Gathering <u>T</u>ext <u>E</u>ntry <u>M</u>etrics on <u>A</u>ndroid Devices

Steven J. Castellucci

Methods Used:
- User/stakeholder interviews
- Usability benchmarking
- Competitive analysis
- Surveys
- Metrics/log analysis

Research Composition (est.):

70%	30%
Primary	Secondary
20%	80%
Generative	Evaluative

Motivation

- Evaluating mobile text entry important
  - Over 3.2 billion unique mobile phone users globally*
  - Estimated 9.2 trillion text-based messages globally*

- Need mobile application to gather performance metrics

- 57% run on Android, only 21% on iOS*

- Android allows the development, distribution, and use of third-party text entry input methods (IMEs)
  - Keyboard typing
 - Gesture recognition
  - Voice recognition

* Estimates from 2013

Discovery Phase

- Based on competitive analysis of existing desktop apps

Requirements:

- Mobile app that facilitates user studies by presenting phrases and recording text entry performance metrics

- Operates independently of the input method being tested

- Log files that record low-level, time-stamped events, and higher-level, calculated metrics for speed and error rate

- One or more phrase sets that represent mobile text entry tasks (for use in user studies)

- Simple interface to discourage distraction during studies

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Prototype and Design of TEMA
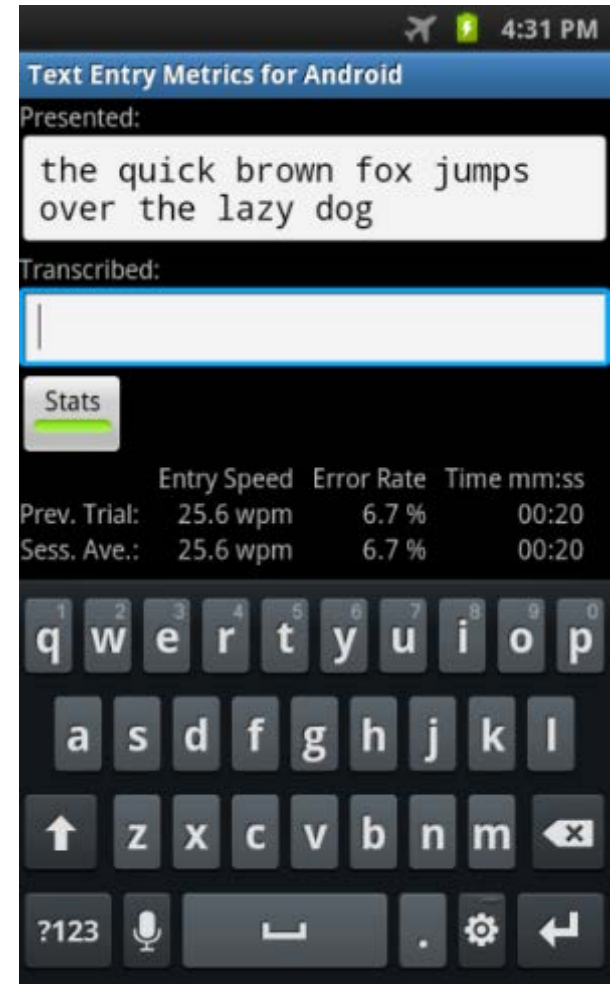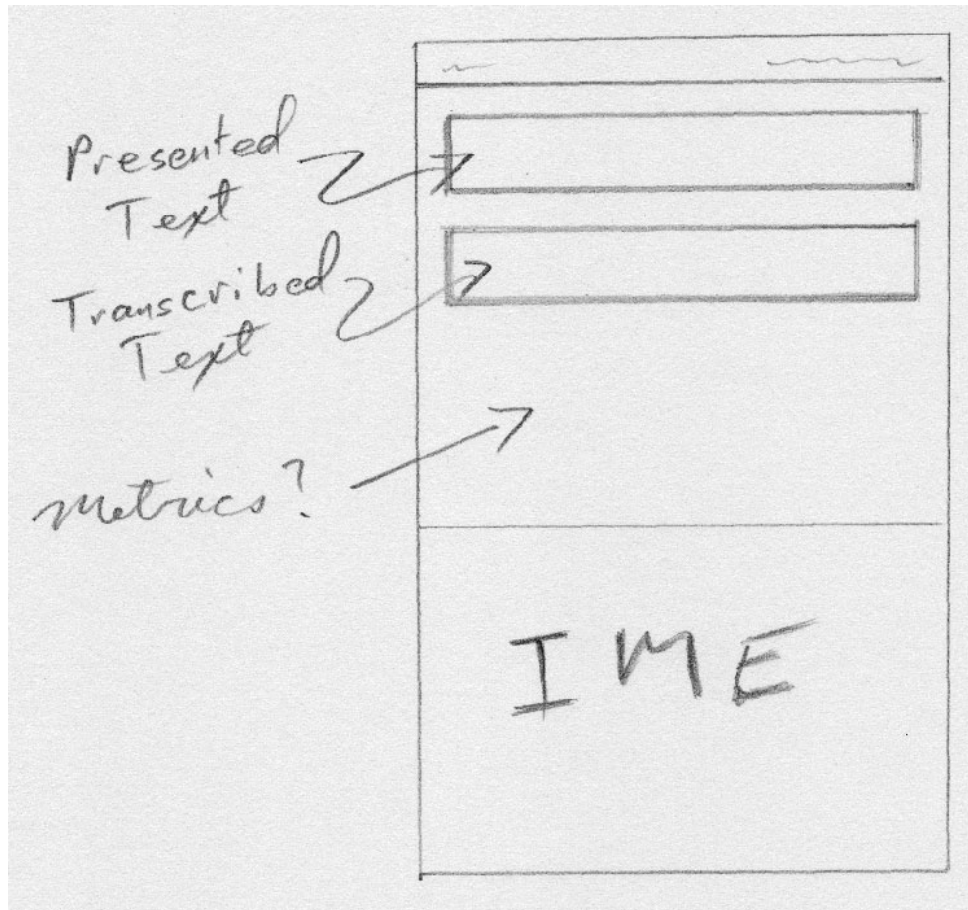
TEMA Features

- 500 transcription phrases

- Trial management

- Detailed event timings and performance metrics in logs

	A	B	C	D	E
1	#Log opened: Tue Mar 27 12:38:36 EDT 2012				
2	#presented	transcribed	presented	transcribed	tota
3	the insulation is not working	the insulation i bot workibg	29	28	
4	february has an extra day	february has an extrs day	25	25	
5	prescription drugs require a n	prescriptiob drugs require a r	33	33	

	F	G	H	I	J	K
me wpm		msd	numBksp	total_error	cor_error	uncor_error
024	33.51955307	3	0	0.103448276	0	0.103448276
259	36.32401017	1	0	0.04	0	0.04
488	37.75743707	1	0	0.03030303	0	0.03030303

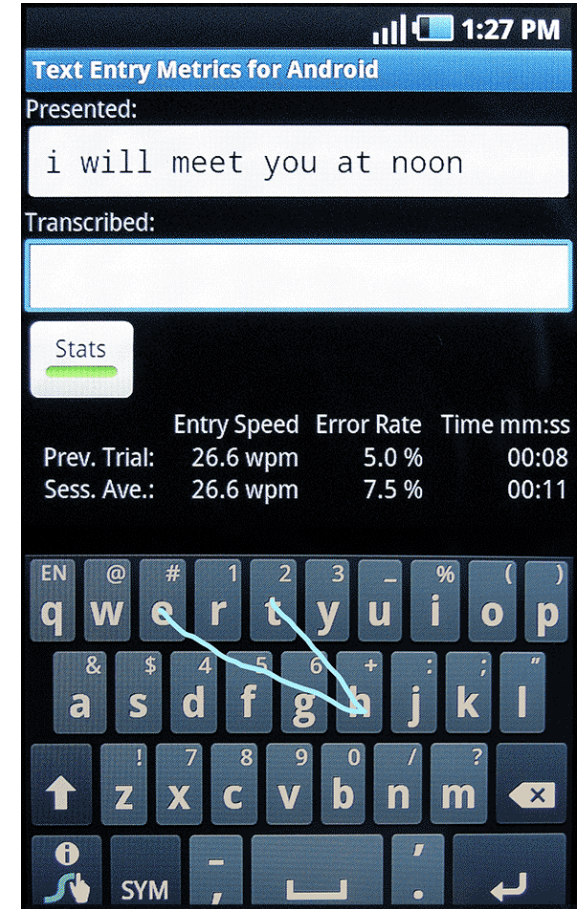|	A	B	C
1	#Log opened: Tue Mar 27 12:38:36		
2	#the insulation is not working		
3	0	t	pos@0
4	285	h	pos@1
5	481	e	pos@2
6	835	<Sp>	pos@3
7	1189	i	pos@4
8	1466	n	pos@5
9	1623	s	pos@6
10	1922	u	pos@7
11	2185	l	pos@8

Input Independent
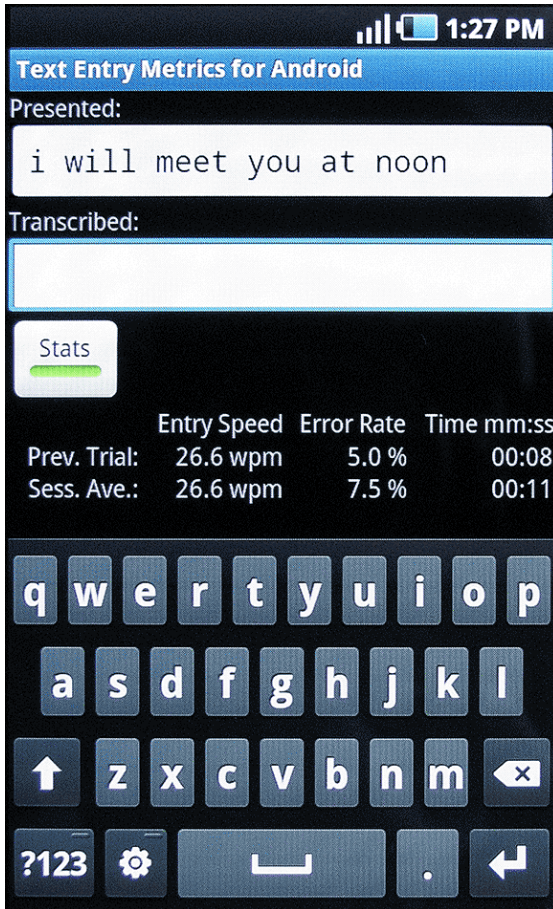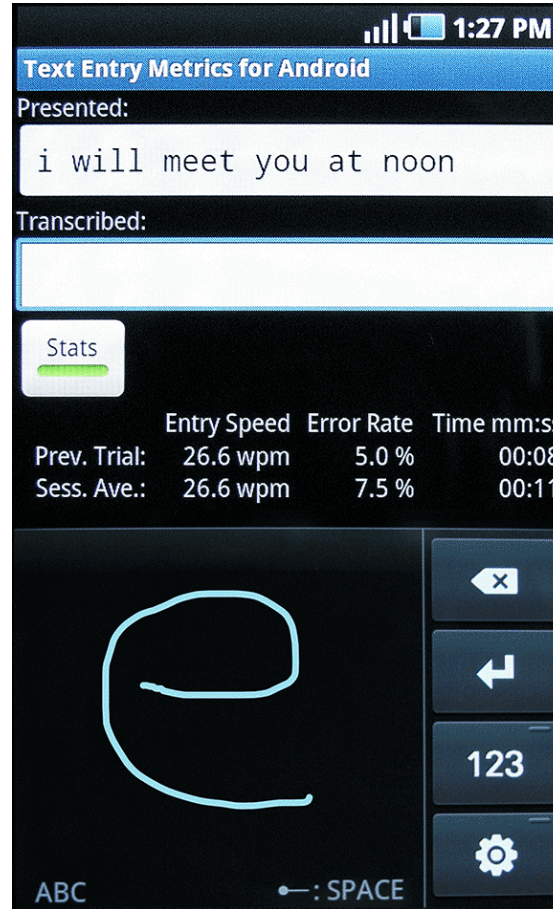


Qwerty   *DioPen*   *Swype*

Evaluation – User Study

- Usability testing of TEMA, and benchmark testing three existing third-party IMEs

- 16 participants (6 females, 10 males)

- Novices with respect to touchscreen Qwerty typing, handwriting recognition, shape writing input

- 10 phrases in each of the conditions:
  - Qwerty (thumbs)
  - Qwerty (finger)
  - *DioPen*
  - *Swype*

- 50-minute session length

Results
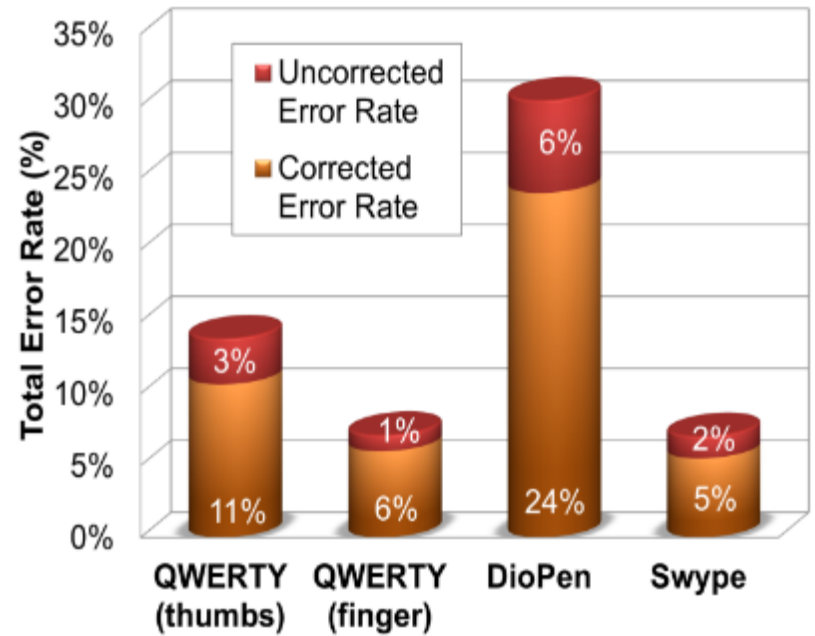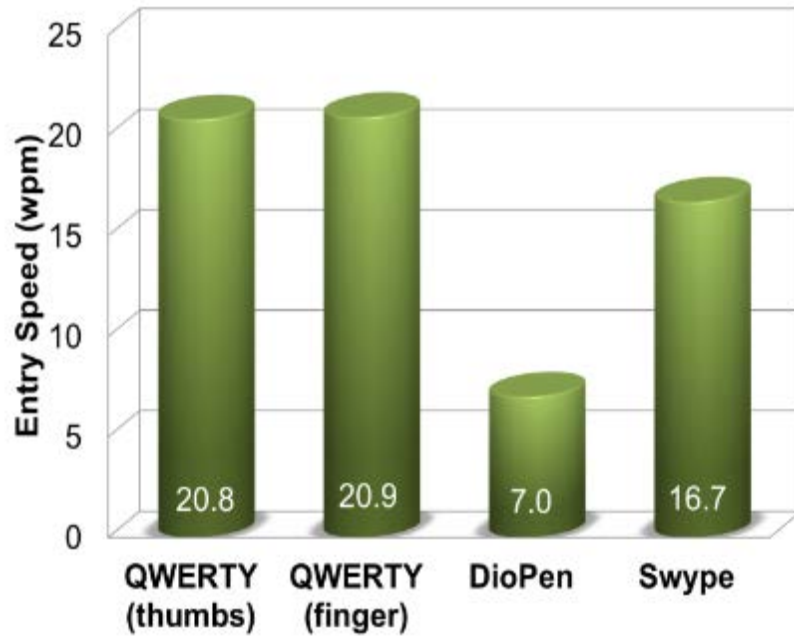
Design Iteration

- Implemented logging of low-level IME-specific metrics using Android's inter-process notification framework

- Added study "safeguards":
    - Disable device's menu button to prevent app switching
    - Minimum accuracy threshold to ensure participant attention

- Added additional device parameters to log

- Changed log formatting from comma- to tab-delimited to avoid collisions with punctuations in the transcribed phrase

Summary

- TEMA facilitates gathering text entry metrics

- User study identified weaknesses in input method design
  - Logs helped identify often misrecognized characters

- TEMA design iteration:
  - Additional data written to logs
  - Enabled study safeguards
  - Implemented logging of IME-specific metrics

- ***As of 2021, used by over 70 academic and industry researchers worldwide (list)***

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