



**ADDIS ABABA UNIVERSITY**

**COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES**

**SCHOOL OF INFORMATION SCIENCE**

**SUCCESS FACTORS OF MOBILE APPLICATION DEVELOPMENT  
AT SELECTED INNOVATION HUB & CO-WORKING SPACES IN  
ADDIS ABABA, ETHIOPIA**

**By**

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**JUNE, 2017**

**ADDIS ABABA, ETHIOPIA**



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A Thesis Submitted to School of Graduate Studies of Addis Ababa University in  
Partial Fulfillment of the Requirements for the Degree of  
Master of Science in Information Science

By: Yosef Ashenafi

Advisor: Getachew Jemaneh

June, 2017

Addis Ababa, Ethiopia



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## **Declaration**

This thesis has not previously been accepted for any degree and is not being concurrently submitted in candidature for any degree in any university.

I declare that the thesis is a result of my own investigation, except where otherwise stated. I have undertaken the study independently with the guidance and support of my research advisor. Other sources are acknowledged by citations giving explicit references. A list of references is appended.

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This thesis has been submitted for examination with my approval as university advisor.

Advisor's Signature: \_\_\_\_\_

Getachew Jemaneh

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June, 2017

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## **LIST OF ABBREVIATION**

AMP	Antenna Mobility Platform
APK	Android Application Package.
APP	Application.
CMS	Content Management System.
CSV	Common Separated Values file.
EU	European Union.
ETC	Ethiopian Telecommunication Corporation.
FAQs	Frequently Asked Questions.
GPS	Global positioning system.
MAD	Mobile application development.
MBaaS	Mobile Backend as an accommodation.
NBIA	National Business Incubation Association.
SaaS	software-as-a-service.
SDK	Software Development Kit.
UI	User Interface.

## **ABSTRACT**

Mobile application development attracts developers because of constant demand for mobile applications and comparatively easy access of the market.

This thesis entitled success factors of mobile application development at selected innovation hub and co-working spaces focuses on identifying the success factors that have direct impact on mobile application development, from the perspective of innovation hub and co-working space centers found in Ethiopia, namely iceaddis, xHub and BlueMoon. Even though there are good descriptions of the mobile application development, a structured description of success factors and potential problems is still missing, to identify success factors and issues of current mobile technology implementations a multiple case study in the area of mobile technologies is needed. Subsequently, this thesis work is one of the solution for this problem.

The necessary data is collected using questionnaires that is distributed for the members at the centers, interviews that are held on between the researchers and the executives, observation and literature reviews. The responses obtained through questionnaires are supplemented with interview. The analysis is done using SPSS statistics version 20. Frequencies, percentage, mean and standard deviation value is used for discussion for the questionnaire collected from those companies.

From the result, the success factors were then ranked according to importance. In each discussion the result is also supplemented by analysis and views of professionals and executive once.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 BACKGROUND

The original purpose of a mobile phone was designed for basic communication. Today, phones are used to perform different advanced activities, for example, to access location via GPS, to take photos, as media players, and to access the internet. The growing usage of smartphones highly contributed to the emergence of advanced mobile applications. In developing countries mobile phones are the most common device used to access the Internet (Poudel 2013).

Mobile communications technology has quickly become the world's most common way of transmitting voice, data, and services in the developing world. Given this dramatic change, mobile applications in general hold significant potential for advancing development (Poudel 2013). They could give the most inexpensive ways for a lot of people to access markets, information, governance, and finance systems previously unavailable to them.

Mobile applications are software designed to take advantage of mobile technology and can be developed for technology besides mobile phones. As a result, there has been a global blast in the number of mobile applications, smoothed by the fast evolution of mobile networks and by the growing functions and dropping prices of mobile devices (Qiang, Kuek, Dymond & Esselaar). "A mobile Application (mobile app) is a software application designed to run on smartphones, tablet computers, and mobile devices." From (Poudel 2013) definition. Mobile application has become a very familiar term in the world today. The popularity of mobile applications has continued to rise, as their

usage has become increasingly prevalent across mobile phone users. Public demand of mobile apps and the handiness of sophisticated developer tools, libraries, and frameworks enabled mobile app development easy, fast and productive (Poudel 2013). Mobile data network and mobile services are still in the early stage in the developing countries. Even if mobile phones are used for accessing the web in the developing countries, there is a lack of technology availability and network coverage. Ethiopia is one of the developing countries that has a lot of room for improvement. The monopolized telecommunication control in Ethiopia contributes for the slow Internet and data communication development (Hana 2016).

Though there have been some studies on the mobile application revolution, there is a lack of systematic analyses, in-depth case studies, and identifying success factors of mobile application development in Ethiopia. Thus this thesis examines their development impact, networks and real life procedures to provide an insight for researchers and developers underpinning from innovations hubs and co-working places.

## **1.2 STATEMENT OF RESEARCH PROBLEM**

Most of the people from developed countries can't imagine leaving home without mobile. Not only the developed countries but also the developing countries like Ethiopia the mobile application user rate growth rapidly (Rashedul, Rofiquel & Mazumder 2010). Statistics show that information and communication technology (ICT) sector in Ethiopia has seen substantial growth over the last five years. Mobile telecommunications grew from a mere 1.2million subscribers in 2007 to around 22million subscribers by the end of 2012. Internet and data subscribers raised from 31 400 in 2007 to 221 000 in 2011. By 2012, the voice communication coverage had

reached 64%, a significant development given Ethiopia's begin from a low base (Hana 2016).

Even if there are well explanations of the mobile application development, the success factors and potential problems is still a gap, to identify success factors and issues of current mobile technology employments a multiple case study in the field of mobile technologies is needed.

Subsequently, this thesis work accentuates the success factors of mobile application development (MAD) at selected innovation hub and co-working space found in Addis Ababa, Ethiopia in general. Furthermore, even though there are studies that identify the success factors of mobile application, those the way of identification factors were not well organized and classified based on their similarity, but in this study success factors are identified based on their importance. This study aims to identify the Success factors of MAD for appropriate management. Consequently, this research study attempt to answer the following research question:

- ① What are success factors of mobile application development of innovation hub and co-working space companies found in Ethiopia?

## **1.3 OBJECTIVE**

### **1.3.1 GENERAL OBJECTIVE**

The main objective of this study is identification of the success factors of mobile application development for a better result.

### **1.3.2 SPECIFIC OBJECTIVE**

This thesis address the following specific objectives:

1. To identify the success factors in mobile application development.
2. To identify the associated factors of mobile application development success.

### **1.4 SCOPE**

The scope of this research is limited on the three innovation hub and co-working spaces found in Addis Ababa, Ethiopia. Currently only those are available, namely iceaddis, x-hub and BlueMoon.

### **1.5 SIGNIFICANCE OF THE RESEARCH PROBLEM**

Significance of the paper is first to know the status of mobile application development in Ethiopia as a nation through a detailed examination of major and iconic innovation hubs and co-working spaces in Ethiopia so far. I identify various Individuals, executives and professional insight and from desk documents to see where we are in mobile application development that hindered the country efforts.

For practice, this paper will suggest unanticipated hurdles small digital entrepreneurs may face if they rely heavily on mobile advertising and the app store to launch and sustain their business.

Secondly detailed examination of ideas of expert executives and those who are regular members of innovation hubs in which most of them publish their own products in mobile stores. Through aspect analysis of study the researcher come up with recommendations and ideas for new startups and investors who are looking for researches and studies.

## **1.6 ORGANIZATION OF THE RESEARCH**

This paper is arranged in five chapters. The first chapter is Introduction which starts with a general background of Mobile Application Development. It explains the research statement, objective, scope and significance. Chapter two deals with literature review about Mobile Application Development and general success factors. The third chapter discusses about the methodology of the research. Chapter four consists of analyzing data, discussion and evaluation of the results. Finally, chapter five contains conclusion and recommendations for further studies.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

In this chapter the researcher reviewed articles, web links and books that support the main theme of the paper. Concepts are overview of mobile application, overview of incubation centers, telecommunication in Ethiopia, mobile application development (MAD), mobile application's effect on society, Mobile app development strategy, Mobile Application Development platforms, Mobile Application Development software and tools, mobile applications frameworks and finally different related works are described and summarized using table.

#### **2.1 OVERVIEW OF MOBILE APPLICATION**

A mobile application or an app, is a type of application software designed to run on a mobile device, specifically for use on small, wireless computing devices, such as smartphones and tablets, rather than desktop or laptop computers.

Mobile applications frequently serve to provide users with similar services to those accessed on PCs. Apps are generally small, individual software units with limited function (Marshal & Gretchen 2006).

Mobile apps are occasionally classified according to whether they are web-based or native apps, which are made specifically for a given platform. A third category, hybrid apps, chains elements of both native and Web apps. When the technologies mature, it's predictable that mobile application development efforts will focus on the creation of browser-based, device-agnostic Web applications as it is progressed now a days.

Mobile web apps are developed using HTML 5, CSS 3, and JavaScript. These applications run on the web server, accessible via web browsers, and are portable across multiple mobile platforms. However, a native and rich UX is difficult to create using this strategy. Despite the fact that several device specific functions and offline stores can be leveraged via HTML 5, restrictions exist due to the sandbox nature of specific platforms and the extent to which HTML 5 specifications are adopted by native browser components on the user's device (Anderson 2012).

The simplest mobile apps take PC-based applications and port them to a mobile device. As mobile apps become more robust, this technique is somewhat missing. A more sophisticated approach involves developing specially for the mobile environment, taking advantage of both its pros and cons (Marshal & Gretchen 2006).

Mobile applications are found on both feature phones and smartphones. The most popular smartphone platforms that support mobile apps today are Android, iOS, Windows-Phone and BlackBerry.

## **2.2 OVERVIEW OF INCUBATION CENTERS**

According to the EU Centre for Strategy & Evaluation Services: Business incubator is defined as an organization that quickens and systematizes the process of forming successful enterprises by providing a comprehensive and integrated range of support, including: incubator space, business support services, and clustering and networking opportunities. A successful business incubator will generate a stable flow of new businesses with average job and wealth creation potential (European Commission Enterprise Directorate-General 2002).

The UKBI (UK Business Incubation) definition states that: Incubation is a unique and very flexible arrangement of business development processes, infrastructure and people, designed to grow new and small businesses by supporting them through early stages of development and change (ECEDG 2002).

Finally, if we consider the NBIA (National Business Incubation Association): business incubation is a business support process that accelerates the successful development of start-up and fledgling companies by providing entrepreneurs with a sequence of targeted resources and services. These services are frequently developed by incubator management and given both in the business incubator and through its network of links (ECEDG 2002). A business incubator's main goal is to produce successful businesses that will leave the program financially viable and self-financing. These incubator graduates have the drive to create jobs, revive neighborhoods, commercialize new skills and technologies, and reinforce local and national economies.

In general, a business incubator will focus on a range of services on clients that are designed to help them launch well managed businesses. This mix of services is generally drawn from: administrative services (photocopying, bookkeeping, etc.); business advice services (coaching, counseling, mentoring, training), technical services (technical advice, access to expensive equipment, etc.), finance raising, and networking opportunities (between clients, links to wider business community). Other services (loan & venture capital funds, lobbying for special bureaucratic treatment, etc.) are occasionally developed to help clients overcome specific problems in the given business situation. Clients can be resident, non-resident or affiliated to the incubator (ECEDG 2002). The services targeted on clients are costly in relation to many other types of business development services (training programs, advice services) but are justified by supporters as investment in success

Because the concentrated support services should lead to higher survival and growth rates of incubated businesses. 4 Source: Centre for Economic and Social Services 2002

12 Global Practice in Incubation Policy Development and Implementation If clients are resident in the incubator, initially they pay a highly subsidized rent or enjoy a rent free period. Subsequently, rents will rise to commercial levels sufficient to cover at least the basic services they receive. After a specified period (2-4 years) clients are usually encouraged to move on to make way for new clients. It is often a stated purpose that an incubator will become sustainable through marketable income, though this is only achieved where the actual income has a realistic chance of covering costs and other objectives do not mitigate against this. In case of resident clients, sustainability is often linked to larger undertaking which can ensure consistent commercial rents (ECEDG 2002).

Global practices demonstrate that success sharing models where the incubator takes an equity stake in its clients, or a royalty on gross sales for a period, or both, can be a better way in pushing for financial sustainability. Globally, there are cases where incubator staff share in the achievement of tenant companies by way of success pool performance schemes (ECEDG 2002). The main focus for incubators is on the combination of services provided to clients. However, previous from a business incubator acknowledging a business as a new client frequently there is a requirement for a clear pre-incubation program to upkeep potential entrepreneurs define their business ideas and develop their plans to the point where they can be evaluated as a potential client. Incubators commonly

Provide hot discussions, short training programs and initial coaching sessions delivered at their premises and often through small pre-incubation at distance where basic services are supplemented by on-line support, all as part of the pre incubation support

programs. Succeeding the period of intense incubation support there also needs to be clear exit route for successful businesses, including after-care services that guarantee both a smooth transition, support for future growth, such as internationalization, and ongoing linkages back to current and new clients of the incubator (ECEDG 2002). Developed local commercial property markets exit is not normally a problem area, however, in poorer regions of developed economies or in developing economies exit can prove to be problematic and the exit plan needs to clearly classify how successful enterprises can leave incubation while remaining located in the area.

Several incubators are now challenging the issue of scaling operations efficiently, and increasingly using the Internet to provide lower-cost services to a larger client base.

### **2.3 TELECOMMUNICATIONS IN ETHIOPIA**

The main reason which the researcher would like to review the literature about telecommunication in Ethiopia is because it has direct relation with mobile application and network.

Ethio telecom, is a combined telecommunications services giver in Ethiopia, which provides internet and telephone services. The owner of Ethio telecom is Ethiopian government and preserves a monopoly over all the entire telecommunication facilities in Ethiopia.(Qiang 2011) Based in Addis Ababa, it is one of the "Big-5" group of state owned companies in Ethiopia, along with Ethiopian Airlines, the Commercial Bank of Ethiopia, Ethio-Insurance, and the Ethiopian Shipping Lines (The Economist 2013).

Ethio telecom was administered, on a management contract from 2010 to 2013 June, by France Télécom, and was precarious to obey with Ethiopian Government orders (Anderson 2012). Since ETC was not capable to address the demands of the fast-

growing country as the government said, it outsourced the administration for France Télécom . It also said that telecommunications facilities will not be privatized, at least not in the near future.(Demeke & Biru 2002) Ethio telecom generates a revenue of over US\$ 300 million for the Ethiopian government, and was called a "cash cow" by the current Prime Minister Hailemariam Desalegn (The Economist 2013).

Ethio Telecom’s supremacy on all telecom services including fixed line, internet, mobile and data communications puts Ethiopia muffled innovation, limited network expansion and restricted the scope of services offers. ETC’s Growth Perspectives in network coverage shown below (The Economist 2013).

Focal Area	Current Status	Phase I (2007/2008)	Phase II (2009)	Phase III (2010)
<b>Fixed</b>				
<b>Capacity(millions)</b>	1058	2	3	4.4
<b>Penetration</b>	1.2	2	2.95%	4.0%
<b>Mobile</b>				
<b>Capacity(millions)</b>	1.5	6.54	7.5	9.9%
<b>Penetration</b>	1.53	6.5	7.4%	9.7%
<b>Coverage</b>	<20%	50%	70%	85%
<b>Fiber</b>	4000km	7000km	10000km	14000km
<b>Broadband(PoPs)</b>	16	40	200	>500
<b>Dial up Internet User</b>	150,000	500,000	800,888	1,000,000

Table 2.1 ETC’s Growth Perspectives in network coverage

## 2.4 MOBILE APPLICATION DEVELOPMENT

Mobile application development is the set of methods and procedures undergone in indicted software for minute, wireless computing contrivances such as smartphones or tablets. These applications can be pre-installed on phones during manufacturing platforms, or distributed as web applications utilizing server-side or client-side processing (e.g. JavaScript) to provide an “application-like” experience within a Web browser. Application software developers additionally have to consider a lengthy array of screen sizes, hardware designations and configurations because of intense competition in mobile software and changes within each of the platforms. Mobile app development has been steadily growing, both in terms of revenues and jobs engendered. A 2013 analyst report estimates there are 529,000 direct App Economy jobs within the EU 28 members, 60% of which are mobile app developers (Neha 2015).

As a component of the development process, Mobile User Interface (UI) Design is also an essential in the formation of mobile apps. Mobile UI deal with constraints and contexts, screen, input and mobility as outlines for design. The utilizer is often the focal point of interaction with their contrivance, and the interface bring about the peripherals of both hardware and software. Utilizer input sanctions for the users to manage a system, and contrivance’s output sanctions the system to denote the effects of the users’ manipulation. Mobile UI design restraints constitute inhibited attention and form factors, such as a mobile contrivance’s screen size for a utilizer’s hand(s). Mobile UI contexts signal hints from utilizer activity, such as location and appointments that can be shown from utilizer interactions within a mobile application (Neha 2015). Overall, mobile UI design’s goal is principally for a recognizable, utilizer-amicable interface. The UI of mobile apps should: consider user’s constrained attention, diminish keystrokes, and be task-oriented with a limited set of functions. This functionality is

fortified by Mobile enterprise application platforms or integrated development environments (IDEs).

Mobile UIs, or front-ends, completely rely on mobile back-ends to fortify access to enterprise systems. The mobile back-end aids data routing, security, verification, sanction, working off-line, and accommodation interpretation. This services is backed by a blend of middleware components including mobile app servers, Mobile Backend as an accommodation (MBaaS), and SOA infrastructure (Neha 2015).

Mobile application development is identical to Web application development and has its roots in conventional software development. One critical difference, however, is that mobile applications (apps) are often indicted categorically to capitalize on the unique features a particular mobile contrivance offers. For instance, a gaming app might be indicted to capitalize on the iPhone's accelerometer.

One way to ascertain that applications show optimum performance on a given contrivance is to develop the application (app) natively on that contrivance. This denotes that at a very low caliber, the code is indicted categorically for the processor in a particular contrivance. When an app needs to run on multiple operating systems, however, it is limited if any code that can be reused from the initial development. The application must be re-indicted for each categorical contrivance (Neha 2015).

In the future, it's predictable that a majority of mobile application development efforts will concentrate on building browser-based applications that are device-skeptic. Such sites are built to load promptly over a cellular network and have finger-friendly navigation.

Successful mobile app development requires more than just a compelling user interface. It also requires:

1. Testing
2. Integration
3. Security
4. Quality assurance
5. Ongoing management

However, the technique may be as facile as building up a current engender, TV, poster or in the cyber world technique, or be entirely, exclusively mobile. Be safe in the awareness that the resources are well proven, affordable and are the most frequently used technology around (Neha 2015).

Assessing mobile app development strategy, Mobile Application Development platforms, Mobile Application Development software and Mobile Application Development tools.

## **2.5 MOBILE APPLICATION'S EFFECT ON SOCIETY**

Mobile application has also a great effect in society other than individuals or business (Natalie 2012). The whole society can be facilitating using mobile application. Some issues are described as bellow:

- **Social Link:** Some mobile application like Facebook, Twitter, Messenger, Skype, and Google Talk helps the society for communication. So the social relation improves and make strong. And this is good for family, friend and society (Natalie 2012).
- **Save time and increase productivity:** In different countries people can do their daily work like check email, contact with business partner from any time in bus, car or

walk. So, no need to wait in room or office. In this way save the time and people can get more time to work (Natalie 2012).

- Increase Job vacancy: The mobile application development and mobile application business make more job vacancy available in society. So many people can get job in this field. This is also good for society and country.
- Considerable Cost Saving: Mobile VoIP application can help people to making international call from mobile. As a result the monthly expenditure reduced.
- Entertainment: Using mobile application people in society can entertained themselves. There are so many other social effect issues which all are ethically good for the society

## **2.6 MOBILE APP DEVELOPMENT STRATEGY**

Nowadays, mobile sites and applications are central to nearly every organization's business approach. With the right strategy, mobile sites and applications can offer increased visibility to the Agency's mission, while also serving us provide value to external stakeholders (Anderson 2012).

At the same time, due to the potential for extensive publicity through mobile channels, there is a higher risk for the Agency if the wrong mobile application development strategy or technology is adopted.

Mobile Application Development Strategy will go over the following types of mobile app development and briefly outline the advantages and disadvantages against each of them (Anderson 2012):

- Mobile Web App Development

- Hybrid App Development
- Native Mobile App Development

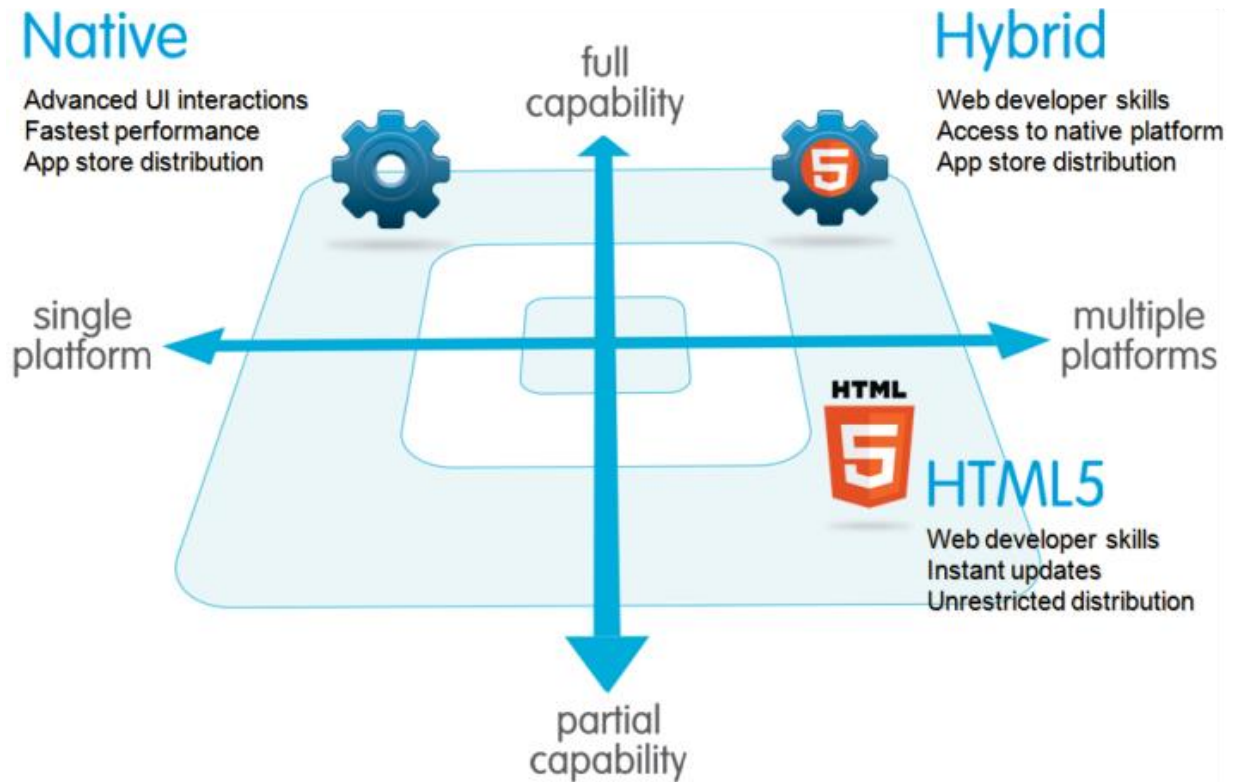


Fig 2.1 Native hybrid and HTML5 web app development capability

### 2.6.1 MOBILE WEB APP DEVELOPMENT

Mobile web apps are developed using HTML 5, CSS 3, and JavaScript. These application are executed on the web server, accessible via web browsers, and are portable across multiple mobile platforms. These mobile web apps would leverage the Standalone template or be built in the Web CMS, both of which are fully responsive to various screen sizes (Anderson 2012). However, a native and rich UX is difficult or impossible

to make using this strategy. Despite the fact that several device specific tasks and offline stores can be leveraged through HTML 5, constraints exists due to the sandbox nature of specific platforms and the extent to which HTML 5 specifications are adopted by native browser components on the user’s device (Neha 2015).

Advantages	Disadvantages
Better manageability due to web server based deployments	Lack of native UX
Excellent portability across multiple platforms	Lower performance due to browser based dependencies
High ease of code maintainability and reuse	Dependence on native browser implementation for access to device capabilities
Decrease in total cost of ownership	Unpredictable performance due to dependency on internet connection
Lower development costs	Applications are “stateless” meaning that the user must initiate a task before the application will respond.
Fastest time to market	

Table 2.2 Advantage and disadvantages of mobile web app development

**2.6.2 HYBRID APP DEVELOPMENT**

Hybrid app development frameworks leverage a combination of web based and native app development. Applications are built using HTML 5, CSS 3 and JavaScript. These applications are then compiled using the native SDK and provide better portability across platforms as compared to native apps. Some of the hybrid frameworks deliver flexibility to extend and customize the platform by adding extra wrapper plug-ins which allow the application to have more specific native device capabilities (Anderson 2012).

Advantages	Disadvantages
Limited access to native device capabilities	
Excellent portability across platforms	
Easy to deploy like native applications	UX is better than mobile web applications but not as good as native mobile applications
Greatest potential for code re-use	Performance issues due to browser based dependencies
Decreased ownership cost	Dependency on hybrid framework developer to add capability for native API extensions
Faster time to market	

Table 2.3 Advantage and disadvantages of Hybrid app development

**2.6.3 NATIVE MOBILE APP DEVELOPMENT**

Native mobile apps created for a specific operating system are developed using the native language of that platform (such as Google’s Java-based “Android” or Apple’s Objective C “iOS”). The applications have access to all of the devices capabilities and functionalities since they use the native SDK for application development. These application provide the highest UX factor compared to other types of application development (Anderson 2012).

Advantages	Disadvantages
Tighter integration with platform which results in the app running more efficiently.	A unique set of source code is created which prohibits code reuse
Maximum performance	Higher development and maintenance costs
Easier to deploy to app stores	Longer time to market, since app store approval is required
	More expensive to develop and reach a smaller audience

Table 2.4 Advantage and disadvantages of Native app development

**2.7 MOBILE APPLICATION DEVELOPMENT PLATFORMS**

Companies are increasingly looking for a Mobile Application Development Platform (MADP) which fulfills their wishes for both present and future projects. It's a broad field and vendors brought a wide range of capabilities. Here are five of the best, identified by Gartner as leaders in the field. (Thor 2012).

**2.7.1 SAP**

Associated with other major independent software vendors (ISVs), SAP bet primary on mobility. It's most recent portable contribution, Sybase Unwired Platform (SUP), has established rapidly since its beginning discharge in 2010, giving an adaptable environment for application development with modules for Eclipse and Visual Studio. While it has a steeper learning curve than many other solutions, it is a brilliant preference for extensive mobile initiatives, particularly in relation with SAP's Afaria mobile device management (MDM) solution. (Thor 2012).

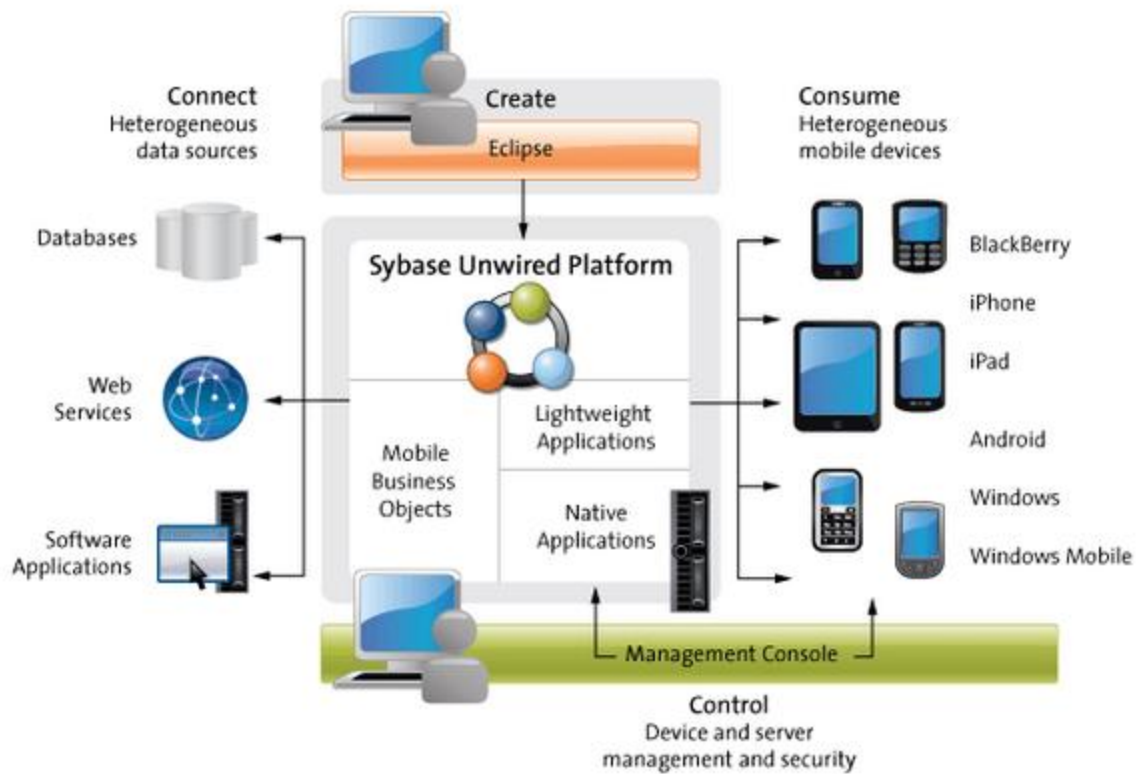


Fig2.2 Sap platform for mobile application development

### 2.7.2 SYCLO

Syclo originally specialized in field service and enterprise asset management (EAM) applications for ruggedized devices after it acquired by SAP in June, but over the years it increased the scope of its platform to the entire popular mobile OSs. But, enterprises with needs around EAM and field-service-based clients are expected to get the most out of Syclo. (Thor 2012).

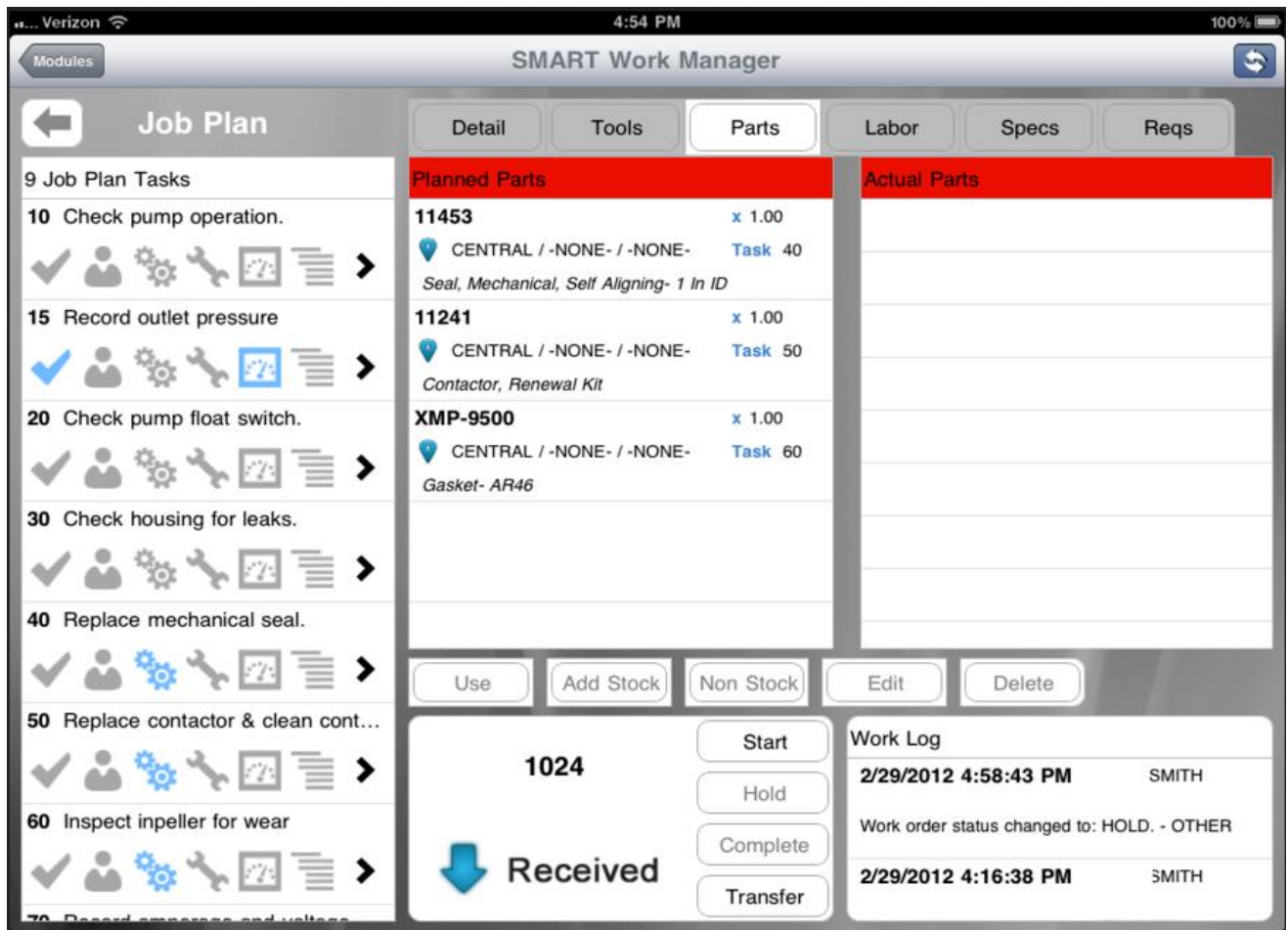


Fig 2.3 Syclo framework for mobile application development

### 2.7.3 ANTENNA

It is suitable for companies that look for multiple applications for several types of mobile devices and install them as a cloud service. Antenna Mobility Platform (AMP) contains a development studio composed with a scalable cloud runtime service and users that run on a wide array of mobile devices. Its AMPchroma mobile software-as-a-service (SaaS) contribution, which established in February 2012, bring more capabilities, like integration with MDM based on Antenna's acquisition of Volant's Systems (Anderson 2012).

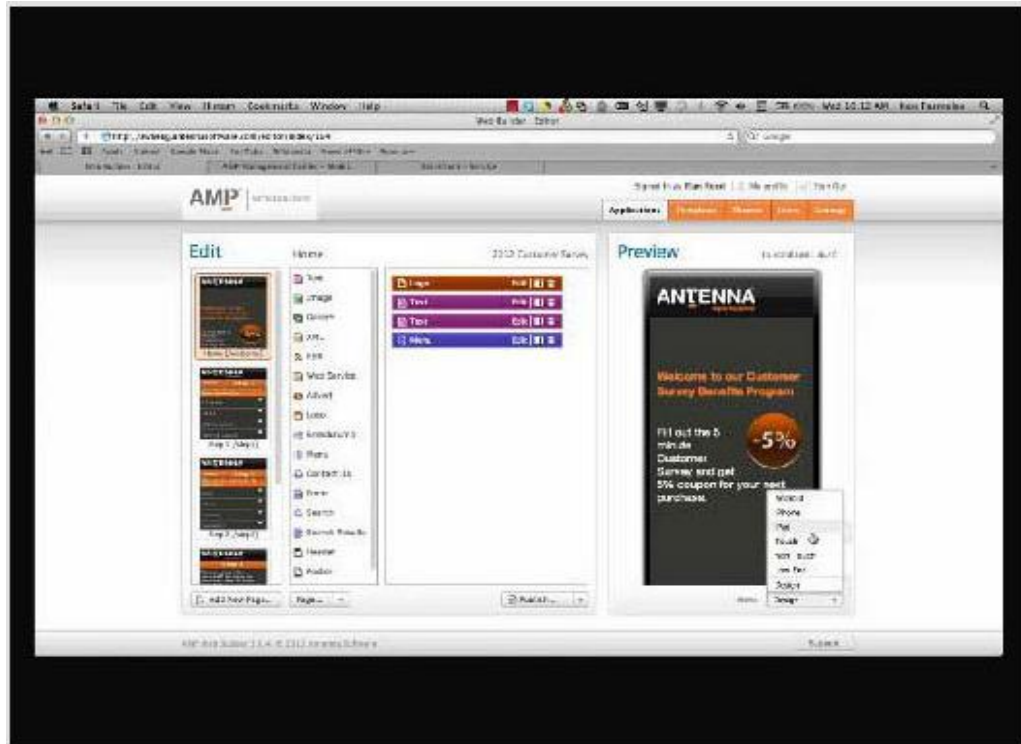


Fig 2.4 Antenna for mobile application development

## 2.7.4 KONY

Kony's platform is upright fit for projects that needs the use of native functionalities on an array of mobile devices. The environment is used to build applications for tablets, smartphones, feature phones, mobile browsers and browsers, that it deploy to all of them (Thor 2012).

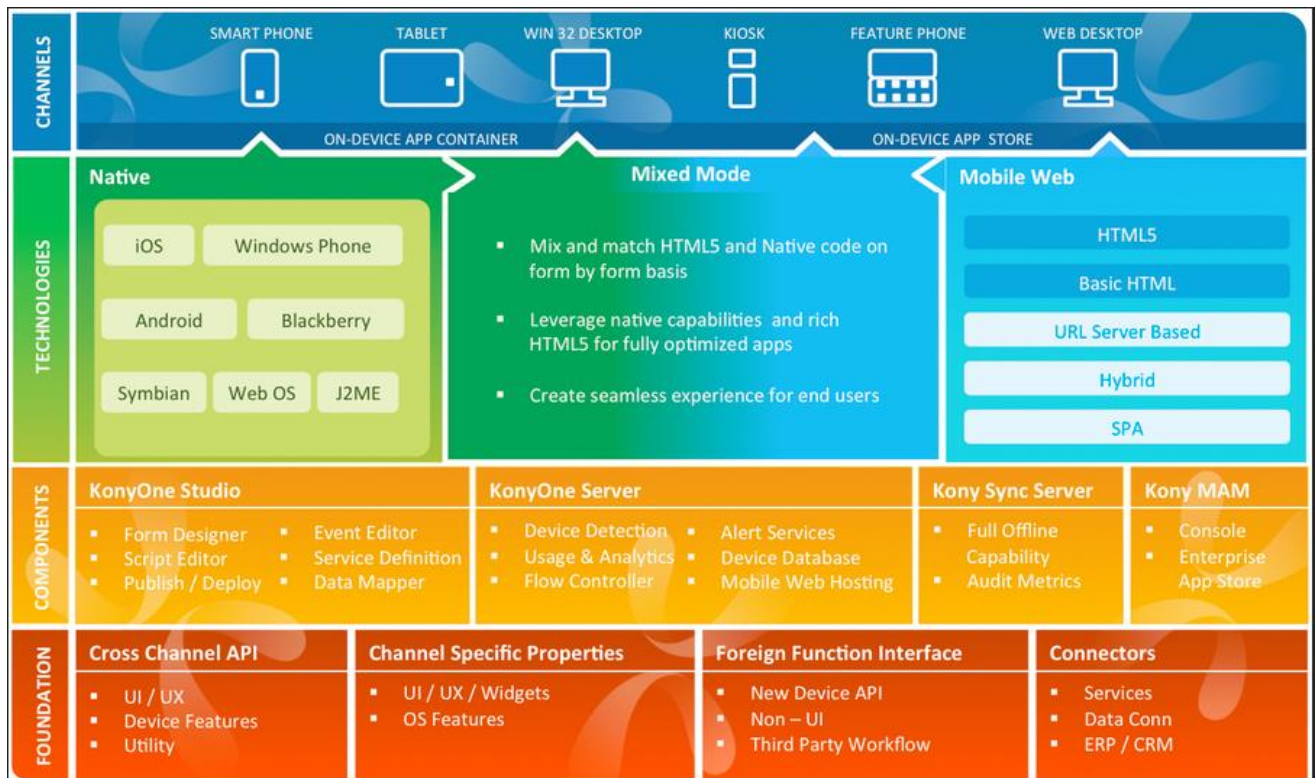


Fig 2.5 Kony platform for mobile application development

### 2.7.5 ADOBE

PhoneGap helps to wrap HTML5 apps in native containers that makes it a strong choice for media-rich enterprises with necessities for mobile clients, or companies that needs to wrap mobile Web apps with other platforms like Sencha, jQuery Mobile Dojo Mobile and others. It is also available for Windows, Linux and Mac OS platforms (Thor 2012).

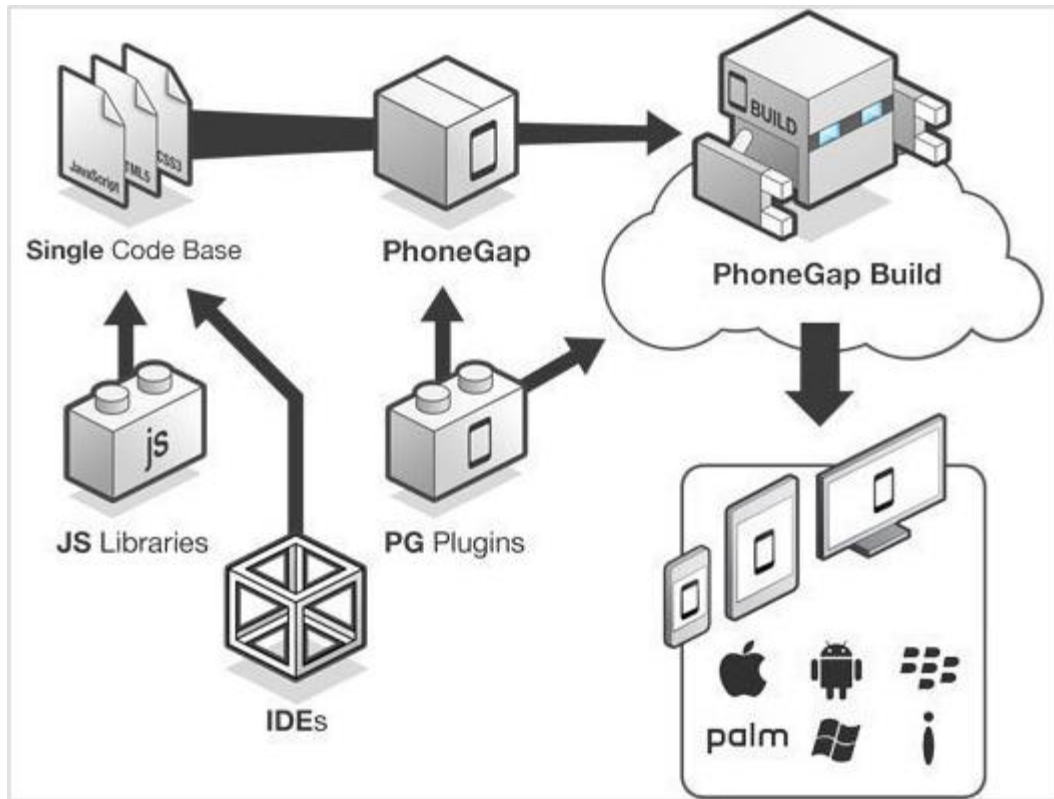


Fig 2.6 Adobe platform for mobile application development

## 2.8 MOBILE APPLICATION DEVELOPMENT SOFTWARE AND TOOLS

Among the development software and tools different articles suggest different usage when some appreciate native development (e.g. Java for android and xcode for ios) the others prefer cross platform once (e.g. xamarin, phonegap, appcelerator, ifactor, kony etc.). We heard a lot about the native once and most peoples are aware relative to the other cross platforms (Alberto 2017). The researcher brought the concept of cross platform in a little bit detail from articles which he revises:

### 2.8.1 XAMARIN

Xamarin has been going increasingly recently, inviting a record-setting \$54m investment and methodically building out its platform and growing its reach. Since the

release of Xamarin2, the company has certainly appeared as one of the leading solutions for cross-platform development (Alberto 2017).

### **2.8.2 PHONEGAP**

PhoneGap is the most famous cross platform development trademark in the development community. Adobe-owned tool is grounded on the open source Apache Cordova project and is totally free, which goes some way to expound its popularity. Adobe is also working on an enterprise version of PhoneGap (Alberto 2017).

### **2.8.3 APPCELERATOR**

It is an enterprise-focused development platform that lets developers write JavaScript with its Alloy MVC framework. JavaScript, as many developers will already be acquainted with the language, reducing the need to spend time getting to grips with unfamiliar code. Appcelerator also gives a virtual private cloud option for enterprise customers, which helps to work with sensitive company data. The enterprise product also comes with analytics, performance management and dedicated infrastructure. Nonetheless they request to contact them directly for pricing (Alberto 2017).

### **2.8.4 IFACTR**

iFactr is planned primarily for enterprises looking to rapidly build out apps for their mobile workers. The company says its platform brings a very low learning curve, letting developers to get to grips with the basics within two to three days of training. iFactr also recommends its robust prototyping features, allowing companies to quickly create prototypes for their employees to test out. The iFactr platform uses Xamarin to compile its native apps on iOS and Android (Alberto 2017).

### **2.8.5 KONY**

Kony provides a variety of tools as part of its enterprise Mobility Platform to benefit business create apps from a single codebase. The Studio platform practices JavaScript and simple features like drag and drop also reusable widgets and the ability to import existing or external libraries (Alberto 2017).

## **2.9 MOBILE APPLICATION DEVELOPMENT FRAMEWORKS**

A framework is a complex software development environment. It includes many sub-components which helps to create our application. Such sub-components include tools sets, compilers, debuggers, application programming interfaces, different code libraries and many other components (Alberto 2017).

Mobile Development Frameworks give developers a generic foundation of functionality that can be modified for mobile application specific software. Frameworks can be in three categories: native frameworks for platform-specific development, mobile web app frameworks, and hybrid apps, which combine the features of both native and mobile web app frameworks. A company's IT department will outline requirements and choose a framework based on their platform of choice. Native frameworks allow developers to utilize every functionality that is native to a mobile platform (iOS, Android, Windows and Galaxy). However, native frameworks are platform specific and can only create apps for one mobile platform (Raj 2014). Instead of writing an application from scratch and dealing with large portions of code to make the application work on different platforms of a framework. List of mobile application development frameworks are listed below with a little summarization from article (Raj 2014).

### **2.9.1 IONIC**

Ionic is one of the most common framework that is available today. Via Ionic, one can build exciting native and progressive web applications. This framework is the best choice to make a high-performance app (Justin 2016). The framework is constructed to work on the modern mobile devices available, which is vibrant for those who are about to hit the mobile app market.

The Ionic website has Ionic Market, in which that let's any one to download templates and projects built by other programmers (Justin 2016). With the help of Ionic command line utility one can develop, emulate, and execute app. The Ionic Lab elements lets to test an application on both iOS and Android.

Ionic works great with Angular, which brings a powerful SDK. With efficient core architecture, which is appropriate for creating even the most complex apps. Ionic can be joint with Cordova, PhoneGap and Trigger.io projects. Ionic has an ergonomic design and is easy and simple to learn (Justin 2016).

### **2.9.2 EXT JS**

This framework is based on HTML5 and JavaScript. It helps to make a wide range of mobile applications. This framework also contains widgets like lists, forms, menus, toolbars, etc. All components are built regarding the main requirements for mobile applications. The resource provided helps to create incredible applications for iOS, Android, Windows phone (Raj 2014).

This framework works perfectly with other APIs as well. Therefore, it collaborate with different APIs to realize the desirable result. Ext JS is best for rapid development of applications for mobile devices (Raj 2014).

EXT JS brings numerous tools to examine our application and see how it works, like Sencha Test. It helps to do cross-platform and cross-browser testing. Sencha Inspector is a debugging tool, which abridges analyzing of code and improves the total performance of the application (Raj 2014).

### **2.9.3 JQUERY MOBILE**

JQuery offers numerous documents that drives to get in touch with this flexible framework. JQuery mobile is constructed on the jQuery base. As a result, no one can have a difficulties with this framework if they are accustomed with jQuery syntax. The framework is powered by Ajax navigation system. It guarantees flat animation of pages deprived of facing any errors.

Among the many features this framework offers, one is ThemeRoller. With the help of this feature, one can generate a unique design for their app.

JQuery is a module-based framework that permits to make as much custom builds as one needs (Raj 2014).

### **2.9.4 ADOBE PHONEGAP**

PhoneGap is a framework for constructing hybrid applications using CSS, JavaScript and HTML. The framework is able to guarantee high performance on different devices and

lets to bring the application for target users without considering any hardware limits (Raj 2014).

Additionally, there a bunch of plugins available. Several educational resources will help to learn how to use it. If there is any hitches. It is not also difficult to extend the functionality of this framework. PhoneGap is in the development phase and there are many third-party tools available now. Also PhoneGap social community helps anyone to find the way out from any problems (Raj 2014).

Anyone can develop applications for Android, iOS, Windows, Blackberry, Ubuntu, Firefox OS, mac OS and Windows Phone. The flexibility of this framework makes it a great option for app developers. This framework supports different debugging tools, like Safari Web Inspector for iOS, Chrome Developer Tools for Android and Visual Studio Web Debugging Tools for Windows Phone. It also includes a collaboration feature that lets a number of developers to work on a single project (Raj 2014).

Among the greatest tools of Adobe PhoneGap, one is Hydration. It decreases the amount of time required to compile an application and simplify the process of updating it. When new version of an application is uploaded by a developer, a user catches a notification and if they choose to run the new version, it will automatically bring and execute the final code (Raj 2014).

### **2.9.5 INTEL XDK**

Intel XDK helps to create HTML5 applications quick and with minimized problems and issues. As a complex software development solution, Intel XDK brings an extensive range of features, like supporting of industry-leading tools and plugins.

This framework contains powerful debugging tools, like Weinre — a remote debugging tool that runs an application on a certain device. Another debugging tool available is Chrome Developer Tools, which help debug JavaScript code, Cordova plugins, DOM elements and CSS rules. Intel XDK comprises a very precise emulator to perceive how application functions on different devices (Raj 2014).

## **2.10 RELATED WORKS**

In this section related works about mobile application development is described. The researcher compare and contrast the works of related literatures with this paper. At last, summery of the selected literatures is given in tabular format.

The first thesis entitled critical success factors of mobile application development in Ethiopia by Ayda girmay in 2016, with the objective of identifying the critical success factors of mobile application development for appropriate management. In Ayda's paper after identifying the critical success factors as organizational, Technological and Employee Behavioral issues, Ayda reaches on providing training, functionality, change management and maintainability mentioning as a critical success factors that strongly associated for the success of mobile application development that are found under those three categories. The very similarity of Ayda's work with this paper is, both are trying to find the success factors of mobile application development. And the main difference is, the population in which the papers trying to address. As Ayda suggests in her final recommendation, her study is undertaken from three selected companies in Ethiopia. Therefore, further studies should be directed towards identifying critical success factors in mobile application development for better result (Ayda 2016). In which, among her population most of the companies are not majorly working on mobile

application development. So one needs to have the exact dourer of the action. Therefore, the researcher of this paper prefers to study on each innovation hubs and co-working spaces that are found in Ethiopia for an improved result.

The second research, conducted by Sunni Thompson, entitled 5 factors of mobile application success, proposes Entertainment, utility, usability, functionality and maintenance as a five factors that affect mobile application development. Thompson identified those factors as one which will predict the success or failure of a branded app. As the Thompson marks a member of a given team was asked to evaluate the potential success of a client's mobile application. In order to understand what "makes or breaks" any given app, and analyze the successes and failures of a number of branded mobile apps. From qualitative research (Sunni 2009). So the likeness of Thompson work with this thesis is, both works on the success factors of mobile application development and the difference is, Thompson work success factors are for already published mobile apps which are branded once, from the context of clients mobile application, which are not for new development of mobile application development unlike this thesis.

On third one can found the works of Natalie Jun Pei Chin in 2012, the study mainly focuses on Location-based services, in this research, a comprehensive and holistic view of the critical success factors of location-based services was gained using the electronic brainstorming Approach. Natalie suggest 15 success factors of mobile application development as Speed, Real-Time/Up-To-Date Information, Cost, Usefulness/ Benefits, Simple/Ease of Use, Reliability, Personalization/ Preference Setting, Privacy, Smart Location-Based Services, Aesthetics, Quality of Reviews, Integrated

Applications/Services, Standards & Platform Independence, Size of Applications, Publicity of Location-Based Services. The similarity of Natalie's research with this paper is both are trying to find the success factors of mobile application development but their difference is unlike this paper Natalie works specifically for Location-based services only, Natalie also uses electronic brainstorming Approach to reach on the identified success factors.

The next researchers Henning Heitkotter, Sebastian Hanschke, and Tim A. Majchrzak in 2012 wrote about the design criteria to assess cross-platform development approaches using case base methodology they briefly presented a comprehensive set of criteria for evaluating cross platform development approaches for mobile applications by identifying the 7 decision criteria. The similarity of their work with this paper is that, identification of success factors. And the difference is that their work mainly focus on finding the decision criteria factors for designing cross-platforms mobile application development only.

Haiqi Feng, Tamara Hoegler, & Wolffried Stucky in 2015 come up with critical success factors for m-commerce, in there paper, they present a theoretical framework of critical success factor which will help companies to establish the m-commerce strategy and to implement the m-commerce applications. The likeness of their paper with this paper is, the success factor identification in mobile application development. And their alteration is they only focus on m-commerce not on general mobile application development.

Finally the researcher acquires essential inputs from the above researches. Mainly the three success factors which further requires scientific explanation are taken from those researches namely executive, member behavioral and technological factors. The other factor which is colleague factor is assumed by the researcher observation as one of the members of one of the incubation center.

Authors and years	Objective/Purpose	Methodology/Approach	Major Findings	Recommendations
Ayda Girmaye ,2016	To analyses critical success factors of mobile application development	Descriptive research	Success factors are: 1. Organizational issues. 2. Technological issues. 3. Employee behavioral issues.	This literature can be used as an input to find out critical success factors in mobile application development of Ethiopian companies.
Thompson, July, 2009	To identify success factors for mobile application development	Experimental research	Success factors are: 1. Entertainment factors 2. Usability factors 3. Maintenance factors 4. Utility factors 5. Functionality factor	Based on the identified factors discussed in this literature, we can categorize them for appropriate management
Natalie Jun Pei Chin, 2012	To provide a comprehensive list of critical success Factors important towards a successful implementation of Location-based service.	Experimental research	Success factors are: 1. Speed 2. Real-Time/Up-To-Date Information 3. Cost 4. Usefulness/ Benefits 5. Simple/Ease of Use 6. Reliability 7. Personalization/ Preference Setting 8. Privacy 9. Smart Location-Based Services 10. Aesthetics 11. Quality of Reviews 12. Integrated Applications/Services	In this research, a comprehensive and holistic view of critical success factors of location-based services was gained using the electronic brainstorming Approach.

			13. Standards & Platform Independence 14. Size of Applications 15. Publicity of Location-Based Services	
Henning Heitkotter, Sebastian Hanschke, and Tim A. Majchrzak, 2012	To design criteria to assess cross-platform development approaches	Case based methodology	They identify the 7 decision criteria namely: 1. Development coast 2. Development environment, 3. GUI design, 4. easy of development, 5. Maintainability, 6. Scalability, 7. Opportunity	It gives a brief understanding about approaches by designing criteria
Haiqi Feng, Tamara Hoegler, & Wolfried Stucky , 2015	To Explore the Critical Success Factors for Mobile Commerce	Descriptive research	critical success factors (CSF) for m-commerce are: 1. Endogenous variables. 2. Moderator variables. 3. Exogenous variables.	A set of factors can potentially positively affect the success of m-commerce and should be taken into account by enterprises while adopting m-commerce

Table 2.5 Related works summary

**2.11 RESEARCH GAP**

A Research gap is something that remains to be done or learned in an area of research. Groups and individuals now a days brought interest on mobile application development due to its nature of relative easiness and high income generation. So researches and studies are prerequisite to be conducted in related concepts. This thesis, as one research, is an input for Ethiopian handful mobile application development related research that are found currently. By grasping scientifically proven success factors. Which is supported by views, insights and recommendations of young enthusiastic mobile application developers which are active members of innovation hub with their

own, one or more published mobile application, also executives, highly professional and experienced once insight. This is very helpful from the perspective of Ethiopia's current status. Even though there are good descriptions of the mobile application development, identifications of success factors related to mobile application development from software Development Company's perspective, A structured description of success factors that are scientifically proven, supported besides examined by professional insights is very helpful. Identification of potential problems from innovative individuals' perspective which are found under incubation centers is also missing.

## **2.12 CHAPTER SUMMERY**

In this chapter the researcher reviewed the literatures that are related to the subject of the researcher opinions. Therefore some explanation of key points related to mobile application development addressed, also related works that have direct connection with this paper examined. This helps for identification of success factors that further tested on the next chapters. At last the research gap in which this paper comes to fill recognized and explained.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 INTRODUCTION**

Here the researcher would like to demonstrate what steps to just go through for addressing the research questions with the strategies and steps undergo, on the way to come up with the best result from this research. The Research approach, access, strategy, Study population, Instrumentation, study variables, Data processing, analysis, reliability and validity are explained below.

#### **3.2 RESEARCH APPROACH**

The research used deductive research approach. A deductive approach is focused with developing a hypotheses based on existing theory, and then coming up with a research strategy to test it (Kumar 1996).

It has been stated that, deductive means reasoning from the particular to the general. If a normal relationship or link seems to be implied by a particular theory, it might be valid in many scenarios. A deductive design might test to see if this relationship or link did find on more general conditions (Kumar 1996). Similar to this definitions this paper also test to see if the association works on other circumstances. Starting from hypothesizing those four success factors which are, Executive, Member Behavioral, Technological and Colleague factors it tries to reach those significant success factors among each detail of the factors by examining cases and other facets.

### **3.3 RESEARCH ACCESS**

The ability to gather primary data during this study is dependent on gaining access to an appropriate source in the organizations. Therefore, the researcher as member of one of the innovation hub and co-working place (xHub), is in a favorable position to get access from individual executives.

The researcher also contacted friends who are currently members of the other two innovation hub and co-working places discussed the prospects of the research. They spoke to several of their colleagues on his behalf and they agreed to conduct telephone interviews with certain members of the executives, some of which had been in software related area for an average of 5 – 10 years. Due to the non-intrusive nature of the research, there is no objections or limitations raised by the participants with regards to the questions asked or the purpose of the study.

### **3.4 STUDY POPULATION**

#### **3.4.1 SAMPLING METHOD**

Based on the research objectives and the issues to be investigated, all the innovation hubs and co-working places so far participate. However, among them, members and executives are selected using accidental sampling in which the researcher puts the questioner on each innovation hubs and the administrators their facilitates the filling of questioner when their active member having his/her own published mobile app comes they gave and make the questioner to fill up. This sampling techniques is non-probability sampling in which we include people who are easy to reach.

Total population is used to identify and use all the three innovation hubs and co-working places since only three are found in Ethiopia so far. Whereas among the members and executive random sampling technique is used for the quantitative data collection process to give an equal chance of selection among the samples. From the

study sample size 93% was given for quantitative data whereas 7% was given for qualitative data due to small respondent size.

The researcher randomly picks the members from member list using lottery method until the sample size fulfill. And then 60 respondents were nominated for the quantitative data collection process.

Even if I take total population which are active members that are nominated by the appointed facilitators of those innovation hubs, there is, none response rate of 10% assumed by the researcher among the 60 total population by 95% confidence level.

Therefore, using this sample size formula:

$$\frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$

Assuming:

Statistics	Description
<b>N</b>	Population size
<b>E</b>	Margin of error (as a decimal)
<b>Z</b>	Confidence level (as a z-score)
<b>P</b>	Percentage value (as a decimal )

Using the formula the total population size of this paper becomes 57.

The researcher select managers and project Advisors from each incubator centers for in-depth interview by using purposive sampling, based on the criteria such as: those who have sufficient time to give in-depth interview and available during the time of data collection. The managers were nominated due to, it is assumed that they have more information about their company in detail than other members.

### **3.5 RESEARCH STRATEGY**

This study would adopt a case study strategy in answering the research questions. Asserts that the case study strategy would be useful if the aim of the study is to gain a rich understanding of the research perspective and the process being endorsed. Here Data is collected by observation, participation and a range of other methods including examining existing records, interviews and tests by focusing at individuals, a small group of people or a unit (an organization for example) (Poudel 2013).

Therefore as this study aims to understand the success factors of mobile application development in three innovation hub and co-working places in Addis Ababa, Ethiopia, the researcher plan to use both qualitative and quantitative approach.

#### **3.5.1 PRIMARY DATA COLLECTION**

The researcher therefore chose to collect primary data from 3 innovation hubs and co-working places using questionnaires distributed-in-person to chosen respondent. This was done amongst friends and colleagues. Data from the semi-structured interviews would be collected using a tape recorder, and the conversations with all 4 executives would be transcribed word for word, and expression for expression. The advantages inherent in this approach is that it allows the researcher to document and see patterns in words and emotions that would not be available if other forms of interviews were conducted.

##### **3.5.1.1 QUANTITATIVE QUESTIONNAIRE**

Quantitative methods are mainly used in the data collection process of research. It involves data that is either in the form of, or expressed as numbers (Kumar 1996). Semi-structured questionnaire is designed for the data collection. Most of the questions

format are adopted from (Ayda 2016) having a common area with different population, the researcher adopt the questioner by considering the objective of the study.

The question has two parts: part 1 contains the back ground of the respondents, gender, age, education levels, positions, experience and departments. Part 2 contains questions requiring the respondents to state their agreement or disagreement on the issues of Mobile Application Development success factors. In this study, the five point Likert-Scale (1=stronglyDisagree, 2= Disagree, 3=Moderate, 4= Agree, 5=Strongly Agree) from negative to positive dimension is applied due to its universal acceptance and simplicity (Johns 1996).

A Likert-scale is a composition of serious of four or more Likert-type items that are combined into a single composite score or variable during data analysis process and the item are used to provide a quantitative measure of character or personality attribute (Raj 2014).

### **3.5.1.2 QUALITATIVE SEMI STRUCTURED INTERVIEW**

Following the access grant to 4 members of the executive team from the organizations, 15 – 20 minute telephone interview, face to face interview and electronic mail carried out depending on the individual. Since a semi-structured interview is a qualitative interview that is defined by a pre-set question guide. It aims to provide in-depth findings through informal discussions with participants (Collis & Hussey 2003). This interview method is chosen over unstructured or structured interviews, because this study intends to answer the research questions by asking specific questions, but not so much (unstructured) that it generates unusable data, and not so less (structured) so as not to miss out on any unanticipated information.

### **3.5.2 SECONDARY DATA**

Secondary data is the data that have been already collected and recorded by someone else and readily available from other sources (Ian & Spears 1997). Also data or information that is already available that described above. It can be obtained from different literatures, valuable books from internet, statics, figures as well as published materials. However, the researcher used those materials as a secondary data sources.

### **3.6 INSTRUMENTATION**

Instrument is the general term that researchers use for a measurement (survey, test, questionnaire, etc.). It differentiate between instrument and instrumentation, consider that the instrument is the device and instrumentation is the course of action or the process of developing, testing, and using the device (Kumar 1996). As instrumentation, the researcher adopt the interview questions and the format of the questioner from (Ayda 2016). The interview questions were advocating the researcher main idea so the researcher acquires the questions necessary and when it comes to the questioner the researcher only needs the format of the questions. Since the success factors are subjective to this study.

### **3.7 STUDY VARIABLES**

#### **3.7.1 DEPENDENT VARIABLES**

The dependent variable is the variable a researcher is interested in. The changes to the dependent variable are what the researcher is trying to measure with all his techniques. Success of mobile application development is dependent variable.

### **3.7.2 INDEPENDENT VARIABLES**

An independent variable is a variable believed to affect the dependent variable. This is the variable that, the researcher, manipulate to see if it makes the dependent variable change which are:

1. Executive factors :( Providing Training, increased entrepreneurship , Project management, User's needs, Implementation strategy, Usability, functionality and Maintainability)
2. Member Behavioral factors: (Communicate, Specific Role, Skill, & decision making)
3. Technological factors :( platform, tools, approaches and methods)
4. Colleagues factor: (Motivation, environment, socializing, opportunity)

The researcher reaches on selecting those independent variables through a detailed examination of literatures which are summarized on table 2.5 and discussion also a pilot testing that shows those variables works on the case or population that the researcher chooses.

### **3.8 RELIABILITY AND VALIDITY**

Reliability means the consistency of the measure that is important to detect basis (Anagnostou & Capocasa 2015). It means that, it is the degree to which an agreement produces stable and consistent result. In the accidental sampling for the data collection in which the appointed facilitator provides the questioner when the member attains, the unstructured interview using face to face and electronic mail used to strength the reliability of the information collected from respondent, the organization of questionnaire, data triangulation between quantitative and qualitative data make this

research reliable because the researcher used the qualitative data to strengthen the result get from quantitative result.

Validity means measuring what we want to measure (Anagnostou & Capocasa 2015). In simple term it is measuring what you are supposed to measure. Different statistical measurement such as 95% confidence interval with P value ( $<0.05$ ), frequency, percentage and other statistical tools were used for this thesis to meet the objective of the study and to measure the variables validity. In this case, based on the instrumentation, the questionnaires format were adopted from (Ayda 2016) and tested using pilot-testing and necessary corrections and amendment was considered after pilot testing to check the validity of the questioner. And the interviews questions were espoused based on the study objective in order to strengthen the data collected quantitatively for reliability.

### **3.9 DATA PROCESSING AND ANALYSIS**

Series of activities or stages performed on data to verify, organize, transform, integrate, and extract in a suitable output form for subsequent use (Anagnostou & Capocasa 2015).

For the research, data is collected, presented, analyzed and interpreted by employing different techniques to attain the objectives of the study. The data analysis is done after collecting all the data from the respondents. After data collection, each questionnaire will checked visually for completeness including the validity and variability which I discussed on section 3.8. The data entered into SPSS version 20.0 statistical software packages for data cleaning and analysis.

The statistical method which is used in the analysis is logistic regression at 95% confidence interval, P-value ( $<0.05$ ) others statistical tools such as percentage, frequency and mean were employed to examine the relationship and statistical

association between independent and outcome variables. Results presented using statistical tools such as, graphs, tabulation and percentage via SPSS version 20 statistics software. Also the data collected from interviews presented qualitatively using Daily Interpretive Analysis, DIA technique (Raj 2014).

### **3.9.1. COLLECTING AND ANALYZING INTERVIEW DATA USING DIA**

#### **3.9.1.1 COLLECTING INTERVIEW DATA:**

Before analysis process the data should be collected In DIA, Daily Interpretive Analysis which the researcher adopt from the research (Ayda 2016). The DIA is a time consuming process but is consider necessary for the interview process. It reduces the ever increasing ambiguity, and structures the results. The data can be collected using either by using tape recordings, taking notes or both. In this case both voice recording via my mobile phone and taking note is used for collecting interview data.

Interview recording and note taking concurrently.

Hence, it needs to develop standardized ways to treat the respondents. The following is a check list of items that the researcher will consider and develop during the interview:

1. Preparing a standard form to record all notes: It provide basic identification information (date, time, name of the interview, etc.).

1. Date	_____
2. Time	_____
3. Location	_____
4. Interview Id #	_____

Table 3.1 Content Form

2. Developing a reliable way to documentation and save notes.

### **3.9.1.2 ANALYZING THE DATA USING DIA:**

The objective of the DIA is to assemble and interpret the information that was collected (Ayda 2016). At the end of every day of interviewing, it is crucial to write a report that summarizes and interprets the information obtained (Raj 2014).

Moreover, one of the functions of the DIA is to document flashes of insight, or preliminary conclusions, which are collected during recording the respondents. The notes are analyzed to show the dynamic interrelatedness of the various pieces of information that the respondent presents. The respondent's discussion is therefore much more than a collection of reality reports, which simply require the interviewer to list. While concrete informational items are critically important, so it is the ways in which the respondent assembles aspects of his/her reality (Raj 2014).

### **3.9.1.3 FORMAT OF THE DAILY INTERPRETIVE ANALYSIS:**

The format consists of at least three parts: (1) Record, (2) Analysis, and (3) Conclusions, and Written notes taken during the interview of what was said will provide the raw

materials for the report. The report must be sufficiently complete and written with sufficient clarity (Raj 2014).

1. Record: The first section is a written interpretation of the information that was provided by the informant in the process of the interactive interview. The objective is to construct as complete a record as possible of what the informant said. In this case note taking is used for data record.

2. Analysis: By means of the Record as a reference point, the second part of the DIA gives an analysis of the information by interpreting the information provided by the informer and connecting it to the key objectives of the study. Different from the Record, the Analysis section needs the active participation of the analyst who is estimated to rearrange the information, and interpret the interviews in an understandable ways. This may demand drawing connections between different thoughts or processes that were stated in the interview. (Marshal & Gretchen 2006).

The objective of the Analysis Section of the DIA is to interpret the content of the interview in a way that relates the findings to the objectives of the project.

3. Conclusions: In this section it is encouraged to go beyond the Records and Analysis to draw more general conclusions. Statements in the Conclusions Section can be thought of as “working hypotheses” or “preliminary conclusions”. Therefore, the objective of the DIA is to assemble and interpret the information obtained from the data collected at the end of interview (Marshal & Gretchen 2006). Three format of DIA is observed. One is recording data: which helps to constrict the information, the second is analyzing data using the recorded data as a reference point, which is DIA provide analysis information by interpreting the information provided by the informer and

relating into the main objective of the study. Then finally conclude based on the result as a final format for DIA.

### **3.10 CHAPTER SUMMERY**

In this chapter methodology of the thesis explained. Starting from research approach it continued to research access, strategy, population, instrumentation, study variables, reliability and validity and at last way of data processing and analysis of the research explained, in which the outcomes analyzed in detail on the next chapter entitled Analysis and discussion.

## **CHAPTER FOUR**

### **ANALYSIS AND DISCUSSION**

For identifying success factors of mobile application development from three innovation-hubs and co-working places questionnaires are distributed for random members which were available on the office during the gathering of data. The responses obtained through questionnaires are supplemented with interview. The analysis is done using SPSS statistics version 20. Frequencies, percentage, mean and standard deviation value is used for discussion for the questionnaire collected from those companies. In general, the total number of questionnaires distributed was 60 and the returned questionnaires are 57 with a response rate of 95 %.

#### **4.1. DEMOGRAPHIC ANALYSIS**

A total of 57 participants were enrolled in to the study from those incubation centers. Namely iceaddis, xHub and BlueMoon, of whom 38(66.7%) were males and 19(33.3%) were females. Majority (68.5%) of the study participants were aged between 20-30 years, (17.5%) were aged between 31-40years and the rest (14%) are less than 10 years of age. with mean and S.D of 2.04 and 0.566. Concerning educational level (21.3%) are diploma holders (49.1%) of respondents have bachelor degree and 28.1% of respondents are graduate degree (MSC) the rest (10.5%) are other than this scopes except PhD since no one is choosing from the respondents. According to job category, majority of the respondents 28(43.1%) are software developer, 6(9.2%) Team Leader 4(6.2%) are both Database Admin and project managers. And 2(3.1%) are equally Network admins and peoples having job category other than those listed above. In terms of Year of experience 17(29.8%) were 4-6 years and more closely 16(28.1%) were

1-3, 12(21.1%) less than 1 years and 10(17.5%) have 7-9 years. The demographic results is presented graphically by table as shown below.

<b>Variables</b>	<b>Measure</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Age</b>	<20	8	14%
	20-30	39	68.5%
	31-40	10	17.5%
<b>Gender</b>	Male	38	66.7%
	Female	19	33.3%
<b>Level of Education</b>	Diploma	7	12.3%
	Bachelor Degree	28	49.1%
	Master's Degree	16	28.1%
	Other	6	10.5%
<b>Job Category</b>	DB Admin	4	6.2%
	Project Manager	4	6.2%
	Software Developer	28	43.1%
	Team Leader	6	9.2%
	System Analyst	2	3.1%
	Network Admin	2	3.1%
	Other	19	29.2%
<b>Year of Experience</b>	<1	12	21.1%
	1-3	16	28.1%
	4-6	17	29.8
	7-9	10	17.5
	>9	2	3.5

Table 4.1 Socio-demographic characteristics of the respondents

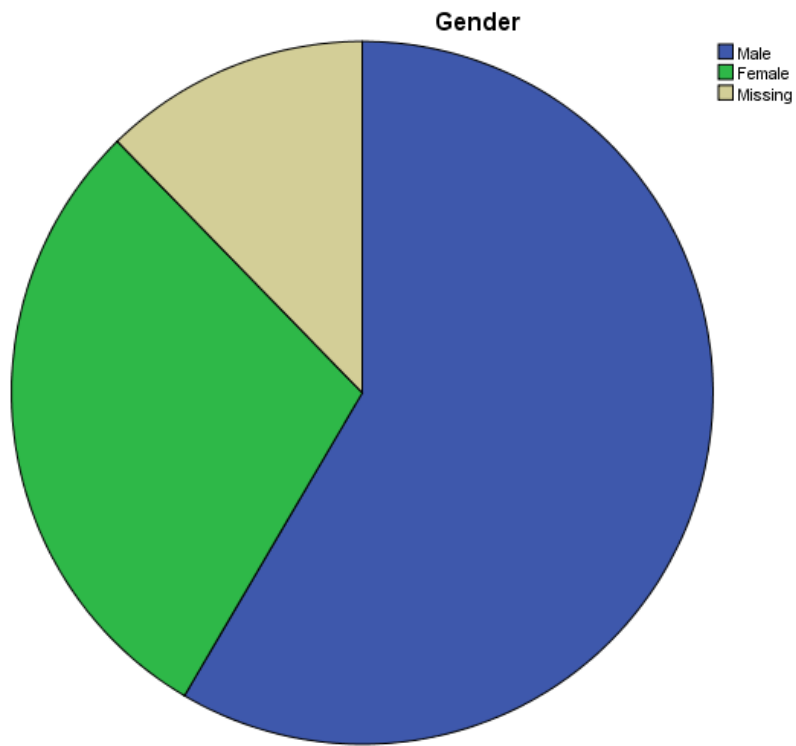


Fig 4.1 sex ratio of the respondents

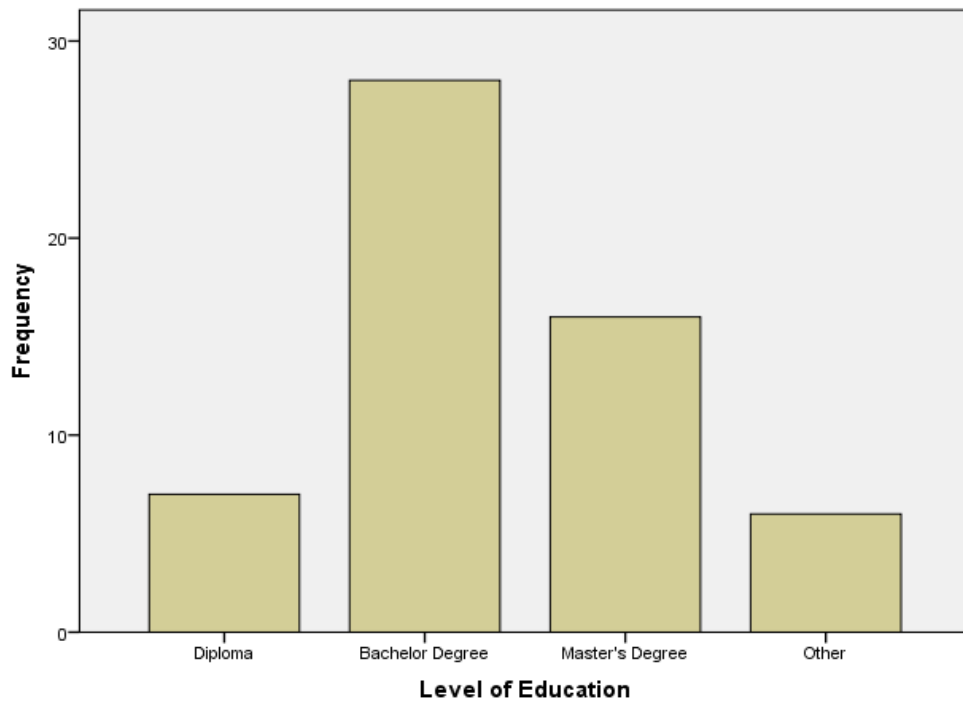


Fig 4.2 level of education of the respondents in their expertise

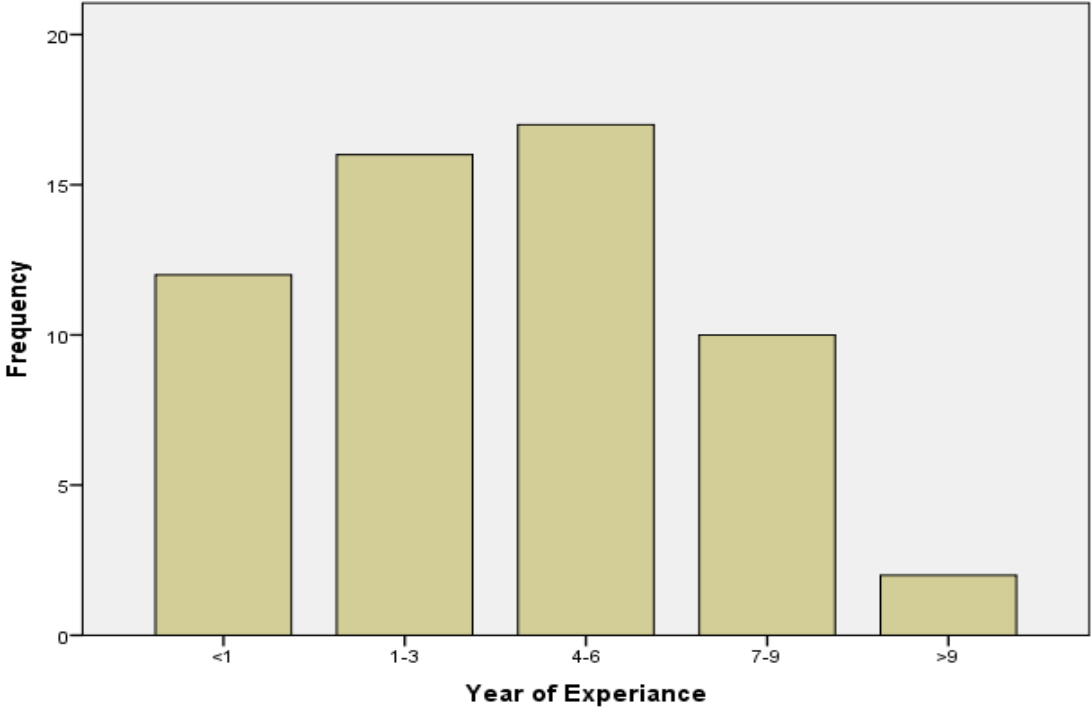


Fig 4.3 respondent's year of experience in their expertise

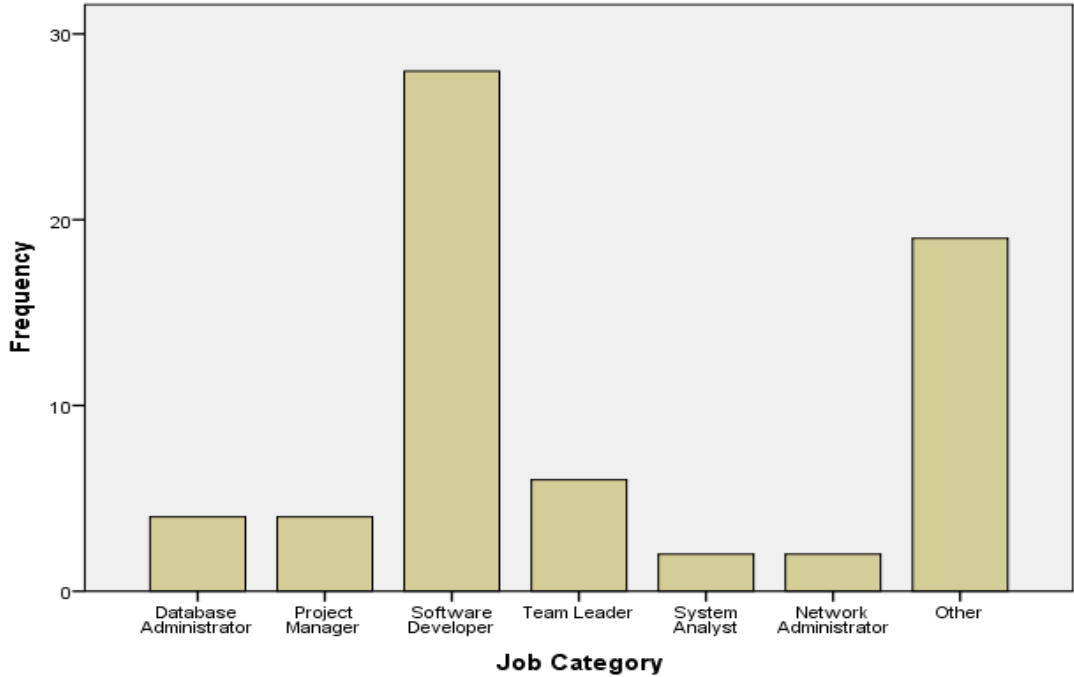


Fig 4.4 respondent's Job category

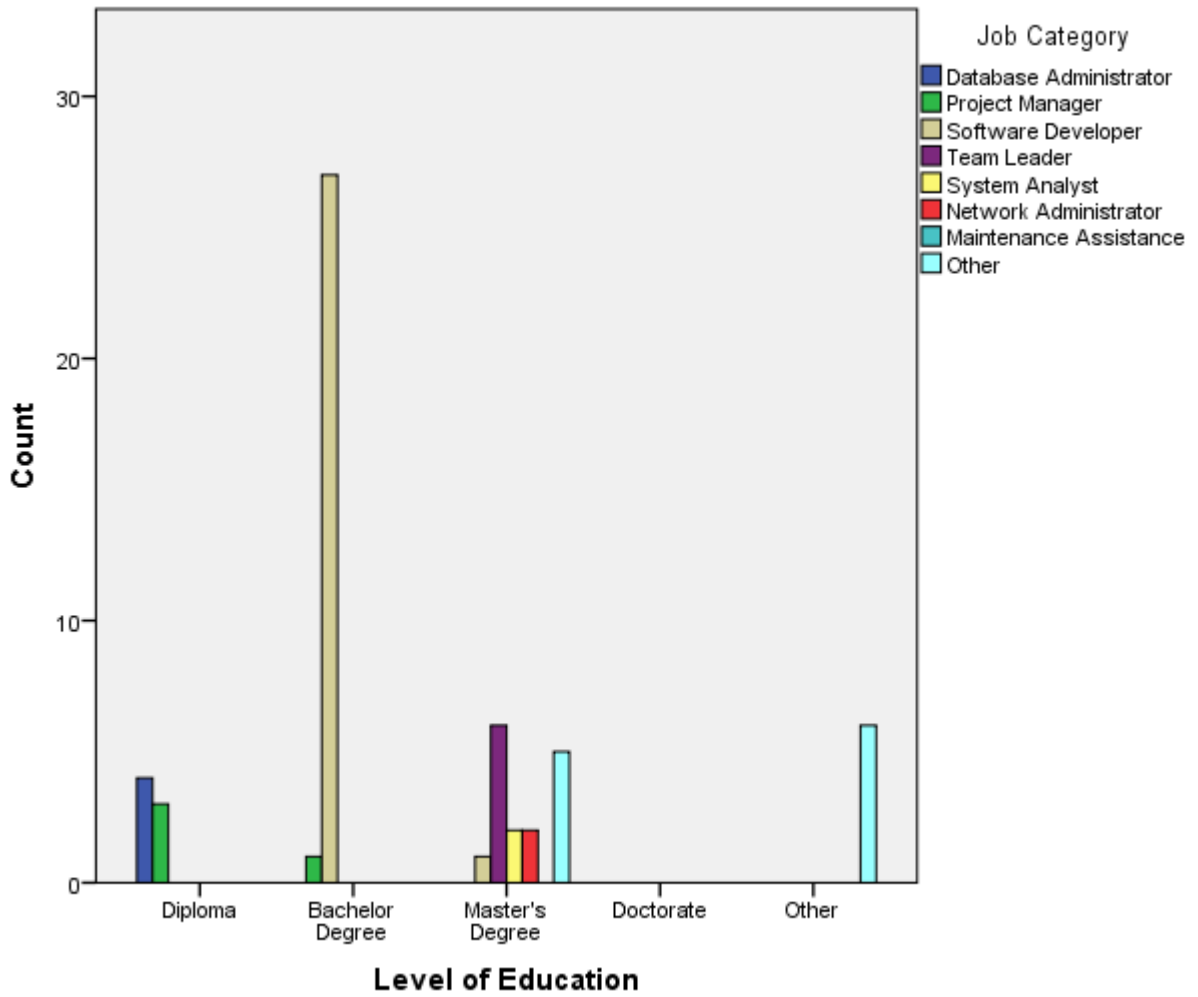



Fig 4.5 respondents' job category vs. level of education

## 4.2. EXECUTIVES FACTORS

One of the means for the success factors of mobile application development via the success of mobile application development is by providing training to the employee. The data presented in (Table4.2) indicate that 5(7.7%) respondents were strongly agreed and 26(45.6%) were agreed. In which training was found to be significantly associated with the development of mobile application in their company.

 As one of the incubation manager said that most of innovation hubs and co-working spaces give training as it is their main job, also they prepare workshops and give support in time of need for the innovators and those members who are working on their mobile apps with a fair monthly fee. “This is also a place where young entrepreneurs, local and visiting creatives get professional support and consultancy”.

In today’s business sector, Executive factor helps for the success in mobile application development, to be profitable and competitive. Among Executives factors training, experience, users need, Implementation strategy, entertainment factors, maintainability and functionality were found to be significantly associated with mobile application development in those incubation centers which was validated with the study finding by Sunni Thompson, 2009 .Ensuring that the application meets more than one of the success factors will stack the chances of the application succeeding and she analyzed the successes and failures of a number of branded mobile apps. From this qualitative research, she identified five factors that will predict the success or failure of a branded app this are entertainment factor, usability factor, utility factor, functionality factors and maintenance factors (Sunni 2009).

In case of company experience, 10(17.5%) of respondents were agree that the more experienced company could enhance for the success of companies in the success of mobile application development.

- ✎ Experiences of companies are the major one for successful mobile application development since they will be well equipped for their work and have a better experience of things which may face them on the future, they can handle all the problems which will occur with genuine manner.

Regarding to users need 17(29.8%) respondents were strongly agreed and 9(17%) were agreed. The success of mobile field service implementations was affected by the implementation strategy, project management, Entertainment factor, maintainability and functionality of the used mobile technology (Collis & Hussey 2003). The best apps in this category create an interface that is seamless with content, features, and the device itself. Those that flourish in creating a unified user experience usually taken for granted; however, those that fail are bitterly criticized. It is easy for application designers to fall into a trap of over-designing; forgetting the user experience mantra that “intuitive is familiar.” (Sunni 2009).

- ✎ One of the innovation hubs official says that most of the products which they assist and published by their members are majorly focus on creativity or coming up with new ideas other than doing the routines that everyone is engaged on so users need from different perspective is meet through a detailed research of the members.

According to the data presented in (Table 4.2) indicate that 11(19.3%) respondents were strongly agreed and 26(45.6%) were agreed that Implementation strategy was

found to be significantly associated with the development of mobile application in their startups.

Regarding to functionality, 29(50.9%) were agreed and 6(10.5%) were strongly agreed that Strong project management were significantly associated with the development of mobile application in their company. In line with these finding, similarly, the most impressive (and helpful) aspect of the app is that it leverages the phone’s camera, allowing users to search for books, DVDs, and CDs by taking pictures of the items. The app then provides a link to purchase digitally or will locate the item in the nearest store. (Robson 2002).

This study indicated that entertainment is significant to mobile application development. Since the developers focus on the users need other than the necessity unlike other companies.

- ✎ One of company staff disclosed that their company product regarding to mobile application are mostly focused on entertaining issues even though there are developers who are focused on billing and mobile phone features like SMS, IVR, and USSD telecom service since it is subjective to the inventor himself/herself .


<b>Variables</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>	<b>P-Value</b>
Training	-	8(14%)	18(31.6%)	26(45.6%)	5(7.7%)	0.172
Companies Experience	4(7%)	18(31.6%)	18(31.6%)	10(17.5%)	7(12.3%)	0.187
Users need consideration	2(3.5%)	2(3.5%)	29(50.9%)	17(29.8%)	7(12.3%)	0.285
Implementation strategy	-	2(3.5%)	18(31.6%)	26(45.6%)	11(19.3%)	0.010*

Strong project management	-	4(7%)	18(31.6%)	29(50.9%)	6(10.5%)	0.208
Focus on entertainment	10(17.5%)	10(17.5%)	28(49.1%)	9(15.8%)	-	0.005*


Table 4.2 Executives factors contribution for mobile application development

**4.3 MEMBER BEHAVIORAL FACTORS**

According to the data presented in (Table4.3) indicate that 17(29.8%) respondents were strongly agreed and 24(42.1%) were agreed that Communication and sharing of ideas with colleges helps for better effort in mobile application development. In which skill was found to be significantly associated with the development of mobile application in their company.

 One of company manager said, they believe that mobile application development process needs communication and sharing of ideas between themselves since the tech-world is in constant change, updating information each other in those innovation hubs is very crucial, unlike other companies new programming languages and open sources are highly useable in the community.

In other case, this study indicated that communication, specific role and decision making is very significant to mobile application development with. These could be due to open source version control systems which are very accessible and practical in those innovation hubs. And one executive and expertise disclosed the issue as follows:

 “Most web-developers have probably worked with some sort of revision control system, but designers may find it a foreign concept. The usual benefit of using revision control is the capability to have an unlimited number of people working on the same code base, without having to constantly send files back and forth.”

<b>Variables</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>	<b>P-Value</b>
Maintainability factor	-	4(7%)	12(21.1%)	24(42.1%)	17(29.8%)	0.604
Simple and clear functionality	2(3.5%)	-	6(10.5%)	14(24.6%)	35(61.4%)	0.025*
Sharing of Idea	-	6(10.5%)	10(17.5%)	16(28.1%)	25(43.9%)	0.194
Specified role to play	-	4(7%)	14(24.6%)	26(45.6%)	13(22.8%)	0.827
Developers skill	-	4(7%)	16(28.1%)	20(35.1%)	17(29.8%)	0.119
Idea expression and decision making	-	2(3.5%)	10(17.5%)	26(45.6%)	19(33.3%)	0.275

Table 4.3 Member behavioral Factors contribution for mobile application development

#### **4.4 TECHNOLOGICAL FACTORS**

According to the data presented in (Table 4.4), approach in this result reveals 13(22.8%) of the respondent were strongly agree and 22(38.6%) were agreed that approach outlet for mobile application development. In accordance with other finding, in evaluation of mobile application paradigms there are three approaches in mobile application development, namely the native approach, web approach and the hybrid approach that uses as a working environment to develop mobile application development (Ayda 2016).

Moreover, 6(10.5%) of the respondent strongly agreed and 14(24.6%) were agreed that platform such as Android Samsung, IOS apple are options to develop mobile application. In accordance with other finding, variety of different platforms emerged

and developers are developing applications. An important issue for the application developer is to decide which platforms help to support mobile development (Ayda 2016). Native apps are famous for their fast and responsive UI, and the seamless capability to access hardware features. However, creating such apps is complicated and requires much effort from developers on any platform. Meanwhile, jQuery Mobile shortens the code to build nice-looking and adaptive UI for HTML5 mobile apps. Phone-Gap framework also lets developers make the HTML5 app access built-in apps and run on multiple platforms effectively (Huy & Vanthanh 2012).

However, none of the respondents strongly agree and 18(31.6%) of the respondent were agreed that tools contributes to mobile application. In accordance with other finding, the accessibility of various kinds of tools allows software developers to generate the task of the mobile application development from its early stage to its growing stage.

Regarding Following Methodology and procedural steps, 13(22.8%) of the respondent were strongly agree and 22(38.6%) were agreed that Following Methodology and procedural step helps the development process for mobile application development success.


- ✎ One of the manager said that technology mainly affect the product to be published mainly choosing between native and hybrid once is the challenge of most of mobile developers, after coming up with the app idea. The first reason is that they want to publish their product in every devices once. Even if they have their own performance and device-specific issues on the most hybrid technologies.

<b>Variables</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>	<b>P-Value</b>
Choosing best approach	-	2(3.5%)	20(35.1%)	22(38.6%)	13(22.8%)	0.042*
Better platforms only	3(5.3%)	6(10.5%)	28(49.1%)	14(24.6%)	6(10.5%)	0.966
Following steps secure product	-	-	22(38.6%)	22(38.6%)	13(22.8%)	0.034*
Using better tools and techniques	-	4(7%)	35(61.4%)	18(31.6%)	-	0.505

Table 4.4 Technological Factors contribution for mobile application development

#### 4.5 COLLEAGUES FACTORS

According to the data presented in (Table4.3) indicate that 6(10.5%) respondents were strongly agreed and 18(31.6%) were agreed that Incubation center members' published mobile application is one of the motivation for work.

 One of the manager from those innovation hubs revealed that, colleague's that are our members also from our networks effect in our innovation hub is so undeniable, he said positive peer pressure is the main force of the development and generation of new ideas in the hub.

In other case, Incubation center's environment can enable one to come up with an enhanced mobile application solution with the respondents response of 13(22.8%) strongly agreed and 24(42.1%) agreed once. The major thing which one can notice easily from here is that, there is no significant success factor from colleague factor which is also unexpected by the researcher but the result of the analysis shows.

✎ As much as possible we try to make the environment to be accessible and very friendly with free internet use and e-libraries on the local server which exposed the users for new mobile application ideas. Even when they look the surrounding everyone is working on his own creative which regenerate their working power again said one of the manager from the company.

<b>Variables</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>	<b>P-Value</b>
Members work motivation	-	8(14%)	25(43.9%)	18(31.6%)	6(10.5%)	0.326
Incubation centers environment	-	4(7%)	16(28.1%)	24(42.1%)	13(22.8%)	0.233

Table 4.5 Colleagues Factors contribution for mobile application development

#### **4.6 DISCUSSION OF THE FINDING**

This part of the thesis discusses the findings based on the result of the analysis. The success factors categorized in four sections namely Executives factors, Member behavioral factors, Technological factors and Colleagues factor in which the researcher selects based on literature reviews, pilot-test result, observation and additional discussions with colleagues and co-workers' sub points which are significant once are explained below.

In this study, From executives factor, Implementation strategy with P-value (0.01), Focus on Entertainment with p-value (0.005) were mentioned as a success factors that strongly associated for the success of mobile application development because their P-value is less than 0.05 as consistent with the study finding by Ayda girmay (Ayda 2016) showed that the success of mobile field service implementations was affected by the training provided to company employees, functionality, change management and maintainability. And the Author in (Doolittle & Moohan 2012) showed that the key factors for developing Mobile application were having understanding about designing for simplicity and usability.

In addition to this, Maintainability, Simple and clear functionality, Sharing of Idea, Specified role to play, Developers skill, Idea expression and decision making were selected as success factors in Member behavioral perspective, among simple and clear functionality with P-value (0.025) is significant Which was comparable to the study conducted by Joseph Doolittle (Doolittle & Moohan 2012) showed that the key factors for developing Mobile application were having understanding about designing for simplicity and usability.

Furthermore, from variables introduced by the researcher under Technological factors half are considered as significant. that are Choosing best approach with P-value (0.042) and Following steps secure product with P-value (0.034) and, Better platforms only, and Using better tools and techniques were not selected as significant success factors, Which was comparable to the study conducted by Authors from (Heitkotter, Hanschke & Tim 2012), showed that among the identified seven decision criteria GUI design, easy

of development, Maintainability and scalability has direct link with the significant findings that are discovered by the researcher.

And also the Authors showed in (Anderson 2012), in evaluation of mobile application development strategy, three strategies in mobile application development were importantly mentioned as, the Mobile web app development, Hybrid App development and native mobile app development. Mobile Application Development Platform (MADP) that can support their needs for both current and future projects, such as SAP, Syclo, Antenna, Kony and adobe were listed by Authors in (Thor 2012).

In other case, concerning member behavioral issues, simplicity and clear functionality were the significant success factors with P-value (0.025). Other factors which are Maintainability factor, Sharing of Idea, Developers skill and Idea expression, Specified role to play and decision making was not significantly associated with the success of mobile application factors in employees as comparable to the study conducted by (Ayda 2016) that the key factors for developing Mobile application were skill.

Regarding Colleagues factor issues, the variables identified by the researcher which are Members work motivation and Incubation centers environment, both are not significant enough with P-value greater than 0.05 which were not expected by the researcher, this factor were selected based on the researchers knowledge and observation also the data collected from the interview and questionnaire.

Finally in order of relevance with their p-value, focus on Entertainment and implementation strategy from Executive factors, clear functionality from member

behavioral factor and following steps strictly and choosing best approach from technological success factor is placed in order of importance respectively.

#### **4.7 CHAPTER SUMMERY**

In this chapter the researcher analyzed and discuss the results of the methodology applied, in which, it explained the outcomes, in graphs, percent and other statistical tool specifically SPSS version 20.0 and lastly it closes the discussion by prioritizing the significant success factors that are identified through the process.

## **CHAPTER FIVE**

### **CONCLUSION AND RECOMMENDATION**

#### **5.1 CONCLUSION**

Mobile computing is the future of business. Smartphone and tablet sales are on the increasing and businesses are finally jumping on board. However, choosing the exact path is difficult for business just stepping out into mobile territory. In this research, a comprehensive and holistic view of success factors of mobile application development are identified. This approach provided deep insights from practitioners and researchers from literature review, views of professionals and experienced executive individuals from interview and exact problems and opportunities identification from active mobile app developers which are active members of innovation hubs and co-working spaces via questioner conducted. These success factors were then ranked according to importance. Also, each of the success factors was rated on a Likert scale. The ranking and rating of the success factors according to importance can help practitioners focus on the most important success factor.

The results showed that, focus on Entertainment and implementation strategy from Executive factors, clear functionality from member behavioral factor and following steps secure product and choosing best approach from technological success factor is placed respectively in order of importance. The outcomes of this study can help other practitioners create a competitive mobile application considering success factor strategy that are pointed on this paper.

Therefore, we can conclude that Incubation centers provision of adequate Training for their members helps the developer substantially. In addition Implemented strategies of companies are one of the helpful factor. Mobile Application Development team member functionality has to be clear and simple for the users in order to have a better result in MAD. At last strict follow-up of Methodologies and procedural steps is agreed upon by the developers as that which can secure the development process of mobile application.

Ethiopia is eager to absorb new technology, and the government is making aggressive plans. Ethio-Telecom is in charge of ICT industry providing incentives to push the mobile industry. As a result, there is significant growth in both government and non-government entrepreneurship for the development of mobile applications. Therefore this paper is very helpful for researchers, practitioners and scientists who are looking for the study conducted on mobile application development in Ethiopia in one way or another.

## **5.2 RECOMMENDATIONS**

To improve understanding and development about the new-coming technology which is Mobile Application Development in Ethiopia, the following recommendation is forwarded.

- Every app developer hopes to build the next big hit but, as is the case for any hit-driven market, a large group will be left behind with little to show for their efforts, applying the mentioned significant success factors in order of importance will help one to be profitable and help on reducing risk of failure on mobile application development.

- Incubation centers endowment of adequate Training for their members helps the developer substantially. So the researcher recommends deploying more innovation hubs and co-working spaces that helps individuals, groups and for all the nation to be more profitable from this area.
- Implemented strategies of companies have significant role in developing successful mobile application, as the researcher observes, mobile applications are developed together with other software products in companies. The researcher recommends that forming sole mobile development companies, by focusing on this area brings success.
- Clear and simple functionality distribution among mobile application development team brings a better result in mobile application development. So the researcher recommends innovation centers to work on bringing those talented individuals to come up together for a better product.
- Monitoring Methodologies and procedural steps strictly can secure the development process and it is obliging for enhanced mobile application product deployment, which are a means of solving economic, social and political problems. So the researcher recommends applying this business sector widely helps, in order to gain more benefit of income, to whistle for corrupted issues, to connect with friends and families, to entertain users and to gain more revenue for Ethiopia also for the globe in general.

### **5.3 LIMITATION**

There are some limitations in this study. The success factors generated in this study were subjective in nature. The approach used to collect these success factors, questioners, observation and interviews are generally used to generate subjective

ideas or opinions to address a specific problem. Therefore, it was difficult to completely eliminate the impacts of the research subjects' subjectivity on the results of this study. Also the researcher did not include the networks that support and co-work with those incubation center across worldwide. For future research, other researchers can include the networks of groups. Additional research methods can be employed to supplement the existing method. For example, the triangulation method can be used where multiple methods are used in one study to collect data. It is also suggested that future research repeat this research in different environments (e.g., different institutions, different countries) to reduce subjectivity and enhance generalizability.

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# APPENDIX I

## Questionnaire

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### **PART 1: Respondent Background**

The researcher would like to thank you for taking your valuable time in order to fill this questioner. Your information will be kept strictly confidential.

**For each of the following items, please make a tick mark in the box that represent you**

No.	Questions	Response
1.1	Age	<input type="checkbox"/> <20 <input type="checkbox"/> 20-30 <input type="checkbox"/> 31-40 <input type="checkbox"/> 41-50 <input type="checkbox"/> 51-60 <input type="checkbox"/> >60
1.2	Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female
1.3	Level of Education	<input type="checkbox"/> Diploma <input type="checkbox"/> Bachelor Degree <input type="checkbox"/> Graduate Degree (MSc) <input type="checkbox"/> Doctorate (PhD) <input type="checkbox"/> Other (please specify)
1.4	Job Category	<input type="checkbox"/> Database Administrator <input type="checkbox"/> Project Manager <input type="checkbox"/> Software Developer <input type="checkbox"/> Team Leader <input type="checkbox"/> System Analyst

		<input type="checkbox"/> Network Administrator <input type="checkbox"/> Maintenance <input type="checkbox"/> Other (please specify)
1.5	Year of Experience	<input type="checkbox"/> <1 <input type="checkbox"/> 1-3 <input type="checkbox"/> 4-6 <input type="checkbox"/> 7-9 <input type="checkbox"/> >9

**PART TWO: Select or mark one from the five choices using the following manual.**

**1=Strongly Disagree [SD], 2=Disagree [D], 3=Neutral [N], 4= Agree [A], 5=Strongly Agree [SA]**

No		SD	D	N	A	SA
	<b>Executives Factors</b>					
1	Incubation centers providing adequate Training for us in order to upgrade members' knowledge.	1	2	3	4	5
2	Experienced companies can develop better Mobile Application development than incubation centers.	1	2	3	4	5
3	Incubation centers consider users need before developing Mobile applications.	1	2	3	4	5
4	Companies Implementation strategy can affect mobile application development.	1	2	3	4	5
5	Companies' strong Project management is a significant reason for mobile application development success.	1	2	3	4	5
6	Incubation centers focus on Entertainment factor when developing Mobile applications.	1	2	3	4	5
	<b>Member behavioral Factors</b>					
7	Mobile application Maintainability is the important factor that must be in consideration during the development process.	1	2	3	4	5
8	Functionality of Mobile application should be clear and simple for the users.	1	2	3	4	5

9	Communication and sharing of ideas with colleges is vital for better effort in mobile application development.	1	2	3	4	5
10	Everybody has his/her own specified role to play and specific task to perform in mobile application development team.	1	2	3	4	5
11	Mobile Application Developers should be skilled, educated and trained for tools/ technologies used in the project	1	2	3	4	5
12	Expressing ideas and ability of decision making with team member is a major responsibility in mobile application development squad.	1	2	3	4	5
	<b>Technological Factors</b>					
13	Choosing best Approach (like Native, Web and Hybrid) is one factor during Mobile Application development.	1	2	3	4	5
14	Better Platforms (such as, Blackberry, IOS, Android) only be considered in the development process.	1	2	3	4	5
15	Following Methodologies and procedural steps can secure the development process and better product deployment.	1	2	3	4	5
16	Choosing better Tools and techniques (Like Phonegap, xamarin) other than native ones, can make the application development easy.	1	2	3	4	5
	<b>Colleagues Factors</b>					
17	Incubation center member's published mobile application is one of the motivation for work.	1	2	3	4	5
18	Incubation center's environment can enable one to come up with an enhanced mobile application solution.	1	2	3	4	5

## APPENDIX II

## INTERVIEW

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1. What kinds of software development services does your organization provide? Is that mobile application only or other software development?
2. Do you think that companies experience affect the development process? If yes, How?
3. What are the success factors that influence Mobile Application Development process in your company? What things must be fulfilled for a better and profitable Mobile Application Development?
4. What kind of professionals should be involved in Mobile Application Development team?
5. As a manager of the company what thing must be done for the developer's in order to increase their performance?
6. What are the problems faced during the development process?
7. Do you think that mobile application is widely applied in our country, Ethiopia? If No, What do you suggest for better effort?