

# A comparison of implementation time: Android vs. HTML5

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# Agenda

- 1 Introduction
- 2 The experiment
- 3 Results and Discussions
- 4 Threats to Validity
- 5 Conclusion and Future Work

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# Introduction

- **Mobile devices** are becoming **ubiquitous** in today's society;
- Existence of multiple operating systems such as Android, Black-Berry, iOS and Windows;
  - **Native Development**
- Independent of operating system;
  - **Web Development**
- **Compare the approaches web and native**, especially regarding the **time to develop** each of them.

# Native Development

- Designed to run on a device tied to a specific operating system;
- Developed to make the most of the ability of devices, both hardware and software;
- The internet connection is not essential;
- This kind of application requires a different version of the app for each platform.

# Web Development

- Available on the internet and accessed through a web browser;
- Platform independent;
- The internet connection is essential;
- This kind of application can not fully access the features of the device hardware.

# Why?



VS



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**Android**

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**HTML5**

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Device Models  
Open Source

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Deployment Costs  
Standardization

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Table : Motivations

- 1 Introduction
- 2 The experiment**
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# Research Question

**QP1 - Which of development platforms has the lowest average time for implementation of mobile applications, Android or HTML5?**

# Objective – Structure

- **Object of Study:** mobile development platforms.
- **Proposal:** identify the mean time to deploy Android and HTML5 applications.
- **Focus:** investigate whether the choice between the development platforms Android and HTML5 can influence quantities like time.
- **Perspective:** researchers.
- **Context:** professional software developers.

# Objective – Variables

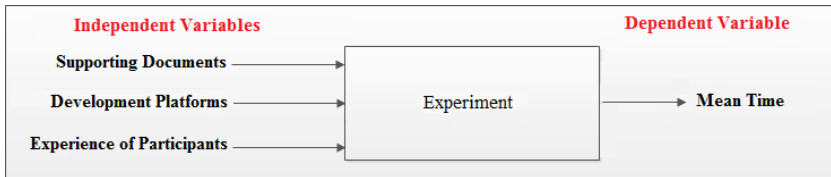


Figure : Independent and Dependent Variables of the Experiment

# Objective – Research Hypothesis

**Null Hypothesis (H0):** The average time to implement applications for Android is equivalent to average time of applications implemented in HTML5.

- $\mu(t) \text{ Android} = \mu(t) \text{ HTML5}$

**Alternative Hypothesis 1 (H1):** The average time to implement applications for Android is upper to average time of applications implemented in HTML5.

- $\mu(t) \text{ Android} > \mu(t) \text{ HTML5}$

**Alternative Hypothesis 2 (H2):** The average time to implement applications for Android is less than to average time of applications implemented in HTML5.

- $\mu(t) \text{ Android} < \mu(t) \text{ HTML5}$

# Instrumentation

- Criteria for Selection of Participants;
- Training;
- Dynamic Execution:

Platform	Group 1	Group 2	Execution
Android		X	First
HTML5	X		(UC01)
Android	X		Second
HTML5		X	(UC02)

- UC01 – Validate User Registration;
- UC02 – Authenticate User Default;
- Supporting documents:
  - Use Case Document;
  - Component Diagram;
  - Sequence Diagram;
  - Document of Execution.

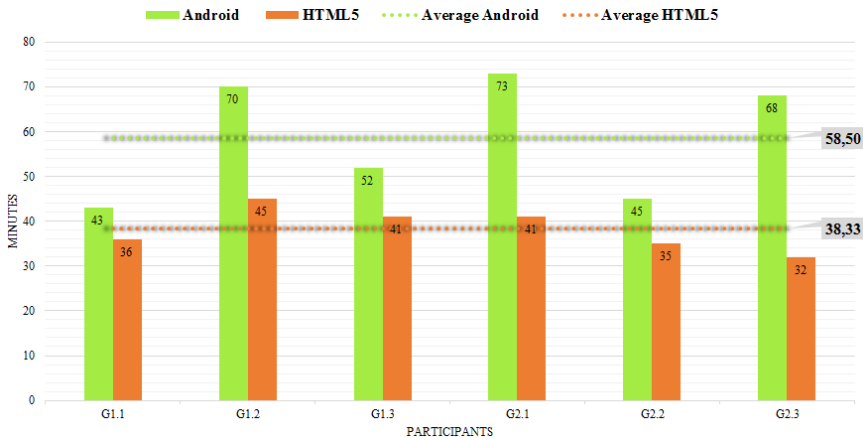
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# Results – Summarization of Times

Participant	Android (minutes)	HTML5 (minutes)
G1.1	43	36
G1.2	70	45
G1.3	52	41
G2.1	73	41
G2.2	45	35
G2.3	68	32

Table : Individual implementation times

# Results – Averages Obtained





# Discussions – Shapiro-Wilk Test

	Shapiro-Wilk		
	Statistic	df	Sig.
<b>Time Android</b>	0,856	6	<b>0,176</b>

Table : Shapiro-Wilk Test for the Android platform  
(Source: SPSS Tool – IBM)

	Shapiro-Wilk		
	Statistic	df	Sig.
<b>Time HTML5</b>	0,953	6	<b>0,765</b>

Table : Shapiro-Wilk Test for the HTML5 platform  
(Source: SPSS Tool – IBM)

# Discussions – Normal Distribution

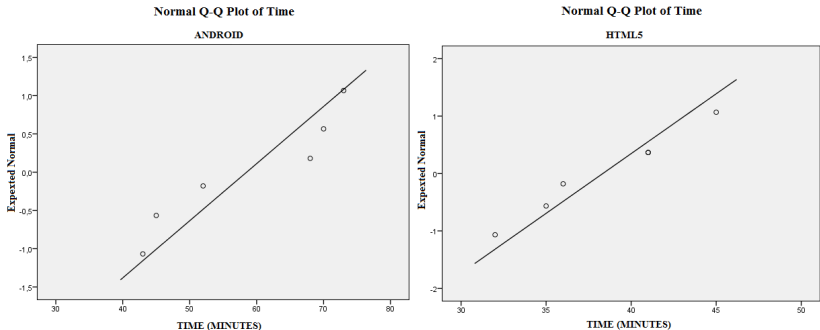


Figure : Normal distribution for Android and HTML5 platforms  
(Source: SPSS Tool – IBM)

## Discussions – Test T

		Levene's Test for Equality of Variances	
		F	Sig.
<b>Time</b>	Equal variances assumed	24,011	<b>0,001</b>
	Equal variances not assumed		

Table : Levene Test (Source: SPSS Tool – IBM)

		T-Test for Equality of Means						
		t	df	Sig (2-tailed)	<b>Mean Difference</b>	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
<b>Time</b>	Equal variances assumed	3,471	10	0,006	<b>20.167</b>	5,810	7,220	33,113
	Equal variances not assumed	3,471	6,264	0,012	<b>20.167</b>	5,810	6,093	34,240

Table : T Test (Source: SPSS Tool – IBM)

# Discussions – Considerations

Null Hypothesis (H0):

- $\mu(\mathbf{t})$  Android =  $\mu(\mathbf{t})$  HTML5  $\Rightarrow$  Refuted;

Alternative Hypothesis 1 (H1):

- $\mu(\mathbf{t})$  Android  $>$   $\mu(\mathbf{t})$  HTML5  $\Rightarrow$  Accepted;
- $\mu(\mathbf{t})$  HTML5  $\approx$  35% less;

Alternative Hypothesis 2 (H2):

- $\mu(\mathbf{t})$  Android  $<$   $\mu(\mathbf{t})$  HTML5  $\Rightarrow$  Refuted.

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# Threats Identified

- Number of participants;
- Participant's experience;
- Use cases proposed;
- Development environments:
  - Creation of the visual interface;
  - Execution.






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# Final Considerations

- Conclusion
  - Statistical evidence of H1.
- Future Works:
  - Replications:  
<https://www.dropbox.com/sh/ovsmjpwjtjuqzgx/0eNRiKv-JG>
    - Analysis of threats to validity.
  - Inclusion of new variables:
    - Generated defects;
    - Code complexity;
    - Maintainability.



# References

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# Questions

