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A Comparative Analysis of Mobile Applications Development Approaches

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Abstract:
As we know there are many approaches are available now a days to develop mobile applications. But it is very difficult to choose by a developer which approach will be better. To understand this a comparative analysis of mobile applications development approaches are needed. Based on this analysis a developer can easily go for best approach. Over the last decade mobile technologies progressed immensely and
mobile market went through a very turbulent phase that brought a lot of changes. It is thus important for software developers not to intractably keep to their previous assumptions, technologies and development approaches without studying the situation in context of their current mobile application development approaches. One of the factors in the success of a project is the selection of the right development tools. It may seem that this is not as important for mobile applications, since they run on small devices and have only a few screens. Although the statement could have been considered true a few years back, it gets less true with every year, as mobile applications get closer in complexity to their desktop counterparts. If we talk about Mobile platforms it is differ in their inner implementation parts,user interface of mobile, user interaction concepts, mobile operating systems even they run on and various other aspects. These differences are also translated into the development environments of each mobile platform. All mobile platform having different constraints,they use different programming languages, libraries packages,frameworks and different type of design patterns.

Keywords: Frameworks, Android, Native, Hybrid, Xamarin.Forms

Introduction:
Before going to mobile applications development approaches, we should know about the mobile applications. In simple word an application can be define in such a way "a set of instructions or rules which perform some task", If that task is performed by mobile device it will be called a mobile application. Mobile application has to run on mobile browser. For any application we can easily distinguish application is which type either it is web based either window based or mobile based. Applications can be easily identified with the help of its output screen if we are getting output in web browser application is called web application if application is getting output in window form, we can easily say this type of application is window based. Like the same way if we will get output in mobile browser then that application will be called as mobile application. To get this output in mobile browser mobile device is required. Mobile device does not mean only mobile phones although, it can be any mobile device that is easy to carry like PDA, Note Book, Phablet, Tablet etc. There were many operating systems which is available like: iOS, Android, Windows, BlackBerry, Firefox OS, Tizen, Bada, webOS, MeeGo and several others. However, most of these have never become widely popular. Only iOS and Android operating system achieved a great success. Software development teams therefore have to choose not only the mobile platform for which they will develop their applications, but also tools and technologies with which to implement the mobile applications.

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Categorization of Mobile Applications and Its development Environments:

Mobile applications also can be categorized as per used by platforms. A mobile application can be native mobile application or hybrid or web based mobile applications. An application which runs on specific platform is called native application like a calculator in android phone runs on android phone only it can't run on any other device. If we talk about hybrid application it means that the application can run in any device. Hybrid application is not a platform specific. For example, what's app chat applications can use in android phone and iOS phone also. If any web-based applications running through WAP it means it is called mobile web-based application. This is the way we can categorize mobile applications.

	Android	iOs	Window
IDE	Android Studio	XCode	Visual Studio
Programming language	Java/Kotlin	Objective C/Swift	C#
Database	MySql	ormlite, ormdroid	LINQ

Fig 1: Components of mobile applications development

Categorization of Mobile Applications Development Frameworks:

For any mobile application developer, the primary work of the developer is selecting the mobile development framework. There are many mobile development frameworks as per their own needs.

Android:
Android is the platform for native mobile applications development. Android platform provides Java framework Application programming interfaces for the functionality to building native apps. Java framework Application programming interfaces which is written in the Java language. With the help of these Java framework Application programming interfaces we create Android applications by simplifying the re-use of code, android system components and services. [1]

Ionic
Ionic is a robust framework that most mobile app developers have used from time to time. The fact that it comes for free is an added advantage. It forms a great combination with JavaScript, CSS3, and HTML while developing native apps, which makes it a tremendous client-side framework. Ionic even helps in developing hybrid apps as it possesses an element of HTML 5. App developers consider it as a credible asset for developing Progressive Web Apps, and there's no doubt about it. The Ionic framework supports the most advanced smart devices. It creates a supportive platform for mobile apps before they get launched. [2]

Flutter
Google had introduced Flutter, which is an open-source development platform for quality mobile apps. Composed in Dart Language, Flutter is another cross-platform for developing mobile apps. It's handy in developing hybrid apps, so this framework is used frequently. It helps in developing

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visuals with the help of Skia, the engine that renders 2D. Flutter even allows you the opportunity to test your project. In case the developer commits a mistake, he doesn't need to restart the entire project. [2]

PhoneGap

The PhoneGap enables to view every minute change or alterations caused to app development process. The developers are capable of teaming this cross-platform framework with CSS, HTML5, and JavaScript while developing apps. Adobe PhoneGap should rank high on list of preferences when you're developing any hybrid app. [2]

There aren't any hardware limitations for developers, and they enjoy considerable freedom even while witnessing a best-in-class performance from this fantastic framework. Apart from iOS and Android, there are several other Operating Systems that boast apps built with PhoneGap. You may even incorporate a few plugins for gaining the leverage of adding extra functionality. [2]

Xamarin.Forms

Xamarin.Forms is a framework to develop cross mobile platform app. This is the product of Microsoft. With the help of XAML(Extensible Application Markup Language) we can develop cross platform applications that can be easily deploy in any mobile platform either iOS or Android or Window. [3]

Comparative analysis of Native application development approaches and Hybrid application development approaches:

One application has been implemented and tested to find out the analysis of Native application development approaches and Hybrid application development approaches

Native application development coding pattern (Android)	Hybrid application development coding pattern (Xamarin.Forms)

On button Click : Coding in Java Programming Language used
 	
EditText e1=(EditText)findViewById(R.id.editText4);
EditText e2=(EditText)findViewById(R.id.editText5);
int no1=Integer.parseInt(e1.getText().toString());
int no2=Integer.parseInt(e2.getText().toString());
int no3=(no1+no2)/2;
EditText
	On button Click: Coding in C# Programming Language used.
	int val1 = int.Parse(txtVal1.Text);
	int val2 = int.Parse(txtVal2.Text);
	int res = val1 + val2;
	int res1 = val1 - val2;
	int res2 = val1 * val2;
	int res3 = val1 / val2;
	int res4 = val1 % val2;
	await DisplayAlert("Addition",res.ToString(), "OK");

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e3=(EditText)findViewById(R.id.editText6);
e3.setText(no3+"");	

Design part coding pattern in XML: <TextView android:id="@+id/textView2" android:layout_width="wrap_content" android:layout_height="wrap_content" android:text="@string/num1" /> <TextView android:id="@+id/textView3" android:layout_width="wrap_content" android:text="@string/num2" /> <TextView android:text="@string/result" /> <Button android:id="@+id/button6" android:text="@string/Add" />	Design part coding pattern in XAML: <?xml version="1.0" encoding="utf-8" ?> <ContentPagexmlns="http://xamarin.com/schemas/2014/forms" xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml" xmlns:local="clr-namespace:App7" x:Class="App7.MainPage"> <StackLayout> <Label x:Name="valueLabel" Text="Enter Value1" Font="Large" HorizontalOptions="Center" VerticalOptions="CenterAndExpand" /> <Entry x:Name="txtVal1" Placeholder="Enter Value1"></Entry> <Label x:Name="valueLabel2" Text="Enter Value2" Font="Large" HorizontalOptions="Center" VerticalOptions="CenterAndExpand" /> <Entry x:Name="txtVal2" Placeholder="Enter Value2"></Entry> <Button Text="Click Me!" HorizontalOptions="Center" VerticalOptions="CenterAndExpand" Clicked="OnButtonClicked" /> </StackLayout> </ContentPage>

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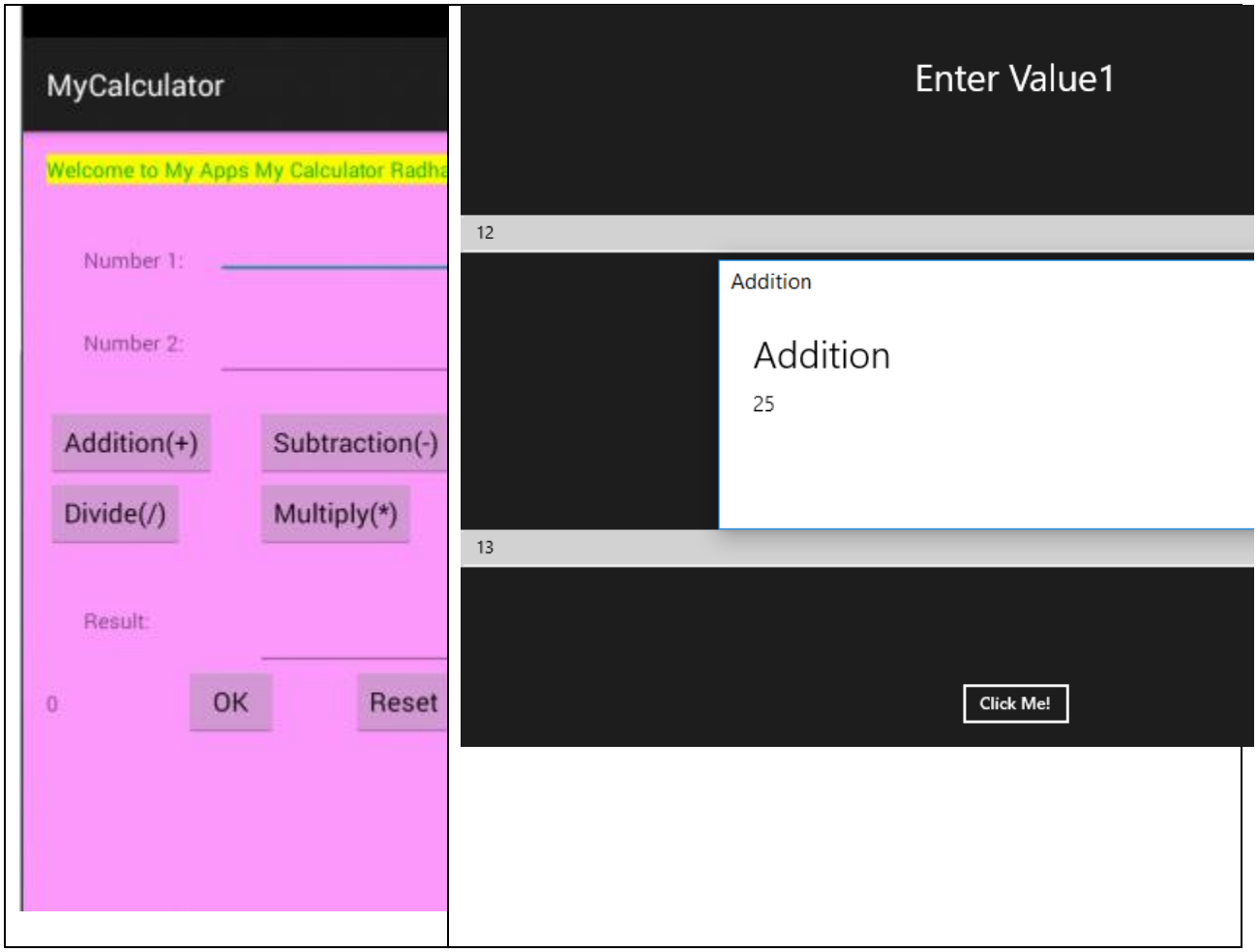

Table: For Comparative analysis of Native application development approaches and Hybrid application development approaches

Conclusion:

Hybrid approach seems to be more suitable as it allows to reuse much of the already existing code from the web implementation. This approach is currently quite popular and with the growing computationalpower of mobile devices the quality of the resulting applications is getting better as well. However, we have to consider the developments in the mobile. There is a difference in between hybrid and native basically the way how a new screen is displayed in native and hybrid applications. In native applications new screen shows immediately. Even if the data for the screen is not available immediately and needs to be loaded, at least the basic layout and static elements are rendered, and the data is inserted after it has been fetched. However, since in this approach screens consists mainly of HTML documents that are fetched from a server as a whole, together with their data, it takes some time for the whole screen to appear. Moreover, fetching the whole web page with all its resources is much more data and time consuming than downloading some JSON, or XML file for a native application. Having to wait for a new screen to load brings down the usability of the application by increasing the time it

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takes for a user to complete her task. Therefore, improving a page load time is an important part of the development.

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