

# Better, Faster, and Cheaper: What is Better Software?

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# Defects

Quality for whom?

# Defects

Definition?



# Example

Not interested in SW anymore,  
I want to publish a fantasy book!

# Example: Market Analysis

- Theme: Kind of scary?
- Plot: Quest
- Characters: Fantastic Creatures

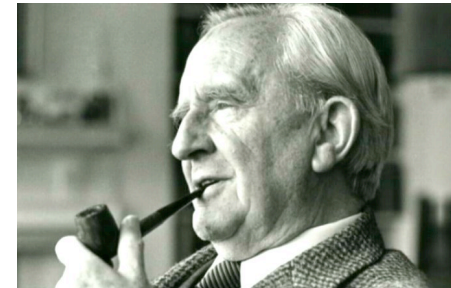
# Example: Market Analysis

- Theme: Kind of scary?
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- Add some philosophy?



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# Example: Consult



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# Example: Consult

A photograph of a restaurant bill. The bill is white with black text. It lists various food and drink items with their prices. At the bottom, the total is highlighted in yellow. A hand is visible on the right side, pointing to the total. The background of the photo shows a dark, patterned curtain.

1 MARE MONTE SPAGHETTI	\$39.00
1 RIGATONI SICILIANA	\$36.00
1 MILANESA	\$55.00
1 INSALA CARCIOFI	\$18.00
2 PARMESAN CHUNKS	\$28.00
1 LG WATER	\$12.00
5 TANNY 40	\$275.00
2 TRUFFLE CARPACCIO	\$200.00
2 ASPARAGUS NELLO	\$60.00
3 CAPPUCCINO	\$27.00
2 CALAM. FRITTI	\$40.00
2 PROSC. MOZARELLA	\$68.00
2 ESPRESSO	\$15.00
1 TIRAMISU	\$15.00
1 MINESTRONE VERO	\$18.00
3 LA TACHE ROMANEE CO	\$15000.00
2 CHATEAU PETRUS	\$10000.00
2 J.W. BLUE	\$150.00
3 TRUFFLE TAGLIOLINI	\$585.00
2 CRISTAL ROSE nagnum	\$10000.00
	\$36841.00
TAX	: \$3251.89
SUB-TOTAL	: \$39892.89
20% GRAT	: \$7328.20
<b>TOTAL</b>	<b>\$47221.09</b>

THANK YOU

# Example: Design

There should be 5+ Elves

At least 3 dwarves...

An army of orcs led by a diverted wizard.

When one wears the ring, he should be invisible to everyone but the bad guy...

~~The ring cannot be destroyed~~

The ring can be destroyed in 20000 Celcius....

Kill the good wizard then resurrect three chapters later...

Last minute victory for good guys

Talking trees!  
not trees, let's say "ent"

Perfect way to describe the bad guy:

"A lidless eye in flames"

# Example: Writing



# Example: Co-author



# Example: First draft



# Example: Proof-read



well never says it directly, the  
ression of the author's disgust  
he behavior and <sup>the diction</sup> ~~quotes~~ of these  
tion makes ~~this~~ disgust appe  
say, <sup>and</sup> in many different plac  
<sup>main</sup> ~~on~~ of these ~~characters~~.



# Example: Improve



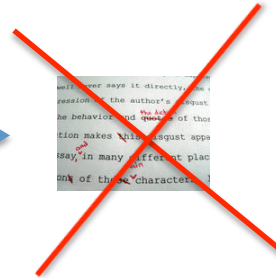
# Example: Improve



# Example: The Book

*Ruler of  
the Disk*

by  
B. Turhan



# Defects

Quality for vendor

?

Quality for end-user

# RoboCup

“By mid-21st century, a team of fully autonomous humanoid robot soccer players shall win the soccer game, comply with the official rule of the FIFA, against the winner of the most recent World Cup.”



# RoboCup

“In the league, all teams use identical (i.e. standard) robots. Therefore the teams concentrate on software development only, while still using state-of-the-art robots. The robots operate fully autonomously, i.e. there is no external control, neither by humans nor by computers.”



hogazici university, turkey



# Quality Measure

$$perf_{TX} = \frac{1}{n} \sum_{i=1}^n gs_i - gc_i$$

# Case study

Team A & Team B

Real-time, embedded, *competing*

# Summary

metric	TA	TB
Standing (in 24)	1st	16th-24th
Avg. goals scored	>4	<1
Avg. goals conceded	<1	>3
Wins/draws/loses	7/1/0	0/1/2
Overall performance score	3.25	-3.00

# Hypotheses

metric	$H_0$	$H_A$
cc	$CC_{TA} = CC_{TB}$	$CC_{TA} \neq CC_{TB}$
lcom	$LCOM_{TA} = LCOM_{TB}$	$LCOM_{TA} \neq LCOM_{TB}$
rfc	$RFC_{TA} = RFC_{TB}$	$RFC_{TA} \neq RFC_{TB}$
wmc	$WMC_{TA} = WMC_{TB}$	$WMC_{TA} \neq WMC_{TB}$
cbo	$CBO_{TA} = CBO_{TB}$	$CBO_{TA} \neq CBO_{TB}$
noc	$NOC_{TA} = NOC_{TB}$	$NOC_{TA} \neq NOC_{TB}$
dit	$DIT_{TA} = DIT_{TB}$	$DIT_{TA} \neq DIT_{TB}$
perf	$PERF_{TA} = PERF_{TB}$	$PERF_{TA} \neq PERF_{TB}$

# Data

metric	#data		median		min		max	
	TA	TB	TA	TB	TA	TB	TA	TB
cc	534	31	8	45	0	0	883	1228
lcom	534	31	3	9	0	1	83	52
rfc	534	31	7	20	0	0	133	81
wmc	534	31	3	18	0	0	70	56
cbo	534	31	1	0	0	0	31	9
noc	534	31	0	0	0	0	24	0
dit	534	31	0	0	0	0	3	0
perf	8	3	4	-3	0	-6	5	0

# Results

$H_0$	Reject	Direction	p-value
cc	<b>yes</b>	TA < TB	<b>&lt;0.001</b>
lcom	<b>yes</b>	TA < TB	<b>&lt; 0.001</b>
rfc	<b>yes</b>	TA < TB	<b>&lt; 0.001</b>
wmc	<b>yes</b>	TA < TB	<b>&lt; 0.001</b>
cbo	<b>yes</b>	TA > TB	<b>0.0115</b>
noc	no	TA = TB	0.0929
dit	<b>yes</b>	TA > TB	<b>0.0188</b>
perf	<b>yes</b>	TA > TB	<b>0.0189</b>

# Limitations

- *bool* isComparable(TeamA, TeamB)
- *bool* winByChance(TeamX)
- *bool* apply(otherContext)

# Summary & Conclusions

Using defects as a quality measure for the stakeholders who undertake the project is reasonable. However, it has limited/no value for capturing end-users perception for quality above the baseline.



# Summary & Conclusions

The team that has achieved a significantly higher performance in the tournament also has significantly better design characteristics.

# Summary & Conclusions

Robotic soccer may be a new source  
of data for the community.

# Future Work

Is there an association between design and “quality”?

OR

Does good design necessarily lead to “good” products?

# Thanks!

## Q&A

This research is partially supported in Finland by Tekes under Cloud-SW project, and in Turkey by Tubitak