model and Hypothesis

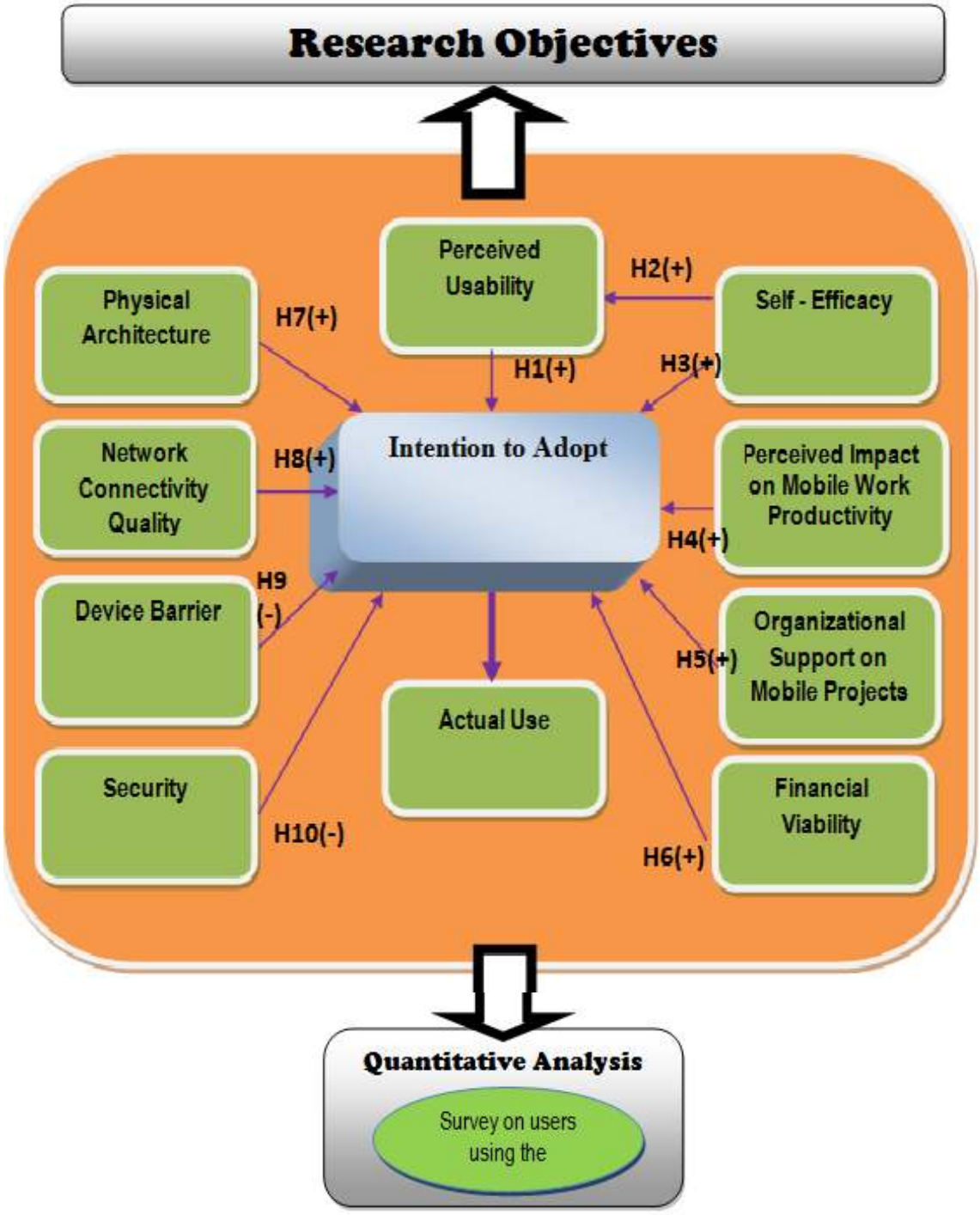


Figure 3.2: Theoretical Analysis representing the whole research structure

3.3.1 Perceived Usability

Early research by Davis, F. D. (1989) on Technology Acceptance Model (TAM), indicates that the Technology Acceptance Model is the dominant model with two exclusive factors that drives the model; (1) perceived ease of use and (2) perceived usefulness. TAM is often used in information systems to analyze the consumers' adoption pattern. Davis (1989) suggested that perceived usefulness and the perceived ease of use as the main factors that alter the consumers' adoption towards high-tech products. The usability factor for mobile business services has been considered as the key driver of the business impact of using the services by Markova, M. et. al. (2008). By applying this in the mobile service context, it defines how mobile services can be integrated well into consumers' daily life activities. The more usable mobile business services, the higher the integration by consumers, Kukkonen O. et. al (2003), has introduced seven principles for highly goal-driven mobile services; mobility, usefulness, relevance, ease of use, fluency of navigation user centeredness and personalization. Meanwhile Voulle M. et. al (2008), and Kukkonen O. Et. al (2003), contributed the following themes to be considered for the questions of evaluating the usability factor; installation, reliability, ease of use, efficiency, effectiveness, and user satisfaction and support. To study perceived usability of PDA utilization to improve the operation efficiency of the organization, the study will be based on the perceived usability factor considering the themes that has been introduced by Voulle M. (2008) MOBIS-Q.

H1: Perceived usability has positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

3.3.1.2 Self - Efficacy

Self efficacy is the belief of and the confidence in being able to successfully perform the task at hand, Shen et. al. (2008). Wood et. al (1989) has discussed the individual's ability to mobilize the motivation, cognitive resources, and course of action required to meet the affirmed situational demands. Consumers who are more exposed to technology will usually have higher confidence in attempting to use mobile service. This is due to the fact that they believe and understand that mobile service will ultimately improve their performance. Besides that, higher self efficacy can also helps the users to overcome the perceived constraints, such as skills and money (Hung et al. 2003), and thus increase the usage of mobile business service. To study self-efficacy, the factor the selection is based on is based on Shen Y. C. (2008) study on a benefit-cost perspective of the consumer adoption of the mobile banking system.

H2: Self – efficacy has significant relationship on perceived usability on intention to adopt PDA technology to improve organizations operation efficiency.

H3: Self – efficacy has positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

3.3.1.3 Perceived Impact of Mobile Work Productivity

Productivity and on - time task completion has been the key points for organizations to consider having improvised technology, Rangone et. al. (2006), and Evans (2002). Rangone has also identified that productivity improvement can be achieved through eliminating unproductive travel, improving data accuracy, avoiding unnecessary work by entering data only once while on location. Verburg (2006) stated mobilizing process and producing conducive paperless environment eventually contribute to less paperwork management and reduce traveling from home and office on working hours providing benefits from productivity impact on the organization. Thus, perceived impact on mobile work productivity for mobile business projects is expected to be positively associated with intention to adopt PDA utilization to improve the operation efficiency of the organization. To study perceived impact on mobile work productivity, the study will be based on Voulle M. (2008) MOBIS-Q.

H4: Perceived impact of mobile work productivity has postive effect on intention to adopt PDA technology to improve organizations operation efficiency.

3.3.1.4 Organization Support on Mobile Business Projects

Organizational support is considered to have a strong impact on project success. For example, ability of the top management supports on mobile project teams by means of resource allocation, coordination, and communication support to facilitate mobile business process project coordination and monitoring between staff team members will generate better

understanding of the effects of organizational support on the mobile business process project initiated by the management, Drouin N. eat al (2010). Therefore, greater attention is paid to the relationship of these components and support can be better designed to improve mobile business process project team performance. Thus, organization support for mobile business projects is expected to be positively associated with intention to adopt PDA utilization to improve operation efficiency of the organization**.** To study organization support on mobile business projects, the study will be based on Liang et. al (2007).

H5: Organizational support on mobile business project has positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

3.3.1.5 Financial Viability

The financial resources contribute and affects the PDA devices usage on the organization operation efficiency, business process as well as to make sure the smooth maintenance of the mobile business platform which leads to smooth operation being carried out on daily basis. Wang et. al. (2006) has identified that perceived financial resources is defined as a person's belief on his capability to be able to fund enough money for a system. According to Hung et al. (2003), external and internal constraints will affect the perceived consumer behavior. External constraint reflects on money while internal constraints are knowledge and skills required. Financially viable pressures such as the increased costs of materials, higher fuel prices, paying competitive

wages, and venture in new technology must be vigilantly managed to retain and upgrade business processes. Weinstein A. (2008). Chung N. et. al. (2009), identified that technical support is a critical attribute that can be assessed adequately. This aspect will be brought into financial viability to understand organization financial support to ensure users are provided with ongoing training and there are adequate budget for maintenance of the system. Koutsoutos, A. (2005), identified that financial and travel agencies prove more productivity growth as compared to other industries. Abd-Kadir H. et. al. (2010), in their study identified AM- Bank has achieved a total increase of 55.55% in productivity; the increase is by 59.4% for technical efficiency change and 0.975% loss of technological change. Thus, financial viability will be positively associated to the PDA utilization to improve operation efficiency of the organization. To study perceived impact of financial viability on PDA utilization and the impact on the operation efficiency among the users, the study will be based on Liang et. al (2007).

H6: Financial viability has positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

3.3.1.6 Physical Architecture

IT infrastructure and the cost incurred when organization plans to implement the PDA based mobile application business process in the organization are important. According Unhelkar B., (2009), in order to facilitate the mobile business operations and enterprise transaction management, the following issues have to be considered; communication supports that is wired or non –

wired data transmission, the integration between heterogeneous systems that might exist in the organization, the architecture that would be required to support users where their processes of mobility have a great potential for reaching out globally. IT governing policy is required to ensure users are aware of organizations alignment to IT strategy with mobile business strategy to be able to measure IT performances. According to Chung S. H. et. al. (2003), the speed with which an organization can support the integration of technology components to support business needs of the IT infrastructure improves its competitiveness in the market. The financial industry leads the way when it comes to ICT technologies including mobile, Service Oriented Architecture (SOA), BPM (Business Process Management) and next-generation self-service tools, Santanos et. al.,(2009). Thus, in this study physical architecture is expected to be positively associated with the impact on PDA utilization to improve the operation efficiency of the organization. To study perceived impact of physical architecture on mobile business projects, the study will be based on Liang et. al (2007).

H7: Physical Architecture has positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

3.3.1.7 Network Connectivity Quality

This factor will be covering two aspects; (1) network activities; data processing, information access and performance, by Gebauer J. et. al. (2004) and (2) trust in telecommunication service provider, based on Shen Y. C.

(2010). The major differences that PDA devices made is mobilizing technology, allowing access to service universally while on the move through various devices on wireless network. According to Lee (2005), perception of interactivity which comprises of; user control, responsiveness, connectedness, ubiquitous connectivity and contextual offer has demonstrated significant effect on users trust to adopt mobile commerce. Shen Y. C. (2008) concluded that "trust" is vital factor to reduce users risk perception in adopting new technology. Thus network connectivity quality is expected to be positively associated with the impact on PDA utilization to improve the operation efficiency of the organization.

H8: Network connectivity quality has positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

3.3.1.8 Device Barrier

Tarasewich P. et. al, has considered service characteristics on device (limited bandwidth, network connectivity, transactional cost, privacy) as one of the main components that has negative impact on the intention to adopt usage of mobile technology for the use of mobile commerce. Sripalawat et. al (2011), Ram S. Et. al., (1989) and Laukkanen T.,(2007) has also stated that device barriers is one of the factors why users resist to use mobile banking. Thus, in this study, device barrier is expected to be negatively associated with the impact on PDA utilization to improve the operation efficiency of the organization. The questionnaires for this section will be adopted from Voulle M. (2008) MOBIS-Q.

H9: Device barrier has negative effect on intention to adopt PDA technology to improve organizations operation efficiency.

3.3.1.9 Security

Security is the main motivation factor for using PDA based mobile devices for transactions, Herzberg (2003). In spite of the enormous ease the mobile banking system may transport, concerns on security issues are important to users and organizations. Shen Y. C. et. al.,(2010) identified three risk factors (trust, behavioural introspection and technology anxiety) which are thought to influence the security concern in adopting the mobile banking service. He explained that, security primarily refers to the risks of disclosing personal or sensitive information to other unconstitutional parties that possibly will use the information inappropriately. According to Lee T. M. (2005), 'trust' was the main focus as compared to other seven factors considered affecting the adoption decision, where else Lu et al. 2008, identifies that trust in the use of the internet is an essential factor for users to shop and perform transactions over the internet, and banking Nor K. M. et. al.(2007). Thus, in this study security is expected to be negatively associated with the impact on PDA utilization on the operation efficiency of the organization.

H10: Security has negative effect on intention to adopt PDA technology to improve organizations operation efficiency.

3.3.1.10 Other Hypothesis

Besides the 10 hypothesis mentioned above the following hypothesis will be used to test based on demographics information.

H11: Age has significant difference on the use on perceived usability, self – efficacy, perceived impact on mobile work productivity to adopt PDA technology to improve organizations operation efficiency.

H12: Number of years of experience has significant difference on perceived usability, self - efficacy to adopt the PDA technology to improve organizations operation efficiency.

3.4 Research Design

The main objective of this study is to examine "the factors that influence the PDA usage to improve business operations efficiency" by the banking and financial institutions. Particularly, it is to study the key driving factors that make the employees continue using the mobile business process.

There are many research designs being used and being developed in order to assist in data collection mainly quantitative and qualitative. On the other hand Creswell et al., (2003) & Onwuegbuzie Et. al., (2003) emphasised on mixed mode of collecting and analyzing data. Cresswell J.W. (2002) indicated that research methods selection should be driven by the research question. According to Saunders (2003), survey method is easily understood and the data collected would be standardized, allowing easy comparison and more control over the research process. Borrego et. Al. (2009), quantitative methods reasonably fit well for deductive approach where the researchers are able to exhibit the hypothesis justifying variables, the purpose of statement,

and the direction of narrowly defined research question. Cresswell J.W. (2002), explained process of hypothesis being tested and the process of designing the research questions directs how the data collection will be carried out with the appropriate use of statistical methods to study the data.

Generally, empirical study based on self administered survey questionnaire will be carried out to identify more concise factors that affect the PDA utilization on the operative efficiency as well as the IT manager's perspective involved in the implementation of the PDA to support the business processes. In order to collect data from employees of banking and financial institutions', formal request for permission will be extended to personnel in charge. The survey questionnaire was chosen as the data collection method. A statistical comparison method will be adopted to study the data collection.

With the objectives of the research taken as the for data collection, various samples of questionnaires will be reviewed. These included Vuolle et. Al (2008), developing a questionnaire for measuring mobile business service experiences and referencing his discussion on research article titled identifying usability and productivity dimension for measuring the success of mobile business services, Liang et. al.(2007) for adoption of mobile technology in business: a fit-viability model, Shen et. al. (2010), a benefit – cost perspective of the consumer adoption of the mobile banking system and Sripalawat et. al. (2011), M-banking in metropolitan Bankgkok and comparison with other countries. It is understood clearly that there is a need to extend the Technology Acceptances Model (TAM) model by Davis (1989). For this study, TAM, Theory of Planed Behaviour (TPB) used by Sripalawat, Usability study by Voulle et. al. (2008) and knowledge from Fit-Viability-Model (FVM) used by

Liang T. P., (2007) together with other approachs have been reviewed to compile a more comprehensive outcome to identify the factors that influence the operation efficiency in the banking and financial institutions. The questions will be evaluated and modified according to the objectives of the research. Almost all the questions will be close – ended question for easier responses as well as structured data collection.

3.5 Survey Population and Sample Size

The study would be conducted in Malaysia. There are many organizations today which are fond on having the mobile facilities to improve their business operations both to provide good customer's services and also to optimize the business operations. Some of the organizations that use this facility are from the banking sector, telecommunication operators, financial institutions, corporate and multiple marketing (MLM) loyalty programme, content providers and mobile marketing. This study will be based on the banking and financial services organization in Malaysia; random sampling will be used in selecting the respondents. Some of the organization that has been identified are;

No	Organization Name	Business in Nature	Sample Size	No. Of Questionnaires received
1	Malayan Banking Berhad (MAYBANK)	Maybank is Malaysia's largest financial services group and has a strong regional presence in South East Asia.	15	10
2	Prudential	Established 1942. Serves the savings, protection, life insurance and investment needs of Malaysians by offering a full range	10	8

		of financial solutions		
3	Standard Chartered Malaysia	Standard Chartered Bank in Malaysia, a member of the Standard Chartered Group was established in 1875. Providing financial products and services including retail, Islamic and wholesale banking for individuals, small and medium-sized enterprises, as well as corporate and institutions.	15	6
4	HSBC Amanah	HSBC Amanah is the global Islamic financial services division of the HSBC Group. Established in 1998. HSBC Amanah represents the largest Islamic financial – is an international bank.	10	9
5	CIMB	CIMB Group's multi-local business model providing: Consumer Banking, Corporate & Institutional Banking & Markets and Group Asset Management, Insurance & Takaful.	10	9
6	CHARTIS DIRECT	Chartis Direct - enables direct to consumer interaction to cater to the needs of the active and discerning Malaysian consumer. Chartis is the world's leading property-casualty and general insurer.	10	11
7	Great Eastern Assurance	Great Eastern Life Asurance (M) Berhas - began its operations in 1908. Insurance organization.	10	6
8	AmBank (M) Sdn Bhd.	Provides financial services - retail banking, commercial banking, investment banking and insurance sectors.	10	10
9	United Overseas Bank (UOB) Malaysia	Focus on financial services, insurance, asset management, investment advisories, travel planners, and venture management.	10	5
		Total	100	74

This study focuses on the selected organizations and also a set of specific users whom are involved in using PDA or mobile devices to accomplish daily

business. It intends to find out how users in each organization would perceive the factors that have been identified in the theoretical framework.

3.6 Survey Instrument

With the selection of survey as a technique, survey questionnaire will be used to assess relevant information that would contribute in achieving the objectives of this research. The instrument survey has been designed to access "An analysis of factors influencing the impact of PDA utilization on the operation efficiency of banking and financial institutions in Malaysia". The instrument will be designed based on the factors identified from the literature review.

The self-administered questionnaire will be distributed to employees of selected organizations to perform statistical analysis. The questionnaire will be divided into 11 sections; demographic information and factors influencing the impact of PDA utilization which includes (perceived usability, perceived impact on mobile work productivity, organizational support on mobile business project, financial viability, physical architecture, network connectivity quality, device barrier, security, and intention to adopt).

3.6.1 Questionnaires formations - Constructs and questions included in the questionnaire

This section of the study will demonstrate the different factors that have been selected to be studied and the number of survey questions that has been

carefully selected and formed together to be able to formulate useful information from the employees. There a total of 10 sections excluding the demographics information that has been designed using the 5 point Likert scale. The demographics data is designed to be on the nominal scale.

3.6.1.1 Demographic Information

This section will be the last section in the questionnaire, it includes; personal information of the employees mainly to understand their age, gender, educational background and employees position level, and years of experience in the field.

3.6.1.2 Perceived Usability

This factor is mainly used to understand users experience on installation processes, reliability, ease of use, efficiency, effectiveness, and user satisfaction and support. The questions that have been derived from this themes are as follows;

Item	Measurement	Reference
PU1	The mobile application can be easily installed and setup on my mobile devices.	1. Voulle M. et. al.(2008) 2. Hung S. Y. et. al. (2003) 3. Wang et. al (2010) 4. Davis (1989) 5. Gu et.al (2009) 6. Herzberg (2003)
PU2	I find the installation process to be very fast and convenient	
PU3	I did not encounter any error during the installation process	

PU4	I have a very successful and pleasant first encounter with the use of mobile application services	7. Chung & Kwon (2009)
PU5	It only takes a short time for me to learn the mobile application services	
PU6	I now complete most of my business tasks using my mobile devices	
PU7	It is very convenient for me to multitask especially when I am travelling	
PU8	I never encounter any error or system fault while performing tasks with my mobile devices	
PU9	I have all the necessary functions on my mobile devices to perform my business tasks.	
PU10	I can easily navigate through the menu on my mobile devices.	
PU11	The menu and functions of the mobile services are very user-friendly.	
PU12	Help information is available and relevant to context when I require it	
PU13	I am able to understand and appreciate an additional advantage from utilizing mobile applications to enhance existing organization information systems.	

3.6.1.3 Self – Efficacy

Self-efficacy is used to test the users believe and confidence level in using the PDA over the mobile business processes. Most of the questions for this section are derived based on the users' belief.

Item	Measurement	Reference
SE1	I am able to complete more business services daily.	1. Shen Y. C. (2008) 2. Sripalawat J., et. al. (2011)
SE2	I am able to improve the fluidity of my work through mobile services.	
SE3	I feel more motivated and satisfied when I finish my tasks through mobile services.	
SE4	I am satisfied with the quality of my task outcome through the usage of mobile services.	
SE5	I prefer using mobile services compared to traditional approaches to complete my business tasks.	
SE6	It takes less time to complete my usual tasks when I'm using mobile business services.	

3.6.1.4 Perceived impact on mobile work productivity

Productivity is the essential factor that contributes mainly to the operation efficiency by allowing the management to consider reducing operational cost and wastage of time for completion of tasks. The questions are based on the user's ability to manage the use of PDA devices to indicate the success through improved performance, and ability to manage and control task completion.

Item	Measurement	Reference
PI1	I have managed to reduced my travelling with use of mobile business services	1. Voulle M. et. al.(2008) 2. Liang T. P., (2007) 3. Gebauer J. et. al. (2004)
PI2	Mobile business services has increased my work productivity	
PI3	By performing my business services through mobile devices, I have increased my efficiency and productivity at work.	
PI4	I am able to plan and coordinate my tasks more effectively through mobile business services.	
PI5	With Mobile business services I have managed to reduce the number of working phases compared with what was required before.	
PI6	I have better access to information needed at work.	
PI7	I am able to make quick decisions on the move	
PI8	I find mobile business services enhances information processing	
PI9	I am satisfied with the quality of my task outcome through the usage of mobile services.	

3.6.1.5 Organizational support on mobile business projects

This factor is used to investigate the organization top management participation effort and involvement on the development process, and management of the mobile business projects.

Item	Measurement	Reference
OS1	Key executives in the corporate headquarter participate in the project decision	1. Liang T. P., (2007) 2. Herzberg (2003) 3. Chung & Kwon (2009)
OS2	Key executives in the corporate headquarter assigned members into the project team	
OS3	Organization provide adequate budget for developing the system	
OS4	Organization has allocated required number of staff to be part of the mobile business process project team and assist in project coordination and monitoring.	

3.6.1.6 Financial Viability

Three questions have been formed to cover financial viability, factor which was aimed to investigate on organization financial support to maintain and support the employees with adequate resources to ensure that the system is able to perform the required task efficiently.

Item	Measurement	Reference
FV1	Organization provide adequate budget for maintaining the system.	1. Liang T. P., (2007) 2. Herzberg (2003) 3. Sripalawat et. al (2011) 4. Wang et al (2008)
FV2	Organization has allocated budget for the adoption of mobile technologies - need to hire employees with special expertise.	

FV3	Staff using mobile technology to enhance their performance without requirement of additional training, and if not, there is adequate budget to conduct training	

3.6.1.7 Physical Architecture

This factor aims to investigate whether the placement of all the necessity hardware, software, technology and governance is in place.

Item	Measurement	References
PA1	Organization has adequate hardware for operating the system to support mobile business process	1. Liang T. P., (2007)
PA2	Organizations have qualified network management system to take real-time transaction processing	
PA3	Organization has necessary software for implementing mobile applications	
PA4	Internet technology to support web based businesses and IT infrastructure to support the Internet technology in place.	
PA5	I am well informed and educated with organizations IT governance policy to ensure proper utilization of the mobile business process functionalities.	

3.6.1.8 Network connectivity Quality

Connectivity is the essential requirements for users' access, gather and process the information to complete the tasks. This factor plays the intermediary role between the physical architecture and the PDA devices being utilized by the users. The connectivity is usually supported by a

telecommunications service provider to enable the organization to use the services to transmit data services. The concern here is on the ability to carry out huge amount of tasks over PDA devices and also the trust over the telecommunication services providers.

Item	Measurement	Reference
NC1	I seldom receive notice "outside coverage area" while in the midst of performing transaction.	1. Shen Y.C. et. al. (2010) 2. Lee (2005) 3. Labdry & Barmash (2007).
NC2	I seldom face connection "painfully slow" – due to slower wireless network protocols and weak cellular radio signals.	
NC3	While entering data – the connection was lost at submission time and requires to start over.	
NC4	I do face issue with task fail due to the mobile services network issues	
NC5	I think the telecom supplier who provides mobile banking services is trustworthy	
NC6	I think the telecom supplier who provides mobile banking services will do everything in their capacity to protect the subscribers' rights.	
NC7	I think the telecom supplier who provides mobile banking services will do everything to secure the transactions for the organization.	
NC8	I think the telecom supplier of the mobile banking services is capable of overcoming all kinds of technical difficulties.	

3.6.1.9 Device Barrier

This factor is focused on the characteristics of the PDA devices to support the users to be used over the organizations mobile business process services.

Item	Measurement	References
DB1	I think a bigger screen and better resolution mobile device will enable me to perform more tasks.	1. Vuolle et. al. 2008 2. Gebauer J. et. al. (2004) 3. Sripalawat et. al (2011)
DB2	A low-end mobile device will discourage me from performing complicated business tasks with it.	
DB3	The battery capacity of my mobile device is not sufficient for me to perform my tasks daily.	
DB4	I am satisfied with the responds rate of my mobile device to my commands and actions.	
DB5	The large amount of workload and multitasking has slowed down the performance of my mobile device.	
DB6	I think it is inconvenient to input information using my mobile device.	
DB7	I find exchanging and transmission of information between my mobile device and other devices (ie. Computer) is very easy.	
DB8	I will have to concentrate fully on using mobile services and cannot afford to have any disturbance from surrounding environment.	

3.6.1.10 Security

The concern over security will be a never-ending process. Having the operations to be performed on real-time basis over any PDA device has potential risk that the user may face which ultimately leads to privacy and security issues. The consideration of questions derived for this factor include users believes over the security implementation that is in place to protect user's business task operations on a daily basis.

Item	Measurement	References
SE1	I am skeptical about the security mechanism of mobile banking services.	1. Shen Y. C. Et. al. (2010) 2. Herzberg (2003) 3. Tarasewich and Nickerson (2002) 4. Sripalawat et. al (2011) 5. Fang et al (2006)
SE2	I do not believe the design of the mobile banking system can actually provide security and privacy online.	
SE3	Current system is well protected from stolen information, damages to web sites by hackers, hijack of web sites and viruses.	
SE4	I consider it safe to do financial transactions over the mobile network system	

3.6.1.11 Intention to Adopt

The questions below will be used to investigate on user's perspective and continuity to use PDA devices over the mobile business processes.

BI1	I am highly interested in using the mobile application services.
BI2	I will be interested to know the future improvement plan for mobile application services.
BI3	I am comfortable with Mobile application services over the previous business process.
BI4	I am among the first once to move with organization decision on utilization of mobile device to perform operations using mobile application services

3.7 Pilot Testing for Reliability Test

In order to enhance the validity of the study, the questionnaires will be accessed using Cronbach's Alpha Analysis. According to Fornell & Larcker (1981), an item-to-total correlation analysis and a confirmatory factor were performed on 46 items to select items that actually provide good measurement validity. They have selected only items with factor loadings 0.5 and higher. Permission to distribute the questionnaires was obtained from banking and financial institutions' (Appendix A). Total of (8) questionnaires have been distributed and collected from Maybank (4) and Prudential (4) over a period of one week to assist in the pilot testing of the questionnaires with a total of 65 items (Appendix B). It was identified that respondents were taking more than 20 minutes to answer the questionnaire. Upon compilation of the (8) questionnaires, the Cronbach's Alpha Analysis was performed. Table 3.1 demonstrates the coefficient and standard deviation. Some questions that have been identified to be repeating and having lower factor loadings will be removed. That includes items in perceived usability, device barriers and also perceived impact on mobile work productivity. This process will also assist in reduction of time consumed to answer the questionnaires. Upon completion of the test, the result indicate that most of the values of the correlation factor loading are above 0.8, which is a good level according to Vuolle et. al.(2008), except for perceived usability and security where the factor loading is at 0.7. The completed questionnaires are attached in (Appendix C).

Table 3.1: Cronbach's Alpha Analysis

Items	Cronbranch Alpha	No of Items	Std deviations	Mean
Perceived Usability (PU)	0.718	8	3.11677	12.5000
Self – Efficacy (SE)	0.898	6	3.32738	9.2500
Perceived impact on mobile work productivity (PI)	0.894	8	3.72012	12.1250
Organization support on mobile business projects (OS)	0.942	4	2.56348	6.5000
Financial Viability (FI)	0.806	3	1.38873	4.7500
Physical Architecture (PA)	0.851	5	2.23207	6.8750
Network Connectivity Quality (NC)	0.822	6	3.88909	13.6250
Device Barrier (DB)	0.814	6	4.79397	14.8750
Security (SC)	0.758	3	1.30247	4.3750
Intention to Adopt (IN)	0.802	4	2.05287	5.7500

3.8 Data Collection Procedure

Upon completion of reliability testing, permission to distribute the questionnaires was obtained from banking and financial institutions' selected for the study personally by the author. The questionnaires were distributed to selected financial and banking sector that has been identified in the survey population and sample selection. The data was planned to be collected during working hours prior to the appointment that will be fixed with the person in charge during working days (5 days per week) over 3 weeks. The respondents for this survey has been randomly selected from the employees of respective organizations, whom are using the PDA other mobile devices to carry out work related tasks regardless being part of IT or IS department to complete the

questionnaires. The questionnaire were distributed and closely monitored and collected back. Respondents were notified that the personal information and organization name will not be revealed. If there is a requirement to publish material, required documents and permission will be obtained from the respective personnel in charge for verification. Respondents were ensured that information will be anonymous. The total estimated duration that has been dedicated for revising the questionnaires and data collections is presented in Table 3.2.

Table 3.2 Data Collection Procedure

Items	Task – Questionnaires re-design and Data Collection	Duration
1.	First data collection for reliability testing.	1 week
2.	Testing – Cronbach's Alpha Analysis (on 7 questionnaires).	1 week
3.	Revised questionnaire based on analysis outcome and correction from supervisor.	2 weeks
4.	Request / Contact Person In charge for permission to conduct survey.	1 week
5.	Distribute 100 questionnaires and Collection process.	3 weeks

3.8.1 Data Analysis

The questionnaire distributed, was closely monitored and collected back. However, some organization had difficulty with the process of immediate collection and the author had to collect the questionnaires after 3- 4 working days. Out of a total of 100 questionnaires that were distributed, 83 were collected back and only 74 questionnaires were valid. In total, there were 9

questionnaires with problems such as missing last page and incomplete questionnaires.

3.8.1.1. H1 – H10

The data collected from the respondents was analysed using Statistical package for the Social Science (SPPS) tool.

The respondent demographic data was analysed using descriptive statistics. The hypothesis of the study (H1 – H10) was tested using the Correlation – Pearson. The selection is mainly based on the knowledge the author has acquired in the short period of time of be able to utilize the SPSS tools to analyze the data collected. Further to this, Leard Statistics (2012), has stated that the Pearson product-moment correlation coefficient is a measure of the strength and direction of association that exists between two variables measured on at least an interval scale. According to Urdan (2005), for a Pearson product-moment correlation, both of the variables must be measured on an interval or ratio scale and are known as continuous variables. In other words, the change in one variable is associated with changes in other variables. Upon reading information on how to conduct correlation analysis, the author discovered that there are assumptions that need to be taken into consideration for correlation analysis, which has been taken into consideration for this study and noted that there is no serious violation of the four assumptions given by Leard Statistics (2012). The assumptions include:

- Variables are measured at the interval or ratio level
- Variables are approximately normally distributed
- There is a linear relationship between the two variables.
- Pearsons's *r* is sensitive to outliers, so it is best if outliers are kept to a minimum or there are no outliers.

3.8.1.2. H11 and H12

One way ANOVA on the other hand will be used to test (H11 and H12). One way ANOVA is used to compare the means between the groups (age, education level and number of years of experience) and compared to three or more independent variables. The purpose of using ANOVA according to Urdan (2005), is to compute the average amount of difference, or variation, between the scores of members of different samples large or small compared to the average amount of variation within each sample, otherwise known as random error. The assumption that has been taken into consideration for this test based on Leard Statistics (2012);

- Independent variable consists of two or more categorical independent groups.
- Dependent variable is either interval or ratio (continuous)
- Dependent variable is approximately normally distributed for each category of the independent variable
- Equality of variances between the independent groups (homogeneity of variances).

- Independence of cases.

As for this study, three dependent variables (age, education level and number of years of experiences) have demonstrated to be normally distributed and does not seriously violate the assumption stated above.

3.9 Conclusion

The ultimate aim of research methodology is to provide an in depth description detailing the plan on the research to be carried out to design the survey instrument and decide on the sample size before proceeding to conduct and collect survey questionnaires. Random sampling has been applied to study current research on an exploratory attempt to highlight the factors that demonstrates impact on the utilization of PDA devices on financial and banking institution operation efficiency. The data will be analyzed using SPSS tools utilizing Pearson Correlation techniques and One-way ANOVA to study and justify the hypothesis that has been derived for each factor including some demographic variables that will be used to study the significance of relationship that has been derived for this study.

CHAPTER 4

DATA ANALYSIS

4.1 Introduction

The primary purpose of this chapter is to ascertain the effect of the factors affecting the intention to adopt PDA technology to improve organizations operation efficiency. With successful completion of data collection, the data will be analyzed and presented in this chapter. Three types of analysis techniques used for this study are; (1) descriptive analysis for demographic information study (frequency and percentage), (2) Pearson Correlation to test the significant relationship among the variables, and (3) One way Anova to test the demographic dependent variables against the independent variables that has been clearly specified in chapter 3. Compilation of the questionnaires likert scale data input is attached in (Appendix D).

4.2 Demographics Analysis

The demographic information has been analyzed using descriptive statistics analysis using frequency and percentage. Figure 4.1 shows that out of 74 respondents, 39 (53%) was male and 35 (47%) are female respondents.

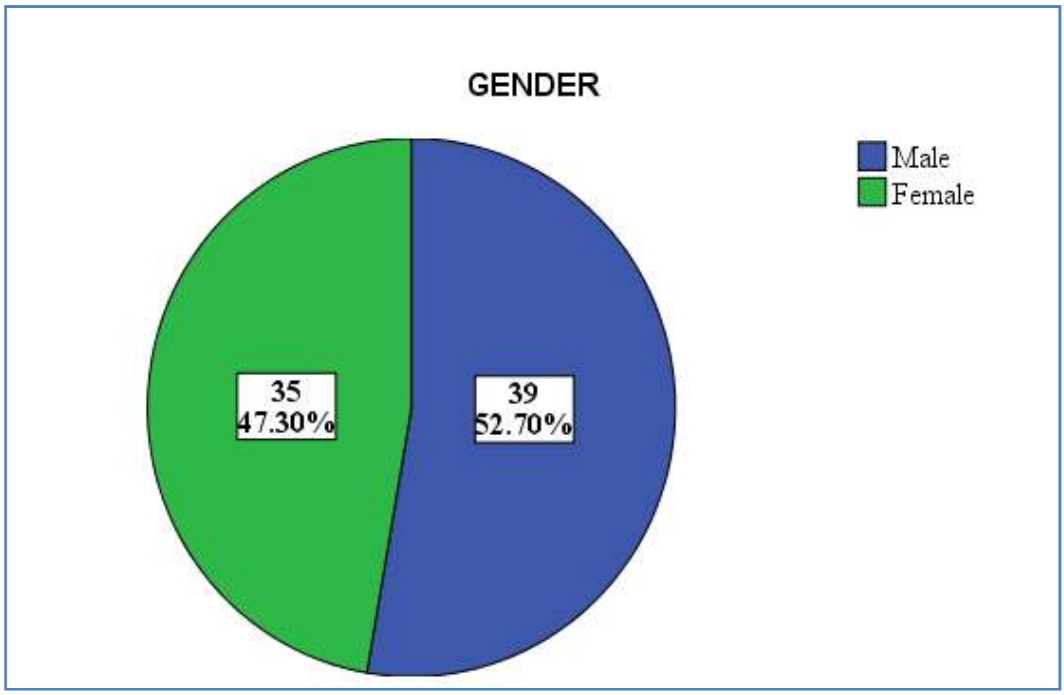


Figure 4.1: Represents the Gender distribution

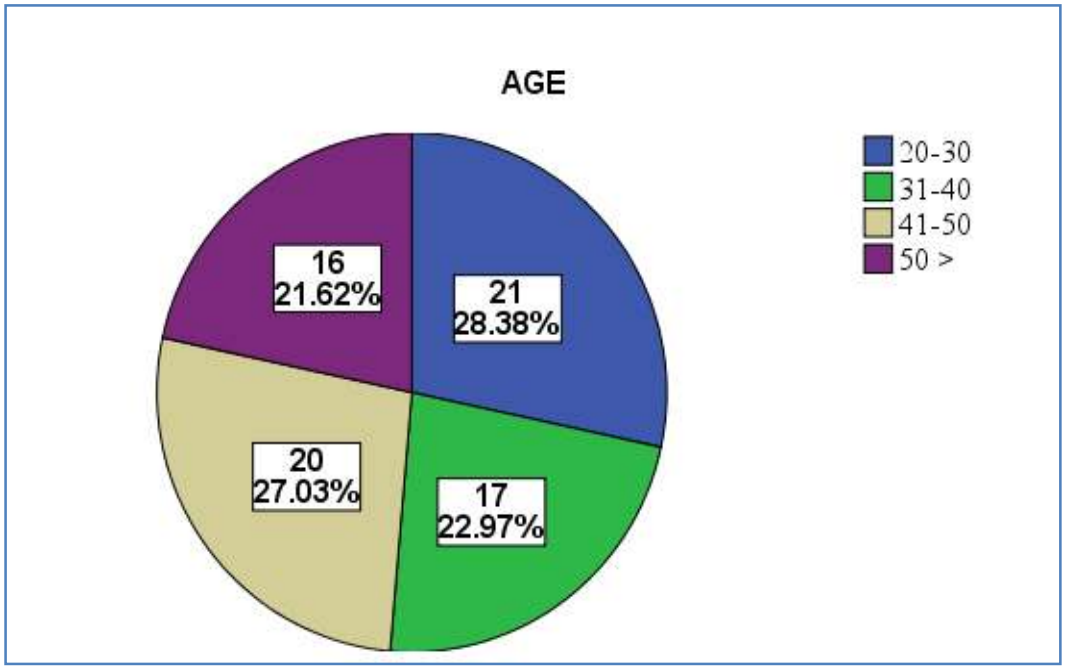


Figure 4.2: Represents the Age distribution

Figure 4.2 presents age group of the respondents, where the groupings range from the ages of 20 to 50 and above. In terms of age distribution it

indicates that the questionnaires has been well distributed, the bigger number of respondents are actually from the age group between 20 - 30 years with 21 (28%) of respondents followed by 17 (23%) respondents were between the age of 31- 40 years old, respondents between the age 41 – 50 are 20 (27%) and 16 (22%) of the respondents are of the age of 51 and above.

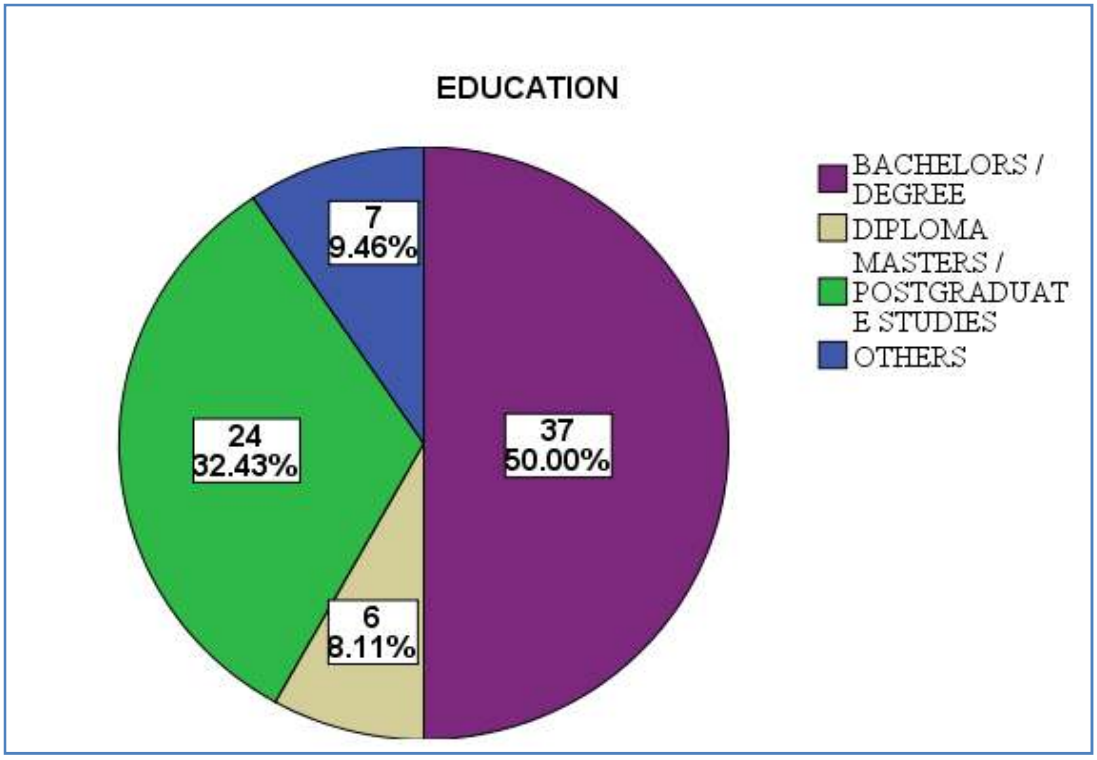


Figure 4.3: Represents the Education distribution

Education qualifications, Figure 4.3 indicates that most of the respondents are degree holders which are 37 (50%), postgraduate studies at 24 (32.4%), diploma holders at 6 (8%), and others (doctorates & professional qualification) 7 (9.5%).

As for the employment management level being held by the respondents, Table 4.4 demonstrate 36 (49%) of the respondents held positions at the senior executive level, followed by 21 (28%) of the respondents were at

junior level, 15 (20%) are from the executive management and finally 2 (3%) respondents from the management level.

Figure 4.4: Represents Management Level Distribution

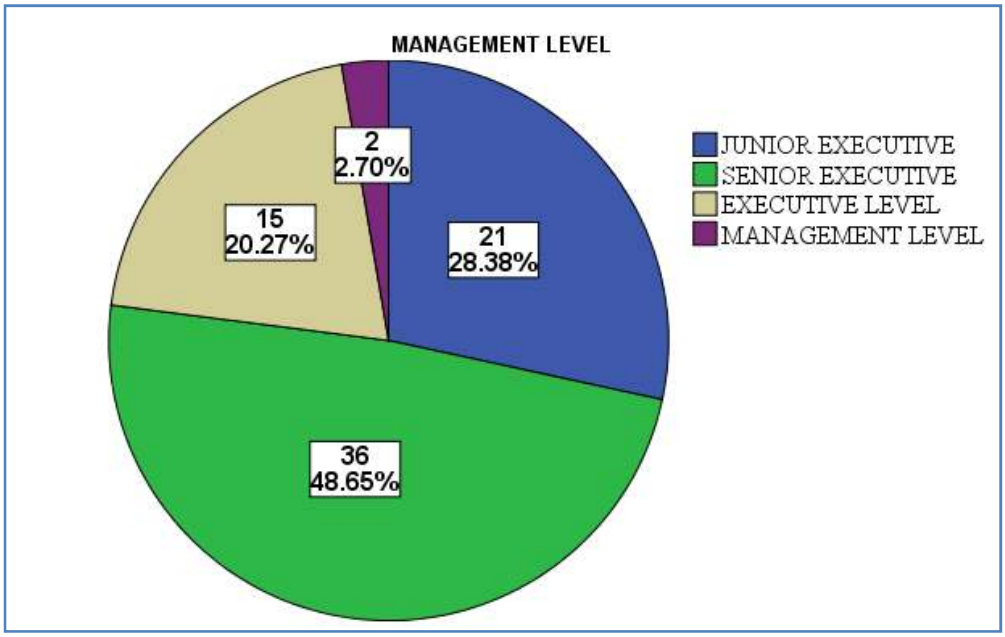
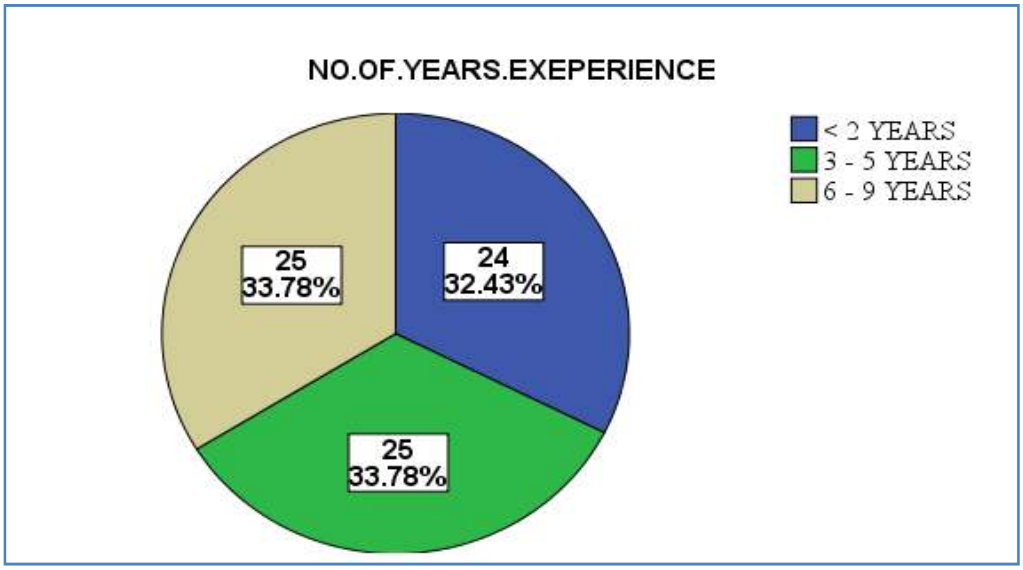


Figure 4.5: Represents the Number of Years Experience



Among all the demographic information that has been gathered, the Figure 4.5 represents the occupation distribution indicate a equal distribution.

There are about 25 (34%) respondents who have three to five years of experience in the field; the same number and percentage represent the respondent whom has six to nine years of experience in the same field, and finally 24 (32%) of respondents have less than two years of experience.

4.3 Hypothesis Testing (H1 – H12)

The dependent variable (IN) and the other independent variables (PU, SE, PI, OS, FI, PA, NC, DB, SE) have been tested using SPSS tool utilizing Correlation - Pearson to find out the significance of the relationship affecting the intention to adopt PDA technology to improve organizations operation efficiency.

4.4 Null Hypothesis

In this session, descriptive statistics will be used to test the research null hypothesis.

(i) H_o1 - Perceived usability does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

(ii) H_o2 - Self – efficacy does not demonstrate any significant relationship on perceived usability on intention to adopt PDA technology to improve organizations operation efficiency.

(iii) H_o3: Self – efficacy does not demonstrate positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

(iv) H_o4 - Perceived impact of mobile work productivity does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

(v) H_o5 - Organizational support on mobile business project does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

(vi) H_o6 - Financial viability does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

(vii) H_o7 - Physical Architecture does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

(viii) H_o8 - Network connectivity quality does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

(ix) H_o9 - Device barrier does not demonstrate any negative effect on intention to adopt PDA technology to improve organizations operation efficiency.

(x) H_o10 - Security does not demonstrate any negative effect on intention to adopt PDA technology to improve organizations operation efficiency.

Other Null Hypothesis includes

(i) H_o11 - Age does not demonstrate any significant difference on the use on perceived usability, self – efficacy, perceived

impact on mobile work productivity to adopt PDA technology to improve organizations operation efficiency.

(ii) H_o12 - Number of years of experience does not demonstrate any significant differences on perceived usability, self - efficacy to adopt the PDA technology to improve organizations operation efficiency.

4.4.1 Testing the Hypothesis with Evidence

Having derived the null hypothesizes, the rest of the report will examine the significant effect and significant relationship for each hypothesis. The results of financial and banking respondents on the questionnaires tested using Pearson Correlation technique is presented in Table 4.6 to Table 4.14 along with respective hypothesis testing and discussion. The outcomes indicate that every positive valued factor has more influence on the respondents to accept the use of PDAs technology to improve operation efficiency. In total, there are eight out of ten factors, which are; perceived usability, self – efficacy, perceived mobile work productivity, organization support on mobile business projects and network connectivity quality, device barrier, and security has significant effect on the intention to adopt, further to that self- efficacy also has demonstrated significant relationship on perceived usability on respondents intention to adopt the PDA technology. The two factors that are not significant are physical architecture and financial viability.

Besides that, Table 4.15, 4.16, 4.17 and 4.18 respectively demonstrate the hypothesis testing that was based on age and number of year of experience, tested using One way ANOVA.

4.4.1.1 Testing Hypothesis H1

H_o1 - Perceived usability does not demonstrate any significant effect on intention to adopt PDA technology to improve organizations operation efficiency.

This factor aimed to request the respondent feedback based on the respondents perception on (installation, reliability (usefulness), ease of use, satisfaction and support). The total number of questions for this variable was 8. The outcome of the respondents indicates that perceived usability is positively associated to intention to adopt of the PDA technology to improve organization operation efficiency (H1), represented in Table 4.1. This hypothesis received empirical support of ($r = 0.415$, $p < 0.000$). This outcome is consistent with Chiu eat. al (2005) and Sripalawat et. al.,(2011) and Herzberg (2003). Thus, when perceived usability is shown to be easy to use, reliable, satisfying and useful, the user's intentions to adopt it will be greater than otherwise. In this situation the null hypothesis H_o1 is rejected.

Table 4.1: Pearson correlation results for Perceived Usability factor and Intention to adopt PDA technology to improve organization operation efficiency

		Intention to Adopt	Result
PU	Pearson Correlation	.415**	
	Sig. (2-tailed)	.000	Reject H_o1
	N	74	

**. Correlation is significant at the 0.01 level (2-tailed).

4.4.1.2 Testing Hypothesis H2

H_o2 - Self – efficacy does not demonstrate any significant effect on perceived usability on intention to adopt PDA technology to improve organizations operation efficiency.

This factor was aimed to request for respondents feedback on the perception of self believe, defined as an individual's self confidence to perform behaviour to increase perceived usability. The total number of questions for this variable was 5. The outcome of the respondents indicates that self-efficacy is positively associated to perceived usability of adopting the PDA technology to improve organization operation efficiency (H2), represented in Table 4.2. It is predicted that the higher the self – efficacy perception on perceived usability is, the higher the respondent's intention to adopt PDAs technology to improve organization operation efficiency. This hypothesis received empirical support of ($r = 0.689$, $p < 0.000$). Thus this outcome proves that the higher the respondents believe in using PDAs or mobile on mobile business process, the intention to adopt will be greater than otherwise and null hypothesis H_o2 can be rejected.

Table 4.2: Pearson correlation results for Self –Efficacy factor and Perceived usability to adopt PDA technology to improve organization operation efficiency

		Perceived Usability	Result
SE	Pearson Correlation	.689**	Reject H_o2
	Sig. (2-tailed)	.000	
	N	74	

**. Correlation is significant at the 0.01 level (2-tailed).

4.4.1.3 Testing Hypothesis H3

H_o3: Self – efficacy does not demonstrate positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

This factor aimed to request the respondent feedback based on the respondents perception on self believe, defined as an individual's self confidence to perform behaviour in adopting the PDAs technology. The total number of questions for this variable was 5. The outcome of the respondents indicates that self- efficacy is positively and strongly associated with intention to adopt the PDA technology to improve organization operation efficiency (H3), represented in Table 4.3. It is predicted that the higher the self – efficacy, the higher the respondent's intention to adopt PDAs technology to improve organization operation efficiency. This hypothesis received empirical support of ($r = 0.800$, $p < 0.000$). The result is consistent with previous research result by Sripalawat et. al.,(2011), Agarwal et. al. (2000), Wang et. al. (2008) and Shen Y. C. et. al. (2010). Thus, comparing the outcome of H2 and H3, the factor self – efficacy has a stronger influence on the intention to adapt as

compared to direct relationship to perceived usability. Thus the null hypothesis H_o3 is rejected.

Table 4.3: Pearson correlation results for Self –Efficacy factor and Intention to adopt PDA technology to improve Organization operation efficiency

		Intention to Adopt	Result
SE	Pearson 3orrelation	.800**	Reject H_o3
	Sig. (2-tailed)	.000	
	N	74	

**. Correlation is significant at the 0.01 level (2-tailed).

4.4.1.4 Testing Hypothesis H4

H_o4 - Perceived impact of mobile work productivity does not demonstrate any significant effect on intention to adopt PDA technology to improve organizations operation efficiency.

As for perceived impact on mobile work productivity, the questionnaires was designed to request feedback on the respondents perception on productivity impacts enabled by mobile business services, like reduced traveling, increased efficiency, ability to improve task planning and coordinating, improved access to information and ability to make quick decision. The total number of questions for this variable was 6. The outcome of the respondents indicates that perceived impact on mobile work productivity is positively associated to perceived usability to adopt of the PDA technology to improve organization operation efficiency (H4), represented in Table 4.4. It

is found that the higher the perceived impact on mobile work productivity perception, the higher the intention to adopt PDAs technology to improve organization operation efficiency. This hypothesis received empirical support of ($r = 0.461$, $p < 0.000$). The result is consistent with previous research result by Gebauer J. et. al. (2004), and Herzberg (2003). Thus, Null hypothesis H_o4 can be rejected.

Table 4.4: Pearson correlation results for Perceived Impact on Mobile Work Productivity factor and Intention to adopt PDA technology to improve organization operation efficiency

		Intention to Adopt	Result
PI	Pearson Correlation	.461**	Reject H_o4
	Sig. (2-tailed)	.000	
	N	74	

**. Correlation is significant at the 0.01 level (2-tailed).

4.4.1.5 Testing Hypothesis H5

H_o5 - Organizational support on mobile business project does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

The organization support questionnaires was designed to request feedback on the respondents perception on management involvement, support, budget allocation for system development and acquiring skilled or experiences personnel to support PDA or mobile project development and implementation. The total number of questions for this variable was 4. The outcome of the

respondents indicates that perceived impact on mobile work productivity is positively associated to perceived usability to adopt of the PDA technology to improve organization operation efficiency (H5), represented in Table 4.5. This hypothesis received empirical support of ($r = 0.386$, $p < 0.000$). The current research is consistent with Chung et. al. (2009), Liang T. P. (2007), and Herzberg (2003). Thus, the null hypothesis H_o5 is rejected. Although the coefficient is at a higher level, the implications here is that most financial and banking organizations are aware of the PDA or mobile usage on the mobile business process to improve organization operation efficiency, but taken steps to give complete support to this process.

Table 4.5: Pearson correlation results for Organisation Support on Mobile Business Projects factor and Intention to adopt PDA technology to improve organization operation efficiency

		Intention to Adopt	Result
OS	Pearson Correlation	.386**	Reject H_o5
	Sig. (2-tailed)	.001	
	N	74	

**. Correlation is significant at the 0.01 level (2-tailed).

4.4.1.6 Testing Hypothesis H6

H_o6 - Financial viability does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

As for financial viability, the questionnaires was designed to request for respondents perception on budget allocation by organization to maintain the current system, hiring skilled staff with special expertise and proving existing

staff training opportunities if required. The total number of questions for this variable was 3. The outcome of the respondents for financial viability indicates week relationship to intention to adopt of the PDA technology to improve organization operation efficiency (H6), demonstrated in Table 4.6. This hypothesis received empirical support of ($r = 0.105$, $p < 0.372$), which does not indicate a strong significance as compared to organization support for mobile business projects. The current result is consistent with Liang et. al (2007). Thus, the hypothesis H_o6 is accepted. The implication is that financial and banking institutions are aware of the need for PDA or mobile technology usage on the mobile business process, however they are still restricted to the concept of less maintenance cost as much been spent on having the system implemented.

Table 4.6: Pearson correlation results for Financial Viability factor and Intention to adopt PDA technology to improve organization operation efficiency

		IN	Result
FI	Pearson Correlation	.105	Accept H_o6
	Sig. (2-tailed)	.372	
	N	74	

4.4.1.7 Testing Hypothesis H7

H_o7 - Physical Architecture does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

With regards to physical architecture, the questionnaires was designed to request for respondents perception on adequate hardware and software installation, network management quality, IT infrastructure support and educating staff with IT governance policy established in the organization. The total number of questions for this variable was 5. The outcome of the respondents for financial viability indicates a weak relationship to the intention to adopt the PDA technology to improve organization operation efficiency (H7), demonstrated in Table 4.7. This hypothesis received empirical support of ($r = 0.118$, $p < 0.318$). The current research is not consistent with Liang et. al (2007) and Santanos et. al., (2009). Thus, the null hypothesis H_o7 is accepted.

Table 4.7: Pearson correlation results for Physical Architecture factor and Intention to adopt PDA technology to improve organization operation efficiency

		IN	Result
PA	Pearson Correlation	.118	Accept H_o7
	Sig. (2-tailed)	.318	
	N	74	

4.4.1.8 Testing Hypothesis H8

H_o8 - Network connectivity quality does not demonstrate any positive effect on intention to adopt PDA technology to improve organizations operation efficiency.

Network connectivity quality is essential to ensure that all transaction processes via PDAs or mobile is carried out successfully enabling information access, update and storage to complete daily operations, the questionnaires was designed to request for respondents perception on network coverage, speed,

trust on telecommunication suppliers, and their abilities to support the organization on technical difficulties. The total number of questions for this variable was 6. The outcome of the respondents indicates that network connectivity quality is positively associated to the intention to adopt the PDA technology to improve organization operation efficiency (H8), demonstrated in Table 4.8. It is found that the higher the perception on network connectivity quality, the higher the intention to adopt PDAs technology to improve organization operation efficiency. This hypothesis received empirical support of ($r = 0.612$, $p < 0.000$). This result is consistent with previous research result of Shen Y.C. et. al. (2010), Lee (2005) and Labdry & Barmash (2007). Consequently, the null hypothesis Ho8 is rejected.

Table 4.8: Pearson correlation results for Network Connectivity Quality factor and Intention to adopt PDA technology to improve organization operation efficiency

		Intention to Adopt	Result
NC	Pearson Correlation	.612**	Reject H_o8
	Sig. (2-tailed)	.000	
	N	74	

**. Correlation is significant at the 0.01 level (2-tailed).

4.4.1.9 Testing Hypothesis H9

H_o9 - Device barrier does not demonstrate any negative effect on intention to adopt PDA technology to improve organizations operation efficiency.

With regards to device barrier, the questionnaires was designed to request for respondents perception of device screen resolutions, low end

mobile device, battery capacity, convenience to key in input information and surrounding environment disturbance while performing mobile business services. The total number of questions for this variable was 6. The outcome of the respondents for device barrier indicates a negative moderate relationship to intention to adopt of the PDA technology to improve organization operation efficiency (H9), as demonstrated in Table 4.9. This hypothesis received empirical support of ($r = 0.163$, $p < 0.165$). Current research is consistent with Gebauer J. et. al. (2004) and Sripalawat et. al (2011). The device barrier proves to be having significance negative relationship with intention to adopt. According to Sripalawat et. al (2011) the progress of mobile technology has been rapid to overcome the identified problems and banking and financial firms has to look at improving the interface design. Hence the null hypothesis H_o9 is rejected.

Table 4.9: Pearson correlation results for Device Barrier factor and Intention to adopt PDA technology to improve organization operation efficiency

		Intention to Adopt	Result
DB	Pearson Correlation	-.294*	Reject H_o9
	Sig. (2-tailed)	.011	
	N	74	

4.4.1.10 Testing Hypothesis H10

H_o10 - Security does not demonstrate any negative effect on intention to adopt PDA technology to improve organizations operation efficiency.

Finally the test done using Pearson correlation is for the factor security, the questionnaires was designed to request for respondents perception on respondents believe in the security in place for PDA or mobile business operation transactions, protection on current system, damages and web site hackers and hijacks. The total number of questions for this variable was 3. The outcome of the respondents for device barrier shown in Table 4.10 indicates a negative relationship to intention to adopt of the PDA technology to improve organization operation efficiency (H10) as expected. This hypothesis received empirical support of ($r = -0.463$, $p < 0.000$). This result is consistent with previous research result by Liang T. P., (2007), Herzberg (2003), Sripalawat et. al (2011) and Wang et al (2008). The security factor proves to be having significance negative relationship with intention to adopt. Thus, the null hypothesis H_o10 is rejected.

Table 4.10: Pearson correlation results for Security factor and Intention to adopt PDA technology to improve organization operation efficiency

		Intention to Adopt	Result
SC	Pearson Correlation	-.463**	Reject H_o10
	Sig. (2-tailed)	.000	
	N	74	

**. Correlation is significant at the 0.01 level (2-tailed).

4.4.1.11 Testing Hypothesis H11

H_o11 - Age does not demonstrate any significant difference on the use on perceived usability, self – efficacy, perceived impact on mobile work productivity and device barrier to adopt PDA technology to improve organizations operation efficiency.

This hypothesis is measured using One way ANOVA measurement. The age is measured against perceived usability, self – efficacy, perceived impact on mobile work productivity and device barrier. Table 4.11 illustrates the descriptive statistics and Table 4.12 demonstrates the relationship and strength of the factors to age. The descriptive statistics clearly indicates respondents aged 51 and above have a higher means score for PU (2.0547), SE (1.9479) and PI (1.8125), where else the respondents aged 20 – 30 presents the highest mean score for DB (2.5476).

As for the lowest mean score, respondents are aged between 21- 30 indicating (1.5179) PU, SE (1.3889). Respondents between ages of 41 – 50 have the lowest means score for PI (1.2583) and DB (2.0333).

Table 4.11: Descriptive statistics for Age grouping and Perceived Usability, Self-Efficacy, Perceived Impact on Mobile Work Productivity and Device Barrier.

Factor	Age Group	N	Mean	Std. Deviation
PU	20-30	21	1.5179	.26007
	31-40	17	1.6618	.43697
	41-50	20	1.6562	.30853
	51 >	16	2.0547	.53613
	Total	74	1.7044	.42683
SE	20-30	21	1.3889	.41611
	31-40	17	1.6275	.52218
	41-50	20	1.4417	.44352
	51 >	16	1.9479	.56999
	Total	74	1.5788	.52067
PI	20-30	21	1.4365	.37814
	31-40	17	1.7353	.49672
	41-50	20	1.2583	.39171
	51 >	16	1.8125	.43833
	Total	74	1.5383	.47185
DB	20-30	21	2.5476	.74562
	31-40	17	2.4902	.48759
	41-50	20	2.0333	.67234
	51 >	16	2.3854	.84922
	Total	74	2.3604	.71674

The empirical statistics shows evident to reject the null hypothesis $H_{o10.}$ However, not all four factors demonstrate a very strong significance. The PU indicates (F = 6.142, p = 0.01), SE (F = 4.761, p = 0.04), PI (F = 6.753, p = 0.00) variables demonstrate strong significance levels and only the device barrier demonstrates a moderate significance relationship between age and device barrier where the p value is (F = 1.480, p = 0.227).

Table 4.12: ANOVA result representing the relationship strength of Age between Perceived Usability, Self – Efficacy, Perceived Impact on Mobile Work Productivity, Device Barrier.

		Sum of Squares	df	Mean Square	F	Sig.
PU	Between Groups	2.771	3	.924	6.142	.001*
	Within Groups	10.528	70	.150		
	Total	13.299	73			
SE	Between Groups	3.354	3	1.118	4.761	.004*
	Within Groups	16.436	70	.235		
	Total	19.790	73			
PI	Between Groups	3.648	3	1.216	6.753	.000**
	Within Groups	12.605	70	.180		
	Total	16.253	73			
DB	Between Groups	2.414	3	.805	1.480	.227
	Within Groups	38.055	70	.544		
	Total	40.469	73			

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.4.1.12 Testing Hypothesis H12

H_o11 – Number of years of experiences does not demonstrate any significant difference on perceived usability, self – efficacy, device barrier and intention to adopt the PDA technology to improve organizations operation efficiency.

This hypothesis is measured using One way ANOVA measurement. The number of years of experiences is measured against perceived usability, self – efficacy, perceived impact on mobile work productivity and device barrier. Table 4.13 illustrates the descriptive statistics and Table 4.14 demonstrates the relationship and strength of the factors to number of years of experiences. The descriptive statistics clearly indicate respondents with 6 - 9 years experience have a higher means score of (1.6900) for PU. Respondent with 3 – 5 years of experience have a higher means score of (2.0933) for DB. The respondents with less than 2 years of experiences have a higher means score of (1.6250) SE.

Respondents with 3 -5 years of experiences indicate the lowest means score for PU (1.6700) and PI (1.5067). Respondents with number of years of experiences between 6 – 9 years indicate lowest mean score for SE (1.5200). Finally respondent with less than 2 years of experience presents the lowest means score of (1.9236) for DB.

Table 4.13: Descriptive statistics for Age grouping and Perceived Usability, Self-Efficacy, Perceived Impact on Mobile Work Productivity and Device Barrier.

Factors	Number of Year of Experiences	N	Mean	Std. Deviation	Std. Error
PU	< 2 YEARS	24	1.7552	.46256	.09442
	3 - 5 YEARS	25	1.6700	.38844	.07769
	6 - 9 YEARS	25	1.6900	.44064	.08813
	Total	74	1.7044	.42683	.04962
SE	< 2 YEARS	24	1.6250	.51838	.10581
	3 - 5 YEARS	25	1.5933	.59137	.11827
	6 - 9 YEARS	25	1.5200	.45977	.09195
	Total	74	1.5788	.52067	.06053
PI	< 2 YEARS	24	1.5208	.46706	.09534
	3 - 5 YEARS	25	1.5067	.45000	.09000
	6 - 9 YEARS	25	1.5867	.51171	.10234
	Total	74	1.5383	.47185	.05485
DB	< 2 YEARS	24	1.9236	.81942	.16726
	3 - 5 YEARS	25	2.0933	.78333	.15667
	6 - 9 YEARS	25	1.9600	.64241	.12848
	Total	74	1.9932	.74456	.08655

The empirical statistics provide evidence to reject alternative hypothesis $H_0$12, the outcome of ANOVA test clearly indicates that there is no significance difference between number of experiences group means with four factors (PI, SE, PI and DB). The PU ($F = 0260$, $p < 0.772$), SE ($F = 0.258$, $p < 0.773$), PI ($F = 0.119$, $p < 0.820$) and DB ($F = 0.349$, $p = .706$).

Table 4.14: ANOVA result representing the relationship strength of Number of Year of Experience between Perceived Usability, Self – Efficacy, Perceived Impact on Mobile Work Productivity, Device Barrier.

Factors	Number of Year of Experiences	Sum of Squares	df	Mean Square	F	Sig.
PU	Between Groups	.097	2	.048	.260	.772
	Within Groups	13.202	71	.186		
	Total	13.299	73			
SE	Between Groups	.143	2	.071	.258	.773
	Within Groups	19.647	71	.277		
	Total	19.790	73			
PI	Between Groups	.091	2	.045	.199	.820
	Within Groups	16.162	71	.228		
	Total	16.253	73			
DB	Between Groups	.394	2	.197	.349	.706
	Within Groups	40.074	71	.564		
	Total	40.469	73			

4.5 Conclusion

Chapter 4 discusses the result of the analysis based on valid data collected from 74 respondents from the financial and banking institutions. In total, there were three methods of data analysis used (descriptive, Pearson correlation and One way ANOVA). The descriptive statistics were used to analyse and study the demographic information. There were 12 hypothesis identified for this study. Hypothesis 1 to hypothesis 10 were analysed using Pearson correlation, which indicated strong significance for 8 factors (PU, SE, PI, DB, OS, NC, SC to Intention to adopt) and (SE to PU), where else (FI and PA) demonstrates a weak relationship. ANOVA test was conducted on age and the number of years of experience has demonstrated interesting results. Age has shown respondents above 51 to be more likely to adopt and use the PDA technology as compared to the general perception on the younger generation preferences to use PDA or mobile technology. Meanwhile there is no significant difference between number of years of experiences and PU, SE, PI and DB was identified.

The research findings suggest that it is obvious that financial and banking institution have to focus on continuous support on system maintenance, continuous improvement plan on security to increase the user's confidence over the use of PDAs or mobile on mobile business process to improve the operation efficiency of the organizations.

CHAPTER 5

DISCUSSION & CONCLUSION

5.1 Introduction

Mobile business processes has been adopted by many banking and financial institutions' with the intention of expanding customer services and improving internal business operation efficiency. With this in mind, the aim of this project was to examine the factors that are influencing the utilization of PDA and their impact on the operational efficiency of banking and financial institutions. Upon completing data collection and analysis from 74 valid respondents, the results indicate that 8 out of 10 hypotheses that were initially proposed was validated. Mobile banking has been expanding quickly in Malaysia and the introduction of mobile business process has been an eye opener for the banking and financial institutions. The research outcome suggests that greater emphasis on certain important factors (security, device barriers, financial support for system usage, underlying physical architecture and its maintenance) is necessary to increase user's confidence in adopting PDA device utilization more effectively. Strong positive correlations are found between factors such as self – efficacy, network connectivity quality, perceived impact on mobile work productivity, perceived usability, organization support on mobile business projects and the users intentions to adopt. In particular, self – efficacy is demonstrated to have significant correlation with perceived usability. ANOVA testing revealed that respondents aged above 51 are more likely to adopt and use PDA technology as compared to their younger counterparts. On the other hand there is no significant correlation between

number of years of experience and perceived usability, self – efficacy, perceived impact on mobile work productivity, and device barriers.

5.2 Findings and Discussion

The aim of this project is to obtain new insights into the factors affecting the use of PDAs to improve business and operational efficiency in banking and financial institutions. These factors also contribute in encouraging and promoting the PDAs usage amongst the users who are employed in these institutions. A summary of the finding and ranking of the significance level is presented in Table 5.1. The outcome clearly presents eight out of ten factors at significant probability level of 0.01 (hypothesis with double asterisks).

Table 5.1: Ranking - Pearson outcome based on strength of each variable relationship to Intention to Adopt and Perceived Usability.

Hypothesis	Variables	Pearson Correlation	P-value	Ranking
H10	SC * IN	-.463**	.000	7
H9	DB * IN	-.294*	.011	8
H3	SE * IN	.800**	.000	1
H2	SE * PU	.689**	.000	2
H8	NC * IN	.612**	.000	3
H4	PI * IN	.461**	.000	4
H1	PU * IN	.415**	.000	5
H5	OS * IN	.386**	.001	6
H7	PA * IN	.105	.372	9
H6	FI * IN	.118	.318	10

Pearson Correlation test indicates the first and most influential factor is self – efficacy on intention to adopt (H3), and self – efficacy on perceived usability (H2). The result of both hypotheses demonstrates that users are comfortable and confident in using PDAs to carry out business related task if

they consider such usage to be effective. It can be surmised that self – efficacy can assist in reducing perceived constraints and increasing intention to adopt. Self – efficacy ranks as the first priority amongst users due to the following perceived benefits: business task accomplished on time, convenience of accessing information and transaction processing anywhere, anytime especially during rush hours. These findings are consistent with Huang et. al. (2003) and Sripalawat et. al. (2011). Hypothesis (H3) significance level is much higher as compared to self – efficacy affecting perceived usability (H2). The outcome of hypothesis (H3) indicates that users are confident in utilizing PDA to improve operation efficiency.

The second influential factor is the network connectivity quality (H8). This factor is found to be significant given the fact that most banking and financial institutions provide considerable focus on ensuring that network coverage is up to task with regards to transaction speed. Other factors include telecommunication suppliers, and their ability to support the organization on technical difficulties and transactional data protection. One possible inference is that banking and financial institutions are strongly motivated to provide support to customers to ensure that a high level of satisfaction is achieved in using these facilities.

The third significant factor is the perceived impact on mobile work productivity. This factor is essential as it indicates to the management that users are realizing the benefits of using PDAs: namely, quick decision making and increased productivity resulting from effective management and task

planning. This finding is consistent with Rangone A. et. al. (2006), and Evans N. D. (2002).

Perceived usability was ranked fourth in demonstrating significant relationship to intention to adopt. The possible inference is that users feel that there is sufficient support for task mobility (task completion on the move), which is realized via intuitive functional navigation abilities on their PDAs. It is interesting to note that self efficacy shows a better outcome on intention to adopt as compared to perceived usability. This would seem to indicate that users might be willing to invest time to acquire the skill set to learn a difficult system if they felt that the return on investment in terms of efficiency was justified.

Organizational support is ranked fifth with respect to significance in adopting PDAs. This support typically takes the form of key stakeholders showing a high level of interest and involvement in the success of the projects by ensuring adequate allocation of budget and resources. The findings are consistent with Liang et. al. (2007).

There are also two obstructive factors that have been considered in this study; namely security and device barrier. Security (H10) has a higher negative significance relationship as compared to device barrier (H9). It is a relevant point to note that in spite of the clear perceived benefits that users were obtaining from PDA utilization, there still remained major concerns regarding security and privacy issues in using these devices; particularly when

performing online transactions. Device barrier (H9) issues such as small screen size, low-end device functionality, battery capacity, limited input methods and environment disturbances all have considerable negative impact on intention to adopt the PDA. One possible improvement that can be done by banking and financial institutions' is to consider design interface to eliminate some of the device barriers. The finding is also consistent with Shen Y. C. et. al. (2010) and Sripalawat et. al. (2011).

There are two hypotheses that have demonstrated presence of weak relationships; (1) physical architecture which demonstrates rather weak relationships towards intention to adopt (H7); followed by (2) financial viability (H6). These findings highlight the need for banking and financial institutions to improve hardware and software installation support and provide adequate maintenance of IT infrastructure. Additional steps also need to taken in order to educate staff on IT governance policy established in the organization. One possible reason why physical architecture does not provide significant result might be due to the job functions of the respondents of the questionnaires. The respondent's occupations seem to be skewed more to non-IT related fields, which would presumably indicate a lack of exposure to the importance of physical infrastructure in supporting the use of PDA technology. Another possible inference is that organizations are aware that in the rapidly evolving arena of IT technology, there is a paucity of standards available and any efforts to implement such standards may ostensibly result in rapid obsolescence. Businesses are generally acquainted with the importance of using real-time information to enhance their companies' agility and

competitiveness. However, this requires more than simply speeding up existing data processing systems; there is a need for deploying a different IT and business architecture. This can only be realized with appropriate attention paid to the various factors mentioned earlier.

The evidence suggests that network connectivity and organizational support are not major issues for users. The study however highlights the fact that users' perception on both physical architecture and financial support need to be enhanced in order to address any frustrations that may arise in PDA utilization. This could be one of the reasons explaining the disparity in correlating significance between self–efficacy and intention to adopt (H3), and self – efficacy and perceived usability (H2). It would appear that physical architecture and financial viability also contribute a negligible negative influence towards the other variables identified in this study (perceived usability, perceived impact on mobile work productivity and self –efficacy).

In addition to the 10 hypotheses discussed above, there were 2 hypotheses tested on age range and years of experience. The outcome of age (H11) measured for significant differences in perceived usability and self – efficacy with regards to perceived impact on mobile work productivity. The findings indicate respondents above 51 are more likely to adopt and use PDA technology as compared to their younger counterparts. This is counter intuitive to the general assumption that the younger generation are more comfortable with technology use. One of the possible inference is that the younger generation are comfortable with using technology for leisure (social networks

such as Facebook, playing games, or watching YouTube), but are less certain about the viability of PDAs when used in a working environment. Older generation may have seen different transitions of technology over the span of a working career, and are hence able to see the use of PDAs as another logical step in the constant evolution of IT usage in the work place.

Years of experience (H12) was also measured for significant difference in perceived usability, self – efficacy, device barrier and intention to adopt PDA based mobile business process. It was found that the length of experiences did not significantly influence PDA utilization. This is could be due to that experience does not necessarily provide users sufficient background to decide with regards to PDA utilization; as this may be perceived to be no different than standard utilization of other types of technology in facilitating business processes.

The research findings suggest that financial and banking institution need to continue to focus on providing support for system maintenance and physical architecture. They also need to adopt appropriate security procedures and measures that can significantly increase user's confidence on the use of PDAs in business processes. Lastly, there seems to be a need to collect feedback from users to further improve the mobile business application interface design to address the device barrier problem currently faced by users.

5.3 Contribution to academic research

This study provides new, interesting insights into the diffusion pattern of the factors influencing the impact of PDA utilization on the operational efficiency of banking and financial institutions in Malaysia. The theoretical factors for this study have been adopted and modified from various current studies. This includes the model called TAM, TRA Usability model and FVM. It is hardly surprising to discover that the process of adopting new technologies is a rather complex phenomenon, due to the interplay of a variety of factors.

Thus it is important to carry out a study based on an industrial context. This is the reason the usability study designed by Voulle et. al. (2008) was considered for this project. The findings of this study presents that neither TAM, TRA, Usability model and FVM can be a standalone model to demonstrate comprehensive understanding of new services, technology, infrastructure, human interactions and organization supports. This does not mean the current theoretical framework used in this study complements all other models. The implication is that selection of theoretical framework for technology adaptation should consider other potential models to be able to analyse different angles of the adaptation, in addition to including a Usability model to analyse the usability of specified context.

5.4 Contribution to financial and banking institutions

The various findings detailed above suggest several approaches for these institutions to further accelerate the adoption and use of mobile technologies for business processes.

5.4.1 Conducting User Awareness Programs

To encourage users' adoption of mobile banking systems, managers should emphasise the benefits and reduce consumers' perception of potential risks (security, device barrier, and concerns with physical architecture and its maintenance) in adopting PDAs to perform business tasks. In addition, users can be offered attractive benefits such as perceived positive impact on productivity, constant access to information, leading to quick decisions on the move and subsequent reduction in the amount of time spent travelling. Although it is true that the younger generation are more tech-savvy, the research findings has indicated that younger users are not comfortable to utilize PDAs in their work processes. To address this, the organization has to provide adequate training programs to educate the younger generation of users on the potential benefits that can be realized with PDA based online business transactions. However, caution must be taken when generalising these findings and discussion to other mobile commerce efforts adopted by other industries or user groups.

5.4.2 Reducing security risks and educating users

With respect to security risks, one of the most surprising trends is that users are increasingly ready to allow their online personal profile information to be tracked by advertisers, if it results in lower cost or free content. Thus, it is important for the management to ensure that users are educated and well informed with regards to organization IT governance policy, security and privacy implementations and proper utilization of the functionalities offered through the mobile business applications. This in turn provides an opportunity to elevate confidence levels of users who were previously hesitant to adopt the technology because of security considerations.

5.4.3 Improving User Interface Design to Reduce Effects of Device Barrier

Collecting users' feedback to improvise the interface design will also help the organisation to effectively reduce user's frustration on device barriers that are specific to PDA usage. The primary aspects that can be looked into include input methods, and data representation and system quality. It is important to understand that banking and financial industry can greatly benefit from the simplicity of the mobile banking platform. This simplicity will encourage increased usage of these devices to carry out business related tasks while on the move.

5.4.4 Physical Architecture and continuous Maintenance Support

To ensure proper ongoing physical architecture support, organizations have to consider a long term plan for maintenance. If the organization believes that there are no appropriate standards available, and any efforts to implement such standard may result in swift obsolesce; then the organization will have to reconsider the appropriate implementation of the mobile business process framework. In any case, organizations still need to provide continuous maintenance which is essential to ensure that users are able to use mobile business applications successfully without additional frustrations.

5.5 Limitations of the Study

There are valid reasons and evidence to indicate that the TAM, TRA Usability model, and FVM can be used individually to test technology viability. However it is also important to take note of other corresponding models that exist and can be used to test specific technology perspective. In this study the theoretical model was derived from various models identified. However this model is also not complete in itself. Future research should consider other corresponding models that are capable of providing different perspectives on new technology adoption. The findings have also highlighted the fact that the significance of self – efficacy to intention to adopt was higher compared to the significance of self – efficacy to perceived usability. The model used in this study did not consider all the other factors that could have affected this difference. This study is also focused specifically on variables that affect users

directly at both personal and system level. Another interesting avenue for future research is to examine other essential aspects of mobile business process, such as information quality, information presentation, system quality, and trust on intention to adopt PDA to improve operation efficiency and so on.

5.6 Future Recommendations

Future research should focus in line with the findings for possible further investigation to confirm the findings;

- Physical architecture – indicates there is no significance to intention to adopt this hypothesis. It is recommended that this factor be studied through a group of respondents that are more inclined and well versed with IT infrastructure technologies. An interview session would be a more suitable approach to be conducted with the relevant personnel.

- Financial viability – to confirm the findings further, questionnaires can be improved to investigate whether the respondents are aware of the organization's vision and mission. This factor will be used to investigate whether the users have an idea of the organization's budget allocations for maintaining the current system, and to provide adequate training. In this case, respondent's feedback can be classified into two distinct categories; (1) respondents that have a clear picture of the organizations IT budget; and

(2) those that do not have such knowledge. These distinct categories can then be used to test the significant differences with financial viability questions that have been used for this study. Example of types of questions that can be included in the study are:

1. I am aware of organization IT road map (short term and long term).
2. I am aware of yearly IT budget allocation to support overall organization

- This study revealed the interesting insight that the older generation of workers are more comfortable with PDA utilization as compared to their younger counterparts. A possible inference for this as noted earlier was that youngsters' interest in PDA utilization is more focused no entertainment and socializing purposes. To investigate further on the respondents' PDA usage preferences, examples of further questions that can be included is as follows:

1. What kind of applications do you generally use PDA for?

Despite the limitations in this study, the present research serves as a pilot study to explore the factors influencing the impact of PDA utilization on the operational efficiency of banking and financial institutions' in Malaysia. For future research more factors such as, compatibility system quality, information quality, and tradability, information presentation and trust can be explored.

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APPENDIX A – EMAIL PERMISSSION FOR DATA COLLECTION IN BANKING AND FINANCIAL INSTITUTIONS

Dear Sir/Madam,

I am grateful for your generous offer to help me in this study.

I am Gayathri a Master Research student at University Tunku Abdul Rahman with the student number (08UIM07930). My research meant to focuses in the area of PDA usage in organisation. To understand hoe employees in the banking and financial institutions' experience the usage of PDA or other mobile devices to improve daily work related task.

The approach of this study is QUESRIONNAIRE which takes about 15 – 20 minutes. I would like to request you kind permission for an appointment to handover the questionnaires personally to you and to collect it back.

My sincere appreciation for your kind assistance in completing the study.

Should you have any questions, please do not feel hesitate to contact me at 017 363 4362.
For further clarification, you may also send an email to my supervisor, Dr. Victor at hktan@utar.edu.my

Note:
I would like to assure that the data collected will be solely used for academic research purposes only. The data collected is not used for any sort of publishing.

Yours Sincerely,

Gayathri

APPENDIX B

Survey questionnaire on

AN ANALYSIS OF FACTORS INFLUENCING THE IMPACT OF PDA UTILIZATION ON THE OPERATION EFFICIENCY OF BANKING AND FINANCIAL INSTITUITION IN MALAYSIA

Dear Respondents,

This survey is part of Masters of Information System dissertation. The purpose of this study is to investigate Banking & Financial Institutions on factors that influences the utilization of PDA on the operations.

The questionnaire is divided into THREE (9) sections:

Section A: Perceived Usability

Section B: Self- Efficacy

Section C: Perceived Impact on Mobile Work Productivity

Section D: Organisational Support on Mobile Business Projects

Section E: Financial Viability

Section F: Physical Architecture

Section G: Network Connectivity Quality

Section H: Device Barrier

Section I: Security

Section J: Intention to Adopt

Section K: Demographics Information

Your responses will be kept strictly confidential. Kindly feel free to contact me if you have any enquiries about this survey.

Thank you for your time and co-operation in this survey.

Gayathri Mageswaran
Gayathri@ucsi.edu.my
Tel no: 017-363-4362

Instructions:

Please read the introduction to each section carefully and follow the instructions for completing the questionnaire provided below.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

	Section A: Perceived Usability of Mobile Business process - *Ease of use and usefulness of the mobile application system & Support.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
PU1	The mobile application can be easily installed and setup on my mobile devices.					
PU2	I find the installation process to be very fast and convenient					
PU3	I did not encounter any error during the installation process					
PU4	I have a very successful and pleasant first encounter with the use of mobile application services					
PU5	It only takes a short time for me to learn the mobile application services					
PU6	I now complete most of my business tasks using my mobile devices					
PU7	It is very convenient for me to multitask especially when I am travelling					

PU8	I never encounter any error or system fault while performing tasks with my mobile devices					
PU9	I have all the necessary functions on my mobile devices to perform my business tasks.					
PU10	I can easily navigate through the menu on my mobile devices.					
PU11	The menu and functions of the mobile services are very user-friendly.					
PU12	Help information is available and relevant to context when I require it					
PU13	I am able to understand and appreciate an additional advantage from utilizing mobile applications to enhance existing organization information systems.					

	Section B: Self-Efficacy - *Defines users beliefs and confidence level in using Mobile application services* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
SE1	I am able to complete more business services daily.					
SE2	I am able to improve the fluidity of my work through mobile services.					
SE3	I feel more motivated and satisfied when I finish my tasks through mobile services.					
SE4	I am satisfied with the quality of my task outcome through the usage of mobile services.					

SE5	I prefer using mobile services compared to traditional approaches to complete my business tasks.					
SE6	It takes less time to complete my usual tasks when I'm using mobile business services.					

	Section C: Perceived Impact on Mobile Work Productivity – *work performance using mobile application.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
PI1	I have managed to reduced my travelling with use of mobile business services					
PI2	Mobile business services has increased my work productivity					
PI3	By performing my business services through mobile devices, I have increased my efficiency and productivity at work.					
PI4	I am able to plan and coordinate my tasks more effectively through mobile business services.					
PI5	With Mobile business services I have managed to reduce the number of working phases compared with what was required before.					
PI6	I have better access to information needed at work.					
PI7	I am able to make quick decisions on the move					
PI8	I find mobile business services enhances information processing					
PI9	I am satisfied with the quality of my task outcome through the usage of mobile services.					

	Section D: Organisation Support on Mobile Projects – *Top management participation on mobile based projects.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
OS1	Key executives in the corporate headquarter participate in the project decision					
OS2	Key executives in the corporate headquarter assigned members into the project team					
OS3	Organization provide adequate budget for developing the system					
OS4	Organization has allocated required number of staff to be part of the mobile business process project team and assist in project coordination and monitoring.					

	Section E: Financial Viability – *Top management financial support to maintain and & enhance the existing mobile application system* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
FV1	Organization provide adequate budget for maintaining the system.					
FV2	Organization has allocated budget for the adoption of mobile technologies - need to hire employees with special expertise.					
FV3	Staff using mobile technology to enhance their performance without requirement of additional training, and if not, there is adequate budget to conduct training					

	Section F: Physical Architecture – *Mobile Application system is well support with the required*	**1**	**2**	**3**	**4**	**5**

	equipments and networks. (Please tick one box in each row)					
PA1	Organization has adequate hardware for operating the system to support mobile business process					
PA2	Organizations have qualified network management system to take real-time transaction processing					
PA3	Organization has necessary software for implementing mobile applications					
PA4	Internet technology to support web based businesses and IT infrastructure to support the Internet technology in place.					
PA5	I am well informed and educated with organizations IT governance policy to ensure proper utilization of the mobile business process functionalities.					

	Section G: Network Connectivity Quality – *Mobile Application system is made reliable for transaction processing.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
NC1	I receive notice "outside coverage area" whilst in the midst of performing transaction.					
NC2	The connections are speed when I am using network based mobile services is very slow					
NC3	While entering data, connection is lost at submission time and requires the process to be restarted					
NC4	I do face issues with task failure due to the mobile services network connectivity issues					

NC5	I think the telecom supplier who provides mobile banking services is trustworthy					
NC6	I think the telecom supplier who provides mobile banking services will do everything in their capacity to protect the subscribers' rights.					
NC7	I think the telecom supplier who provides mobile banking services will do everything to secure the transactions for the organization.					
NC8	I think the telecom supplier of the mobile banking services is capable of overcoming all kinds of technical difficulties.					

	Section H: Device Barrier – *Mobile devices characteristics to support the mobile services* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
DB1	I think a bigger screen and better resolution mobile device will enable me to perform more tasks.					
DB2	A low-end mobile device will discourage me from performing complicated business tasks with it.					
DB3	The battery capacity of my mobile device is not sufficient for me to perform my tasks daily.					
DB4	I am satisfied with the responds rate of my mobile device to my commands and actions.					
DB5	The large amount of workload and multitasking has slowed down the performance of my mobile device.					
DB6	I think it is inconvenient to input information using my mobile device.					
DB7	I find exchanging and transmission of information between my mobile device and other devices (ie. Computer) is very easy.					

DB8	I will have to concentrate fully on using mobile services and cannot afford to have any disturbance from surrounding environment.					

	Section I: Security – *Security concern over the use of Mobile application services* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
SE1	I am skeptical about the security mechanism of mobile banking services.					
SE2	I do not believe the design of the mobile banking system can actually provide security and privacy online.					
SE3	Current system is well protected from stolen information, damages to web sites by hackers, hijack of web sites and viruses.					
SE4	I consider it safe to do financial transactions over the mobile network system					

	Section J: Intention to Adopt –*Readiness of users to expected behaviour to use Mobile application services.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
IN1	I am highly interested in using the mobile application services.					
IN2	I will be interested to know the future improvement plan for mobile application services.					
IN3	I am comfortable with Mobile application services over the previous business process.					

INI4	I am among the first once to move with organization decision on utilization of mobile device to perform operations using mobile application services					

Section K: Demographic Profile

Instruction: Please tick (x) for the answers and fill in the blanks when necessary.

1. Age **2. Gender** Male ☐ Female ☐

☐ 16 - 19

☐ 20 - 23

☐ 24 - 27

☐ 28 – 30

☐ 31- 40

Others: please specify: ☐

3. Education Qualification ? (please tick one):

a) SPM ☐

b) Professional Certifications ☐

c) Diploma / Advances Diploma ☐

d) Bachelors / Degree ☐

4. Occupation (position level) ? (please tick one):

a) Junior Level ☐

b) Senior Level ☐

c) Management Level ☐

d) Executive Level ☐

e) Masters ☐

Others: _____

5. Number of year you are working in the same organisation:

a) Less than 3 years ☐

b) 4 – 6 years ☐

c) 7 – 9 years ☐

d) 10 years & more ☐

Thank you for your time. Your time spent on filling up this questionnaire is much appreciated.

APPENDIX C- AFTER MODIFICATION

Survey questionnaire on

AN ANALYSIS OF FACTORS INFLUENCING THE IMPACT OF PDA UTILIZATION ON THE OPERATION EFFICIENCY OF BANKING AND FINANCIAL INSTITUITION IN MALAYSIA

Dear Respondents,

This survey is part of Masters of Information System dissertation. The purpose of this study is to investigate Banking & Financial Institutions on factors that influences the utilization of PDA on the operations.

The questionnaire is divided into THREE (9) sections:

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Section B: Self- Efficacy

Section C: Perceived Impact on Mobile Work Productivity

Section D: Organisational Support on Mobile Business Projects

Section E: Financial Viability

Section F: Physical Architecture

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Section H: Device Barrier

Section I: Security

Section J: Intention to Adopt

Section K: Demographics Information

Your responses will be kept strictly confidential. Kindly feel free to contact me if you have any enquiries about this survey.

Thank you for your time and co-operation in this survey.

Gayathri Mageswaran
Gayathri@ucsi.edu.my
Tel no: 017-363-4362

Instructions:

Please read the introduction to each section carefully and follow the instructions for completing the questionnaire provided below.

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

	Section A: Perceived Usability of Mobile Business process - *Ease of use and usefulness of the mobile application system & Support.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
PU1	The mobile application can be easily installed and setup on my mobile devices.					
PU2	I find the installation process to be very fast and convenient					
PU3	I did not encounter any error during the installation process					
PU7	It is very convenient for me to multitask especially when I am travelling					
PU8	I never encounter any error or system fault while performing tasks with my mobile devices					
PU10	I can easily navigate through the menu on my mobile devices.					
PU12	Help information is available and relevant to context when I require it					

PU13	I am able to understand and appreciate an additional advantage from utilizing mobile applications to enhance existing organization information systems.					

	Section B: Self-Efficacy - *Defines users beliefs and confidence level in using Mobile application services* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
SE1	I am able to complete more business services daily.					
SE2	I am able to improve the fluidity of my work through mobile services.					
SE3	I feel more motivated and satisfied when I finish my tasks through mobile services.					
SE4	I am satisfied with the quality of my task outcome through the usage of mobile services.					
SE5	I prefer using mobile services compared to traditional approaches to complete my business tasks.					
SE6	It takes less time to complete my usual tasks when I'm using mobile business services.					

	Section C: Perceived Impact on Mobile Work Productivity – *work performance using mobile application.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**

PI2	Mobile business services has increased my work productivity					
PI3	By performing my business services through mobile devices, I have increased my efficiency and productivity at work.					
PI4	I am able to plan and coordinate my tasks more effectively through mobile business services.					
PI5	With Mobile business services I have managed to reduce the number of working phases compared with what was required before.					
PI6	I have better access to information needed at work.					
PI7	I am able to make quick decisions on the move					

	Section D: Organisation Support on Mobile Projects – *Top management participation on mobile based projects.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
OS1	Key executives in the corporate headquarter participate in the project decision					
OS2	Key executives in the corporate headquarter assigned members into the project team					
OS3	Organization provide adequate budget for developing the system					
OS4	Organization has allocated required number of staff to be part of the mobile business process project team and assist in project coordination and monitoring.					

	Section E: Financial Viability – *Top management financial support to maintain and & enhance the existing mobile application system* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
FV1	Organization provide adequate budget for maintaining the system.					
FV2	Organization has allocated budget for the adoption of mobile technologies - need to hire employees with special expertise.					
FV3	Staff using mobile technology to enhance their performance without requirement of additional training, and if not, there is adequate budget to conduct training					

	Section F: Physical Architecture – *Mobile Application system is well support with the required equipments and networks.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
PA1	Organization has adequate hardware for operating the system to support mobile business process					
PA2	Organizations have qualified network management system to take real-time transaction processing					
PA3	Organization has necessary software for implementing mobile applications					
PA4	Internet technology to support web based businesses and IT infrastructure to support the Internet technology in place.					

PA5	I am well informed and educated with organizations IT governance policy to ensure proper utilization of the mobile business process functionalities.					

	Section G: Network Connectivity Quality – *Mobile Application system is made reliable for transaction processing.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
NC1	I receive notice "outside coverage area" whilst in the midst of performing transaction.					
NC2	The connections are speed when I am using network based mobile services is very slow					
NC5	I think the telecom supplier who provides mobile banking services is trustworthy					
NC6	I think the telecom supplier who provides mobile banking services will do everything in their capacity to protect the subscribers' rights.					
NC7	I think the telecom supplier who provides mobile banking services will do everything to secure the transactions for the organization.					
NC8	I think the telecom supplier of the mobile banking services is capable of overcoming all kinds of technical difficulties.					

	Section H: Device Barrier – *Mobile devices characteristics to support the mobile services*	**1**	**2**	**3**	**4**	**5**

	(Please tick one box in each row)					
DB1	I think a bigger screen and better resolution mobile device will enable me to perform more tasks.					
DB2	A low-end mobile device will discourage me from performing complicated business tasks with it.					
DB3	The battery capacity of my mobile device is not sufficient for me to perform my tasks daily.					
DB4	I am satisfied with the responds rate of my mobile device to my commands and actions.					
DB6	I think it is inconvenient to input information using my mobile device.					
DB8	I will have to concentrate fully on using mobile services and cannot afford to have any disturbance from surrounding environment.					

	Section I: Security – *Security concern over the use of Mobile application services* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
SE1	I am skeptical about the security mechanism of mobile banking services.					
SE3	Current system is well protected from stolen information, damages to web sites by hackers, hijack of web sites and viruses.					
SE4	I consider it safe to do financial transactions over the mobile network system					

	Section J: Intention to Adopt *–Readiness of users to expected behaviour to use Mobile application services.* (Please tick one box in each row)	**1**	**2**	**3**	**4**	**5**
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INI4	I am among the first once to move with organization decision on utilization of mobile device to perform operations using mobile application services					

Section K: Demographic Profile

Instruction: Please tick (x) for the answers and fill in the blanks when necessary.

1. Age **2. Gender** Male ☐ Female ☐

☐ 16 - 19
☐ 20 - 23
☐ 24 - 27
☐ 28 – 30
☐ 31- 40
Others: please specify: ☐

3. Education Qualification ? **(please tick one):**

e) SPM ☐
f) Professional Certifications ☐
g) Diploma / Advances Diploma ☐
h) Bachelors / Degree ☐

4. Occupation (position level) ? **(please tick one):**

f) Junior Level ☐
g) Senior Level ☐
h) Management Level ☐
i) Executive Level ☐
j) Masters ☐

Others: _____

5. Number of year you are working in the same organisation:

e) Less than 3 years ☐
f) 4 – 6 years ☐
g) 7 – 9 years ☐
h) 10 years & more ☐

Thank you for your time. Your time spent on filling up this questionnaire is much appreciated.

APPENDIX D – RESPONDENTS DATA INPUT

PU1	PU2	PU3	PU7	PU8	PU10	PU12	PU13	Average	SE1	SE2	SE3	SE4	SE5	SE6	Average
2	2	2	2	3	3	3	3	2.5	2	2	3	2	3	3	2.5
2	2	2	2	1	3	2	1	1.875	3	2	2	2	1	2	2
3	3	3	3	3	3	3	3	3	2	2	3	2	3	3	2.5
1	2	2	2	3	1	1	1	1.625	1	2	2	1	1	1	1.333333
2	2	2	2	3	3	3	3	2.5	2	2	3	2	3	3	2.5
1	1	1	3	2	1	1	1	1.375	1	1	1	2	1	1	1.166667
2	2	1	1	2	1	3	2	1.75	1	2	2	1	1	1	1.333333
2	2	2	2	2	2	3	3	2.25	2	2	3	2	3	3	2.5
3	2	2	2	3	1	1	1	1.875	1	2	2	1	1	1	1.333333
2	2	2	2	3	3	3	3	2.5	2	2	3	2	3	3	2.5
2	2	2	2	1	3	2	1	1.875	3	2	2	2	1	2	2
1	1	1	3	2	1	1	1	1.375	1	1	1	2	1	1	1.166667
2	2	1	1	2	1	3	2	1.75	1	2	2	1	1	1	1.333333
2	2	2	2	2	2	3	3	2.25	2	2	3	2	3	3	2.5
3	3	3	3	3	3	3	3	3	2	2	3	2	3	3	2.5
2	1	1	2	1	1	2	2	1.5	1	1	1	2	2	2	1.5
2	2	2	3	2	2	2	2	2.125	3	2	2	2	1	2	2
1	2	1	1	2	2	2	2	1.625	1	1	1	1	1	1	1
2	2	2	2	3	2	3	3	2.375	1	1	2	2	2	2	1.666667
2	2	1	1	2	2	2	2	1.75	2	2	2	2	2	2	2
1	1	1	1	2	2	2	2	1.5	1	1	1	1	1	1	1
2	1	1	2	1	1	2	2	1.5	1	1	1	2	2	2	1.5
1	2	1	1	2	2	2	2	1.625	1	1	1	1	1	1	1
2	2	2	2	3	2	3	3	2.375	1	1	2	2	2	2	1.666667
2	2	1	1	2	2	2	2	1.75	2	2	2	2	2	2	2
2	2	2	2	1	3	2	1	1.875	3	2	2	2	1	2	2
1	1	1	1	1	2	2	2	1.375	2	2	2	2	2	2	2
2	1	1	2	1	1	2	2	1.5	1	1	1	2	2	2	1.5
1	2	1	1	2	2	2	2	1.625	1	1	1	1	1	1	1
3	2	2	2	3	1	1	1	1.875	1	2	2	1	1	1	1.333333
1	1	2	1	1	3	2	1	1.5	3	2	2	2	1	2	2
2	1	1	1	2	2	2	2	1.625	1	1	1	2	1	1	1.166667
3	2	1	3	2	1	1	3	2	1	1	1	1	1	1	1
2	2	2	3	2	2	2	2	2.125	3	2	2	2	1	2	2
1	1	1	1	2	2	2	2	1.5	1	1	1	1	1	1	1
1	1	1	1	2	2	2	2	1.5	1	1	1	1	1	1	1
1	1	1	1	1	2	2	2	1.375	2	2	2	2	2	2	2
1	1	1	1	1	2	2	2	1.375	2	2	2	2	2	2	2
1	1	1	1	1	2	2	2	1.375	1	1	1	1	1	1	1

PU1	PU2	PU3	PU7	PU8	PU10	PU12	PU13	Average	SE1	SE2	SE3	SE4	SE5	SE6	Average
1	1	1	1	2	2	2	2	1.5	1	1	1	1	1	1	1
1	2	2	2	3	1	1	1	1.625	1	2	2	1	1	1	1.333333
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	2	2	2	1.375	2	2	2	2	2	2	2
1	1	1	1	1	2	2	2	1.375	1	1	1	1	1	1	1
1	2	2	2	3	1	1	1	1.625	1	2	2	1	1	1	1.333333
1	1	1	3	2	1	1	1	1.375	1	1	1	2	1	1	1.166667
1	1	1	1	2	2	2	2	1.5	1	1	1	1	1	1	1
1	1	1	1	1	2	2	2	1.375	1	1	1	1	1	1	1
2	2	2	2	3	3	3	3	2.5	2	2	3	2	3	3	2.5
1	2	1	2	1	1	2	1	1.375	1	1	1	2	1	2	1.333333
1	3	2	1	3	1	2	1	1.75	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	2	1	1.125	1	1	1	2	1	2	1.333333
2	2	1	3	2	2	2	2	2	3	2	2	2	1	2	2
1	1	1	1	1	1	2	1	1.125	1	1	1	2	1	2	1.333333
1	1	1	1	2	2	2	2	1.5	1	1	1	1	1	1	1
1	1	1	1	1	2	2	2	1.375	1	1	1	1	1	1	1
1	1	1	1	1	3	2	1	1.375	3	2	2	2	1	2	2
1	2	1	2	1	1	2	1	1.375	1	1	1	2	1	2	1.333333
1	1	1	1	1	2	2	2	1.375	1	1	1	1	1	1	1
1	2	2	2	3	1	1	1	1.625	1	2	2	1	1	1	1.333333
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	2	2	2	1.375	2	2	2	2	2	2	2
1	1	1	3	2	1	1	1	1.375	1	1	1	2	1	1	1.166667
1	1	1	1	2	2	2	2	1.5	1	1	1	1	1	1	1
1	1	1	1	1	2	2	2	1.375	1	1	1	1	1	1	1
2	2	2	2	3	3	3	3	2.5	2	2	3	2	3	3	2.5
1	2	1	2	1	1	2	1	1.375	1	1	1	2	1	2	1.333333
1	3	2	1	3	1	2	1	1.75	2	2	2	2	2	2	2
2	2	1	3	2	2	2	2	2	3	2	2	2	1	2	2
1	1	1	1	1	1	2	1	1.125	1	1	1	2	1	2	1.333333
1	1	1	1	2	2	2	2	1.5	1	1	1	1	1	1	1
1	1	1	1	1	2	2	2	1.375	1	1	1	1	1	1	1
1	1	1	1	1	3	2	1	1.375	3	2	2	2	1	2	2

PI2	PI3	PI4	PI5	PI6	PI7	AVERAGE	OS1	OS2	OS3	OS4	AVERAGE	FI1	FI2	FI3	AVERAGE
2	1	2	2	3	2	2	3	3	3	3	3	1	3	3	2.333333
3	2	2	3	3	2	2.5	2	2	2	2	2	1	2	1	1.333333
2	1	2	2	3	2	2	3	3	3	3	3	1	3	3	2.333333
1	1	1	3	2	1	1.5	1	1	2	2	1.5	1	2	1	1.333333
2	1	2	2	3	2	2	3	3	3	3	3	2	3	3	2.666667
1	1	1	2	1	1	1.166667	1	1	2	2	1.5	1	2	1	1.333333
1	2	2	3	2	1	1.833333	2	4	2	2	2.5	1	1	1	1
2	1	2	2	3	2	2	2	3	3	3	2.75	1	2	1	1.333333
1	1	1	3	2	1	1.5	1	1	2	2	1.5	1	2	1	1.333333
2	1	2	2	3	2	2	3	3	3	3	3	1	3	3	2.333333
3	2	2	3	3	2	2.5	2	2	2	2	2	1	2	1	1.333333
1	1	1	2	1	1	1.166667	1	1	2	2	1.5	1	2	1	1.333333
1	2	2	3	2	1	1.833333	2	4	2	2	2.5	1	1	1	1
2	1	2	2	3	2	2	2	3	3	3	2.75	1	2	1	1.333333
2	1	2	2	3	2	2	3	3	3	3	3	1	3	3	2.333333
1	1	1	1	1	1	1	2	2	2	2	2	3	2	3	2.666667
3	2	2	3	1	2	2.166667	2	3	3	2	2.5	3	3	2	2.666667
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	1	1	1	1
1	2	1	1	2	1	1.333333	2	1	1	2	1.5	1	3	3	2.333333
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	2	3	3	2.666667
1	1	1	1	1	1	1	2	2	2	2	2	3	2	3	2.666667
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	1	1	1	1
1	2	1	1	2	1	1.333333	2	1	1	2	1.5	1	3	3	2.333333
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	2	2	3	3	2	2.5	2	2	2	2	2	2	3	3	2.666667
1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1.666667
1	1	1	1	1	1	1	2	2	2	2	2	3	2	3	2.666667
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	1	1	1	1
1	1	1	3	2	1	1.5	1	1	2	2	1.5	1	2	1	1.333333
3	2	2	3	3	2	2.5	2	2	2	2	2	2	2	1	1.666667
1	1	1	2	1	1	1.166667	1	1	2	2	1.5	1	2	1	1.333333
2	1	1	3	1	1	1.5	1	1	1	1	1	1	2	2	1.666667
3	2	2	3	1	2	2.166667	2	3	3	2	2.5	3	3	2	2.666667
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	2	1	2	1.666667
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	2	1	2	1.666667
1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1.666667
1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1.666667
1	1	1	2	2	1	1.333333	1	1	2	2	1.5	1	2	3	2

PI2	PI3	PI4	PI5	PI6	PI7	AVERAGE	OS1	OS2	OS3	OS4	AVERAGE	FI1	FI2	FI3	AVERAGE
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	2	3	3	2.666667
1	1	1	3	2	1	1.5	1	1	2	2	1.5	1	2	3	2
2	2	2	2	2	1	1.833333	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1.666667
1	1	1	2	2	1	1.333333	1	1	2	2	1.5	1	2	3	2
1	1	1	3	2	1	1.5	1	1	2	2	1.5	1	2	3	2
1	1	1	2	1	1	1.166667	1	1	2	2	1.5	1	2	1	1.333333
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	1	2	1	1.333333
1	1	1	2	2	1	1.333333	1	1	2	2	1.5	1	2	1	1.333333
2	1	2	2	3	2	2	3	3	3	3	3	2	3	3	2.666667
1	1	2	2	2	1	1.5	1	1	1	1	1	1	3	1	1.666667
1	1	1	1	1	1	1	3	2	2	2	2.25	1	2	2	1.666667
2	1	1	1	1	1	1.166667	1	.	2	2	1.666667	1	2	2	1.666667
2	2	2	2	2	2	2	1	1	1	1	1	2	3	3	2.666667
3	2	2	3	1	2	2.166667	2	3	3	2	2.5	1	3	2	2
2	2	2	2	2	2	2	1	1	1	1	1	1	3	3	2.333333
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	1	2	1	1.333333
1	1	1	2	2	1	1.333333	1	1	2	2	1.5	1	2	1	1.333333
3	2	2	3	3	2	2.5	2	2	2	2	2	1	2	1	1.333333
1	1	2	2	2	1	1.5	1	1	1	1	1	1	3	1	1.666667
1	1	1	2	2	1	1.333333	1	1	2	2	1.5	1	2	3	2
1	1	1	3	2	1	1.5	1	1	2	2	1.5	1	2	3	2
2	2	2	2	2	1	1.833333	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1.666667
1	1	1	2	1	1	1.166667	1	1	2	2	1.5	1	2	1	1.333333
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	1	2	1	1.333333
1	1	1	2	2	1	1.333333	1	1	2	2	1.5	1	2	1	1.333333
2	1	2	2	3	2	2	3	3	3	3	3	2	3	3	2.666667
1	1	2	2	2	1	1.5	1	1	1	1	1	1	3	1	1.666667
1	1	1	1	1	1	1	3	2	2	2	2.25	1	2	2	1.666667
3	2	2	3	1	2	2.166667	2	3	3	2	2.5	1	3	2	2
2	2	2	2	2	2	2	1	1	1	1	1	1	3	3	2.333333
2	1	1	1	1	1	1.166667	1	1	2	2	1.5	1	2	1	1.333333
1	1	1	2	2	1	1.333333	1	1	2	2	1.5	1	2	1	1.333333
3	2	2	3	3	2	2.5	2	2	2	2	2	1	2	1	1.333333

PA1	PA2	PA3	PA4	PA5	AVERAGE	NC1	NC2	NC5	NC6	NC7	NC8	AVERAGE	DB1	DB2	DB3
1	3	3	1	1	1.8	4	5	3	3	3	2	3.333333	2	4	4
2	2	2	1	1	1.6	4	4	2	2	2	2	2.666667	2	3	2
1	3	3	1	1	1.8	4	5	3	3	3	2	3.333333	2	3	3
1	2	2	1	1	1.4	3	3	2	1	2	2	2.166667	2	3	4
1	3	3	1	1	1.8	4	5	3	3	3	2	3.333333	3	5	5
1	2	2	1	1	1.4	3	3	1	1	1	1	1.666667	2	3	3
3	2	2	2	2	2.2	4	4	2	1	2	2	2.5	2	3	2
1	1	1	1	2	1.2	4	5	3	3	3	2	3.333333	1	1	1
1	2	2	1	1	1.4	3	3	2	1	2	2	2.166667	3	5	5
1	3	3	1	1	1.8	4	5	3	3	3	2	3.333333	2	4	4
2	2	2	1	1	1.6	4	4	2	2	2	2	2.666667	2	3	2
1	2	2	1	1	1.4	3	3	1	1	1	1	1.666667	2	3	3
3	2	2	2	2	2.2	4	4	2	1	2	2	2.5	2	3	2
1	1	1	1	2	1.2	4	5	3	3	3	2	3.333333	1	1	1
1	3	3	1	1	1.8	4	5	3	3	3	2	3.333333	2	3	3
1	1	1	1	2	1.2	3	3	2	2	3	3	2.666667	1	1	1
2	2	2	2	1	1.8	4	4	2	2	2	2	2.666667	2	3	3
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	2	3	3
1	2	2	1	1	1.4	1	1	1	1	1	1	1	1	3	3
1	1	1	1	1	1	3	3	3	3	3	3	3	2	1	3
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	2	3	4
1	1	1	1	2	1.2	3	3	2	2	3	3	2.666667	1	1	1
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	2	3	3
1	2	2	1	1	1.4	1	1	1	1	1	1	1	1	3	3
1	1	1	1	1	1	3	3	3	3	3	3	3	2	1	3
2	2	2	1	1	1.6	4	4	2	2	2	2	2.666667	1	3	3
1	1	1	1	1	1	3	3	3	3	3	3	3	1	1	1
1	1	1	1	2	1.2	3	3	2	2	3	3	2.666667	1	1	1
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	2	3	3
1	2	2	1	1	1.4	3	3	2	1	2	2	2.166667	2	1	3
2	2	2	1	1	1.6	4	4	2	2	2	2	2.666667	2	3	4
1	1	1	1	1	1	3	3	1	1	1	1	1.666667	3	5	5
1	2	1	2	2	1.6	3	3	1	1	1	1	1.666667	2	4	4
2	2	2	2	1	1.8	4	4	2	2	2	2	2.666667	2	3	3
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	1	1	1
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	1	1	1
1	1	1	1	1	1	3	3	3	3	3	3	3	1	1	1
1	1	1	1	1	1	3	3	3	3	3	3	3	1	1	1
1	2	1	1	2	1.4	3	3	1	1	1	1	1.666667	1	3	3

PA1	PA2	PA3	PA4	PA5	AVERAGE	NC1	NC2	NC5	NC6	NC7	NC8	AVERAGE	DB1	DB2	DB3
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	2	3	4
1	2	2	1	1	1.4	3	3	2	1	2	2	2.166667	2	1	3
1	1	2	1	1	1.2	2	2	2	2	2	2	2	2	3	4
1	1	1	1	1	1	3	3	3	3	3	3	3	3	5	5
1	2	1	1	2	1.4	3	3	1	1	1	1	1.666667	1	3	3
1	2	2	1	1	1.4	3	3	2	1	2	2	2.166667	2	1	3
1	2	2	1	1	1.4	3	3	1	1	1	1	1.666667	2	4	4
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	2	3	2
1	2	1	1	2	1.4	3	3	1	1	1	1	1.666667	1	1	1
1	3	3	1	1	1.8	4	5	3	3	3	2	3.333333	2	3	3
1	1	2	1	1	1.2	3	3	2	1	1	1	1.833333	1	3	3
1	1	1	1	1	1	3	3	3	3	3	3	3	2	1	3
1	1	1	1	2	1.2	1	3	1	2	2	2	1.833333	2	3	4
1	1	1	1	1	1	3	3	2	1	1	1	1.833333	3	5	5
2	2	2	2	1	1.8	4	4	2	2	2	2	2.666667	2	4	4
1	1	1	1	1	1	3	3	2	1	1	1	1.833333	2	3	2
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	1	3	3
1	2	1	1	2	1.4	3	3	1	1	1	1	1.666667	2	1	3
2	2	2	1	1	1.6	4	4	2	2	2	2	2.666667	2	4	4
1	1	2	1	1	1.2	3	3	2	1	1	1	1.833333	2	3	2
1	2	1	1	2	1.4	3	3	1	1	1	1	1.666667	1	3	3
1	2	2	1	1	1.4	3	3	2	1	2	2	2.166667	2	1	3
1	1	2	1	1	1.2	2	2	2	2	2	2	2	2	3	4
1	1	1	1	1	1	3	3	3	3	3	3	3	3	5	5
1	2	2	1	1	1.4	3	3	1	1	1	1	1.666667	2	4	4
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	2	3	2
1	2	1	1	2	1.4	3	3	1	1	1	1	1.666667	1	1	1
1	3	3	1	1	1.8	4	5	3	3	3	2	3.333333	2	3	3
1	1	2	1	1	1.2	3	3	2	1	1	1	1.833333	1	3	3
1	1	1	1	1	1	3	3	3	3	3	3	3	2	1	3
2	2	2	2	1	1.8	4	4	2	2	2	2	2.666667	2	4	4
1	1	1	1	1	1	3	3	2	1	1	1	1.833333	2	3	2
1	2	2	1	1	1.4	1	3	1	2	2	2	1.833333	1	3	3
1	2	1	1	2	1.4	3	3	1	1	1	1	1.666667	2	1	3
2	2	2	1	1	1.6	4	4	2	2	2	2	2.666667	2	4	4

DB4	DB6	DB8	AVERAGE	SC1	SC3	SC4	AVERAGE	IN1	IN2	IN3	IN4	AVERAGE	GENDER	AGE	EDUCATION
2	3	1	2.666667	1	3	2	2	1	2	2	2	1.75	1	4	3
2	1	2	2	1	1	1	1	2	2	2	3	2.25	1	4	4
2	5	1	2.666667	1	3	2	2	1	2	2	2	1.75	1	4	2
2	3	2	2.666667	1	1	1	1	1	1	1	1	1	2	4	4
3	5	3	4	1	3	2	2	1	2	2	2	1.75	1	4	4
2	5	1	2.666667	2	3	1	2	3	1	1	1	1.5	2	4	3
2	1	2	2	1	1	1	1	1	1	1	1	1	2	4	2
1	1	2	1.166667	1	3	2	2	1	2	2	2	1.75	1	4	3
3	5	3	4	1	1	1	1	1	1	1	1	1	1	4	3
2	3	1	2.666667	1	3	2	2	1	2	2	2	1.75	1	4	3
2	1	2	2	1	1	1	1	2	2	2	3	2.25	1	4	2
2	5	1	2.666667	2	3	1	2	3	1	1	1	1.5	2	4	4
2	1	2	2	1	1	1	1	1	1	1	1	1	2	4	2
1	1	2	1.166667	1	3	2	2	1	2	2	2	1.75	1	4	2
2	5	1	2.666667	1	3	2	2	1	2	2	2	1.75	2	4	4
1	1	2	1.166667	1	1	2	1.333333	1	1	1	1	1	1	3	3
2	5	1	2.666667	1	1	1	1	2	2	2	3	2.25	2	3	2
2	5	1	2.666667	3	3	1	2.333333	1	1	1	1	1	1	3	2
2	2	2	2.166667	2	2	3	2.333333	1	2	2	2	1.75	2	3	2
2	4	3	2.5	1	1	1	1	2	2	2	2	2	1	3	2
2	3	2	2.666667	3	3	1	2.333333	1	1	1	1	1	1	3	2
1	1	2	1.166667	1	1	2	1.333333	1	1	1	1	1	1	3	2
2	5	1	2.666667	3	3	1	2.333333	1	1	1	1	1	1	3	2
2	2	2	2.166667	2	2	3	2.333333	1	2	2	2	1.75	2	3	2
2	4	3	2.5	1	1	1	1	2	2	2	2	2	1	3	3
2	2	2	2.166667	1	1	1	1	2	2	2	3	2.25	2	3	3
1	1	2	1.166667	1	1	1	1	2	2	2	2	2	1	3	3
1	1	2	1.166667	1	1	2	1.333333	1	1	1	1	1	1	3	1
2	5	1	2.666667	3	3	1	2.333333	1	1	1	1	1	1	3	1
2	4	3	2.5	1	1	1	1	1	1	1	1	1	2	3	3
2	3	2	2.666667	1	1	1	1	2	2	2	3	2.25	1	3	2
3	5	3	4	2	3	1	2	3	1	1	1	1.5	1	4	2
2	3	1	2.666667	2	2	2	2	1	1	1	1	1	2	3	2
2	5	1	2.666667	1	1	1	1	2	2	2	3	2.25	2	3	2
1	1	2	1.166667	3	3	1	2.333333	1	1	1	1	1	2	2	2
1	1	2	1.166667	3	3	1	2.333333	1	1	1	1	1	2	1	3
1	1	2	1.166667	1	1	1	1	2	2	2	2	2	2	1	3
1	1	2	1.166667	1	1	1	1	2	2	2	2	2	2	2	3
2	2	2	2.166667	2	2	2	2	1	1	1	1	1	2	1	2

DB4	DB6	DB8	AVERAGE	SC1	SC3	SC4	AVERAGE	IN1	IN2	IN3	IN4	AVERAGE	GENDER	AGE	EDUCATION
2	3	2	2.666667	3	3	1	2.333333	1	1	1	1	1	1	2	2
2	4	3	2.5	1	1	1	1	1	1	1	1	1	1	1	2
2	3	2	2.666667	2	2	2	2	1	2	2	2	1.75	2	1	2
3	5	3	4	1	1	1	1	2	2	2	2	2	1	1	2
2	2	2	2.166667	2	2	2	2	1	1	1	1	1	2	1	2
2	4	3	2.5	1	1	1	1	1	1	1	1	1	1	1	3
2	3	1	2.666667	2	3	1	2	3	1	1	1	1.5	2	1	2
2	1	2	2	3	3	1	2.333333	1	1	1	1	1	1	2	3
1	1	2	1.166667	2	2	2	2	1	1	1	1	1	1	1	2
2	5	1	2.666667	1	3	2	2	1	2	2	2	1.75	2	2	3
2	2	2	2.166667	2	2	1	1.666667	1	1	1	1	1	2	1	3
2	4	3	2.5	1	1	1	1	2	2	2	2	2	1	2	3
2	3	2	2.666667	3	3	1	2.333333	1	1	1	1	1	1	1	3
3	5	3	4	2	2	1	1.666667	1	1	1	1	1	2	2	2
2	3	1	2.666667	1	1	1	1	2	2	2	3	2.25	2	2	2
2	1	2	2	2	2	1	1.666667	1	1	1	1	1	1	2	2
2	2	2	2.166667	3	3	1	2.333333	1	1	1	1	1	1	1	2
2	4	3	2.5	2	2	2	2	1	1	1	1	1	2	3	2
2	3	1	2.666667	1	1	1	1	2	2	2	3	2.25	2	2	2
2	1	2	2	2	2	1	1.666667	1	1	1	1	1	1	2	3
2	2	2	2.166667	2	2	2	2	1	1	1	1	1	2	1	2
2	4	3	2.5	1	1	1	1	1	1	1	1	1	1	1	3
2	3	2	2.666667	2	2	2	2	1	2	2	2	1.75	2	1	2
3	5	3	4	1	1	1	1	2	2	2	2	2	1	1	3
2	3	1	2.666667	2	3	1	2	3	1	1	1	1.5	2	1	3
2	1	2	2	3	3	1	2.333333	1	1	1	1	1	1	2	2
1	1	2	1.166667	2	2	2	2	1	1	1	1	1	2	1	1
2	5	1	2.666667	1	3	2	2	1	2	2	2	1.75	2	2	1
2	2	2	2.166667	2	2	1	1.666667	1	1	1	1	1	2	1	1
2	4	3	2.5	1	1	1	1	2	2	2	2	2	1	2	1
2	3	1	2.666667	1	1	1	1	2	2	2	3	2.25	2	2	2
2	1	2	2	2	2	1	1.666667	1	1	1	1	1	2	2	4
2	2	2	2.166667	3	3	1	2.333333	1	1	1	1	1	1	1	3
2	4	3	2.5	2	2	2	2	1	1	1	1	1	2	3	5
2	3	1	2.666667	1	1	1	1	2	2	2	3	2.25	2	2	2

OCCUPATION	NUMBER OF EXPERIENCE
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OCCUPATION	NUMBER OF EXPERIENCE
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