Do Exploratory Testers Need Formal Training?

An investigation using HCI techniques

Authors: Mark Micallef • Chris Porter • Andrea Borg

Speaker: Christian Colombo

University of Malta

Ongoing Debate: Do Exploratory Testers Need Formal Training?

Hypothesis

- "(Un)trained exploratory testers intuitively use different – yet complementary – exploratory testing strategies"

Research Questions

- **RQ1**: Which types of exploratory testing strategies are utilized by (un)trained testers?

Research Questions

- **RQ1**: Which types of exploratory testing strategies are utilized by (un)trained testers?
- **RQ2**: Which types of bugs are found by testers in each group?

Research Questions

- **RQ1**: Which types of exploratory testing strategies are utilized by (un)trained testers? (S – T)
- **RQ2**: Which types of bugs are found by testers in each group? (B – T)
- **RQ3**: Is there a link between the bugs found and the testing strategies adopted? (B – S)

Research Questions

- **RQ1**: Which types of exploratory testing strategies are utilized by (un)trained testers? (S – T)
- **RQ2**: Which types of bugs are found by testers in each group? (B – T)
- **RQ3**: Is there a link between the bugs found and the testing strategies adopted? (B – S)
- **Bonus**: How should we compose testing teams?

Research Questions

- **RQ1**: Which types of exploratory testing strategies are utilized by (un)trained testers? (S – T)
- **RQ2**: Which types of bugs are fou testers in each group? (B – T)
- **RQ3**: Is there a link between the sting strategies adopted? (B – S)
- **Bonus**: How should we compos

How do we identify what strategy is being used by a tester?

How do we Identify Strategy used?

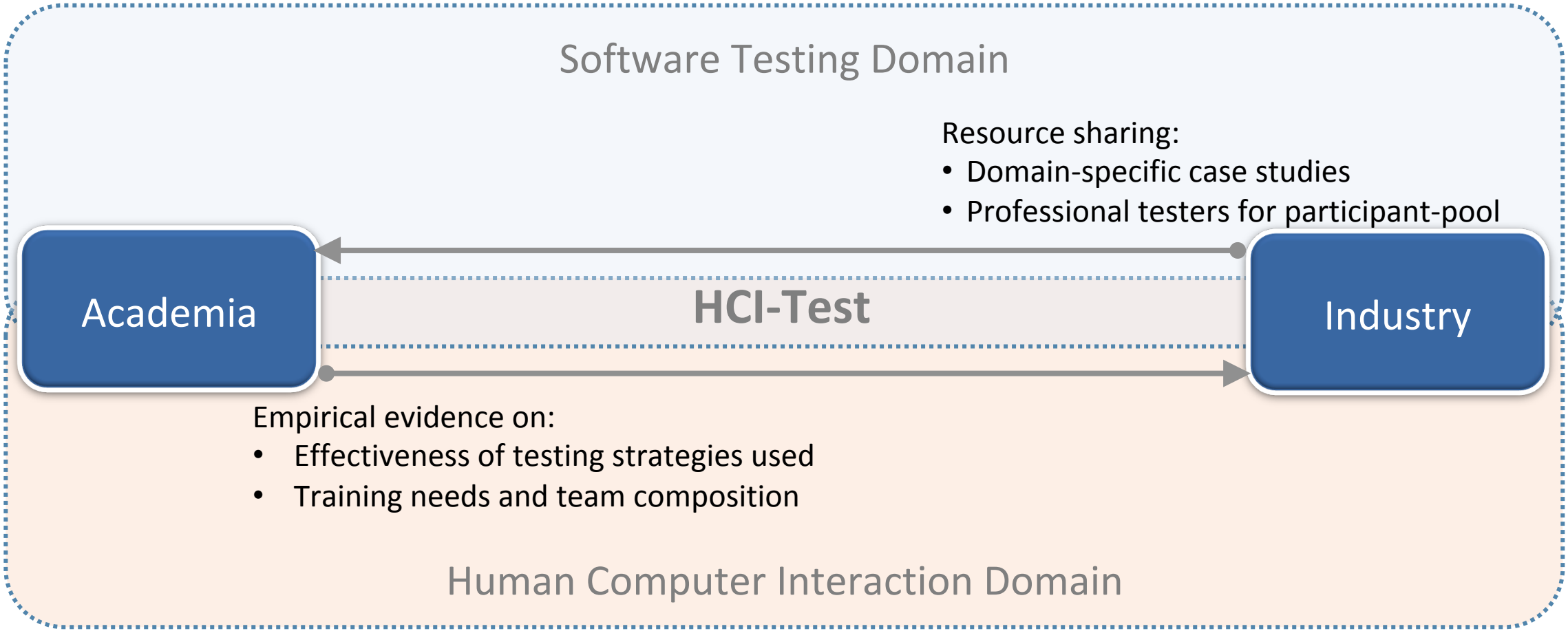
Software Testing Domain

HCI-Test

- Reflective think aloud
- Semi-structured interview
- Eye tracking

Human Computer Interaction Domain

Industry-Academia Collaboration



Experiment Setup: An E-Commerce System

- 20 bugs

Bug Category	Example	#
Content	Spelling mistakes	6
Input validation	Text in numerical field	3
Logical	Incorrect calculations	3
Functional UI	Broken links	6
Non-functional UI	Issues when resizing view	2

Experiment Setup: An E-Commerce System

- 20 bugs
- 20 participants: 10 trained/10 untrained

Experiment Setup: An E-Commerce System

- 20 bugs
- 20 participants: 10 trained/10 untrained

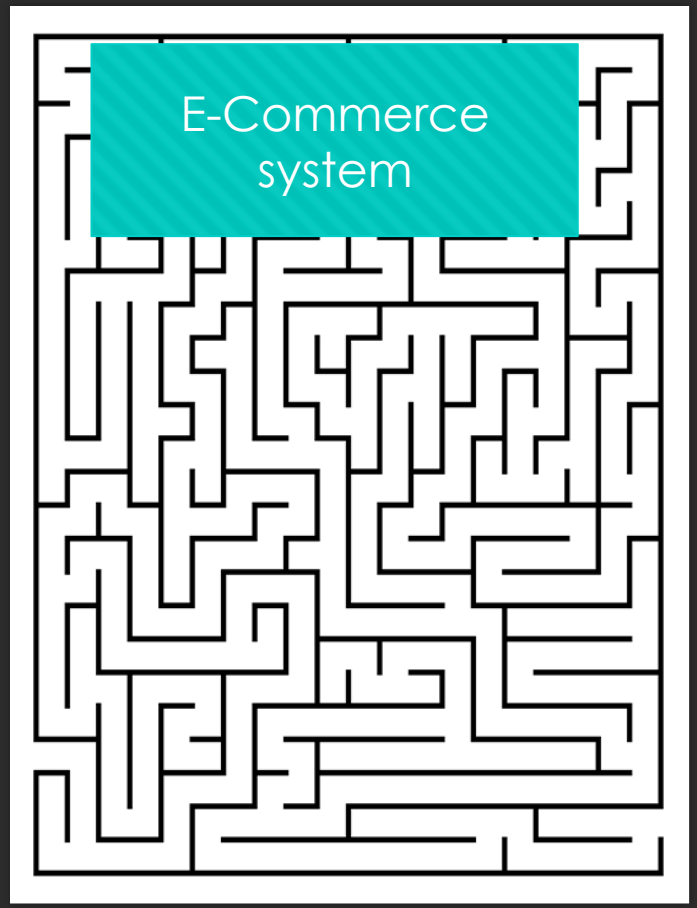
	Carmen				*George*			
ID	Domain	G	A	E	Domain	G	A	E
1	Design	M	36	0	E-comm	F	31	3
2	E-comm	F	51	1	Payments	M	25	3.5
3	Content	M	30	0	E-comm	M	39	13
4	E-comm	M	34	0	Payments	M	27	1.5
5	E-comm	F	37	0	Telco	M	32	3
6	Gaming	M	26	1	Payments	F	23	3
7	E-comm	F	26	0	E-comm	F	27	7
8	E-comm	F	29	0	Payments	M	31	2
9	E-comm	F	24	0	Networks	M	28	6
10	Virtualiz.	M	24	2	Payments	M	21	1
	Median		29.5	0	**Median**		27.5	3
	Mean		31.7	0.4	**Mean**		28.4	4.3

Experiment Setup: An E-Commerce System

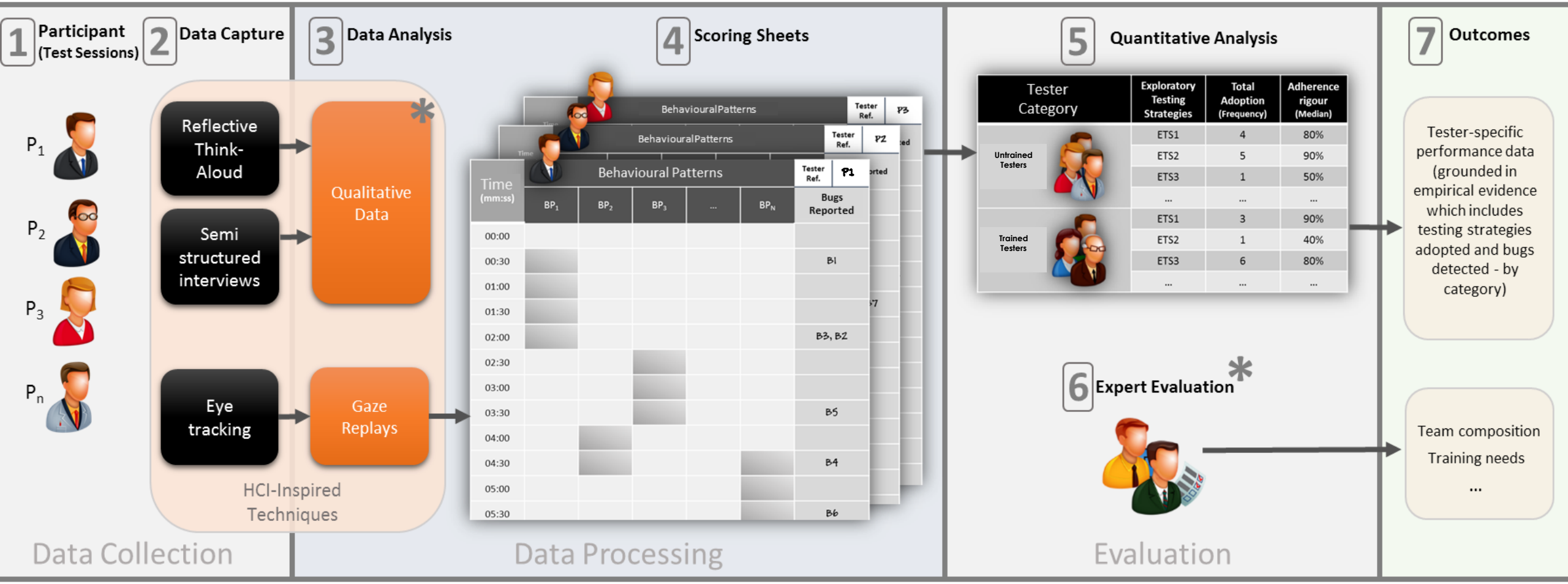
- 20 bugs
- 20 participants: 10 trained/10 untrained
- 7 strategies

Strategy
Exploratory smoke testing
Garbage collectors tour
User interface exploration
Back alley tour
Bad neighbourhood tour
Tour bus strategy
Crime spree tour

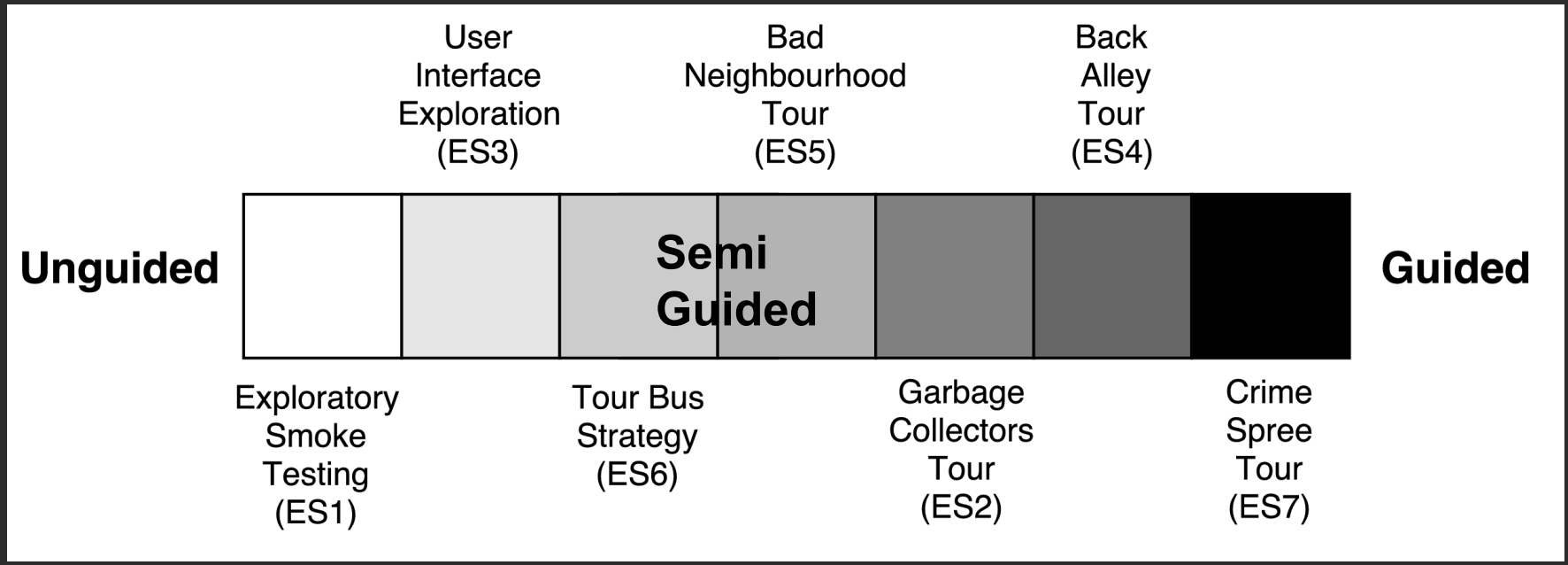
Experiment setup



Protocol Used for this Study



Insights – RQ1 – Strategies vs Testers



RQ1

Strategies used by untrained testers

	Elapsed Time (Minutes)																																							
Carmen	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	2	2	2	2	3	3	3	3	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	1	1	3	3	3	2	2	2	2	3	x	x
2	3	3	3	3	3	3	3	5	5	5	3	3	2	2	1	1	1	1	3	3	3	4	4	4	1	1	1	1	1	3	3	3	5	2	6	3	2	2	2	2
3	3	4	2	6	3	3	1	1	1	1	1	1	7	7	7	7	3	3	3	3	3	3	7	7	7	7	2	2	3	3	3	3	3	3	3	3	3	3	3	3
4	3	5	4	2	3	3	3	3	1	1	1	3	1	1	1	1	4	4	2	4	4	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	2	2	x	
5	7	7	7	1	1	3	3	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3	x	x	x
6	3	7	2	3	3	3	3	3	1	1	1	1	1	3	3	3	3	3	3	3	3	2	2	2	2	2	3	3	1	1	1	1	3	3	3	1	1	1	1	1
7	3	3	3	3	3	3	3	3	3	3	2	1	1	1	3	3	3	3	3	2	2	2	2	3	3	3	2	2	2	3	3	3	3	1	1	4	4	x	x	x
8	3	3	3	3	1	1	1	7	7	7	7	7	7	7	7	7	3	3	3	3	7	7	7	7	7	7	7	7	7	3	3	2	2	2	2	2	2	7	x	x
9	3	3	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	2	2	2	1	1	7	2	2	2	2	2	2	4	4	2	2	2	x	x
10	3	2	6	6	6	1	1	1	1	6	6	3	3	1	7	1	6	6	4	4	3	4	4	3	6	7	2	3	3	3	3	2	1	2	3	1	7	7	1	x

x | No more strategies detected

RQ1

Strategies used by untrained testers

	Elapsed Time (Minutes)																																						
Carmen	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	2	2	2	2	3	3	3	3	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	1	1	3	3	3	2	2	2	2	3	x	x
2	3	3	3	3	3	3	3	5	5	5	3	3	2	2	1	1	1	1	3	3	3	4	4	4	1	1	1	1	1	3	3	3	5	2	6	3	2	2	2	2
3	3	4	2	6	3	3	1	1	1	1	1	1	7	7	7	7	3	3	3	3	3	3	7	7	7	7	2	2	3	3	3	3	3	3	3	3	3	3	3	3
4	3	5	4	2	3	3	3	3	1	1	1	3	1	1	1	1	4	4	2	4	4	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	2	2	x	
5	7	7	7	1	1	3	3	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3	x	x	x
6	3	7	2	3	3	3	3	3	1	1	1	1	1	3	3	3	3	3	3	3	3	2	2	2	2	2	3	3	1	1	1	1	3	3	3	1	1	1	1	1
7	3	3	3	3	3	3	3	3	3	3	2	1	1	1	3	3	3	3	3	2	2	2	2	3	3	3	2	2	2	3	3	3	3	1	1	4	4	x	x	x
8	3	3	3	3	1	1	1	7	7	7	7	7	7	7	7	7	3	3	3	3	7	7	7	7	7	7	7	7	7	3	3	2	2	2	2	2	2	7	x	x
9	3	3	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	2	2	2	1	1	7	2	2	2	2	2	2	4	4	2	2	2	x	x
10	3	2	6	6	6	1	1	1	1	6	6	3	3	1	7	1	6	6	4	4	3	4	4	3	6	7	2	3	3	3	3	2	1	2	3	1	7	7	1	x

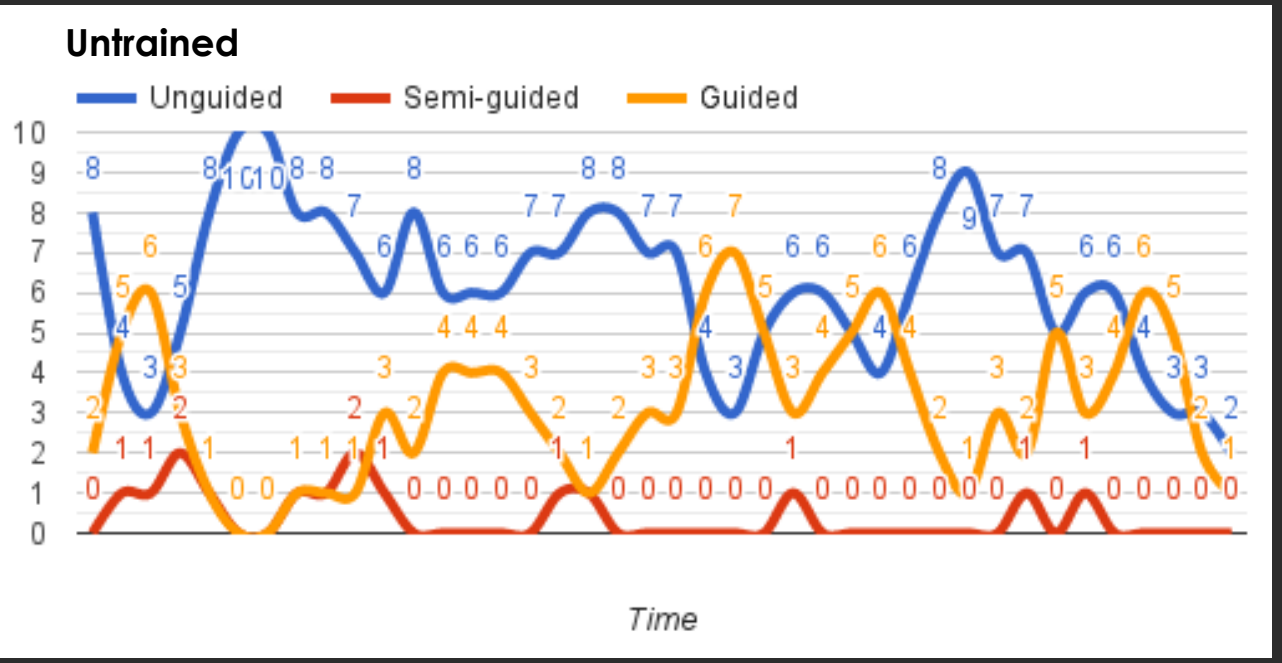
x | No more strategies detected

Strategies used by trained testers

	Elapsed Time (Minutes)																																						
George	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	3	7	7	7	7	3	3	7	7	7	7	7	7	7	5	3	3	3	5	3	7	7	7	7	7	7	7	2	2	2	2	2	2	4	7	7	4	1	1	1
2	3	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	5	1	4	4	1	7	3
3	7	5	3	7	7	1	7	4	1	3	3	1	5	3	4	2	7	1	1	1	2	7	1	1	2	7	7	4	4	4	3	3	3	3	3	3	3	3	1	x
4	1	3	1	1	1	2	2	7	7	1	7	7	7	3	3	3	3	3	3	1	1	1	3	5	5	5	5	5	5	1	7	3	3	4	4	1	1	x	x	x
5	7	7	3	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	3	5	5	1	1	1	1	1	2	2	1	1	1	3	1	7	7	3	1	2	x
6	5	3	3	3	3	3	2	5	5	5	5	1	1	3	3	3	1	3	3	3	3	3	3	3	3	3	3	5	5	4	7	7	7	1	1	1	1	1	1	x
7	1	1	3	3	3	5	1	1	1	1	1	2	2	2	2	2	3	3	1	1	1	1	1	1	2	4	4	4	4	4	3	3	3	3	3	3	1	1	7	x
8	1	2	3	3	3	3	3	3	3	7	7	7	7	7	7	7	3	4	4	4	4	4	4	1	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
9	1	2	1	5	7	7	7	7	1	7	7	3	1	4	3	3	3	3	1	1	4	7	7	5	5	5	2	7	7	3	7	7	2	2	2	7	7	1	1	x
10	7	3	2	3	3	4	4	4	1	7	3	4	4	4	7	7	3	3	1	7	7	3	3	7	7	7	2	1	3	7	2	4	6	x	x	x	x	x	x	x

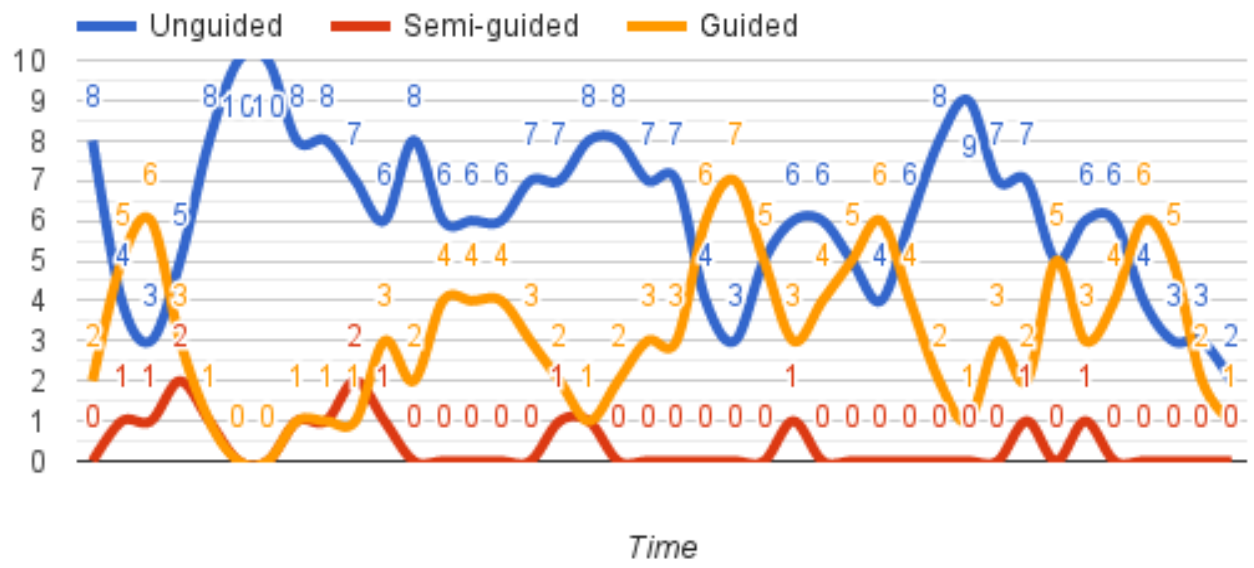
x | No more strategies detected

Insights – RQ1

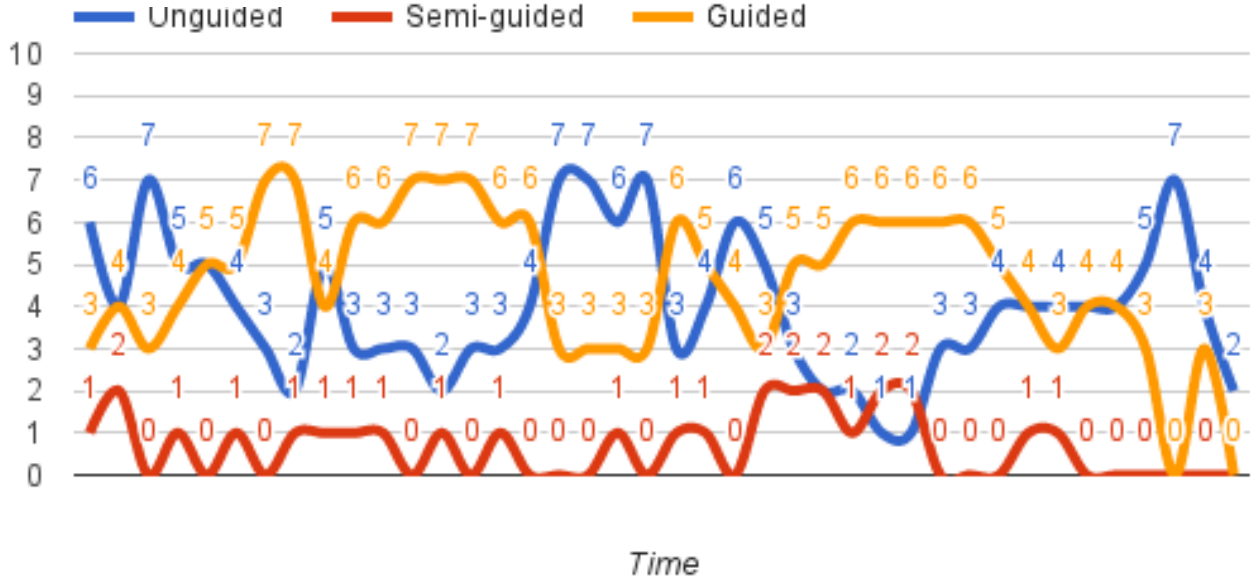


Insights – RQ1

Untrained



Trained



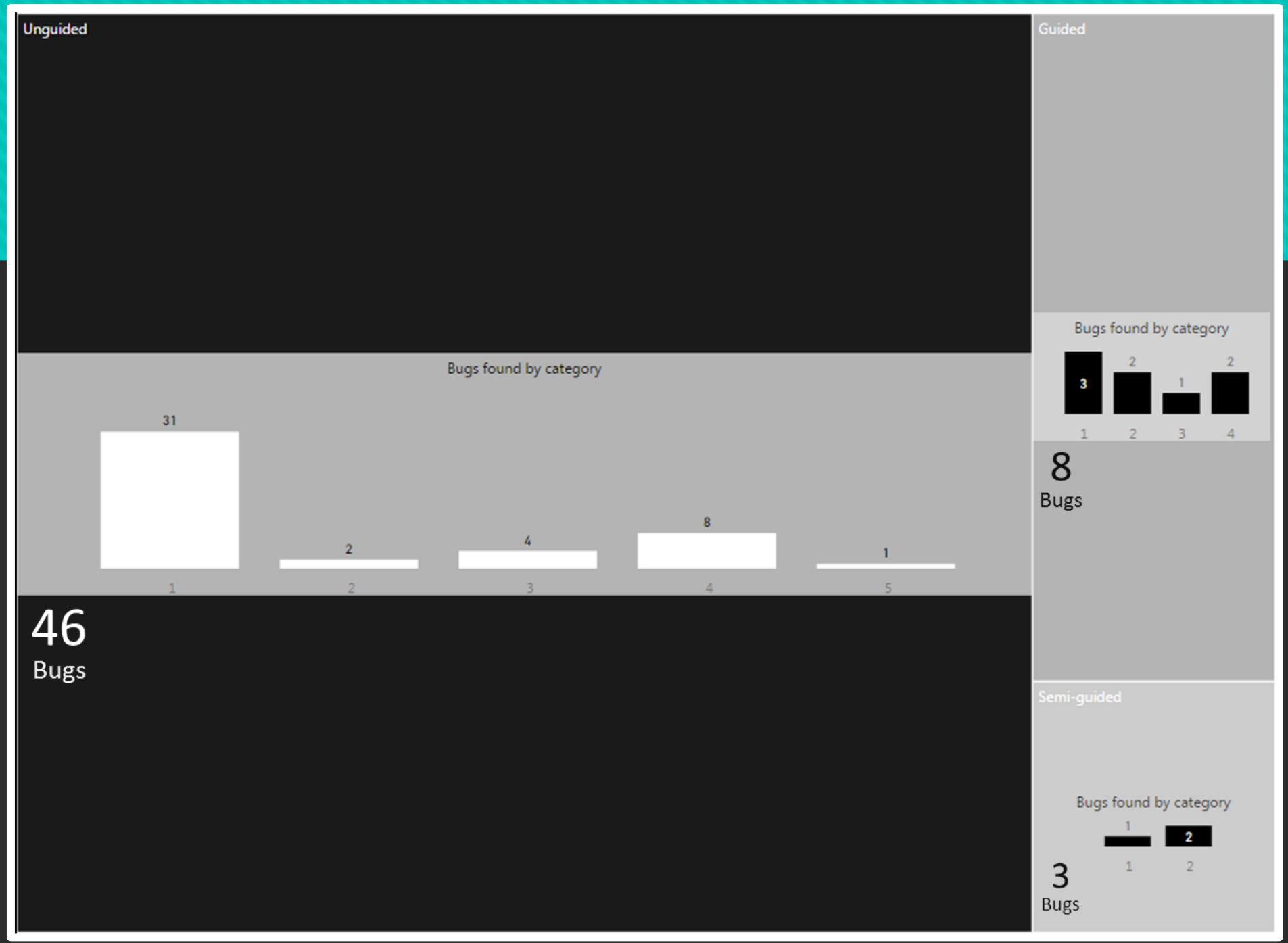
Insights – RQ2 – Bugs Reported & Covered

#	Bug Category	Example	Untrained	Trained
1	Content	Spelling mistakes	35	30
2	Input validation	Text in numerical field	6	23
3	Logical	Incorrect calculations	5	5
4	Functional UI	Broken links	10	11
5	Non-functional UI	Issues when resizing view	1	8
		Totals (bugs reported)	**57**	**77**
		Totals (bug coverage)	**70%**	**95%**

RQ3 – Bugs found by strategy

Insights – RQ3

Untrained Testers

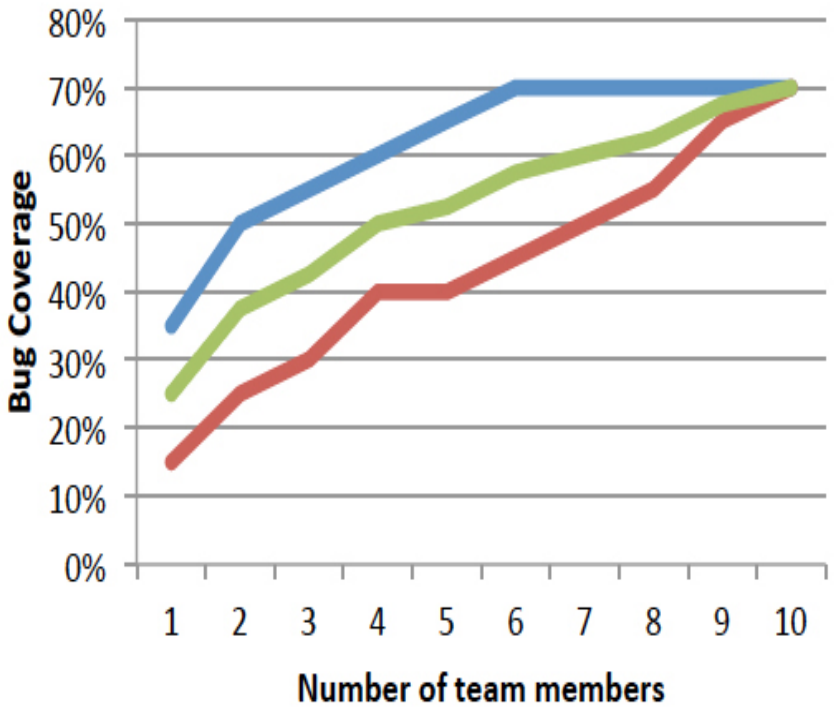


Insights – RQ3

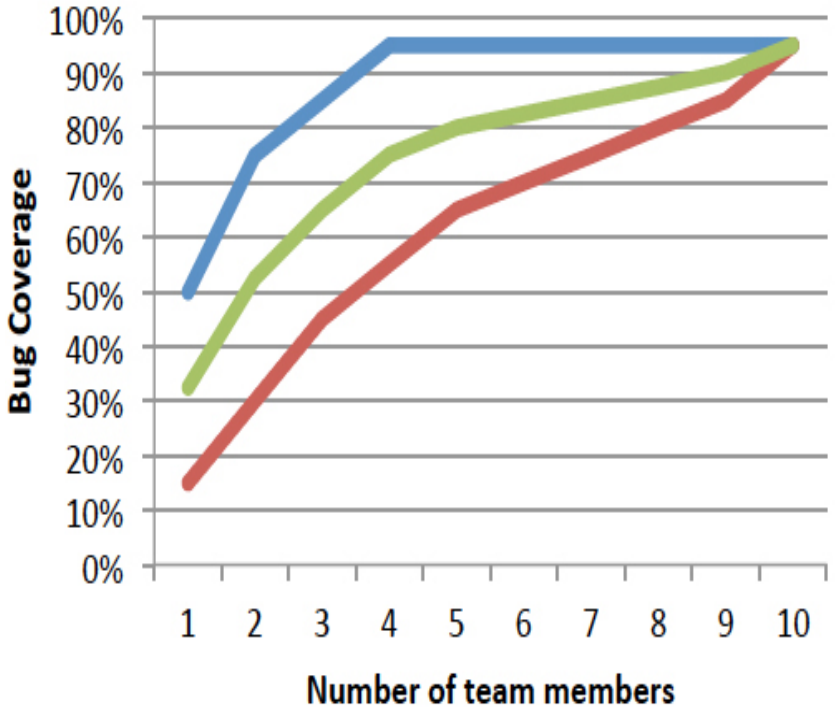
Trained Testers

Bonus Insights – Team Composition

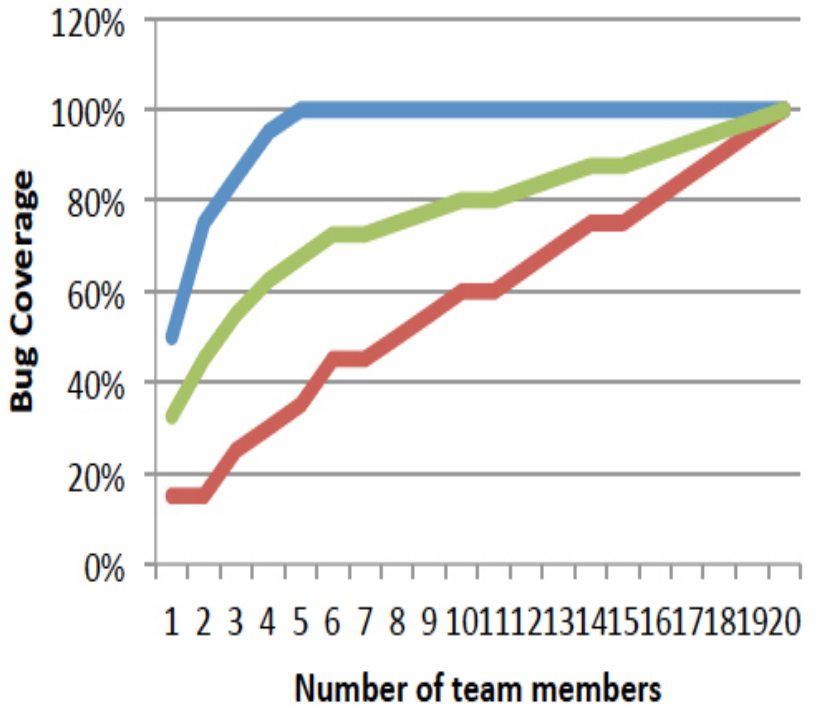
Untrained Only



Trained Only



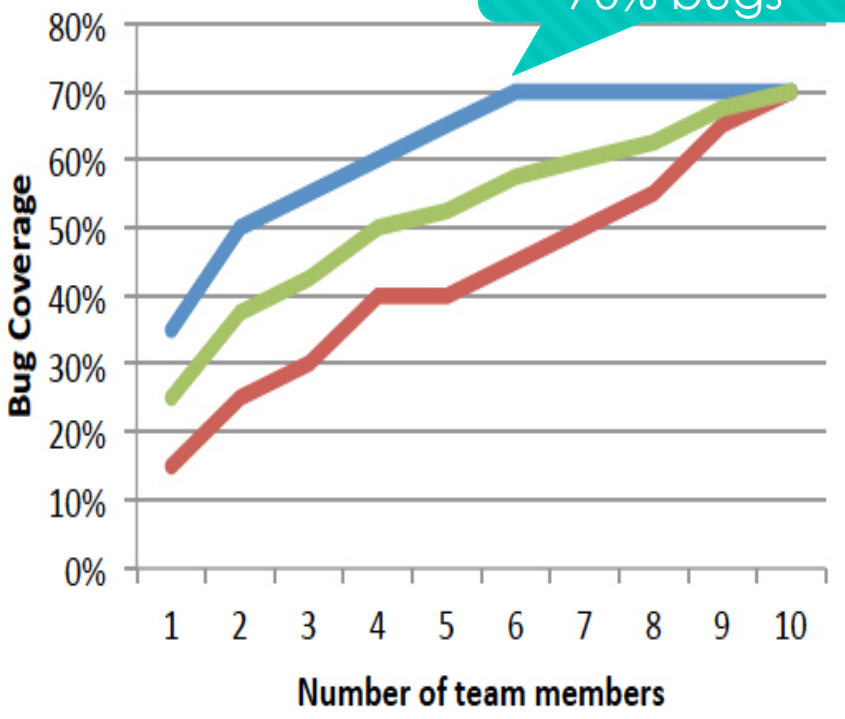
Untrained and Trained



Bonus Insights – Team Composition

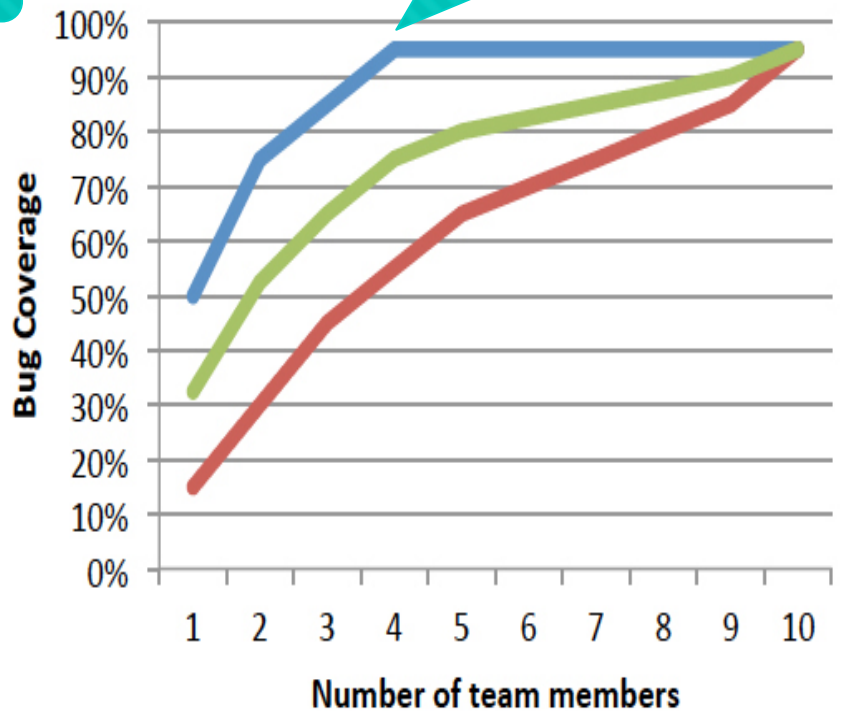
Untrained Only

6 members
70% bugs

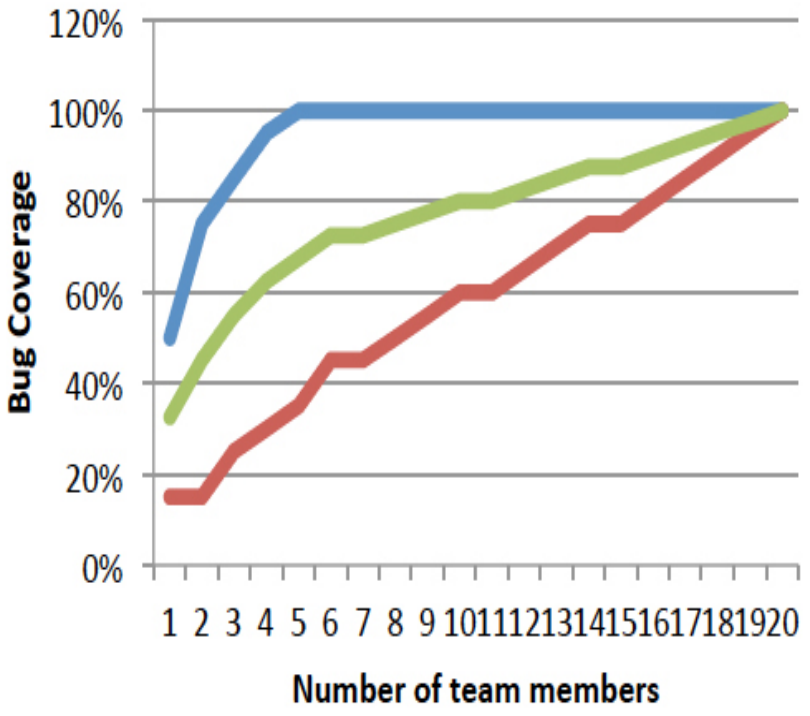


Trained Only

4 members
95% bugs



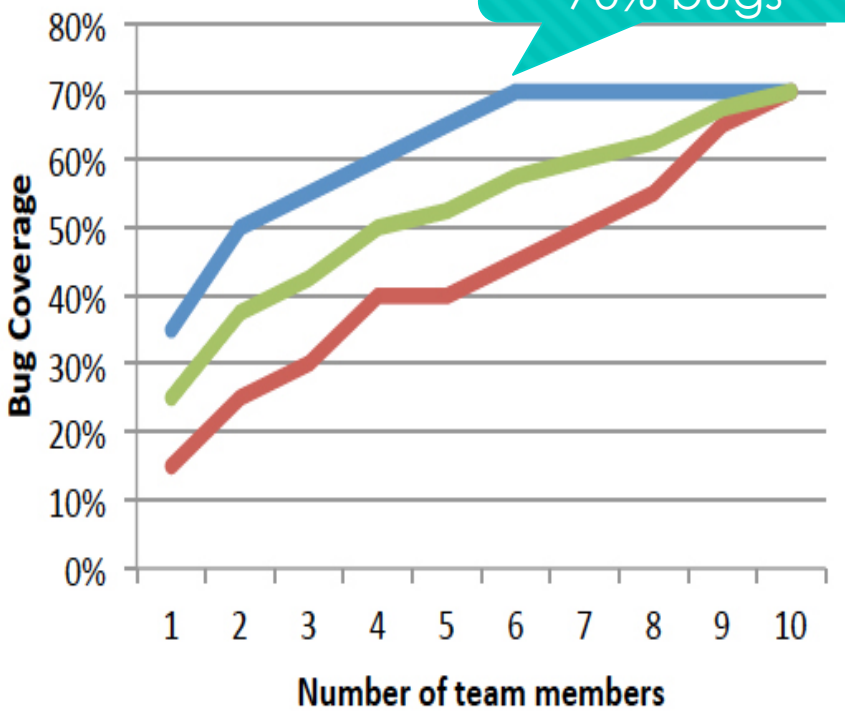
Untrained and Trained



Bonus Insights – Team Composition

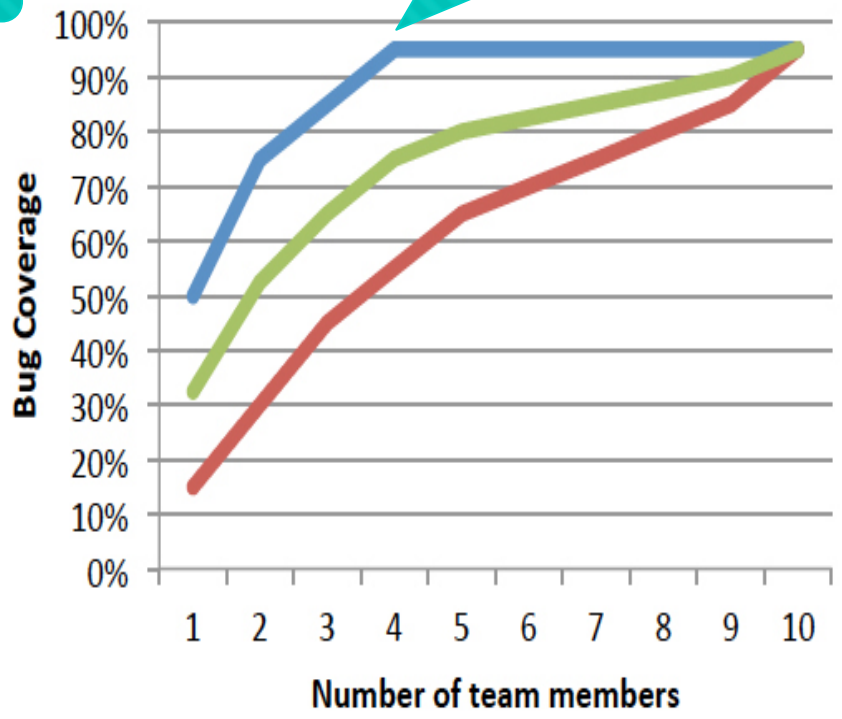
Untrained Only

6 members
70% bugs



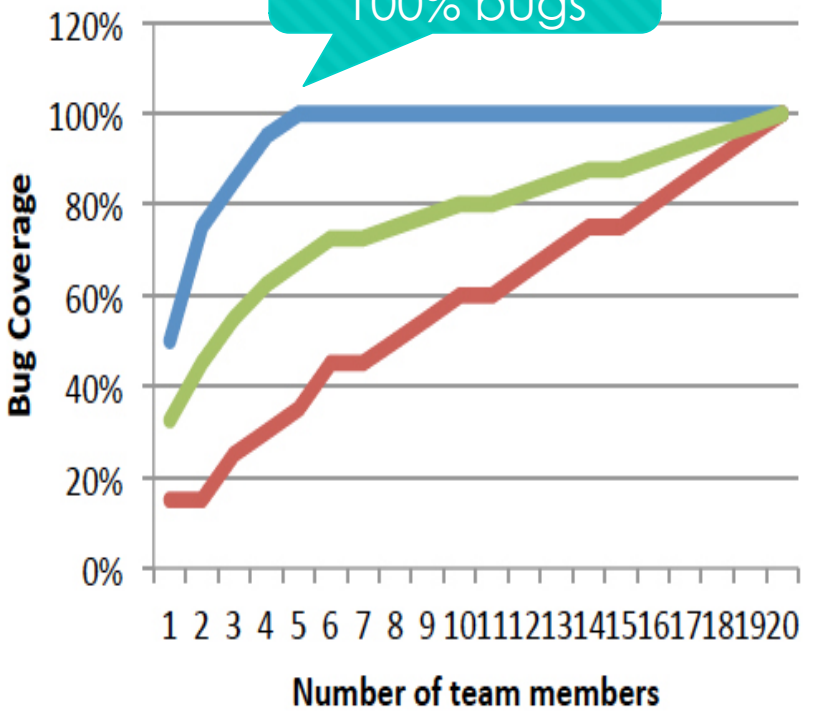
Trained Only

4 members
95% bugs



Untrained

4+1 members
100% bugs



Takeaways

- A **methodology** to gather empirical data on exploratory tester's behaviour
- Insights guide t**eam-composition** and **training** related decisions
  - Trained testers use more guided strategies
  - Trained testers find more bugs
  - Trained testers didn't find all bugs
- Outcomes encourage **further collaboration** between academia (HCI/SE) and the testing community, helping to evolve processes and techniques in both domains

Thank you!

Mark Micallef mark.micallef@um.edu.mt

Chris Porter chris.porter@um.edu.mt

Andrea Borg andrea.borg.12@um.edu.mt