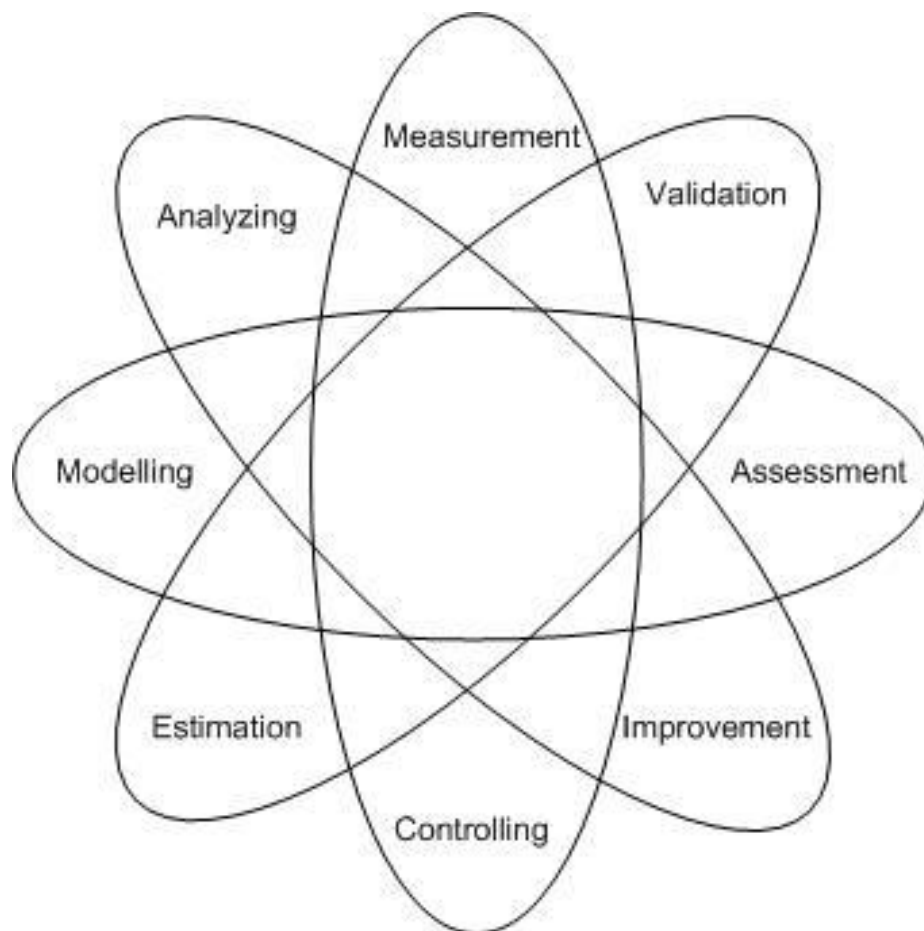


Software Measurement News

Journal of the Software Measurement Community



Editors:

Alain Abran, Manfred Seufert, Reiner Dumke, Christof Ebert, Cornelius Wille

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Mexico City, October 29 – 30, 2020

<https://www.iwsm-mensura.org>

Full Papers submission: May 6, 2020

Notification of acceptance/rejection: June 3, 2020

Final version: July 30, 2020

The IWSM Mensura conference is the result of the joining of forces of the *International Workshop on Software Measurement* and the *International Conference on Software Process and Product Measurement (Mensura)*. Together they form the conference where new ideas from the world of academic research meet practical improvements from industry on topics of measuring software. Each year practitioners and researchers from all over the world gather together to learn about new developments, test new ideas and exchange possible new solutions and applications.

General Chair

Eduardo Gutiérrez, CEO IBM-México

Program Co-Chairs

Alain Abran, ETS Montréal, Canada

Ozden Ozcan Top, Dundalk Institute of Technology, Ireland

Organizing Chair:

Francisco Valdés Souto | Science Faculty UNAM | Mexican Software

Metrics Association (AMMS) | México

Promoting formal measurement and estimation practices

On October 29-30, 2020 the IWSM Mensura conference was held in Mexico City, Mexico. In this first conference of the new decade, which coincides with the celebration of the 30th International Workshop on Software Measurement (IWSM) and the 15th International Conference on Software Process and Product Measurement (MENSURA), while in the industry there is a convergence of different technologies such as AI, ML, IoT, BigData (Industry 4.0), in which software is a fundamental part, we looking forward to confirm the importance of applying formal measurement practices to obtain good results in software development and promote the maturity of software engineering.

We invite proposals from researchers and practitioners in all fields of software measurement. This year, we particularly encourage proposals from experienced industry practitioners and researchers on the state-of-the-art and the future of Information Technology (IT) cost estimation and control.

The topics of concern are listed in (but not limited to) the following Software Measurement Topics:

- Empirical case studies
- Software measurement data mining
- Decision support systems based on software measurement
- Data driven decision making
- Visualizations and dashboards
- Measurement-as-a-Service
- Service-and product-oriented measures
- Measuring the software for the industry 4.0 projects
- Benchmarking
- Resources (cost,effort,time) Estimation
- Formal estimation in agile environments
- Portfolio estimation
- Trends in estimation
- Software size approximation techniques
- Effort estimation based on early size approximation
- Software measurement in Artificial Intelligence
- Effort estimation for machine learning software
- Effort estimation for Industry 4.0 software
- Sizing software ecosystems



Announcement of the GI-FG 2.1.10 Initiatives

Unsere Fachgruppe widmet sich vor allem den Schwerpunkten zum Data Science aus Sicht des Big Data in den Ausprägungen:

- als Big Data im Business-Bereich durch die enorm steigende Anzahl an Informationen und deren Verknüpfungsformen durch vielfältige Verflechtungen von Business-Prozessen in allen B2B, B2C und vor allem auch C2C Bereichen;
- durch die großen Mengen von (Software-) Messdaten als umfangreiche Repositories oder auch Qualitätssicherungsdaten für den Social Media Bereich und den zunehmend komplexeren IoT Systemen;
- in den Anwendungen der Big Data Analyseformen (als preskriptive und prediktive) auch in der Softwareanalytik sowie deren Nutzung als Deep Learning für relevante Entscheidungsprozesse

Aktuelle Initiativen zu Foren, Workshops und Konferenzteilnahmen siehe unter

<https://fg-metriken.gi.de>

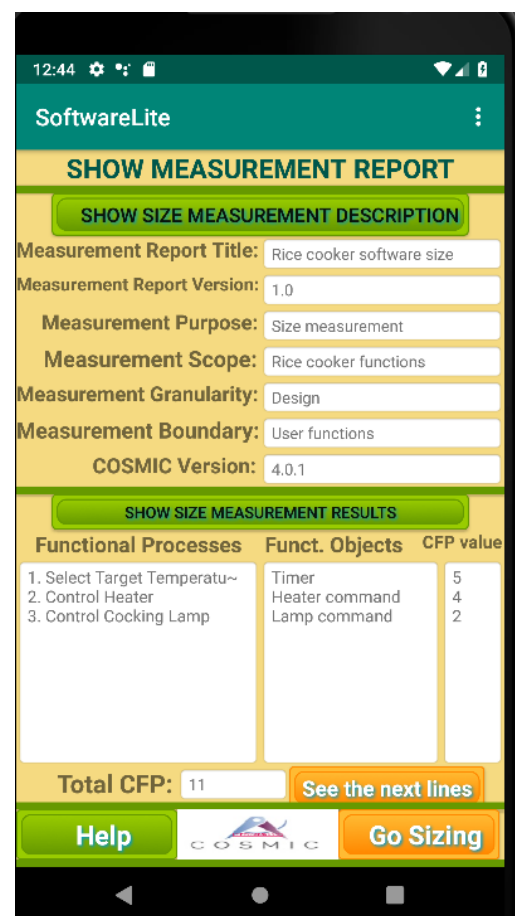
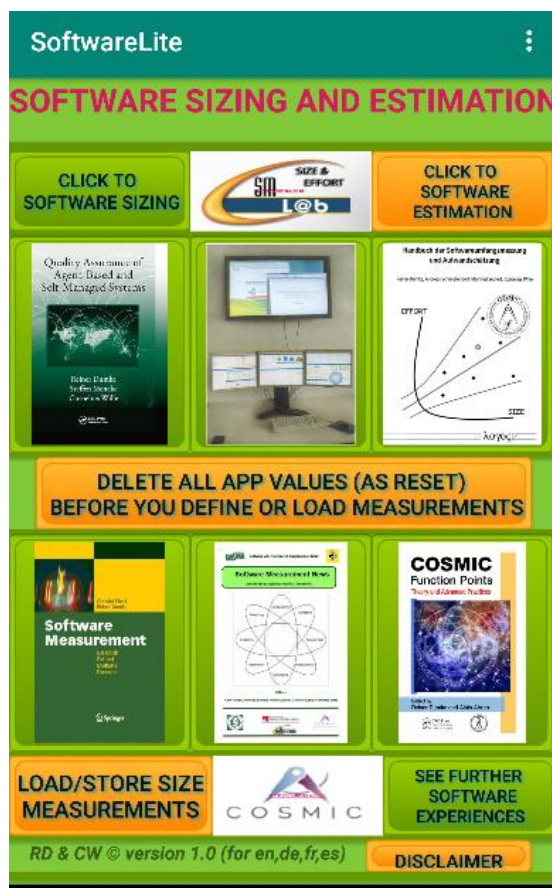


The SoftwareExpert App

Reiner R. Dumke

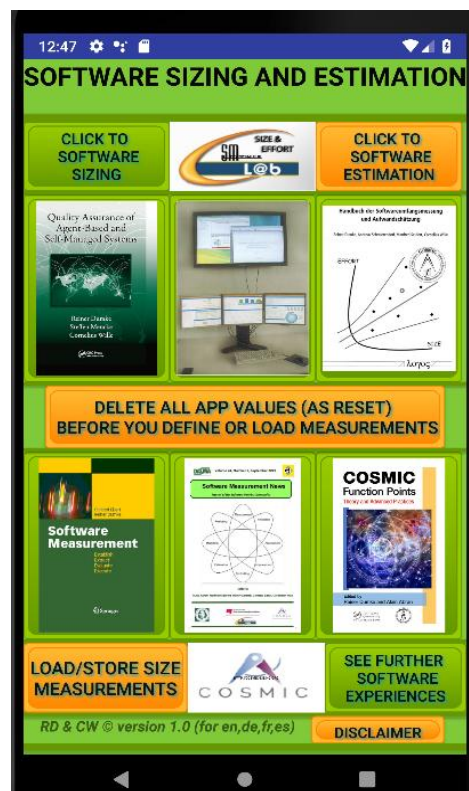
University of Magdeburg, Germany (www.smlab.de)

The **SoftwareLite** app is available in the Google App Store since Oct 2019 and can be used in order to apply the **COSMIC FP size measurements** including their **Early & Quick method** and the COSMIC FP method with the **Local Extension**. See following screenshots.



the classical Rice Cooker example -

The **SoftwareExpert** app should be available in the next time and includes all functionalities of the **SoftwareLite** app. Furthermore, **SoftwareExpert** can be used to apply profound experiences of the empirical software engineering. Especially, the size measure conversions and essential project characteristics could be determined and estimated. See the following screenshots:



estimated project values for the small Rice Cooker example:

12:53 SoftwareExpert

SHOW THE SOFTWARE PROJECT DASHBOARD

Software Project Title: Rice Cooker Estimates

PROJECT SIZES

Product Size: 11 [CFP] 448 [LOC]
 Team Size: 1 [Members]
 Documentation Size: 206 [Pages]

PROJECT EFFORT

Development Effort: 0.39 [PM]
 Testing Effort: 0.18 [PM]
 Documentation Effort: 0.12 [PM]

PROJECT EFFICIENCY

Project Costs: 1452.0 [Euros]
 Project Duration: 1.66 [Months]
 Productivity: 4.61 [CFP/PM] 188.09 [LOC/PM]

PROJECT QUALITY

Chosen Number of Test Cases: 19
 Risks Factor (in percent): 20.33
 Estimated Number of Errors: 1

Go Estimate Goto Derived Project Metrics Go Main Menu for new Dashboard contents

12:54 SoftwareExpert

SHOW DERIVED PROJECT METRICS

Software Project Title: Rice Cooker Estimates

PRODUCT SIZE

Product Size: 11 [CFP] 448 [LOC]
 (the following metrics are shown temporary)

FURTHER PROJECT METRICS

Percentage of Documentation: 99.06 [%]
 (chosen vs. complete)
 Percentage of chosen Test Cases: 76.36 [%]
 (chosen vs. all test aspects)
 Errors per Team Member: 1
 Percentage of Test Effort vs. Development Effort: 46.15 [%]
 Percentage of Documentation Effort vs. Dev. Effort: 30.77 [%]
 Costs per COSMIC Function Point: 132.0 [Euros]
 Costs per Project Month: 874.7 [Euros]
 Estimated Maintenance Effort: 0.78 [PM]
 (based on the Dev. Effort):
 Total Formal Verification Effort: 1.25 [PM]
 (by Klein et al.)

Go Estimate Go Back

IWSM/Mensura 2019

was held at September 19 – 20 in Netherland

Haarlem

The future of IT Cost Estimation

The 2019 conference is held in the vibrant city center of **Haarlem**, one of the oldest cities in the Netherlands and home to the world famous **Teylers museum** of art and science. Haarlem is within a close reach of **Schiphol international airport** and the Dutch capital **Amsterdam**.



The conference was held in very good location and was organized and supported in an excellent manner from the Netherlands colleagues.

see the

contents/proceedings at ceur-ws.org/Vol-2476/



http://ceur-ws.org

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IWSM-Mensura 2019

International Workshop on Software Measurement and International Conference on Software Process and Product Measurement 2019

**Joint Proceedings of the International Workshop on Software Measurement and the International
Conference on Software Process and Product Measurement (IWSM Mensura 2019)**

Haarlem, The Netherlands, October 7-9, 2019.

Edited by

Ayca Kolukisa Tarhan *
Ahmet Coskuncay **

* Hacettepe University, Department of Computer Engineering, Ankara, Turkey
** Ataturk University, Department of Computer Engineering, Erzurum, Turkey

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Workshop

“Evaluation of Service-APIs – ESAPI 2019“

Themenschwerpunkt: API-Sicherheit

November 2019, Dresden

Andreas Schmietendorf

1. Motivation zum Workshop

Die ESAPI-Initiative stellt die vielfältig benötigten Mess- und Bewertungsansätze von webbasiert zur Verfügung gestellten Service-APIs (speziell Public- und Open-APIs) in den Mittelpunkt des Interesses. Mit Sicherheits- und Complianceaspekten von Web-APIs wurde für den am 03. November an der HTW Dresden durchgeführten Workshop ein sehr spezieller, aber hoch aktuellen Themenschwerpunkt gesetzt. Sehr allgemein findet sich zum Thema der API-Sicherheit das folgende Statement [RedHat 2019]:

„Unter API-Sicherheit versteht man den Schutz der Integrität von APIs, und zwar sowohl derer, die Ihnen gehören, als auch derer, die Sie verwenden.“

Eine aus technischer Sicht detailliertere Begriffsbestimmung der API-Sicherheit findet sich unter [Reichert 2019]:

„Wenn Entwickler APIs gestalten, müssen sie Entscheidungen über das Security-Design der Komponenten treffen. Dazu gehören in erster Linie Authentifizierung, Autorisierung, Überwachung und Tracking, – also alle Funktionen, die zeigen, welcher Nutzer welche API, zu welchem Zeitpunkt und für welchen Zweck nutzt.“

Mit Hilfe eines im Vorfeld publizierten Call for Papers wurde für Beiträge im Zusammenhang mit den folgenden Themen sensibilisiert:

- API Sicherheit aus Entwicklungssicht (Anbieter/Nutzer).
- Aspekte der API-Sicherheit im API-Management.
- Empirische Analysen (best practices) zur API-Sicherheit.
- Branchenspezifische Aspekte sicherer APIs (z.B. Banken).
- Bewertung der Compliance bei angebotenen/genutzten APIs.
- Erfolgskriterien für die „API-fizierung“ von Altanwendungen.
- Vor- und Nachteile branchenorientierter API-Spezifikationen.
- Virtualisierung der Softwareentwicklung mit Hilfe von APIs.
- Wirtschaftlichkeits- und Risikobewertungen von APIs.

2. Beiträge im Workshop

Folgende Übersicht enthält die durch das Programmkomitee ausgewählten Beiträge und Autoren. Für weiterführende Informationen zu den Beiträgen sei auf den korrespondierenden Tagungsband [Schmietendorf 2019] verwiesen.

Gehaltene Vorträge

Johann Forster, Thomas Wiedemann (HTW Dresden)

Kombination von REST und MQTT als überlagerter Service

Frederik Kramer (initOS)

Bewertungsmodell zur systematischen Auswahl eines geeigneten API

Jonas Grunert, Lucas Merker (HPI Potsdam, FU Berlin)

API-Protection with OAuth2

Sandro Hartenstein, Gabriel Landa (HWR Berlin, Alpha-Gen)

Kryptowährungsuntersuchung per Public API

Steven Schmidt (Deutsche Bahn)

Bedarf und Konzeption eines Secure Open API MMM

Konrad Nadobny (Bayer AG)

API-fizierung von Legacy-Systemen ...

Posterpräsentationen – FlipCharts

Ludwig Ronny Eckardt (T-Systems Dresden)

Herangehensweise beim API-Testing und API-Simulation

Kadir Ider (KPMG AG)

Barriers for the utilization of Open Data

Konrad Nadobny, Andreas Schmietendorf (HWR Berlin)

Laufende Umfrage zur API-Sicherheit

Ausgewählte Ergebnisse des World Cafes

Zu Beginn des World Cafes wurden die folgenden Themenbereiche durch die Moderatoren *Steven Schmidt*, *Sandro Hartenstein* und *Konrad Nadobny* zur Diskussion gestellt:

- Identitäts- und Zugriffsmanagement bei APIs.
- Security by Design Ansätze für APIs.
- API-Security und (mit) KI-Algorithmen.

Die folgenden Fotos zeigen die jeweils durch 2 Gruppen erstellten Themensammlungen im Diskurs technischer und betrieblicher Maßnahmen zur API-Sicherheit. (gleichbleibende Moderation)

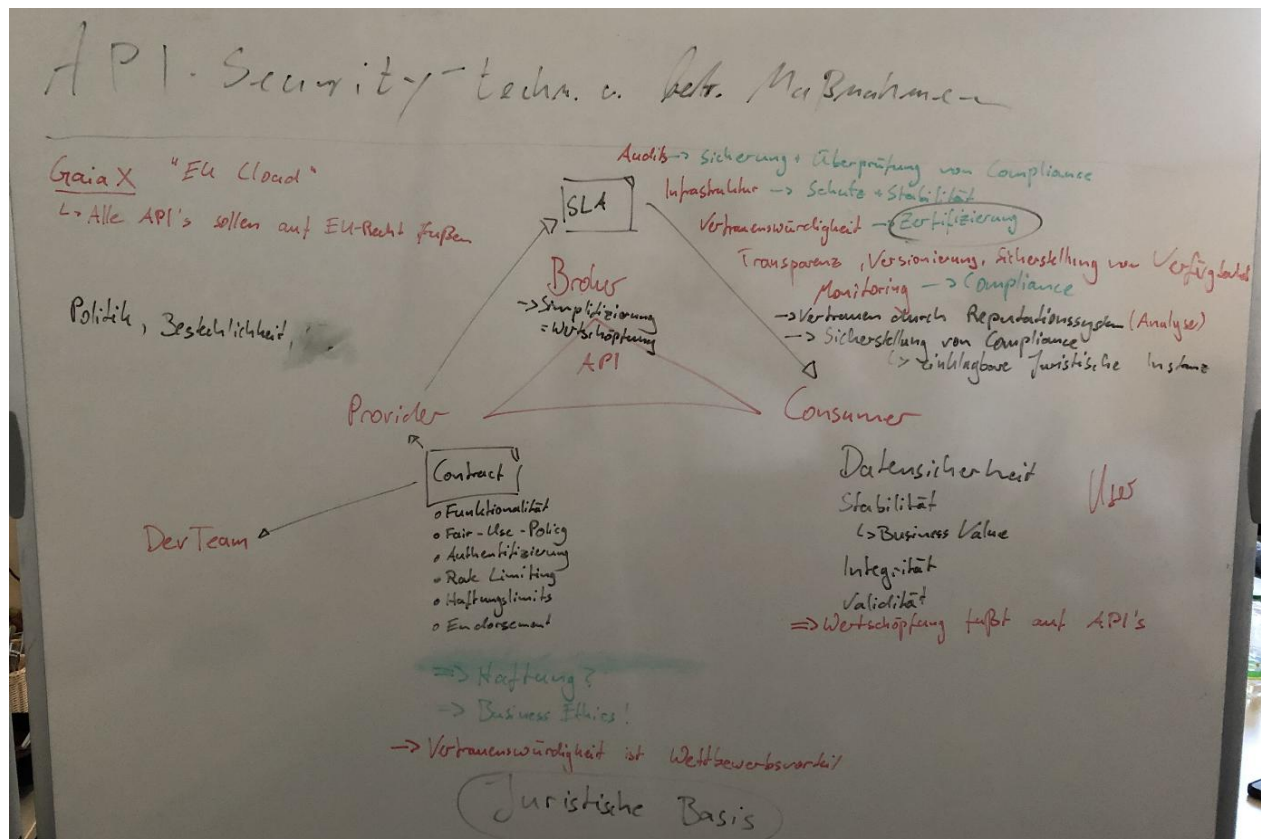


Abb. 1: Themensammlung API-Security (Gruppe 1)

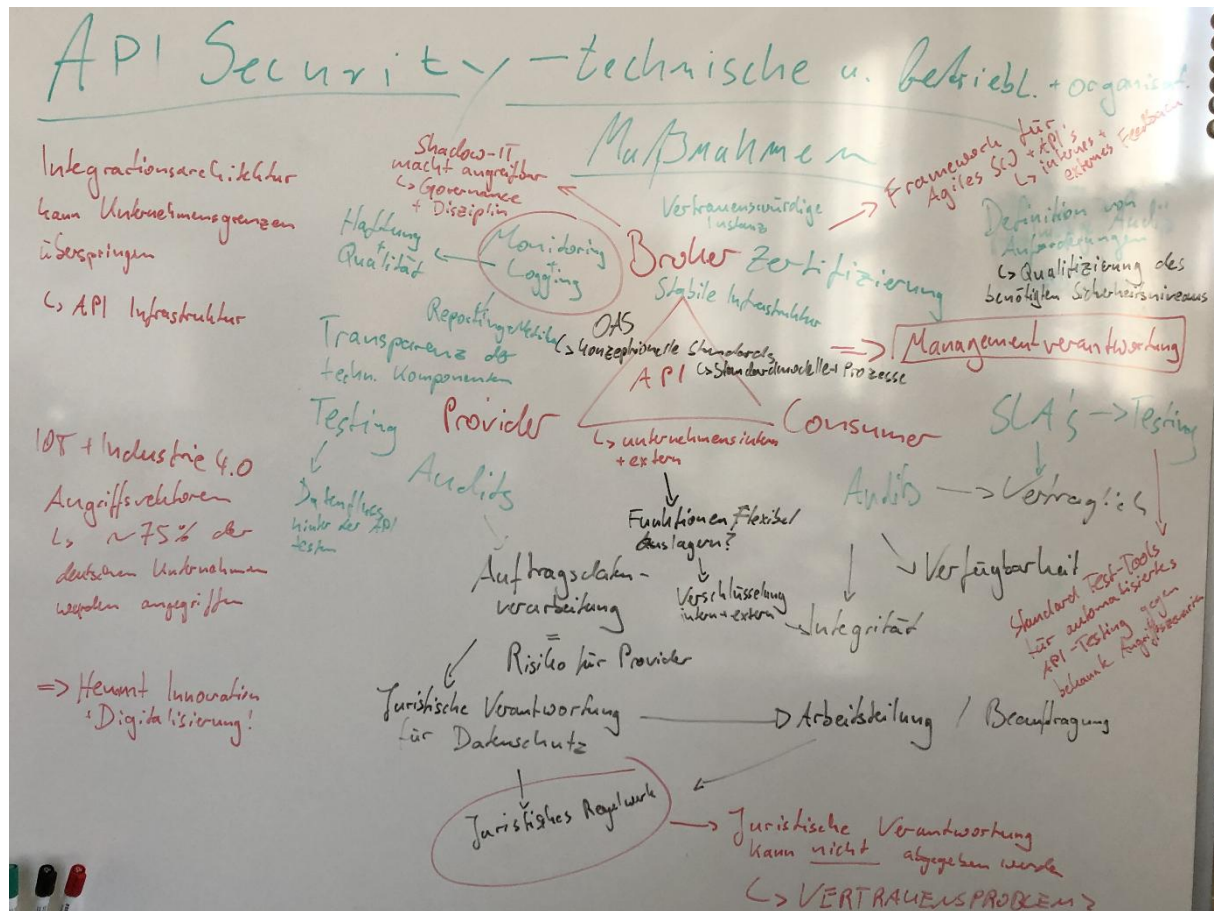


Abb. 2: Themensammlung API Security (Gruppe 2)

3. Weitere Informationen

Auch für das Jahr 2020 ist die Durchführung eines ESAPI-Workshops vorgesehen, der in Berlin (zugesagt als Gastgeber hat bereits die Bayer AG) stattfinden wird.

Weiterführende Informationen werden zeitnah unter <https://blog.hwr-berlin.de/schmietendorf> bzw. www.cecmq.de bereitgestellt:



Abb. 3: Tagungsband zum Workshop ([Schmietendorf 2019])

Quelle: <https://www.shaker.de/de/content/catalogue/index.asp?lang=de&ID=8&ISBN=978-3-8440-6837-5>

4. Quellenverzeichnis

- [RedHat 2019] API Sicherheit, <https://www.redhat.com/de/topics/security/api-security>, RedHat, abgerufen 12. September 2019
- [Reichert 2019] Reichert, A.: <https://www.computerweekly.com/de/tipp/Wie-sich-REST-API-Endpunkte-fuer-Cloud-Anwendungen-absichern-lassen>, abgerufen 12. September 2019
- [Schmietendorf 2019] Schmietendorf, A. (Hrsg.): ESAPI 2019 – 3. Workshop Evaluation of Service-APIs, Dresden – 07. November 2019, in Berliner Schriften zu modernen Integrationsarchitekturen, Shaker-Verlag, Aachen, November 2019, ISBN 978-3-8440-6837-5

5. Dank

Unser Dank gilt den Referenten, Moderatoren und Teilnehmern, aber auch den Partnern und Sponsoren (HTW Dresden, HWR Berlin, Uni Magdeburg, GI, ASQF, ASQT und der ceCMG e.V.), die eine solche Veranstaltung ermöglicht haben. Darüber hinaus geht ein spezieller Dank an die Mitglieder des Programmkomitees, die im Vorfeld des Workshops an der Zusammenstellung der Agenda beteiligt waren. Ein besonderer Dank gilt Herrn Prof. Dr. Thomas Wiedemann von der HTW Dresden und seinen in der Vorbereitung und –Durchführung des ESAPI-Workshops involvierten Mitarbeitern. Das tolle und vor allem sehr persönlich organisierte Catering hat sicherlich Maßstäbe für die kommenden Jahre gesetzt! Ein herzlicher Dank geht auch an die beteiligten Medienpartner SIGS DATACOM GmbH aus Köln und an den Shaker Verlag GmbH aus Aachen.

Enterprise Computing Conference ECC 2020

Transformationen im Unternehmenskontext

Februar 2020, Köln

Andreas Schmietendorf

1. Hintergründe zur Tagung

Entsprechend der mehr als 20-jährigen Tradition beschäftigt sich die *Central Europe Computer Measurement Group* (kurz ceCMG) als herstellerunabhängiger Verein mit dem Management unternehmensweit genutzter IT-Infrastrukturen bzw. den auf diesen ausgeführten Anwendungen. Die oft über Jahrzehnte gewachsenen Anwendungsstrukturen (allg. Erblasten - legacy applications) sind in vielen Unternehmen (z.B. bei Banken und Versicherungen) noch immer eine tragende Säule des Kerngeschäfts. Sowohl aus technologischer als auch aus wirtschaftlicher Sicht gibt es die lang geführte Diskussion um eine potentielle Ablösung der vielfach IBM Mainframe-basierten Lösungen.

Die Erfahrungen zeigen jedoch, dass zwar eine programmiersprachenorientierte Überführung möglich ist, vielfältige Herausforderungen in diesem Zusammenhang nur schwer bewältigt werden können. Typische Problembereiche im Zusammenhang mit konkreten Migrationsprojekten lassen sich in folgender Weise charakterisieren:

- Finden hinsichtlich Skalierbarkeit, Performance und Sicherheit äquivalenter Hardware- bzw. Betriebssystem-Plattformen,
- Umgang mit dem in Altsystemen umfänglich abgelegten fachlich determinierten Wissen in Form der implementierten Algorithmen,
- Unzureichende Dokumentation der Systemarchitekturen bzw. der gänzlich abhanden gekommenen Quellcodes,
- Bewältigung des Aufwands in Zusammenhang mit einer notwendigen Qualitätssicherung automatisch durchgeführter Quellcodetransformationen,
- Isolation der zumeist monolithisch aufgebauten Altanwendung gegenüber über Schnittstellen angebundenen Partnersystemen,
- Die Funktionseinheiten von Altanwendungen lassen sich schwer voneinander abgrenzen und kapseln. Das erschwert die Weiterentwicklung und Wartung.
- Die Urheber der Altsysteme sind längst in Rente, darüber hinaus finden sich nur schwer Informatiker mit korrespondierenden Skills.

Zunehmend setzt sich die Meinung durch, dass gewachsene Altanwendungen eher dem Investitionsschutz unterliegen sollten und neue Anforderungen im Zusammenhang mit der Digitalisierung nicht durch immer neue Systeme erfüllt werden können. Gerade in der Ausbildung junger Informatiker scheint sich dieser Sachverhalt allerdings nur unzureichend niederzuschlagen, wie das folgende Zitat aufzeigt [Starke 2019]:

„Schätzungsweise 70 bis 80 Prozent der gesamten Zeit verbringen Entwicklungsteams rund um die Welt damit, bestehende Systeme (also: Legacy) zu erweitern, zu aktualisieren oder zu optimieren. In typischen IT-Ausbildungen oder Studiengängen jedoch nimmt die Pflege bestehender Systeme einen verschwindend geringen Teil ein.“ Quelle: [Starke 2019]

2. Beiträge des ersten Konferenztages

Shared Keynote – Anwendersicht

- **Stefan Böcher** (Helaba) vergleicht geerbte Software mit einer „Bruchbude“, der häufig nur wenig Beachtung geschenkt wird. Im Ergebnis sind monolithisch gewachsene Architekturen entstanden, welche fachliche Komponenten nur unzureichend voneinander kapseln. Diverse Schnittstellen erschweren die Fortentwicklung/Wartbarkeit derartiger Systeme, verhindern aber auch eine einfache Ablösung. Eine Verbesserung soll durch eine unternehmensinterne Standardisierung der fachlichen Schnittstellen des Kernbanksystems erreicht werden.
- Entsprechend **Dieter Kölbl** (T-Systems) spielten Mainframe-Plattformen im Kontext angebotener Kundenservices bis zum Jahr 2017 praktische keine Rolle mehr. Mit Hilfe einer auf dem Mainframe implementierten Blockchain konnten potentielle Möglichkeiten verdeutlicht werden. Unterstrichen wurde die Notwendigkeit der Modernisierung des Mainframes. Im Einzelnen gilt es, proprietäre Technologien abzulösen, für junge Informatiker attraktive Entwicklungsumgebungen einzusetzen aber auch eine Öffnung über REST APIs zu ermöglichen.
- **Armin Kramer** (Datev) sieht den Bedarf eines fortlaufenden Modernisierungsprozesses, welcher sich auf den Mainframe aber auch auf alternative z.B. cloudbasierte Ansätze bezieht. Im Detail nennt er die Gewährleistung der Plattformunabhängigkeit, die Nutzung moderner Programmiersprachen (z.B. Java) bzw. Tools der offenen Welt (Jenkins, GIT), das Aufbrechen monolithischer Systemarchitekturen, den Einsatz neuer Entwicklungsprozesse für Bestandsanwendungen oder auch die Verwendung von REST APIs bei Cobol-Programmen.

Shared Keynote – Anbietersicht

- **Mark Cresswell** (LzLabs) beschäftigt sich mit den bei Mainframe-Plattformen häufig diskutierten „Vendor Lock-In“, d.h. der Wechsel zu einer anderen Plattform ist zumeist nur mit erheblichen Aufwänden möglich. Die Lösung sieht er in einem softwaredefinierten Mainframe, d.h. dem Einsatz einer virtuellen Maschine, basierend auf einer x86 Systemarchitektur. In diesem Zusammenhang geht er auf ein JIT-basiertes Speichermanagement, Techniken zur Datenbankanbindung (ODBC/JDBC) und eine Entwicklungsumgebung ein.
- **Mark Anzani** (IBM) unterstreicht die Bedeutung des Mainframes im Zusammenhang mit den Herausforderungen der Digitalisierung. Insbesondere wird auf potentielle Vorteile des Mainframes im Zusammenhang mit Cloud- bzw. kognitive Lösungen eingegangen. Bei Cloud-Lösungen bieten sich u.a. vielfältig einsetzbare Sicherheitstechniken (encryption everywhere), die Virtualisierung der Softwareentwicklung (cloud-native development) oder auch die Gewährleistung einer hohen Verfügbarkeit (instant recovery) an.
- **Philipp Brune** (HS Neu-Ulm) sieht bei Legacy-Lösungen Bezüge zu monolithisch und historisch gewachsenen Applikationen, den Einsatz alter Programmiersprachen, strenge Abhängigkeiten vom Middleware-Stack aber auch unzureichend dokumentierte Lösungen. Im Weiteren wird die Modernisierung von Altanwendungen, die Extraktion von Business Rules/Logic aus Cobol und Neuimplementierung sowie das Re-Hosting auf non-Mainframe Plattformen thematisiert. Besondere Chancen sieht er bei der Verwendung von Open Source Software zur Gewährleistung einer offenen Mainframe-Architektur.

Podiumsdiskussion

Ein weiteres viel beachtetes Highlight war die durch Jens Borchers (BfI Hamburg) moderierte Diskussionsrunde. Im Mittelpunkt der zum Teil kontrovers geführten Diskussion standen notwendige Veränderungsprozesse bei Mainframe-basierten sowie unternehmensweit eingesetzten Softwarelösungen. Teilnehmer waren Mark Anzani (IBM/USA), Dieter Kölbl (T-Systems), Mark Cresswell (LzLabs) und Philipp Brune (Hochschule Neu-Ulm). Unter anderem wurden die folgenden Fragen zur Anregung der Diskussion durch den Moderator gestellt:

- Welche Rolle spielt der klassische Mainframe heute und im Verlauf der kommenden 5 Jahre?
- Worin bestehen die aktuellen Probleme (z.B. Kosten, Flexibilität, Skill) des Mainframes bzw. der auf diesen ausgeführten Applikationen?
- Wie können Strategien (Emulieren, Rehosting, Migration, Ersetzen) aussehen, um ein „vendor- lock-in“ bei Mainframe Applikationen zu überwinden?

- Existieren alternative Plattformen für die Umsetzung großer Transaktionsraten insbesondere unter Berücksichtigung der ACID-Anforderungen?
- Können alternative Plattformen die auf dem Mainframe verfügbaren Sicherheitsfeatures gewährleisten?
- Wie sollte eine zukünftige (moderne) Softwareentwicklung mit Nutzung des Mainframes bzw. alternativer Plattformen aussehen?
- Sind Container-basierte Architekturen (z.B. Docker) der nächste Hype oder nur eine weitere Möglichkeit zur Entkopplung fachlicher Funktionseinheiten?
- Wie sollten Informatiker ausgebildet werden, um Softwareentwicklungen in einem diversifizierten Umfeld (Sprachen, Plattformen, ...) zu beherrschen?
- Werden die globalen Klimaveränderungen einen Einfluss auf zukünftig eingesetzte Hardware- bzw. Betriebssystem-Infrastrukturen haben?
- Ist ein leistungsstarker Mainframe klimaschädlicher als sein möglicher Ersatz durch viele X86-Maschinen?

3. Ergebnisse der World Cafes

Neben den bereits vorgestellten Shared Keynotes bzw. der Podiumsdiskussion gab es mit den durchgeführten World Cafes ein weiteres interaktiv gestaltetes Highlight. Durch die Moderatoren wurden 3 Themenbereiche zur Diskussion gestellt, welche jeweils mit 1/3 der Konferenzteilnehmer für ca. 20 Minuten diskutiert wurden:

Heidi Schmidt (PKS Software GmbH)

Thema: Skill Gap im Enterprise Umfeld

- Neuen Mitarbeitern fehlen Skills zu traditionellen Technologien und bringen vor allem neue (wenig erprobte) Ansätze aus dem Studium mit.
- Erfahrenen Kollegen fehlen Skills zu neuen Technologien und Methoden; oft liegen letzte Schulungen weit zurück.
- Skill-Gap - für Unternehmen fatal, da so der Knowhow-Transfer zu den Bestandssystemen blockiert (Wissen geht verloren) wird.

Andreas Schmietendorf (HWR Berlin & OvG-Universität Magdeburg)

Thema: Ende der Softwareentwicklung

- Reichen die Ressourcen aus, um ständig neu zu entwickeln oder bedarf es vielmehr eines Fokus auf Pflege und Wartungsaufgaben?

- Altsysteme wirken auf junge Entwickler wenig „sexy“. In welcher Weise kann die Akzeptanz zur Wartung/Pflege von Altsystemen erhöht werden?
- Bedarf es einer der Industrialisierung entlehnten Vorgehensweise zur Implementierung oder sogar Produktion von SW?

Tobias Leicher (IBM)

Thema: Mainframe Modernisierung

- Gründe für eine notwendige Modernisierung?
- Begriff moderner Softwareentwicklung (z.B. REST APIs)?
- Elitäre Entwicklergemeinschaft (Nimbus), ggf. Verlustängste?
- Möglichkeiten einfacher Testzugänge – Mainframe as a Service?
- Self Services bzw. eine offene Community fehlen noch.

Im Folgenden finden sich die Fotos der zusammengetragenen Aspekte. Für eine weiterführende Auswertung sei auf [Schmietendorf 2020] verwiesen.

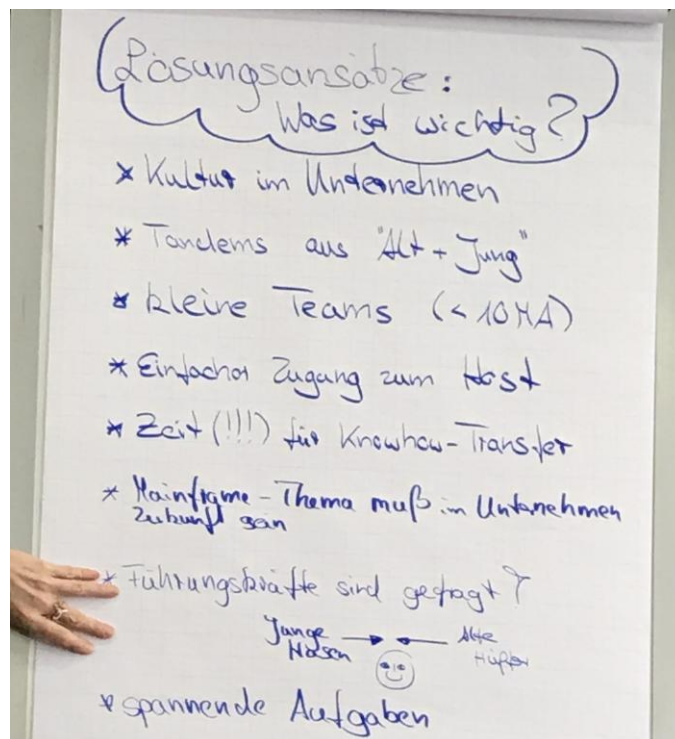


Abb. 4: Diskussionsergebnisse – Skill-Gap

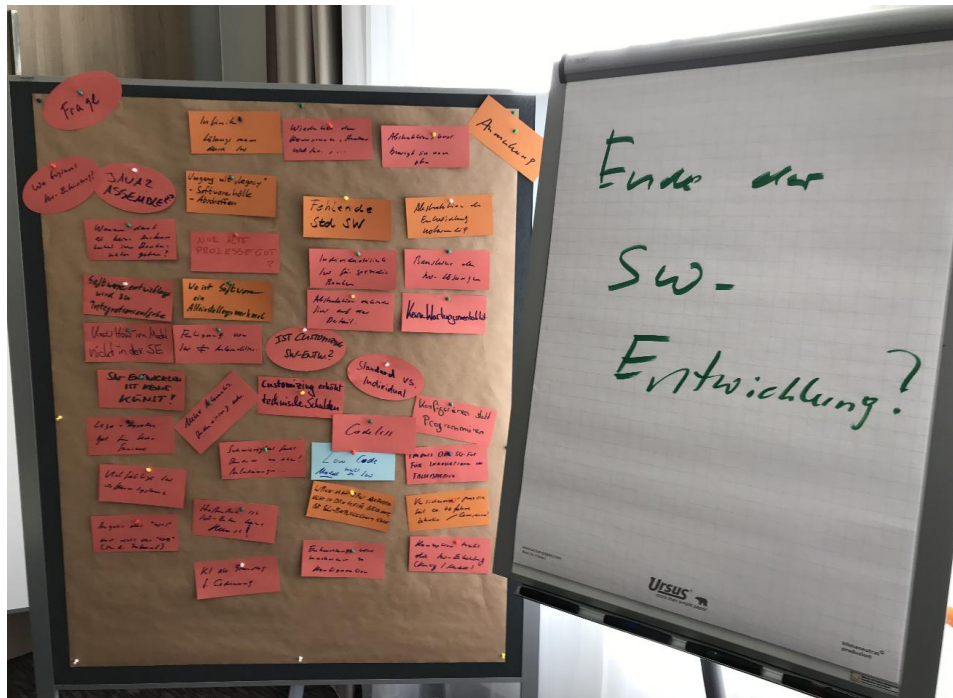


Abb. 5: Diskussionsergebnisse – Ende der Softwareentwicklung

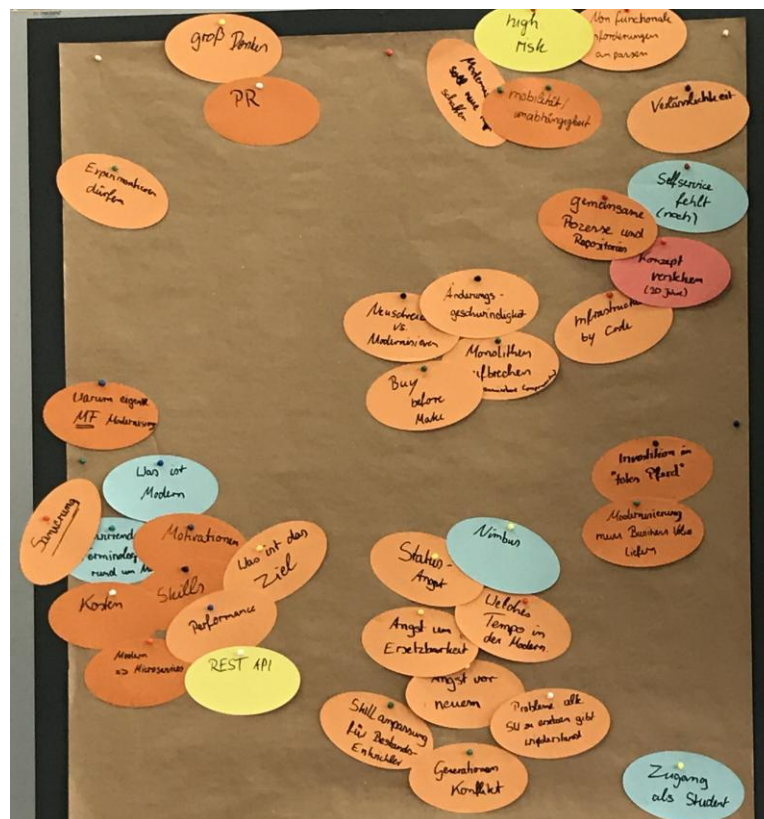


Abb. 6: Diskussionsergebnisse – Mainframe Modernisierung

4. Beiträge des zweiten Konferenztages

Einführende Keynote

Herr Dr. **Frank Simon** (Zurich Gruppe Deutschland) setzte sich mit der Themenstellung „Digitalisierung: Freund und Feind der Security“ auseinander. Entsprechend den Ausführungen des Sprechers wird der klassische Sicherheitsbegriff im Diskurs der Digitalisierung zunehmend durch IT-Security verdrängt. Unter Berücksichtigung der folgenden 4-stufigen Klassifikation zur Digitalisierung wurde schließlich eine Bewertung herausgearbeitet inwieweit die Digitalisierung als „Freund und Feind“ der Security zu interpretieren ist.

- 1 - Digitalisierung im Kleinen,
- 2 - Automation von Geschäftsprozessen,
- 3 - Digitale Geschäftsprodukte,
- 4 - Digitale Geschäftsmodelle.

Interessant war in diesem Zusammenhang auch das Statement, dass die Regulatoren als primäre Treiber einzuhaltender Sicherheitsaspekte in der Versicherungsbranche zu sehen sind. Aus unternehmerischer Sicht findet sich häufig eine risikoorientierte Auseinandersetzung mit notwendigen Sicherheitsanforderungen und tatsächlich eingesetzten organisatorischen bzw. technischen Maßnahmen.

In den anschließenden Workshops wurden durch die Arbeitsgruppen der ceCMG die folgenden Themenbereiche bearbeitet:

Workshop - zPricing:

- Mit den Herausforderungen der digitalen Transformation und in diesem Zusammenhang einzusetzenden Hybrid Cloud Lösungen sowie benötigten neuen Preismodellen setzte sich **Christian Daser** (IBM) auseinander.
- Der Beitrag von **John Dormon** (BMC) ging auf die aktuelle Bedeutung des Mainframes und Herausforderungen im Diskurs eines zukünftigen Kapazitätsmanagements (Next Generation Capacity Management) ein.
- **Rimon Wassef** (Steinbeis Hochschule Berlin) ging auf die Auswirkungen neuer IT-Trends auf das IT-Management ein. Speziell wurde dabei auf die Weiterentwicklung betriebswirtschaftlicher Handlungsfelder Bezug genommen.

Workshop - Secure API-Management

- **Andreas Schmietendorf** (HWR Berlin/Uni Magdeburg) thematisierte die Verwendung API-fizierter KI-Algorithmen. Dafür wurde auf real angebotene APIs und Einsatzszenarien, aber auch die damit einhergehenden Sicherheitsbedürfnisse eingegangen.
- **André Nitze** (Ultra Tendency) verweist auf ca. 30 Mrd. genutzter IoT-Geräte. Ggf. offene Wartungs- und Administrationszugänge bzw. unsicher eingesetzte Web-APIs implizieren starke Sicherheitsrisiken. Zur Überwindung werden die Lösungsansätze entlang der OWASP1 IoT Top 10 Sicherheitsrisiken diskutiert.
- **Steven Schmidt** (Deutsche Bahn) und **Andreas Schmietendorf** (HWR Berlin) stellten unter der Moderation von **Michael Binzen** (Bitkom) ihr neues Buch zu Secure Web-APIs vor. Die Gewährleistung der Sicherheit von Web-APIs wird darin über den gesamten Lebenszyklus (DevOps) erörtert. [Hartenstein 2020]
- **Jonas Grunert** (Bayer AG/HPI Potsdam) geht auf das automatisierte Testen von Open-API Spezifikationen ein. Dafür wird u.a. auf statische Tests, entwicklerorientierte Unit-Tests, Integrationstests aber auch auf Contract-basierte Test-Ansätze eingegangen.
- **Steven Schmidt** (Deutsche Bahn) stellt ein Projekt für öffentliche aber dennoch verschlüsselte WLANs (WPA2-802.1X) für Reisende, welche mit Hilfe der BahnID genutzt werden können, vor. Begleitet wird das Projekt von einer Studie zur Bewertung der Vertrauenswürdigkeit in öffentlichen Netzen.

5. Weitere Informationen

Zu vielen der im Bericht angesprochenen Beiträge können die verwendeten Präsentationen über die Webseite der ceCMG (www.cecmg.de) bezogen werden. Darüber hinaus erscheint in Kürze ein Nachtragsband (vgl. [Greis/Schmietendorf 2018]) zur ECC-Konferenz mit weiterführenden Artikeln bzw. Zusammenfassungen.

6. Quellenverzeichnis

- [Greis/Schmietendorf 2018] Greis, W.; Schmietendorf, A. (Hrsg.): Enterprise Computing Conference 2020 – Ausgewählte Ergebnisse der Podiumsdiskussion, Diskussionsrunden und Workshops, 60 Seiten, in Berliner Schriften zu modernen Integrationsarchitekturen, Shaker-Verlag, Aachen, April 2020, ISBN 978-3-8440-7320-1
- [Hartenstein 2020] Hartenstein, S.; Nadobny, K.; Schmidt, S.; Schmietendorf, A.: Sicherheits- und Compliance-Management im Lebenszyklus von Web APIs, Ergebnisse eines Forschungsprojektes an der HWR Berlin/Uni Magdeburg, 140 Seiten, Monografie, Logos-Verlag, Berlin, März 2020, ISBN 978-3-8325-5086-8
- [Starke 2019] Starke, G.: Legacy ist keine Krankheit – Vermächtnis in kleinen Schritten kontinuierlich fortentwickeln, OBJEKTSpektrum 06/2019,

7. Dank

Unser Dank gilt allen Referenten, Moderatoren und Teilnehmern, die trotz der angespannten Situation den Weg nach Köln gefunden haben. Darüber hinaus geht ein spezieller Dank an die diesjährigen Aussteller (BROADCOM und Compuware) und Sponsoren (EMA – European Mainframe Academy GmbH, PKS Software GmbH, SMT Data A/S und TPS Data GmbH), die eine solche Veranstaltung maßgeblich ermöglicht haben. Ein besonderer Dank gilt Frau Susanne Mund für die perfekte Vorbereitung sowie Frau Gabriele Pfeiffer für das gelungene Management am Konferenzort! Auch dem „Park Inn Hotel Köln City West“ sei an dieser Stelle ausdrücklich für die perfekte Unterstützung und den professionellen Umgang mit schwierigsten Rahmenbedingungen gedankt!

Currently COSMIC Initiatives

Very important: the COSMIC Group had prepared a second certification exam on 'Early Software Sizing with COSMIC' using these two documents. A pilot these of this new certification exam will be done in April, and the official launch will be the following month.

Another important COSMIC news: a task force has revisited the current 130+ page Measurement Manual v 4.0.2, and restructure for ease of access and training. Version 5.0 of the COSMIC Measurement Manual will have 3 Parts as follows:

- Part 1: Principles, Definitions and Rules (17 pages)
- Part 2: Guidelines (17 pages)
- Part 3: Examples of COSMIC concepts and rules (33 pages).

The reviews of Parts 1 and 2 are now complete, and the review of Part 3 will be completed in 2 weeks.

This means that by May 15, version 5.0 should be available - of course free on the COSMIC website.

Within a period of about 6 months, we expect a large number of translations of Parts 1 and 2.

***New description for the Early COSMIC FP method are available
(in two versions: for Practitioners and for Experts)***

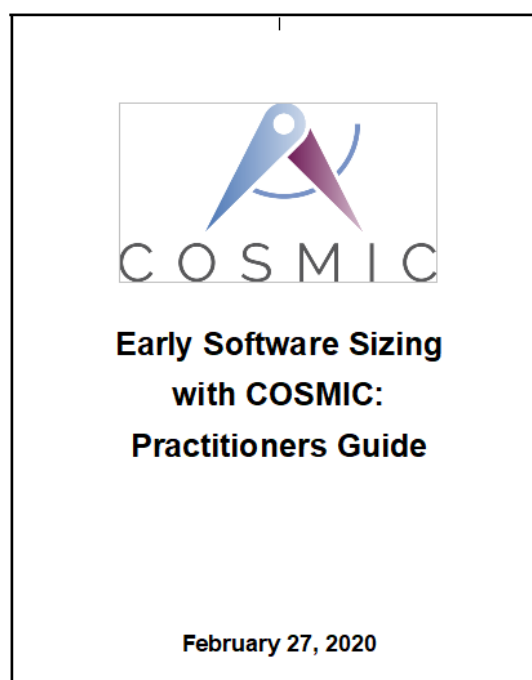


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1. GENERAL PRINCIPLES OF APPROXIMATE SIZING

The COSMIC method provides a standardized way of measuring a functional size of software.

In practice, it is at times sufficient or necessary to approximate a functional size:

- when a size is needed, but there is insufficient time or resources to measure using the standard method;
- early in the life of a project, before the Functional User Requirements (FUR) have been specified down to the level of detail where the accurate size measurement is possible;
- when the quality of the documentation of the actual requirements is not good enough for accurate measurement.

The intended audience for this document is for those who need to establish the size of a piece of software without time or details available to use the standard COSMIC method.

For those who are interested in a more in-depth view of the COSMIC approximation techniques, see the Experts Guide [e\[1\]](#) that discusses their pros and cons, and their recommended areas of application.

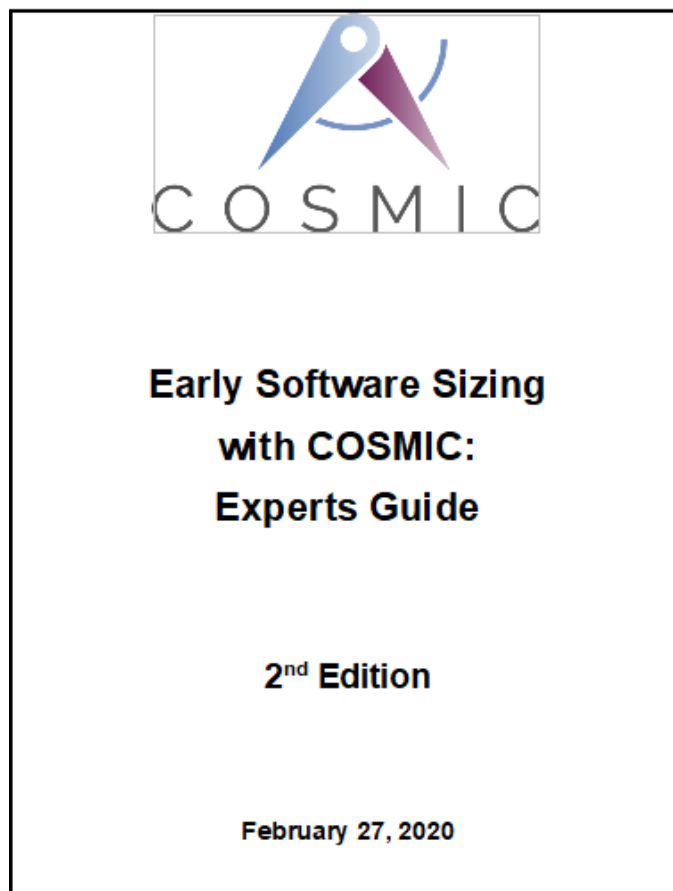
This document describes reasons why it may be necessary to approximate, how actual requirements are often expressed at varying levels of documentation and some general principles of how to recognise and apply approximation techniques.

The rest of the guide describes:

- Techniques for the Requirements Stage (sections 2-6).
- Techniques for the Feasibility Stage (section 7-9).
- A checklist with items to consider when using approximation.

You can use the forum on cosmic-sizing.org/forums to post your questions and receive answers from the COSMIC worldwide community. The quality of any answers will depend on the knowledge and experience of the community member that writes the answer.

. . .



1. GENERAL PRINCIPLES OF APPROXIMATE SIZING.

1.0 Note on Terminology.

The COSMIC method measures the 'Functional User Requirements' (or FUR) of software. COSMIC uses this term to apply to requirements that are specified in sufficient detail for an approximate COSMIC Functional Size Measurement.

Approximate sizing techniques are designed to be applied when this level of detail is not (yet) available. In this Guide, we therefore refer to the 'actual requirements' as the subject that approximate sizing techniques are designed to measure. The term 'actual requirements' may include 'system' non-functional requirements. But many actual requirements that appear initially as 'system' non-functional evolve, as a project progresses, into 'software' functional requirements that can be sized by the same approximation techniques.

For the definition of general COSMIC terms used in this Guide, see the Measurement Manual [2]. For terms specific to this Guide, see the Glossary.

• • •

see: www.cosmic-sizing.org/

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see: www.cosmic-sizing.org/

30 Years IWSM - A Historical Review

do you remember?

Reiner R. Dumke and Alain Abran

The Beginning of the IWSM in 1990

After the change in Germany, we contacted researchers in the field of (Empirical) Software Engineering at first in Germany. In the fall of 1990 we started with a small group of participants from Germany, France, Greece, Hungary and Norway with a 'Workshop'.



Proceedings as simple copies



Typical topics:

Metrics tools

Metrics classification

Code measurements

Test metrics

The Second Workshop 1992 in Vienna

The next workshop was embedded in the annually meeting of the German Society of Informatics (GI) Group 4.3.1 Requirements Engineering held At the Technical University of Vienna in Austria chaired by Prof. Kerner with participants of Germany, Austria and Switzerland.

Conference location



Social Event at the year's wine



Some papers are published in the Softwaretechnik-Trends



Typical topics:

Software metrics

Code measurement

Quality assurance

The Third Workshop 1993 in Stuttgart

The Metrics Workshop 1993 was held at the University of Stuttgart in the annually meeting of the German Society of Informatics (GI) Group 4.3.1 Requirements Engineering of Germany, Austria and Switzerland. The software engineering group of Prof. Jochen Ludewig as one of the leading metrics experts organized this event.

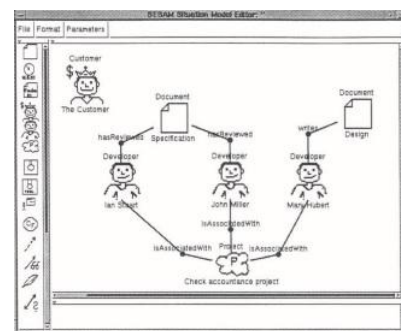
Conference location



Stuttgart' Tool:

SESAM:

an Approach for Simulation of Software Projects using Software Product and Process Metrics



Some papers was published in the first journal of the Metrics News



Typical topics:

Software measurement theory

Software metrics

OO measurement

Metrics tools

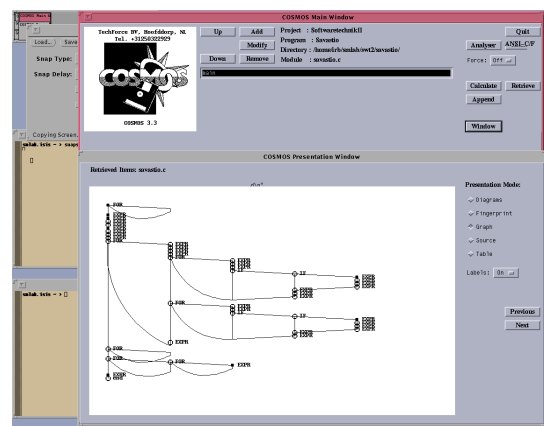
The Fourth Workshop 1994 in Magdeburg

The Metrics Workshop 1994 was held at the University of Magdeburg chaired by Prof. Reiner Dumke with participants of Germany, Netherlands, Norway and Switzerland.

Conference location



Discussion about measurement



Proceedings in a book



Typical topics:

Process metrics

Software test metrics

OO measurement

Metrics tools

Quality assurance

The Fifth Workshop 1995 in Berlin

The Metrics Workshop 1995 was held at the Technical University of Berlin chaired by Prof. Horst Zuse with participants of Germany, Austria and UK.

Conference location



First version of Zuse's ZD MIS



a description and analysis of more than thousand software metrics

Proceedings in a research report



Typical topics:

Quality assurance

Software reliability

OO metrics applications

Metrics tools

The Sixth Workshop 1996 in Regensburg

The Metrics Workshop 1996 was held at the University of Regensburg chaired by Prof. Franz Lehner with participants of Germany, Austria and Canada.

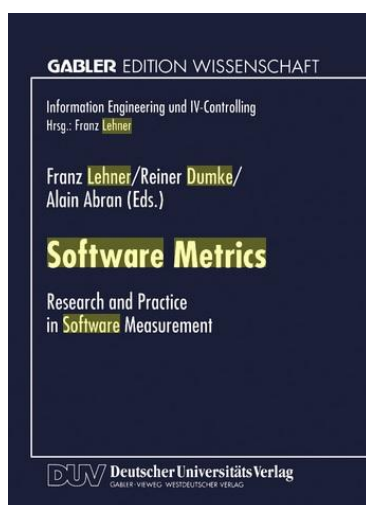
Conference participants



Prof. Lehner 's field of measurement



Proceedings in a book



Typical topics:

Documentation measurement

Software productivity

Java measurement

Software quality assurance

The Seventh Workshop 1997 in Mannheim

The Metrics Workshop 1997 was held at the University of Mannheim chaired by Prof. Franz Stetter with participants of Germany and Belgium.

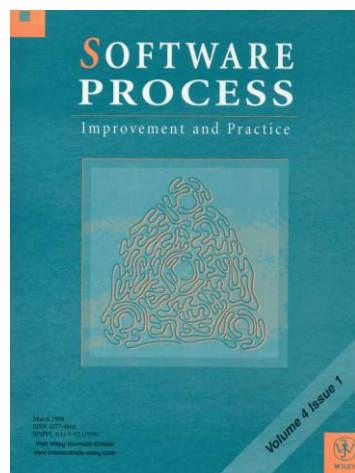
Conference participants



Prof. Stetter's book with an essential part of software measures



Selected papers were published in the Software Process journal



Typical topics:

Metrics data bases

Software reusability

OO design metrics

Quality improvement

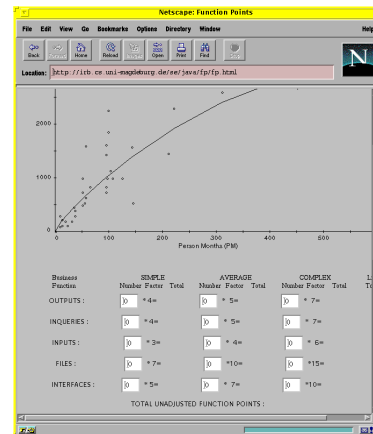
The Eighth IWSM Conference 1998 in Magdeburg

The Measurement Workshop 1998 was held at the University of Magdeburg chaired by Prof. Reiner Dumke with participants of Germany, Belgium, Canada, England, France, Italy and Netherlands.

Conference location

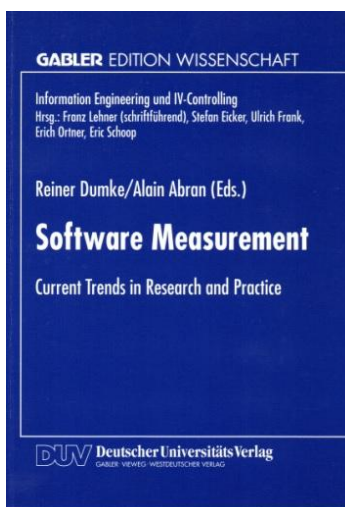


The tool implementation as Web application as e-measurement



the classical Function Points Web application

Proceedings in a book



Typical topics:

Measurement repositories

Metrics tool overview

OO design metrics

Project measurements

The Ninth IWSM Conference 1999 in Canada

The Measurement Workshop 1999 was held in the Caribou Lodge on Lac Superieur near Montreal chaired by Prof. Alain Abran with participants of Canada, Germany, England, Italy and Netherlands.

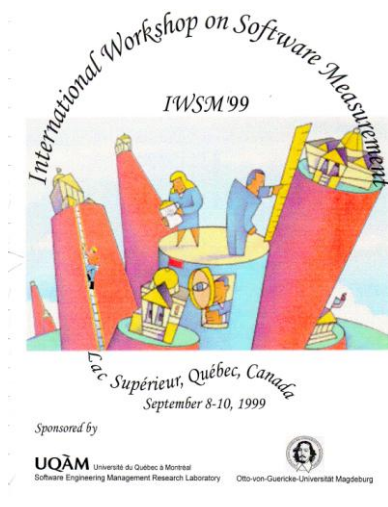
Conference location



Conference participants



Proceedings in a book



Typical topics:

- Project measurements
- Full Function Point applications
- Management tools
- Measurement programs

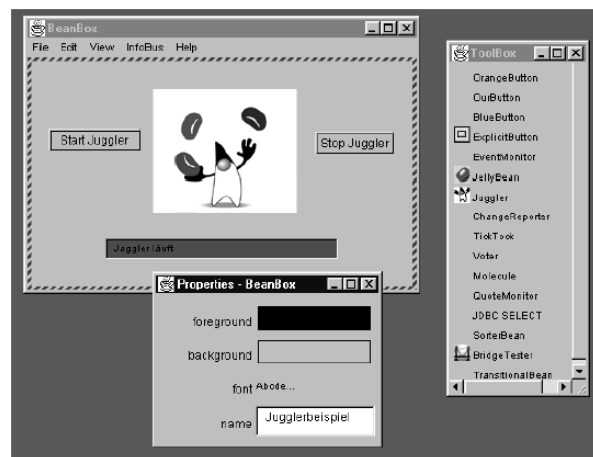
The 10th IWSM Conference 2000 in Berlin

The Measurement Workshop 2000 was held in Berlin chaired by Prof. Andreas Schmietendorf with participants of Germany, Canada, China, England and Italy.

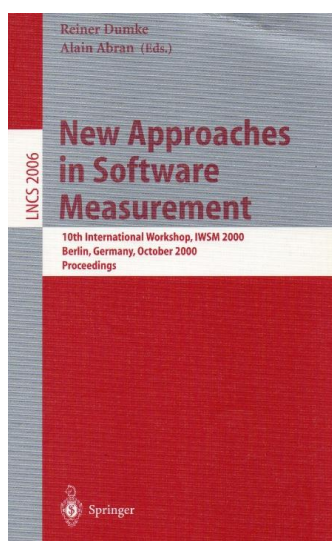
Conference location



EAI research topic



Proceedings in a Springer book



Typical topics:

Component measurements

Software quality measures

COSMIC FFP

OO measurement

Cost/effort estimation

Performance engineering

The 11th IWSM Conference 2001 in Montreal

The IWSM Workshop 2001 was held in Montreal chaired by Prof. Alain Abran with participants of Belgium, Bulgaria, Canada, Germany, Italy, Morocco, Spain and USA.

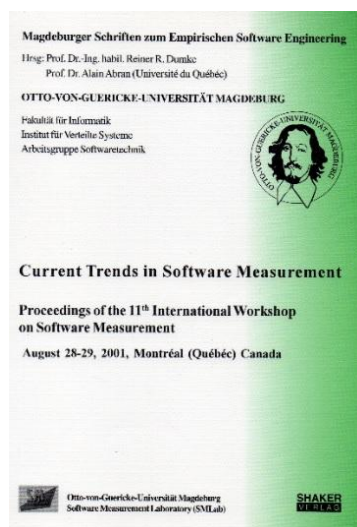
Conference location



Conference participants



Proceedings in a book



Typical topics:

Process measurements
COSMIC FFP applications
Cost estimation
Software agent measurement
Measurement processes

The 12th IWSM Conference 2002 in Magdeburg

The Measurement Workshop 2002 was held in Magdeburg chaired by Prof. Reiner Dumke with participants of Bulgaria, Canada, Finland, Germany, Hungary, Netherlands, UK and Italy.

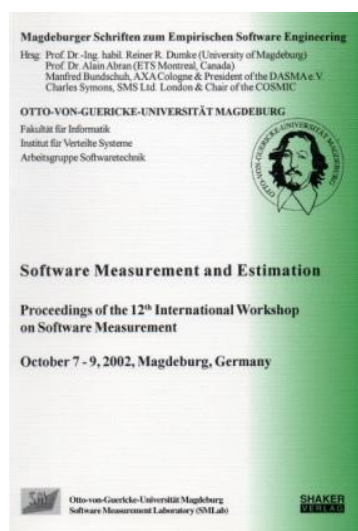
Conference location



Conference participants



Proceedings in a book



Typical topics:

Software metric database

COSMIC FFP applications

Maintenance measurement

Performance measurement

Testability metrics

Quality evaluation

The 13th IWSM Conference 2003 in Montreal

The Measurement Workshop 2003 was held in Montreal chaired by Prof. Alain Abran with participants of Belgium, Canada, Germany, India, Italy, Japan, Netherlands, UK, USA and Vietnam.

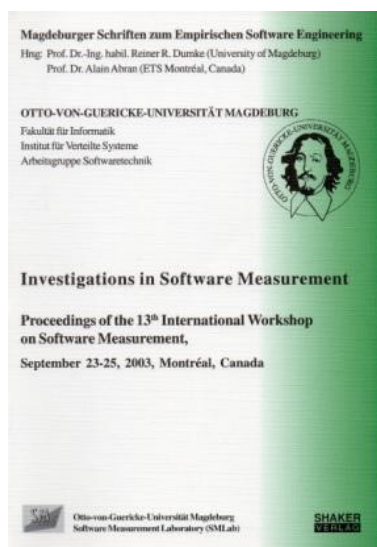
Conference location



Conference speakers



Proceedings in a book



Typical topics:

The COSMIC FP measurement standard IEC/ISO 19761

Software measure validation

Usability measurement

ISBSG estimations

Performance measurement

Process improvement

The 14th IWSM Conference 2004 in Berlin

The Measurement Workshop 2004 was held in Montreal chaired by Prof. Andreas Schmietendorf with participants of Argentina, Australia, Austria, Bahrain, Belgium, Canada, Finland, France, Germany, Italy, Netherlands, Spain, Switzerland, UK and USA.

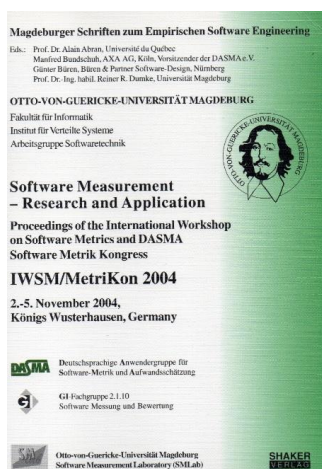
Conference participants



Conference speakers



Proceedings in a book (more than 600 pages)



Typical topics:

Functional size measurements

Cost estimation models

Software reliability

Project management

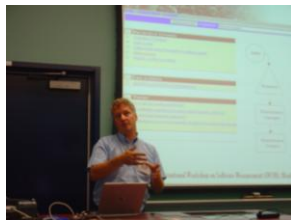
ISBSG benchmarking

Software measurement efficiency

The 15th IWSM Conference 2005 in Montreal

The Measurement Workshop 2005 was held in Montreal chaired by Prof. Alain Abran with participants of Argentina, Australia, Austria, Bahrain, Belgium, Brazil, Bulgaria, Canada, Finland, France, Germany, Ghana, Italy, Netherlands, Poland, Slovenia, Spain, Switzerland, UK, USA and Vietnam.

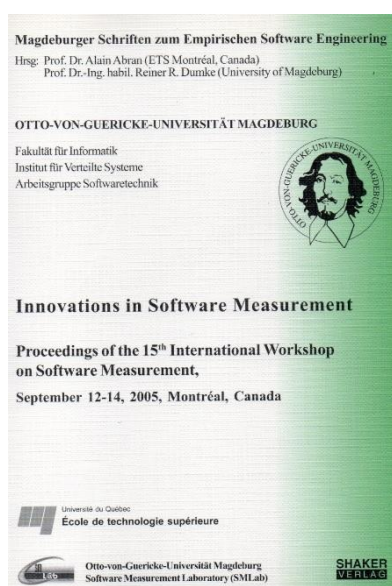
Conference speakers



Conference pause



Proceedings in a book



Typical topics:

COSMIC FP measurements

Effort estimation models

Measurement services

Benchmarking

Offshore measurements

Measurement convertibility

The 16th IWSM Conference 2006 in Potsdam

The Measurement Workshop 2006 was held in Potsdam chaired by Günter Büren with participants of Argentina, Australia, Austria, Bahrain, Belgium, Brazil, Bulgaria, Canada, Finland, France, Germany, Ghana, Italy, Netherlands, Slovenia, Spain, Switzerland, UK, USA and Vietnam.

Conference location



Conference discussions



Proceedings in a book



Typical topics:

Software cost modelling

Software quality assessments

Ontology-based measurements

Measurement processes

Use Case Points

COSMIC FP certification

The 17th IWSM/MENSURA 2007 in Mallorca

The Measurement Workshop 2007 was held in Mallorca (Spain) together with the second MENSURA conference chaired by Prof. Juan Cuadrado-Gallego with participants of Austria, Belgium, Canada, Finland, France, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, UK and USA .

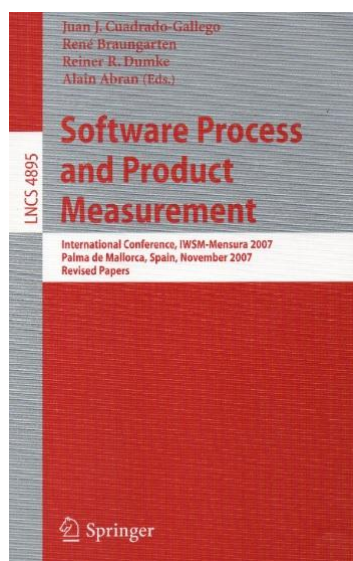
Conference chaires



Conference participants



Proceedings in a Springer book



Typical topics:

Functional size measurements

Agile process measurements

Functional size database

Multi-site empirical studies

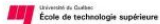
ISBSG benchmarking

COSMIC FP real-time applications

The 18th IWSM/MENSURA 2008 in Munich

The Measurement Workshop 2008 was held in Munich chaired by Manfred Bundschuh with participants of Austria, Canada, Finland, France, Germany, Italy, Netherlands, Pakistan, Spain, Sweden, Switzerland, Turkey and UAE.

Conference publication




IWSM 2008
 18th International Workshop
 on Software Measurement




MetriKon 2008
 DASMA Metrik Kongress



Mensura 2008
 International Conference
 on Software Process and Product Measurement

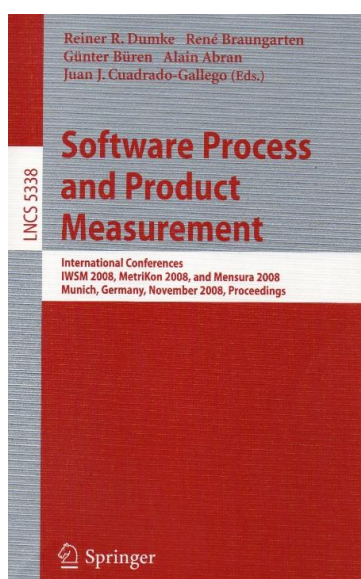
18.-19. November 2008, Siemens AG, München

von **DASMA** Deutschsprachige Anwendergruppe für
 Software-Metrik und Aufwandschätzung
GI FG 2.1.10 GI Fachgruppe Software messen und bewerten
 zusammen mit: Canadian Interest Group on Metrics
 COmmon Software Measurement International Consortium
 Metrics Associations International Network
 Universität Magdeburg,
 École de Technologie Supérieure – Université du Québec, Kanada,
 University of Alcalá, Madrid, Spanien
 unterstützt von: Siemens AG, München

Conference participants



Proceedings in a Springer book



Typical topics:

Quality-driven service orchestration

Measuring million lines of code

Cloud computing measurements

COSMIC FP based estimations

Software project control

Six Sigma applications

The 19th IWSM/MENSURA 2009 in Amsterdam

The Measurement Workshop 2009 was held in Amsterdam chaired by Prof. Jacob Brunekreef with participants of Argentina, Australia, Austria, Belgium, Canada, Finland, Germany, Italy, Netherlands, Spain, Switzerland, Turkey and UAE.

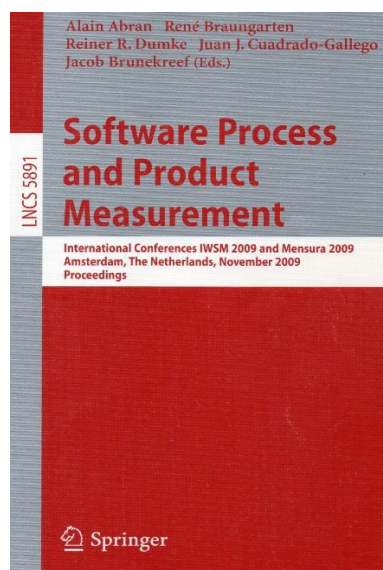
Conference participants



Social Event in Amsterdam



Proceedings in a Springer book



Typical topics:

- Measurement systems
- Risks assessment methods
- COSMIC FP applications
- Web development effort
- Suggestions for benchmarking
- Measurer qualifications

The 20th IWSM/MENSURA 2010 in Stuttgart

The Measurement Workshop 2010 was held in Stuttgart chaired by Dr. Christof Ebert with participants of Australia, Austria, Belgium, Canada, Finland, France, Germany, Italy, Japan, Netherlands, Spain, Switzerland, Turkey and USA.

Conference participants



Event in the Porsche Museum



Proceedings in a book



Typical topics:

Effort estimation

Cost estimaton models

Quality assurance in agile developemnt

Project controlling

ISBSG benchmarking

Design metrics for UML

The 21th IWSM/MENSURA 2011 in Japan

The Measurement Workshop 2011 was held in Nara (Japan) chaired by Prof. Kenichi Matsumoto with participants of Belgium, Canada, Germany, Italy, Netherlands, Slovenia, Spain, Switzerland and UK.

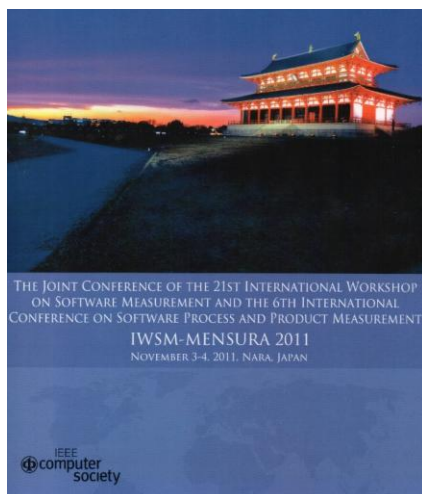
Conference participants



Conference location



Proceedings in an IEEE book



Typical topics:

Functional size measurements

Repository mining

Efficient machine learning

Quality assessments

Human performance

Entropy-based measurements

The 22th IWSM/MENSURA 2012 in Assisi

The Measurement Workshop 2012 was held in Assisi (Italy) chaired by Luca Santillo with participants of Austria, Belgium, Canada, Finland, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, Turkey and UK.

Conference location



Conference speakers



Proceedings in a book and in the IEEE Conference Publishing Service

IWSM MENSURA 2012

2012 Joint Conference of the 22nd International Workshop on Software Measurement and the 2012 Seventh International Conference on Software Process and Product Measurement

(IWSM-MENSURA 2012)

Published by



17-19 October 2012 – GUFPI-ISMMA, Assisi, Italy

Typical topics:

Quality of effort estimation

SOA measurements

COSMIC FP real-time applications

Fuzzy logic approaches

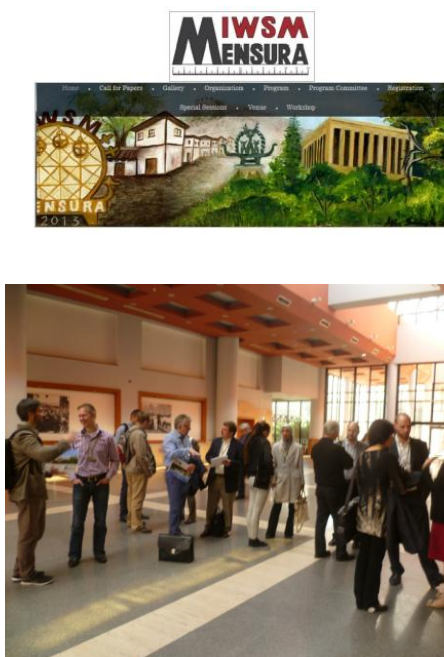
FP metrics convertibilities

Measurement frameworks

The 23th IWSM/MENSURA 2013 in Turkey

The Measurement Workshop 2013 was held in Ankara (Turkey) chaired by Prof. Onur Demirörs with participants of Austria, Belgium, Canada, Germany, Italy, Netherlands, Poland, Spain, Sweden, Switzerland, Turkey and UK.

Conference location



Conference speakers



Proceedings in the IEEE Conference Publishing Service



Typical topics:

Fast functional size measurements

Software reuse measurement

Agile development measures

Project management

Maintenance measurements

Experience reports

The 24th IWSM/MENSURA 2014 in Rotterdam

The Measurement Workshop 2014 was held in Rotterdam chaired by Frank Vogelezang with participants of Austria, Belgium, Canada, Finland, Germany, Italy, Netherlands, Poland, Spain, Sweden, Switzerland, Turkey and UK.

Conference location



Conference speakers



Proceedings in the IEEE Conference Publishing Service (CPS)



Typical topics:

COSMIC FP for mobile Apps

Automotive software measurements

Software estimation models

Measurement process improvement

Performance measurements

GQM extentions

The 25th IWSM/MENSURA 2015 in Poland

The Measurement Workshop 2015 was held in Craków (Poland) chaired by Prof. Andrzej Kobylinski with participants of Austria, Belgium, Canada, Finland, Germany, Italy, Netherlands, Poland, Spain, Sweden, Switzerland and UK.

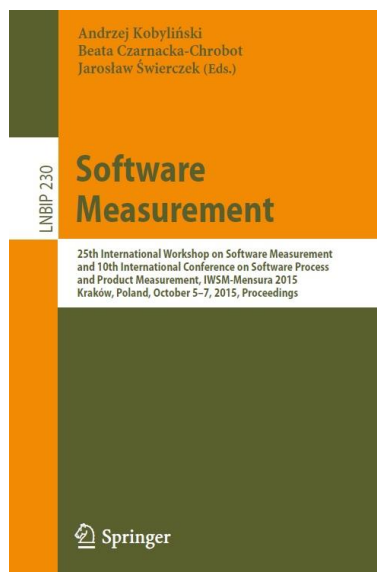
Conference location



Conference speakers



Proceedings in a Springer book



Typical topics:

Early and rapid COSMIC applications

Cost models evaluation

Measurement dashboards

Agile team productivity

Measurement-as-a-Service

Metrology standards application

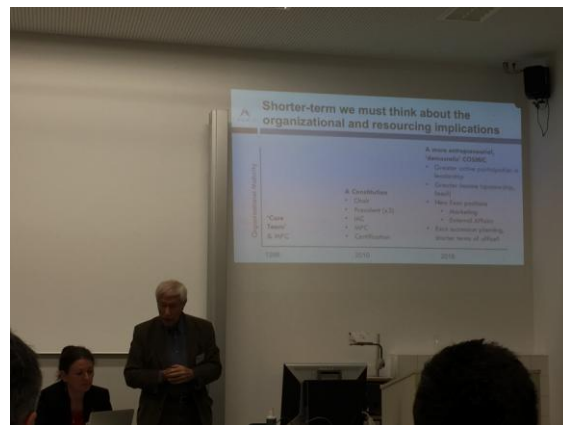
The 26th IWSM/MENSURA 2016 in Berlin

The Measurement Workshop 2016 was held in Berlin chaired by Prof. Andreas Schmietendorf with participants of Australia, Austria, Belgium, Canada, Finland, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, Switzerland, Turkey, UK and USA.

Conference location



Conference sessions



Proceedings in the IEEE Conference Publishing Service (CPS)



Typical topics:

Functional size measurement patterns

Cost estimation models

Requirements measurements

Web accessibility measurement

Benchmarking, Data Analytics

Server license balancing measures

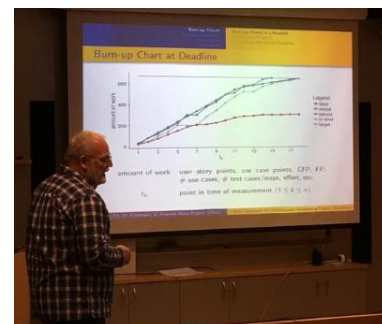
The 27th IWSM/MENSURA 2017 in Sweden

The Measurement Workshop 2017 was held in Gothenburg (Sweden) chaired by Prof. Miroslav Staron with participants of Austria, Belgium, Canada, Finland, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, Switzerland, Turkey and UK.

Conference location



Conference speakers



Proceedings in the ACM International Conference Publishing Service (ICPS)

International Conference Proceeding Series (ICPS) Search within Proceedings

Home > ICPS Proceedings > IWSM Mensura '17

IWSM Mensura '17: Proceedings of the 27th International Workshop on Software Measurement and 12th International Conference on Software Process and Product Measurement

2017 Proceeding

General Chairs: Miroslav Staron, Wilhelm Meding, Program Chairs: 2

Publisher: Association for Computing Machinery, New York, NY, United States

Conference: IWSM/Mensura '17: 27th International Workshop on Software Measurement and 12th International Conference on Software Process and Product Measurement • Gothenburg Sweden • October, 2017

ISBN: 978-1-4503-4853-9

Typical topics:

Measurement patterns
& anti-patterns

Scope management

Service maintenance measures

Project flow analytics

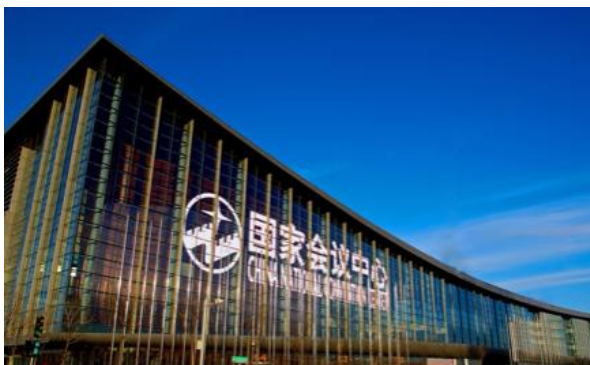
Automated FP measurement

Software effort estimation

The 28th IWSM/MENSURA 2018 in China

The Measurement Workshop 2018 was held in Beijing (China) chaired by Prof. Chen Zong with participants of China, Canada, Italy, Netherlands, Sweden, Turkey and UK.

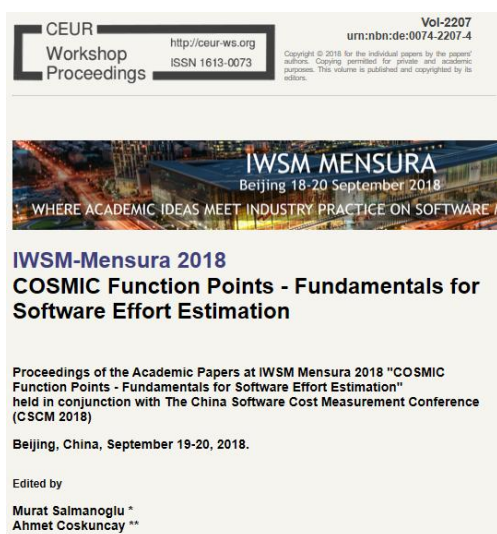
Conference location



Conference participants



Proceedings in the CEUR proceedings service



Typical topics:

COSMIC FP measurements

Early estimation methods

Measurement mobile apps

Measures correlations

Scrum measurements

The 29th IWSM/MENSURA 2019 in Haarlem

The Measurement Workshop 2019 was held in Haarlem (Netherlands) chaired by Frank Vogelesang with participants of Austria, Belgium, Canada, Finland, France, Germany, , Italy, Netherlands, Spain, Sweden, Switzerland, Turkey and UK.

Conference location



Conference speakers



Proceedings in the CEUR proceedings service

CEUR
Workshop
Proceedings

<http://ceur-ws.org>
ISSN 1613-0073

Vol-2476
urn:nbn:de:0074-2476-1

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IWSM-Mensura 2019
International Workshop on Software Measurement and International Conference on Software Process and Product Measurement 2019

Joint Proceedings of the International Workshop on Software Measurement and the International Conference on Software Process and Product Measurement (IWSM Mensura 2019)

Haarlem, The Netherlands, October 7-9, 2019.

Edited by
Ayca Kolukisa Tarhan *
Ahmet Coskuncay **

Typical topics:

Portfolio estimations

MENSURA COSMIC tool

Effort estimation teaching

Blockchain-based projects

COSMIC scaling factors

Software reliability

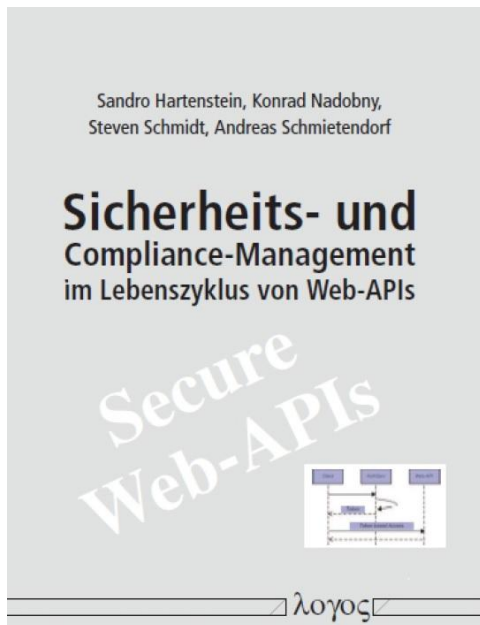
The 30th IWSM/MENSURA 2020 in Mexico

The Measurement Workshop 2020 was held in Mexico City chaired by Prof. Andreas Schmietendorf with participants of Argentina, Australia, Austria, Bahrain, Belgium, Brazil, Bulgaria, Canada, Finland, France, Germany, Ghana, Italy, Netherlands, Slovenia, Spain, Switzerland, UK, USA and Vietnam.

Conference publication



**THANKS and CONGRATULATION
to our Measurement Community !**

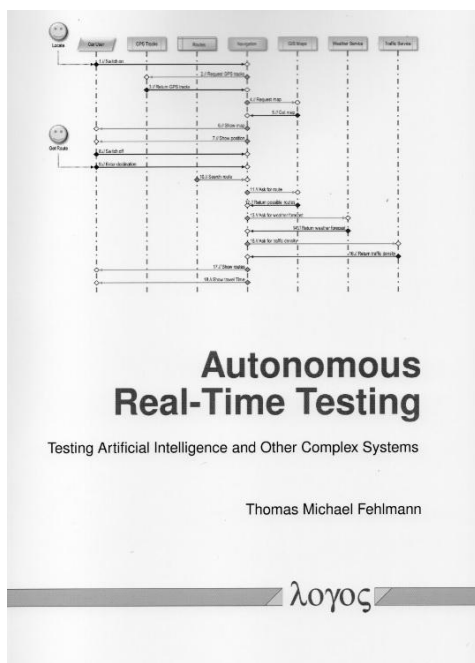


**Hartenstein/Nadobny/Schmidt/
Schmietendorf:**

Sicherheits- und Compliance Management

**Logos-Verlag, Berlin, 2020
ISBN 978-3-8525-5086-8**

This book describes approaches and techniques for implementing Web APIs keeping security-related requirements. The API management involves analytical and constructive approaches for quality assurance during the development. The DevOps approach was considered in the context of business processes.



Thomas M. Fehlmann:

Autonomous Real-Time Testing

**Testing Artificial Intelligence and Other
Complex Systems**

**Logos-Verlag, Berlin, 2020
ISBN 978-3-8525-5086-8**

The book explains the theory and the implementation approach for a framework for Autonomous Real-Time Testing (ART) of a software-intensive system while in operation. Principles and approaches like Combinatory logic, Analytic Hierarchy Process (AHP) and Quality Function Deployment (QFD) are used for a complex testing approach of real-time systems like automotive solutions, IoT control software and embedded system releases.



Schmietendorf, A.:

Workshop ESAPI 2019

Dresden, November 2019

Shaker Verlag, Aachen, 2019,
ISBN 978-3-8440-6837-5

Dieses Buch beinhaltet die Beiträge zur ESAPI-Konferenz 2019 zu Sicherheits- und Complianceaspekten von Web-APIs vor allem in relevanten Anwendungsbereichen.



Miroslaw Staron:

Software Development Measurement Programs

Springer Publ., 2019
ISBN 978-3030063085

This book describes approaches and techniques for implementing software measurement processes from a practical point of view involving tool support, project integration and measurement programs evolution.



Schmietendorf, A.,:

ESAPI 2018

**2. Workshop: Evaluation of Service-APIs
8. November 2018, München**

Shaker Verlag, Aachen, April 2018, ISBN 978-3-8440-6254-0

The book includes the proceedings of the Evaluation of Service-APIs 2018 Workshop held in Munich in November 2018, which constitute a collection of theoretical studies in the field of measurement and evaluation of service oriented and API technologies.

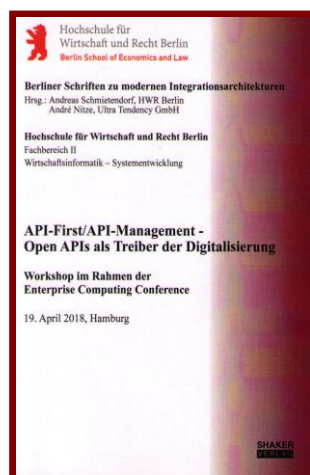


Gerardus Blokdyk:

Software Measurement the Ultimate Step-By-Step Guide

5starcooks Publ. 2018

This book summarizes some helpful practical experiences about measurement integration in software management processes and their successful implementation.



Schmietendorf, A., Nitze, A.:

ESAPI 2018

2. Workshop: API-First/API-Management 19. April, Hamburg

Shaker Verlag, Aachen, April 2018, ISBN 978-3-8440-5927-4

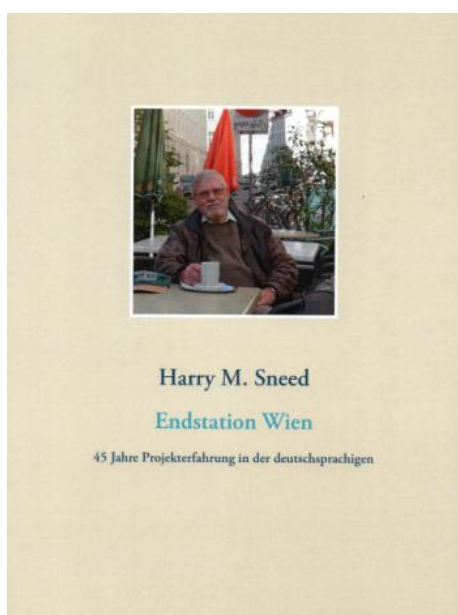
The book includes the proceedings of the API-First/API-Management 2018 Workshop held in Hamburg in April 2018, which constitute a collection of theoretical studies in the field of measurement and evaluation of service oriented and API technologies.

Harry Sneed:

Endstation Wien

45 Jahre Projekterfahrungen in der deutschsprachigen IT-Welt BoD Norderstedt, 2017, 328 S. ISBN 978-3-7448-8364-1

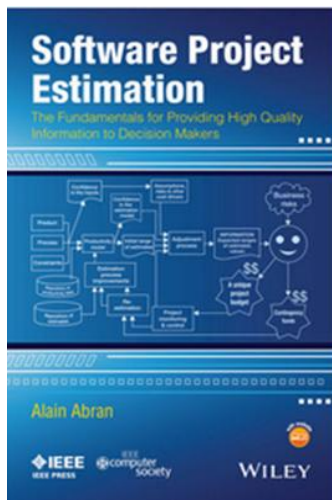
Dieses Buch beschreibt nahezu die gesamte Tätigkeit von Harry Sneed in der IT-Welt, von den Anfängen der Großrechner mit den COBOL und PL/I-Programmen bis hin zu den aktuellen und modernen Ansätzen Service-orientierter Technologien und Systemen. Dieses Buch fasst vor allem die umfangreichen Erfahrungen zu Wartungs-, Migrations- und Testprojekten zusammen, die auch für die Beherrschung aktueller und moderner Software-Anwendungen, wie beispielsweise autonomes Fahren oder Smart Cities, von unschätzbarem Wert sind. Es zeigt in unterhaltener Weise die teilweise immensen Anstrengungen für die kontinuierliche Gewährleistung von IT-Diensten.





Staron, M, Melding, W.:
***Proceedings of the
 IWSM/Mensura 2017***

Joined Conference of the 27th International Workshop on Software Measurement (IWSM) and the 12th International Conference on Software Process and Product Measurement (Mensura), ACM 2017, ISBN 978-1-4503-4853-9
 This proceedings are available at the Computer Science Bibliography of Trier.



Abran, A.:

***Software Project Estimation: The
 Fundamentals for Providing***

High Quality Information to Decision Makers

Wiley IEEE Computer Society Press, 2015 (288 pages), ISBN 978-1-118-95408-9

This book introduces theoretical concepts to explain the fundamentals of the design and evaluation of software estimation models. It provides software professionals with vital information on the best software management software out there. End-of-chapter exercises, Over 100 figures illustrating the concepts presented throughout the book, Examples incorporated with industry data.

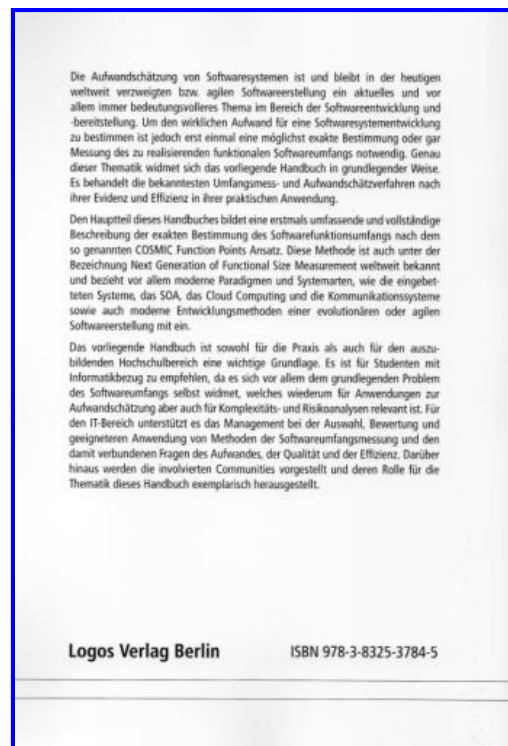
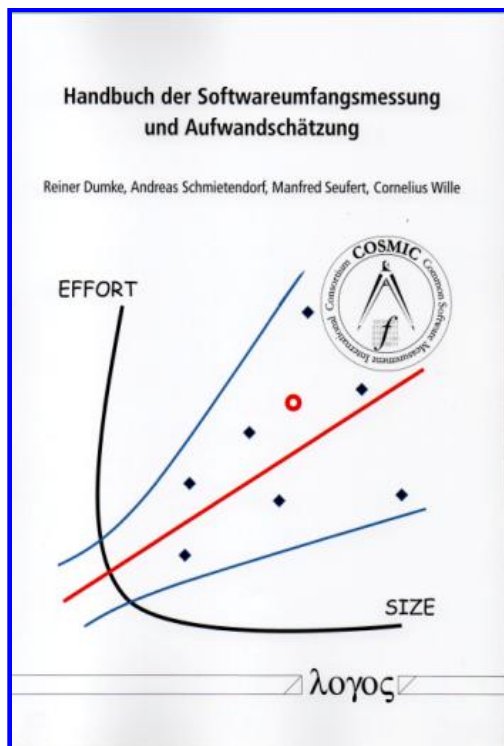
Please remember:

Dumke, R., Schmietendorf, A., Seufert, M., Wille, C.:

***Handbuch der Softwareumfangsmessung und
 Aufwandschätzung***

Logos Verlag, Berlin, 2014 (570 Seiten), ISBN 978-3-8325-3784-5

Eine vollständige Beschreibung der COSMIC Function Point Methode mit zahlreichen industriellen Anwendungen und Erfahrungen.



This book shows an overview about the current software size measurement and estimation approaches and methods. The essential part in this book gives a complete description of the **COSMIC measurement method**, their application for different systems like embedded and business software and their use for cost and effort estimation based on this modern ISO size measurement standard.

Software Measurement & Data Analysis Addressed Conferences

January 2020

- CPP 2020** **9th ACM SIGPLAN International Conference on Certified Programs and Proofs**
January 19-25, 2020 New Orleans, USA
see: <https://popl20.sigplan.org/home/Cpp-2020>
- SWQD 2020:** **Software Quality Days**
January 14-17, 2020, Vienna, Austria
see: <https://2020.software-quality-days.com/>
- SOFSEM 2020:** **46th International Conference on Current Trends in Theory and Practice of Computer Science**
January 20-24, 2020, Limassol, Cyprus
see: <http://www.guide2research.com/conference/sofsem-2020>

February 2020

- ISEC 2020:** **12th Innovation in Software Engineering Conference**
February 27-29, 2020, Jabalpur, India
see: <https://isofit.acm.org/isec2020/keynote.html>
- Smart Data Car Data 2020:** **Automobilwoche Konferenz**
February 20, 2020, Munich, Germany
see: <https://www.smartdata-cardata.de/programm.html>
- SOFTENG 2020:** **International Conference on Advances and Trends in Software Engineering**
February 23 - 27, 2020, Lisbon, Portugal
see: <https://www.iaria.org/conferences2020/ProgramSOFTENG20.html>
- SE 2020:** **Software Engineering**
February 24 – 28, 2020, Innsbruck, Austria
see: <https://se20.ocg.at/>

March 2020

- ASQ 2020:** **Lean and Six Sigma Conference**
February 28 - March 2, 2020, Phoenix, Arizona, USA
see: <https://asq.org/conferences/six-sigma/>

- ECC 2020:** **Enterprise Computing Conference (ECC)**
March 12 - 13, 2020, Cologne, Germany
see: <https://cecmg.de/index.php/veranstaltungen/2-workshop/10-ecc-2020-in-koeln>
- ICEASE 2020:** **21th International Conference on Evaluation and Assessment in Software Engineering**
March 19-20, 2020, Dubai, UAE
see: <https://www.conferenceindex.org/event/international-conference-on-evaluation-and-assessment-in-software-engineering-icease-2020-march-dubai-ae>
- REFSQ 2020:** **26th International Working Conference on Requirements Engineering: Foundation for Software Quality**
March 24 - 27, 2020, Pisa, Italy
see: <https://refsq.org/welcome/>
- ICSA 2020:** **IEEE International Conference on Software Architecture**
March 16 -20, 2020, Salvador, Brazil
see: <https://icsa-conferences.org/2020/index.html>
- Programming 2020:** **Programming 2020**
March 23 - 26, 2020, Porto, Portugal
see: <https://2020.programming-conference.org/>

April 2020

- BigDataService 2020:** **IEEE Big Data Service 2020**
April 13 - 16, 2020, Oxford, United Kingdom
see: <http://www.big-dataservice.net/>
- ODSC East 2020:** **Open Data Science Conference East**
April 13 - 17, 2020, Boston, USA
see: <https://www.odsc.com/boston>
- ICPE 2020:** **11th ACM/SPEC International Conference on Performance Engineering**
April 20 – 24, 2020, Edmonton, Canada
see: <https://icpe2020.spec.org/>
- FASE 2020:** **23th International Conference on Fundamental Approaches to Software Engineering**
April 25 - 30, 2020, Dublin, Ireland
see: <https://www.etaps.org/2020/2019/fase>
- ETAPS 2020:** **European Join Conference on Theory & Practice of Software**
April 25 - 30, 2020, Dublin, Ireland
see: <https://www.dublinconventionbureau.com/Offer/Conference/ETAPS-2020>

May 2020

- CibSE 2020:** **Iberoamerican Conference on Software Engineering**
May 4 - 8, 2020, Curitiba, Brazil
see: <http://www.guide2research.com/conference/cibse-2020>
- STAREAST 2020:** **Software Testing Analysis & Review Conference**
May 3 - 8, 2019, Orlando, FL, USA
see: <http://stareast.techwell.com/>
- ENASE 2020:** **15th International Conference on Evaluation of Novel Approaches to Software Engineering**
May 5 - 6, 2020, Prague, Czech Republic
see: <http://www.enase.org/>
- ASQ 2020:** **World Conference on Quality and Improvement**
May 3 - 6, 2020, Columbus, USA
see: <https://asq.org/conferences/wcqi>
- ICBDM 2020:** **International Conference on Big Data in Management**
May 15 - 17, 2020, Manchester, UK
see: <https://www.nature.com/naturecareers/events/event/92453>
- ICPC 2020:** **International Conference on Program Comprehension**
May 23 - 24, 2020, Seoul, South Korea
see: <http://www.guide2research.com/conference/icpc-2020>
- ICGSE 2020:** **International Conference on Global Software Engineering**
May 23 - 24, 2020, Seoul, South Korea
see: <https://conf.researchr.org/home/icgse-2020>
- SEAMS 2020:** **International Symposium on Software Engineering for Adaptive and Self-Managing Systems**
May 25 - 26, 2020, Seoul, South Korea
see: <https://conf.researchr.org/home/seams-2020>
- ICAMDS 2020:** **International Conference on Applied Mathematics and Data Science**
May 27 - 29, 2020, Hangzhou, China
see: <http://www.icamds.com/>
- OSS 2020:** **International Conference on Open Source Systems**
May 12 - 14, 2020, Innopolis, Russia
see: <https://10times.com/oss-innopolis-tatarstan>

June 2020

- EJC 2020:** **International Conference on Information Modeling and Knowledge Bases**
June 8 - 12, 2020, Hamburg, Germany
see: <https://ejc.informatik.haw-hamburg.de/index.html>

XP 2020:	International Conference on Agile Software Development June 8 - 12, 2020, Copenhagen, Denmark see: https://www.agilealliance.org/xp2020/
ICWE 2020:	International Conference on Web Engineering June 9 - 12, 2020, Helsinki, Finland see: https://icwe2020.webengineering.org/
SDS 2020:	Swiss Conference on Data Science June 26, 2020, Luzern, Switzerland see: https://www.sds2020.ch/
VDA Automotive SYS 2020:	Quality Management for Automotive Software-based Systems and Functionality June 16 - 18, 2020, Potsdam, Germany see: https://vda-qmc.de/en/software-processes/vda-automotive-sys/
IEEE DSC 2020:	IEEE International Conference on Data Science in Cyberspace June 24 - 27, 2020, Hong Kong, China see: https://www4.comp.polyu.edu.hk/~icdsc2020/index.html
BigData 2020:	Big Data Congress June 22 - 26, 2020, Honolulu, USA see: http://www.bigdatacongress.org/2020/
SCC 2020:	International Conferences on Service Computing June 22 - 26, 2020, Honolulu, USA see: http://thescc.org/2020/
AIMS 2020:	7th International Conference on AI and Mobile Services June 22 - 26, 2020, Honolulu, USA see: http://www.ai1000.org/2020/index.html
ICIOT 2020:	International Conference on Internet of Things June 22 - 26, 2020, Honolulu, USA see: http://iciot.org/2020/

July 2020

SQ 2020:	International Symposium on Software Quality July 1 - 4, 2020, Cagliari, Italy see: http://http://sq.covenantuniversity.edu.ng/
ISSTA 2020:	International Symposium on Software Testing and Analysis July 18 - 22, 2020, Los Angeles, USA see: https://http://www.guide2research.com/conference/issta-2020
BIGDADI 2020:	International Conference on Big Data Analytics, Data Mining and Computational Intelligence July 23 - 25, 2020, Zagreb, Croatia see: https://bigdaci.org/
MCCSIS 2020:	Multiconference on Computer Science and Information Systems July 21 - 25, 2020, Zagreb, Croatia see: https://mccsis.org/

Big Data 2020:	Big Data Analysis and Data Mining July 17 - 18 2020, Vienna, Austria see: https://datamining.expertconferences.org/
ICSOFT 2020:	International Conference on Software Technologies July 7 - 9, 2020, Lieusaint – Paris, France see: http://www.icsoft.org/
AGILE 2020:	Annual North American Agile Conference July 20 – 24, 2020, Orlando, USA see: https://www.agilealliance.org/agile2020/
QRS 2020:	IEEE International Conference on Software Quality, Reliability, and Security July 27 – 31, 2020, Vilnius, Lithuania see: https://qrs20.techconf.org/
SERP 2020:	International Conference on Software Engineering Research and Practice July 27 - 30, 2020, Las Vegas, Nevada, USA see: https://americancse.org/events/csce2020/conferences/serp20
CSCE 2020:	World Congress on Computer Science and Engineering July 27 - 30, 2020, Las Vegas, Nevada, USA see: https://americancse.org/events/csce2020
ICOMP'20:	International Conference on Internet Computing and internet of Things July 27 - 30, 2020, Las Vegas, Nevada, USA see: https://americancse.org/events/csce2020/conferences/icmp20
EEE'20:	International Conference on e-Learning, e-Business, Enterprise Information Systems, and e-Government July 27 - 30, 2020, Las Vegas, USA see: https://americancse.org/events/csce2020/conferences/eee20
GCC'20:	International Conference on Grid, Cloud, and Cluster Computing July 27 - 30, 2020, Las Vegas, USA see: https://10times.com/gcc-las-vegas

August 2020

icABCD'20:	International Conference on Advances in Big Data, Computing and Data Communication System August 6 - 7, 2020, Durban, South Africa see: https://10times.com/icabcd
ICDSE 2020:	International Conference on Data Science and Engineering August 12 - 14, 2020, Kerala, India see: http://icdse.in/
Euromicro DSD/ SEAA 2020:	Software Engineering & Advanced Application Conference August 26 - 28, 2020, Portoroz, Slovenia see: https://dsd-seaa2020.um.si/index.htm/

September 2020

- QEST 2020:** **International Conference on Quantitative Evaluation of Systems**
 August 31 – September 3, 2020, Vienna, Austria
 see: <http://www.qest.org/qest2020/index.html>
- EuroAsiaSPI² 2020:** **European Systems & Software Process Improvement and Innovation Conference**
 September 9 - 11, 2020, Düsseldorf, Germany
 see: <http://2020.eurospi.net/index.php/about/eurospi-2016>
- RE 2020:** **IEEE International Requirement Engineering Conference**
 August 31 - September 4, 2020, Zurich, Switzerland
 see: <http://re20.org/>
- SEFM 2020:** **International Conference on Software Engineering and Formal Methods**
 September 14 - 18, 2020, Amsterdam, Netherlands
 see: <https://event.cwi.nl/sefm2020/>
- ODSC 2020:** **Open Data science Conference Europe**
 September 15 - 17, 2020, Dublin, Ireland
 see: <https://www.odsc.com/dublin>
- ASE 2020:** **Automated Software Engineering**
 September 21 - 25, 2020, Melbourne, Australia
 see: <https://conf.researchr.org/home/ase-2020>
- IMMM 2020:** **International Conference on Advances in Information Mining and Management**
 Sept. 27 – Oct. 01, 2020, Rome, Italy
 see: <https://www.iaria.org/conferences2020/IMMM20.html>

October 2020

- MSR 2020:** **Conference on Mining Software Repositories**
 October 5 - 6, 2020, Seoul, South Korea
 see: <https://2020.msrconf.org/>
- ESEIW 2020:** **Empirical Software Engineering International Week**
 October 5 - 9, 2020, Bari, Italy
 see: <https://eseiw2020.di.uniba.it/>
- ESEM 2020:** **Conference on Empirical Software Engineering and Measurement**
 October 8 – 9, 2020, Bari, Italy
 see: https://eseiw2020.di.uniba.it/esem_conf/
- ICSE 2020:** **42th International Conference on Software Engineering**
 October 5 - 11, 2020, Seoul, South Korea
 see <https://2020.icse-conferences.org/>

API 2020:	API Conference 2020 October , 2020, Berlin, Germany see: https://blog.hwr-berlin.de/schmietendorf/
data2day 2020:	Konferenz für Big Data, Data Science und Machine Learning October 19 – 21, 2020, Heidelberg, Germany see: https://www.data2day.de/
CLOUD 2020:	IEEE International Conference on Cloud Computing October 19 -23, 2020, Beijing, China see: https://conferences.computer.org/cloud/2020/
ICWS 2020:	International Conference on Web Services October 19 -23, 2020, Beijing, China see: https://conferences.computer.org/icws/2020/
SERVICES 2020:	IEEE World Congress on Services October 19 -23, 2020, Beijing, China see: https://conferences.computer.org/services/2020/
ICSEA 2020:	International Conference on Software Engineering Advances October 18 -22, 2020, Porto Portugal see: https://www.iaria.org/conferences2019/ICSEA19.html
ICST 2020:	IEEE International Conference on Software Testing, Verification & Validation October 24 - 28, 2020, Porto, Portugal see: http://icst2020.info/
ASQT 2020:	Arbeitskonferenz Softwarequalität, Test und Innovation October 29 , 2020, Bozen, Austria see: http://www.asqt.org/
IWSM/Mensura 2020:	Common International Conference on Software Measurement October 29 - 30, 2020, Mexico City, Mexico see: https://www.iwsm-mensura.org/

November 2020

ESEC/FSE 2020:	European Software Engineering Conference and Symposium on the Foundation of Software Engineering November 6 - 13, 2020, Sacramento, USA see: https://2020.esec-fse.org/
IEEE ICDM 2020:	IEEE International Conference on Data Mining November 17 - 20 , 2020, Sorrento, Italy see: http://icdm2020.bigke.org/
BigDataSE 2020:	14th IEEE International Conference on Big Data Science and Engineering November 10-13, 2020, Guangzhou, China see: http://www.ieee-trustcom.org/BigDataSE2020/

- PROFES 2020:** **International Conference on Product Focused Software Process Improvement**
November 25 -27, 2020, Turin, Italy
see <https://softeng.polito.it/profes2020/>
- SERA 2020:** **IEEE/ACIS Conference on Software Engineering Research, Management and Applications**
November 30, 2020, Kanazawa, Japan
see: <https://www.myhuiban.com/conference/943>

December 2020

- Big Data 2020:** **IEEE International Conference on Big Data**
December 10-13, 2020. Atlanta, USA
see: <http://bigdataieee.org/BigData2020/>
- BCD 2020:** **International Conference on Big Data, Cloud Computing, and Data Science Engineering**
December 14 - 16, 2020, Macao
see: <http://http://acisinternational.org/conferences/bcd-2020/>

see also:

- <http://www.acisinternational.org/newconferences.html>
- <https://www.acm.org/conferences>
- https://www.ieee.org/conferences_events/index.html

COMMUNITIES



Central Europe Computer Measurement Group (ceCMG)

<http://www.cecmg.de>



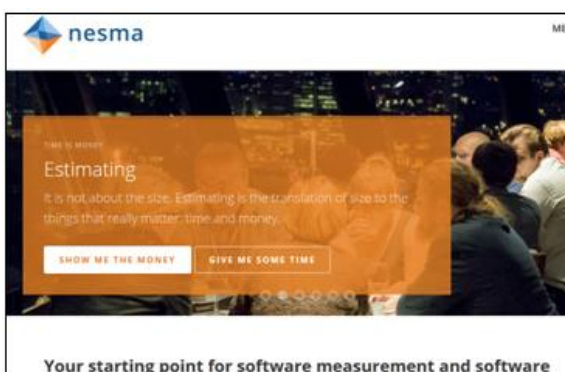
Metrics Association's International Network (MAIN)

<http://www.mai-net.org>



Finnish Software Measurement Association (FISMA)

<http://www.fisma.fi/in-english/>



Netherlands Software Metrics users Association (NESMA)

<http://www.nesma.org/>



GI-Fachgruppe Software-Messung und Bewertung

<https://fg-metriken.gi.de/>

(Measurement News Online)



Common Software Measurement International Consortium (COSMIC)

<http://cosmic-sizing.org>



Deutschsprachige Anwendergemeinschaft für Software-Metrik und Aufwandschätzung

<http://www.dasma.org>



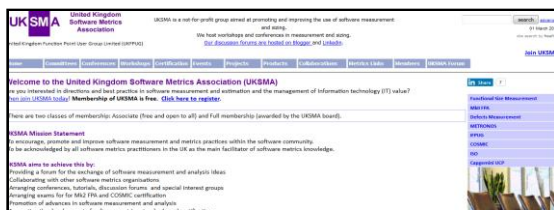
International Software Benchmarking Standard Group (ISBSG)

<https://www.isbsg.org>



**Asociacion Espanola de
Metricas de Software**

<http://www.aemes.org/>



United Kingdom Software Metrics Association (UKSMA)

<http://www.uksma.co.uk>



**Gruppo Utenti Function Point Italia -
Italian Software Metrics Association
(GUFPI - ISMA)**

<http://www.gufpi-isma.org>



Anwenderkonferenz Software- qualität und Test (ASQT)

<http://www.asqt.org>

MEASUREMENT SERVICES



Software Measurement Laboratory
(SML@b)

<http://www.smlab.de>



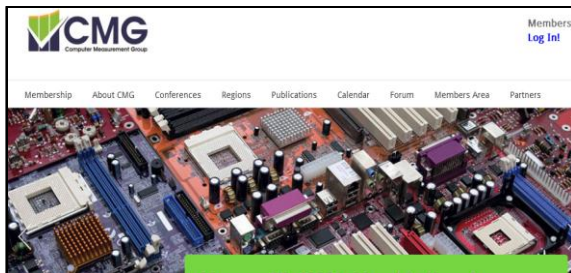
International Function Point
Users Group (IFPUG)

<http://www.ifpug.org>



Practical Software & Systems
Measurement

[www.psmc.com/:](http://www.psmc.com/)



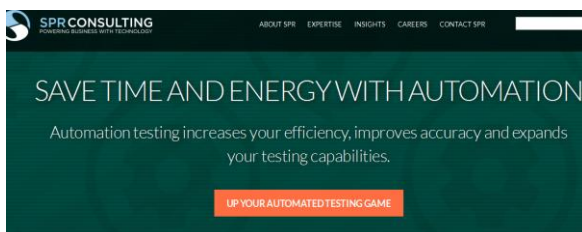
Computer Measurement Group (CMG)

<http://www.cmg.org>



Software Engineering Institute (SEI)

www.sei.cmu.edu/measurement/



Software Productivity Research (SPR)

<http://www.spr.com/>



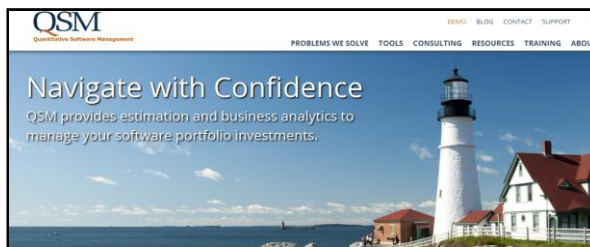
McCabe & Associates

<http://www.mccabe.com>



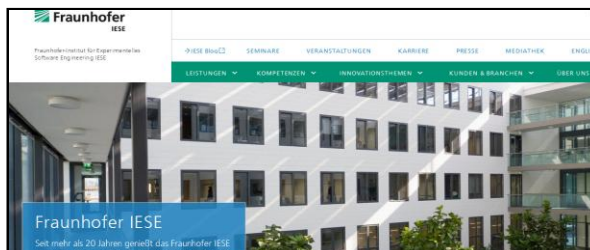
SQS Gesellschaft für Software-Qualitätssicherung

<http://www.sqs.de>



Quantitative Software Management (QSM)

<http://www.qsm.com/>



Fraunhofer Institute for Experimental Software Engineering (IESE)

<https://www.iese.fraunhofer.de/>



National Institute of Standards and Technology (NIST)

<https://www.nist.gov/el>

SOFTWARE MEASUREMENT INFORMATION



Gesellschaft für Informatik

Fachgruppe Software-Messung und -Bewertung

Startseite | Vorstand | Aktuelles | **Bibliografie** | Arbeitskreise | Software Measurement News

Sie befinden sich hier: Startseite/Bibliografie

Software Measurement Bibliography

Basisliteratur finden Sie hier

1 Software Measurement Foundations

- Measurement Overview
- Measurement Principles & Foundations
- Measurement Standards
- Basic (Set of) Measures
- Measurement Validation
- Measurement & Statistics

2 Software Process & Product Measurement

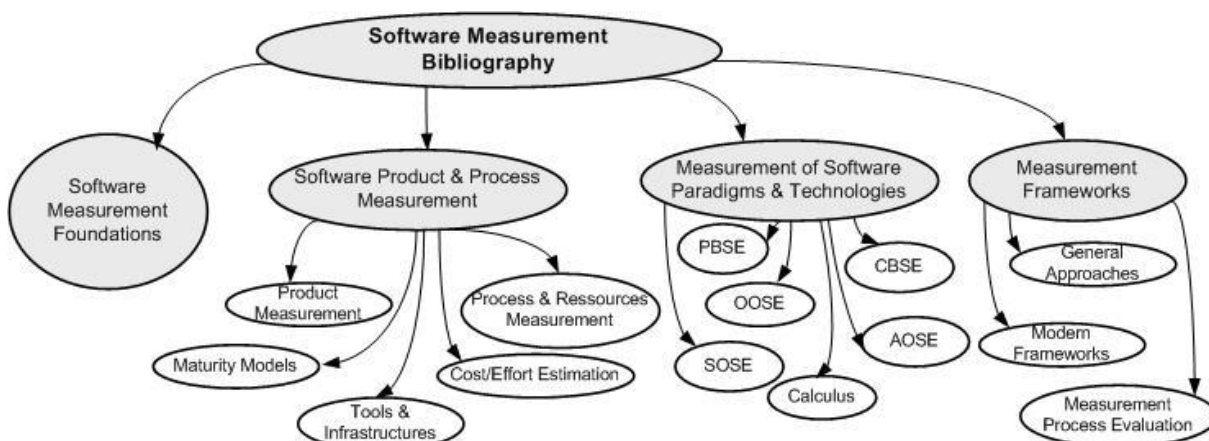
Software Measurement Bibliography

See our overview about software metrics and measurement in the Bibliography at

<https://fg-metriken.gi.de/bibliographie/>

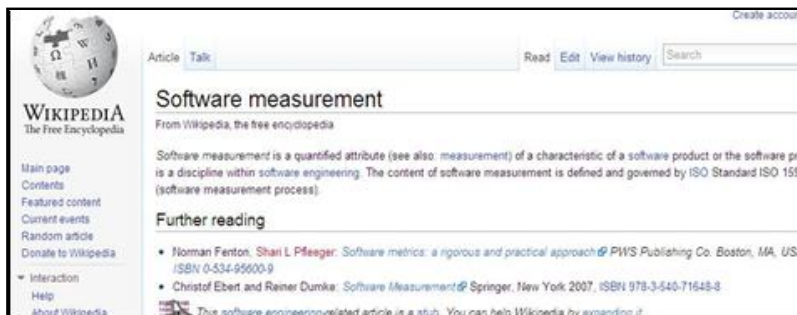
including any hundreds of books and papers

Bibliography Structure:



Software Measurement & Wikipedia

Help to qualify the software measurement knowledge and intentions in the world wide web:



WIKIPEDIA
The Free Encyclopedia

Article: **Software measurement**

From Wikipedia, the free encyclopedia

Software measurement is a quantified attribute (see also: measurement) of a characteristic of a software product or the software process. The content of software measurement is defined and governed by ISO Standard ISO 15939 (software measurement process).

Further reading

- Norman Fenton, Shari L. Pfleeger: *Software metrics: a rigorous and practical approach* PWS Publishing Co. Boston, MA, USA ISBN 0-534-95600-9
- Christof Ebert and Rainer Dumke: *Software Measurement* Springer, New York 2007, ISBN 978-3-540-71648-8

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Software Engineering Body of Knowledge (SWEBOK)

<http://www.swebok.org/>



Project Management Body of Knowledge (PMBOK)

<http://www.pmbook.org>

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2020

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