

Seminar Software Qualität

Auftaktveranstaltung

Maximilian Junker

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Informatik IV: Software & Systems Engineering

Prof. Dr. Dr. h.c. Manfred Broy

Organisatorisches

Termin für das Seminar

Optionen: 22. Januar – 2. Februar

Bitte in Doodle eintragen:

<https://doodle.com/poll/wn8ci39d88xq5uug>

Termine

- Version 1.0 Seminararbeit: 2 Wochen vor Vortrag
- Probevortrag (verpflichtend): 2 Wochen vor Vortrag
- Finale Abgabe Seminararbeit: 1 Woche nach Vortrag

Agenda

1. Organisatorisches
- 2. Software Qualität – Eine Motivation**
3. Effektiv Präsentieren
4. Literaturrecherche

Software Qualität

Eine Motivation

Maximilian Junker

**(mit Folien von Benedikt Hauptmann, Henning Femmer, und
Florian Deissenböck)**

Technische Universität München

Informatik IV: Software & Systems Engineering

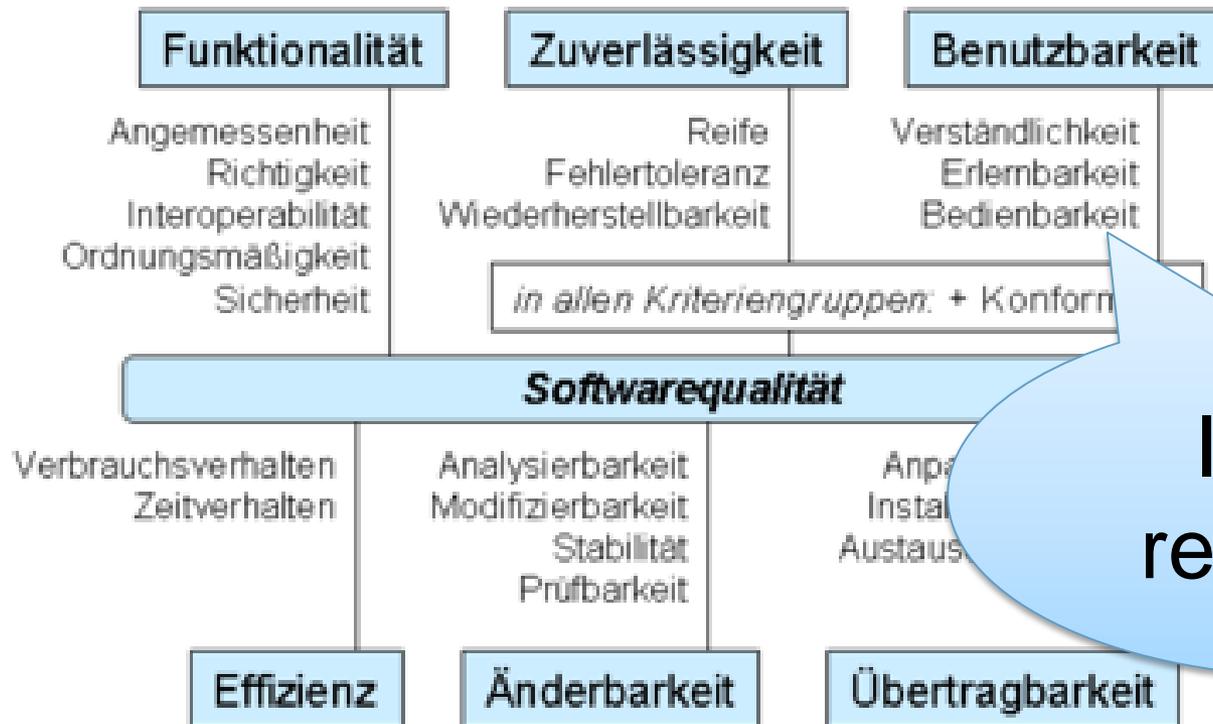
Prof. Dr. Dr. h.c. Manfred Broy

Agenda

1. Software Qualität?
2. Qualität von Sourcecode
3. Qualität von Anforderungen
4. Qualität von Tests
5. Tools für die Qualitätssicherung

Software Qualität fassen – Qualitätsmodelle

Qualitätsmerkmale von Softwaresystemen (ISO 9126)



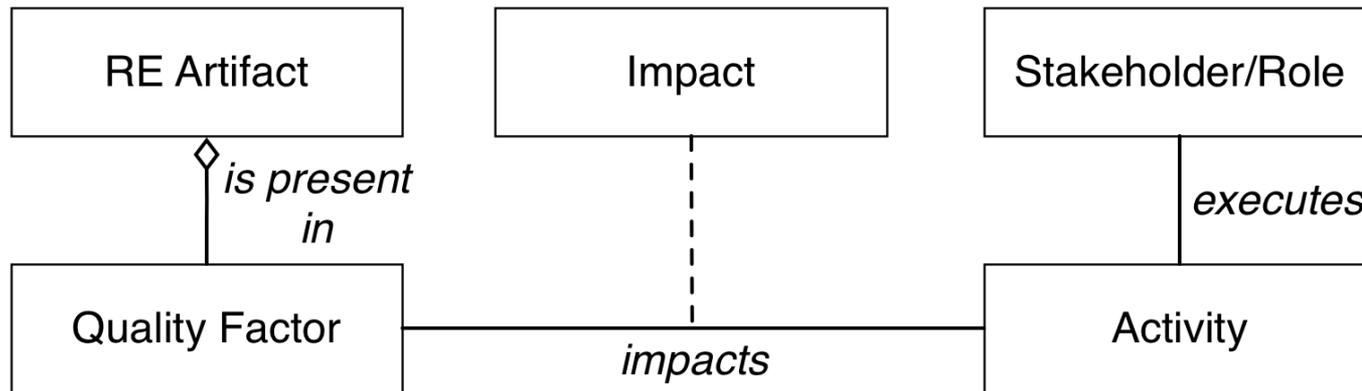
Unterschiedliche Qualitätsmodelle – Was nun?

Set of Reqs. / Reqs. Document	(Individual) Requirements	Requirements Language Criteria
Consistent	Unambiguous	Superlatives
Complete	Necessary	Subjective Language
Affordable	Consistent	Vague Pronouns
Bounded	Complete	Ambiguous Adverbs and Adjectives
Unambiguity	Traceable	Open-ended, non- verifiable. Terms
Clear Structure	Verifiable	Comparatives
Modifiability and Extensibility	Feasible	Loopholes
Traceability	Implementation Free	Incomplete References
	Singular	Negatives Statements
	Agreed	Short Sentences and Paragraphs
	Understandable	One Req. per Sentence

Key:	ISO 29148 & IREB Characteristics
	ISO 29148 Characteristic
	IREB Characteristics

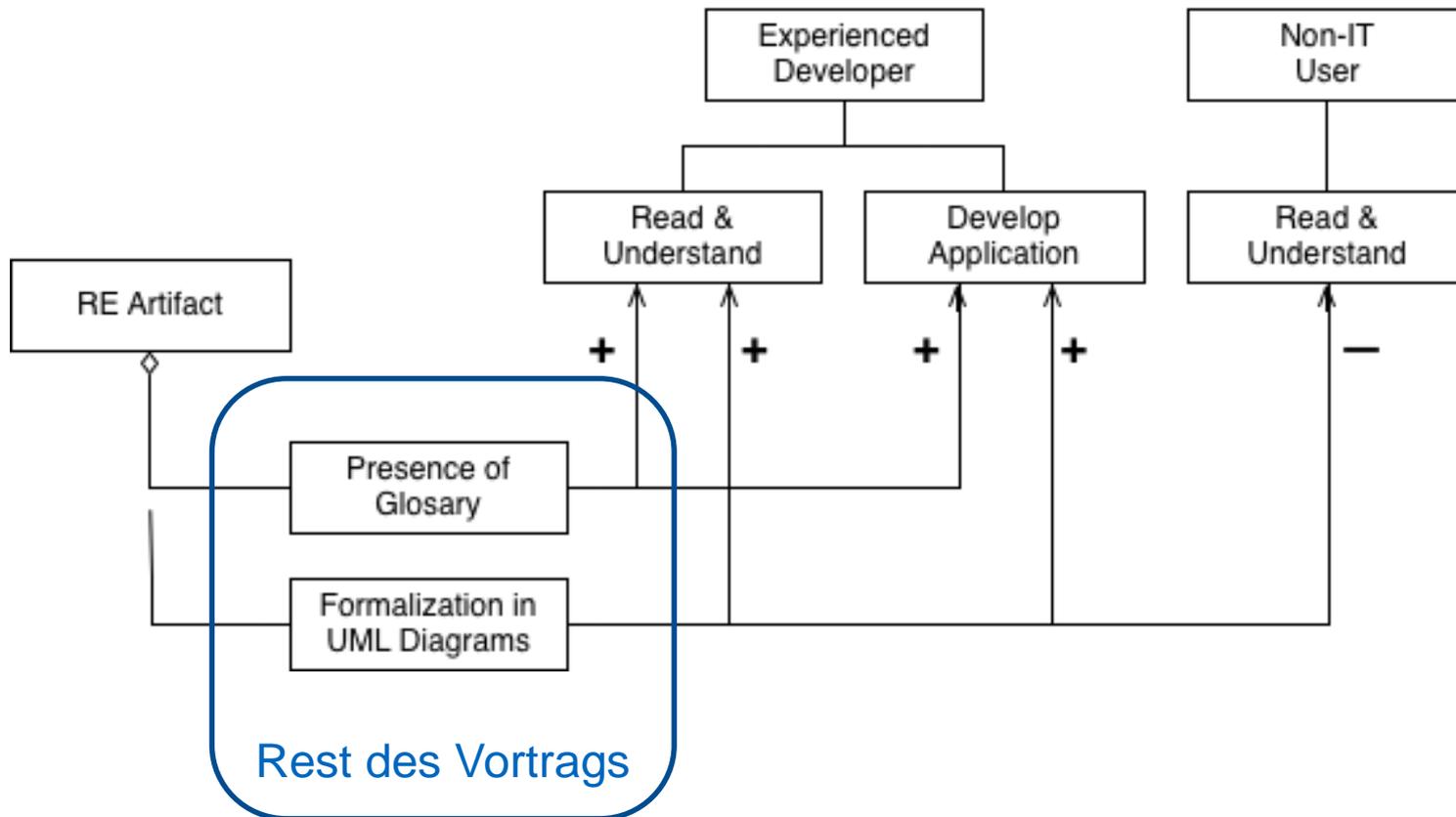
Aktivitätsorientierte Qualitätsmodelle

Beispiel Requirements Engineering



Aktivitätsorientierte Qualitätsmodelle

Beispiel Requirements Engineering



```
socket.error, (errno, strerror):
print "ncfiles: Socket error (%s) for host %s (%s)" % (errno, host, ip)

ncfiles: Urllib2 error (%s)" % msg
output")

for h3 in page.findAll("h3"):
value = (h3.contents[0])
if value != "Afdeling":
print >> txt, value
import codecs
f = codecs.open("alle.txt", "r", encoding="utf-8")
text = f.read()
f.close()
# open the file again for writing
f = codecs.open("alle.txt", "w", encoding="utf-8")
f.write(value+"\n")
# write the original contents
```

Potentielle Bugs

```

46- protected static Properties getPreferences() {
47     if (fPreferences == null) {
48         fPreferences = new Properties();
49         fPreferences.put("loading", "true");
50         fPreferences.put("filterstack", "true");
51         readPreferences();
52     }
53     return fPreferences;
54 }
--

```

Bug Info
🔥 🔥 🔥

BaseTestRunner.java: 47

Navigation

Incorrect lazy initialization and update of static field junit.runner.BaseTestRunner.fPreferences in junit.runner.BaseTestRunner.getPreferences()
On field junit.runner.BaseTestRunner.fPreferences

Bug: Incorrect lazy initialization and update of static field junit.runner.BaseTestRunner.fPreferences in junit.runner.BaseTestRunner.getPreferences()

This method contains an unsynchronized lazy initialization of a static field. After the field is set, the object stored into that location is further updated or accessed. The setting of the field is visible to other threads as soon as it is set. If the further accesses in the method that set the field serve to initialize the object, then you have a *very serious* multithreading bug, unless something else prevents any other thread from accessing the stored object until it is fully initialized.

Even if you feel confident that the method is never called by multiple threads, it might be better to not set the static field until the value you are setting it to is fully populated/initialized.

Rank: Scary (6), **confidence:** High
Pattern: LI LAZY INIT UPDATE_STATIC

Formatierung



```

        hashOut.data = hashes + SSL_MD5_DIGEST_LEN;
hashOut.length = SSL_SHA1_DIGEST_LEN;
if ((err = SSLFreeBuffer(&hashCtx)) != 0)
    goto fail;

if ((err = ReadyHash(&SSLHashSHA1, &hashCtx)) != 0)
    goto fail;
if ((err = SSLHashSHA1.update(&hashCtx, &clientRandom)) != 0)
    goto fail;
if ((err = SSLHashSHA1.update(&hashCtx, &serverRandom)) != 0)
    goto fail;
if ((err = SSLHashSHA1.update(&hashCtx, &signedParams)) != 0)
    goto fail;
    goto fail;
if ((err = SSLHashSHA1.final(&hashCtx, &hashOut)) != 0)
    goto fail;

err = sslRawVerify(ctx,
                  ctx->peerPubKey,
                  dataToSign,
                  dataToSignLen,
                  signature,
                  signatureLen);
/* plaintext */
/* plaintext length */

if(err) {
    sslErrorLog("SSLDecodeSignedServerKeyExchange: sslRawVerify "
               "returned %d\n", (int)err);
    goto fail;
}

fail:
SSLFreeBuffer(&signedHashes);
SSLFreeBuffer(&hashCtx);
return err;

```

Schachtelungstiefe

```
for (const_iterator<Permission> permission =
    permissions.begin();
    permission != permissions.end(); ++permission) {
    if (!permission->isInternal()) {
        if (user->hasPermission (permission)) {
            cout << " " << permission << endl;
        }
    }
}
} /* bezieht sich auf if in Zeile 172 */
}
```

Klone

```

public String format(String field) {
    int i;
    field = field.replaceAll("&\\\\\\\\\\\\\\\\&", "&amp;").replaceAll("[\\n](1,)", "<p>");

    StringBuffer sb = new StringBuffer();
    StringBuffer currentCommand = null;

    char c;
    boolean escaped = false, incommand = false;

    for (i = 0; i < field.length(); i++) {
        c = field.charAt(i);
        if (escaped && (c == '\\')) {
            sb.append('\\');
            escaped = false;
        } else if (c == '\\') {
            if (!incommand) {
                /* Close Command */
                String command = currentCommand.toString();
                Object result = CHARS.get(command);
                if (result != null) {
                    sb.append((String) result);
                } else {
                    sb.append(command);
                }
            }
            escaped = true;
            incommand = true;
            currentCommand = new StringBuffer();
        } else if (!incommand && (c == '{' || c == '}')) {
            // Swallow the brace.
        } else if (Character.isLetter(c) || (c == '%')
            || (Globals.SPECIAL_COMMAND_CHARS.indexOf(String.valueOf(c)) >
                escaped = false;

        if (!incommand)
            sb.append(c);
            // Else we are in a command, and should not keep the letter.
        else {
            currentCommand.append(c);
            testCharCom: if ((currentCommand.length() == 1)
                && (Globals.SPECIAL_COMMAND_CHARS.indexOf(currentComm

```

```

public String format(String field) {
    int i;
    field = field.replaceAll("&\\\\\\\\\\\\\\\\&", "&amp;").replaceAll("[\\n](1,)", "<p>");

    StringBuffer sb = new StringBuffer();
    StringBuffer currentCommand = null;

    char c;
    boolean escaped = false, incommand = false;

    for (i = 0; i < field.length(); i++) {
        c = field.charAt(i);
        if (escaped && (c == '\\')) {
            sb.append('\\');
            escaped = false;
        } else if (c == '\\') {
            if (!incommand) {
                /* Close Command */
                String command = currentCommand.toString();
                Object result = Globals.HTML_CHARS.get(command);
                if (result != null) {
                    sb.append((String) result);
                } else {
                    sb.append(command);
                }
            }
            escaped = true;
            incommand = true;
            currentCommand = new StringBuffer();
        } else if (!incommand && (c == '{' || c == '}')) {
            // Swallow the brace.
        } else if (Character.isLetter(c) || (c == '%')
            || (Globals.SPECIAL_COMMAND_CHARS.indexOf(String.valueOf
                escaped = false;

        if (!incommand)
            sb.append(c);
            // Else we are in a command, and should not keep the letter.
        else {
            currentCommand.append(c);
            testCharCom: if ((currentCommand.length() == 1)
                && (Globals.SPECIAL_COMMAND_CHARS.indexOf(currentComm

```

Anforderungsqualität



*The system generates relations to **other** files, based on attribute values.*

*The controls shall be illuminated where **appropriate.***

*The device shall allow the user to request recommendations in **as few** **steps as possible.***

Undefinierte Akronyme

ERTMS/ETCS	The ETCS part of ERTMS
MA	Movement Authority
RBC	Radio Block Centre

The ERTMS/ETCS on-board equipment shall send an MA request to the RBC and wait. If an SR authorisation is received from RBC, the process shall go to S24.



Unvollständige Anforderungen

Platzhalter und

Standardtexte

*[This section contains the
preconditions of the use case.]*

tbd.

Klone

Copy & Paste Reuse (*Cloning*) führt zu

1. Höheren Wartungsaufwänden
2. Inkonsistenzen

[REQ101]

Component A must receive data and confirmation.

[REQ201]

Component B must receive data and confirmation.

•••

[REQ801]

Component C must receive data and confirmation.

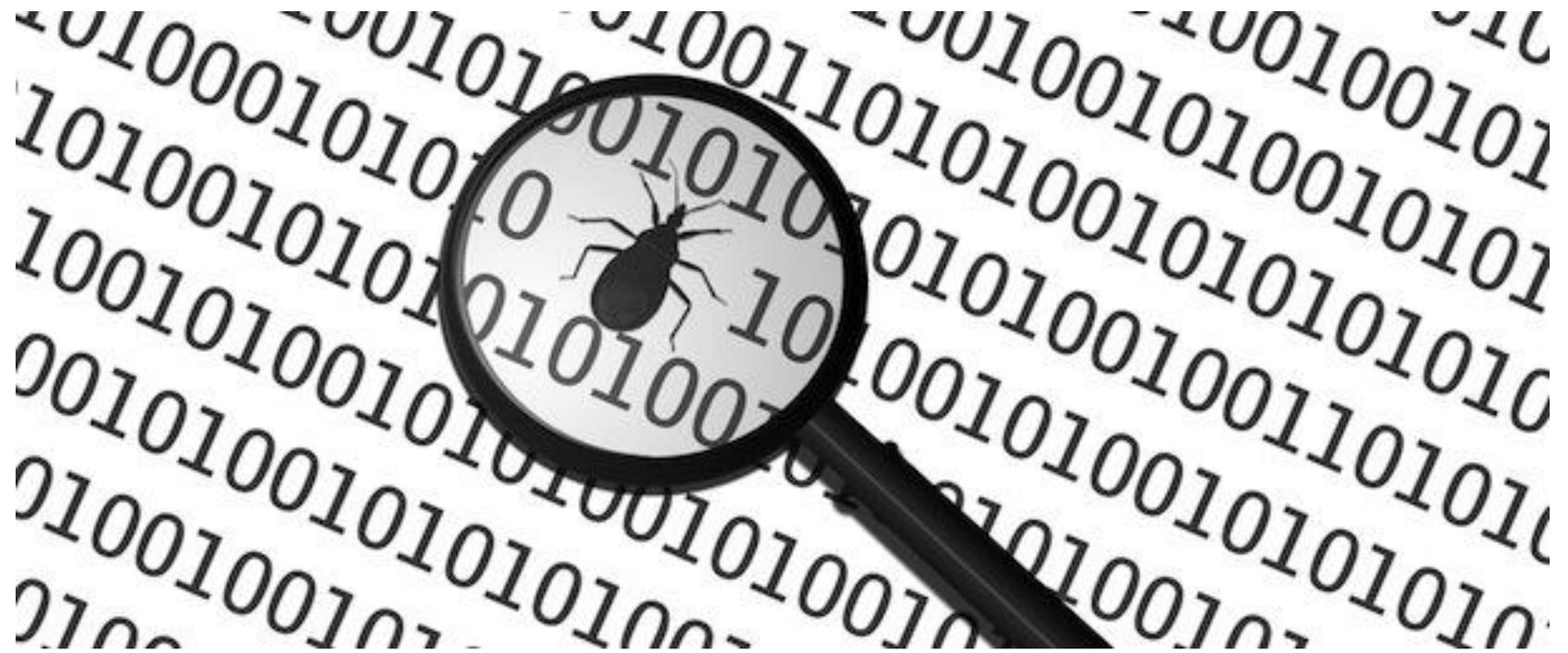
[REQ401]

The component D must receive data and confirmation.

[REQ501]

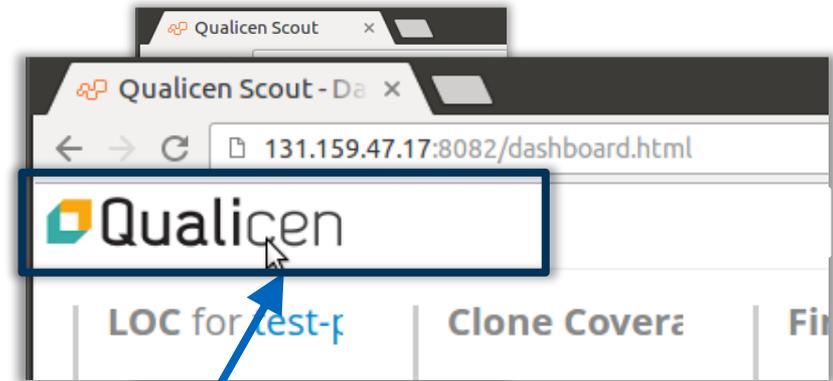
Component E must receive **sender name** , data, and confirmation.

Testqualität



Fragile Tests

#	Action				
1	Mouse	Click	Left	Relative	↔ UsernameField
2	Key Sequence	admin			↔ UsernameField
3	Mouse	Click	Left	Relative	↔ PasswordField
4	Key Sequence	admin			↔ PasswordField
5	Mouse	Click	Left	Relative	↔ LoginButton
6	Validate	Exists			↔ QualicenLogoDashboard



Item	Path
Login_Dialog	Base: /dom[@caption='Qualicen Scout' and @page='login.html' and @path='/login.html' and @browsername='Mozilla']
↔ UsernameField	./input[#'username-field']
↔ PasswordField	./input[#'password-field']
↔ LoginButton	./button[#'login-button']
Main_Windows	Base: /dom[1]
↔ AccountPopupButton	./img[#'account-popup-button']
↔ Logout	./div[#:'1']/div[@innertext='logout']
↔ QualicenLogoDashboard	body/div[10]/img[@src='http://131.159.47.17:8082/images/teamscale']



Neuer Server?

Ineffektive Tests

176832_SecurityTrimmingIsAppliedToSearchResults

[CONTENT]

Validation Ratio



Valid

Name

Just 17 out of 125 step(s) of this test are validating steps. (13.60%)

Setup

TearDown: ---

Step 01: LoginToApplicationAndValidateLoggedInUsername

Step 02: NavigateToDocumentsListPageFromHomePage

Step 03: SetAnyUserWhoCanReadItemsInDraftItemSecuritySetting

Step 04: UploadDocumentToDocumentsLibrary

Step 05: NavigateToHomePageFromEditPage

Step 06: CreateNewSharePointSiteAtHomePage

Step 07: EditNewSharePointSiteAndFillMandatoryFieldsInMetadataPane

Step 08: AddDocumentModuleToExistingNewsSite

Keine oder schlechte Struktur in Tests

#	Action					
1	Run Application	C:\KeePass\KeePass.exe				
2	Mouse	Click	Left	Relative	MasterPassword	
3	Key Sequence	rx			MasterPassword	
4	Mouse	Click	Left	Relative	BtOK	
5	Mouse	Click	Left	Relative	Edit	
6	Mouse	Click	Left	Relative	AddEntry	
7	Mouse	Click	Left	Relative	Title	
8	Key Sequence	\$varTitle			Title	
9	Mouse	Click	Left	Relative	MBtnIcon	
10	Invoke Action	Select ()			LI_Icon	
11	Mouse	Click	Left	Relative	ButtonClose	
12	Mouse	Click	Left	Relative	UserName	
13	Key Sequence	\$varUsername			UserName	
14	Mouse	Click	Left	Relative	Password	
15	Mouse	Click	Right	Relative	Password	
16	Mouse	Click	Left	Relative	SelectAll	
17	Key Sequence	\$varPassword			Password	
18	Mouse	Click	Left	Relative	Repeat	
19	Mouse	Click	Right	Relative	Repeat	
20	Mouse	Click	Left	Relative	SelectAll	
21	Key Sequence	\$varPassword			Repeat	
22	Mouse	Click	Left	Relative	URL	
23	Key Sequence	\$varURL			URL	
24	Mouse	Click	Left	Relative	MBtnStandardEx...	
25	Mouse	Click	Left	Relative	MI_Expires	
26	Mouse	Click	Left	Relative	ButtonOK	
27	Mouse	Click	Left	Relative	Entry	
28	Mouse	Click	Right	Relative	Entry	
29	Mouse	Click	Left	Relative	DeleteEntry	
30	Mouse	Click	Left	Relative	Save	
31	Close Applicati...	CloseWindow	0ms		MainForm	



Neuen
Eintrag
anlegen

Eintrag löschen

Speichern und schließen

Tools für die Qualitätssicherung



Manuelle Reviews

Effektiv:

- Genaue inhaltliche Prüfung möglich
- Prüfen schwer automatisch messbare subjektive Verständlichkeit
- Wissensvermittlung

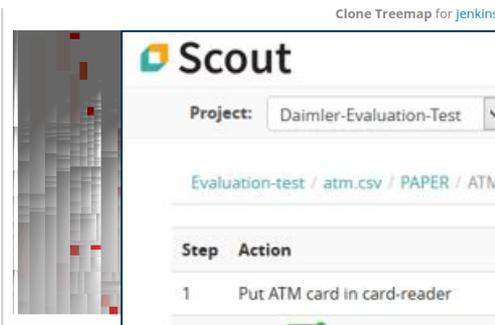
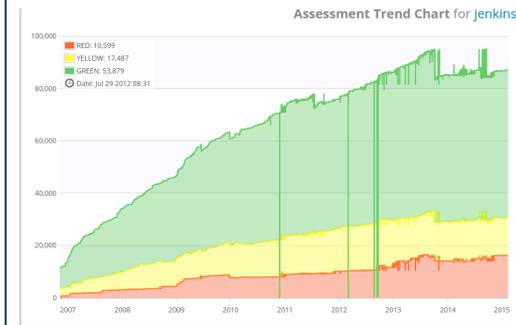
Aber:

- Aufwendig und teuer.
- Lange Feedback-Schleifen.
- Inkonsistent.



Automatisierte Qualitätsanalyse

Teamscale und Scout



Scout Dashboard: Daimler-Evaluation-Test | Documents | More

Project: Daimler-Evaluation-Test | Timetravel: Documents at the most recent revision

Evaluation-test / atm.csv / PAPER / ATM_RANDOM_BAD_PIN | More

Step	Action	Check
1	Put ATM card in card-reader	ATM asks for the PIN.
2	Enter some bad PIN.	ATM responds that the PIN you entered is wrong and that you have only two more attempts left.
3	<u>Enter the same PIN again.</u>	<u>ATM responds that the PIN you entered is the same wrong PIN again and that you have only one attempt left.</u>
4	Put ATM card in card-reader	ATM asks for the PIN.
5	Enter a random PIN.	The result differs depending on whether the PIN is correct.

Automatische Qualitätsanalyse – Zwei Perspektiven

Scout
Dashboard Activity Findings Documents Delta Projects System Admin
Use Cases

Timetravel: Dashboard at the most recent revision

Welcome to the Scout Dashboard

Current Size in Word

2.3k

+424

Current Number of F

0

no change

Current Number of F

146

+27

Findings Churn for ql

0 0 0

Trend: 1 Day

Findings Summary Bar Chart for qualicen---requi

Metrics Trend Chart for qualicen

Requirements Analyst ViewSet - Integrity 10

File ViewSet Format Edit Item Document Content Time Entry View Help

Configuration Manager Integrity User Project Manager Test Engineer Test Manager Requirements Analyst

Query: All Requirements Documents x Requirement Document...cation document (162)

Show items containing where

Section	Text	ID	Document ID	QRC_Findings	QRC_Findings_Text										
1	Introduction		164	162											
1.1	This document is in response to the related Marketing Requirements Document and outlines system level requirements for the product release in the voice of the manufacturer	166	162	Long Sentences	This document is in response to the related Marketing Requirements Document and outlines system level requirements for the product release in the voice of the manufacturer										
2	System Requirements	168	162												
2.1	Waterproof Requirements	174	162												
2.1.1	In order to adhere to safety regulations and match the water depth resistance of competitors, the watch must be waterproof to a depth of 100m. The following table outlines the products of our competitors in the same price range.	176	162	Passive Voice Long Sentences	In order to adhere to safety regulations and match the water depth resistance of competitors, the watch must be waterproof to a depth of 100m. The following table outlines the products of our competitors in the same price range.										
	<table border="1"> <thead> <tr> <th>Company</th> <th>Waterproof to... (m)</th> </tr> </thead> <tbody> <tr> <td>This text has been written.</td> <td>80</td> </tr> <tr> <td>xyz</td> <td>100</td> </tr> <tr> <td>ddd</td> <td>100</td> </tr> <tr> <td>zzz</td> <td>115</td> </tr> </tbody> </table>	Company	Waterproof to... (m)	This text has been written.	80	xyz	100	ddd	100	zzz	115				
Company	Waterproof to... (m)														
This text has been written.	80														
xyz	100														
ddd	100														
zzz	115														
2.1.2	Because of base waterproof protection. Watch face diameter must be at least 1" wide with a thickness of 0.2" to withstand water pressure at 100m. Watch face will be made out of glass.	178	162	Superlatives	Because of base waterproof protection. Watch face diameter must be at least 1" wide with a thickness of 0.2" to withstand water pressure at 100m. Watch face will be made out of glass.										
2.2	Time Zone Requirements	188	162												
2.2.1	All time zones must run of the same internal quartz crystal. To distinguish between the time zones, the embedded microprocessor must calculate the offset of each time zone and keep track of the time zones chosen by the user.	190	162	Long Sentences	All time zones must run of the same internal quartz crystal. To distinguish between the time zones, the embedded microprocessor must calculate the offset of each time zone and keep track of the time zones chosen by the user.										
2.2.1.1	When one time zone time is changed, all others must adjust automatically. The only exception to this is a daylight savings time change. By knowing the offset of each time zone, the MPU can determine the new times for the other times zones using the appropriate offsets.	192	162	Passive Voice Vague Words Loopholes Long Sentences Conditional Words	When one time zone time is changed, all others must adjust automatically. The only exception to this is a daylight savings time change. By knowing the offset of each time zone, the MPU can determine the new times for the other times zones using the appropriate offsets.										
2.3	Timer Requirements	194	162												
2.3.1	This text has been written, optionally.	196	162	Passive Voice Loopholes	This text has been written, optionally.										
2.3.1.1	For the timer feature, the counter on the digital display must be counted down to 00:00:00.	198	162	Passive Voice	For the timer feature, the counter on the digital display must be counted down to 00:00:00.										

Treemap for qualicen---requirements---local

Commit Chart for qualicen

Automatische oder manuelle Qualitätssicherung?

- **Viele relevante Qualitätseigenschaften sind nicht automatisch analysierbar**
 - Kommentare
 - sinnvolle Verwendung von Datenstrukturen und Algorithmen
 - Inhalte von Anforderungen
 - logische Redundanz
- **Diese Eigenschaften bedürfen der manuellen Analyse**
- **Manuelle Analysen sollten soweit möglich durch automatische Analysen unterstützt werden**

