



Build It and They Will Come: Keys to Developing a Successful Software Metrics Program

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Highlights - Carol Dekkers, PMP, CFPS (Fellow), P.Eng. SCEC

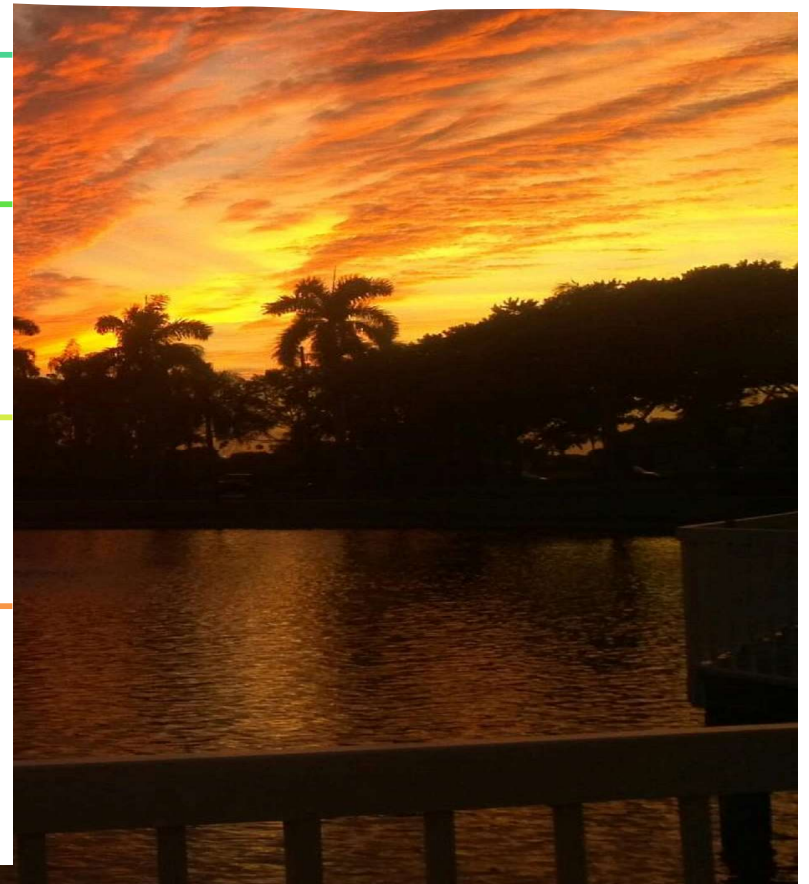
U.S. expert and project editor for ISO/IEC JTC1 SC7 SW Engineering standards.
IFPUG Past President & committee chair (Industry Standards), ICEAA Board Member

Independent consultant, author and speaker (30+ countries) with US & international clients

ICEAA 2022 Educator of the year & Lead Author of CEBOOK-S; o 2023 Global Leader in Consulting; 2022 IFPUG Honorary Fellow

Certified FP Specialist (CFPS-Fellow), SCEC, Certified Scrum Master (CSM), PMP, P.Eng.

Resides in FL, USA. Interests include: festival event & volunteer management, tennis, travel, craft beverages and gourmet food



Highlights - Dan French, PMP, CFPS (Fellow), CSM

- B.S. in Economics from Virginia Tech
- Graduate of the Chubb Institute Top Gun Program
- Over 20 years experience in software cost estimation
- Counting function points for 24 years and been a Certified Function Point Specialist (CFPS) for 22 years (IFPUG Fellow)
- Experience in a number of estimation techniques and tools including SEER-SEM, COCOMO, SLiM, Delphi, and Estimating by Analogy
- Certification Chair for the International Function Point Users Group (IFPUG)
- Recent Certification Director for the IFPUG Board of Directors
- Former Chairman of the IFPUG Functional Software Sizing Committee (FSSC)
- GAO Agile and Cost guides expert team member
- Project Management Institute (PMI) Project Management Professional (PMP)
- Agile Alliance Certified SCRUM Master (CSM)

What is a Software Metrics Program?

- A set of **processes, procedures and metrics** to **gather, report, and store data** related to software development projects.
- Data are used to **measure aspects** of a software development organization.
- **Direct or indirect** metrics¹
- Measures **performance, cost, quality** or other aspects of software development
- Used to develop software **estimates, historical analysis, trending, forecasts** and identify areas for **process improvement**.

Why is a software measurement program important for your organization?

- *“You can’t manage what you don’t measure”*
 - Peter Drucker

- *“In God we trust, all others must bring data.”*
 - W. Edwards Deming



A few words of Caution...*

If we *Make Safety A Prerequisite* then we need to begin with safely handling metrics.

- **Measuring can, in itself, be hazardous.**
(DeMarco)
- Metrics laws:
 - When a measure becomes a target, it ceases to be a good measure ([Goodhart's Law](#))
 - Measures tend to be corrupted/gamed when used for target-setting ([Campbell's Law](#)).
 - Monitoring a metric may subtly influence people to maximize that measure ([The Observer Effect](#)).

What is a Metric...



- “A metric is just an indicator. Just as a high temperature reading on your dash indicates a problem with your engine or cooling system, a metric only lets you know that something might be wrong — forcing that *number* to change doesn't necessarily fix anything.”*

Why is a software measurement program important for your organization?

- AD&M comprise a significant portion budgets
- Improve software development processes and delivery
- Improve software quality
- Demonstrate business value of the IT organization to the organization
- Competitive advantage
- Increase project success rates
- More efficient use of IT resources
- And more...



Perceived Barriers to Software Measurement

- Costs
- Lack of understanding (need & importance)
- Lack of skills/knowledge
- Reluctance to devote resources
- Resistance/reluctance to change
- Short term mentality (quick ROI)
- We already have TONS of data...



Successful Metrics Programs

Start with the End in Mind

1. Identify your BUSINESS GOALS
(that measurement can support) → SMART
2. What are the questions you need to answer?
3. Metrics, measures, and finally data



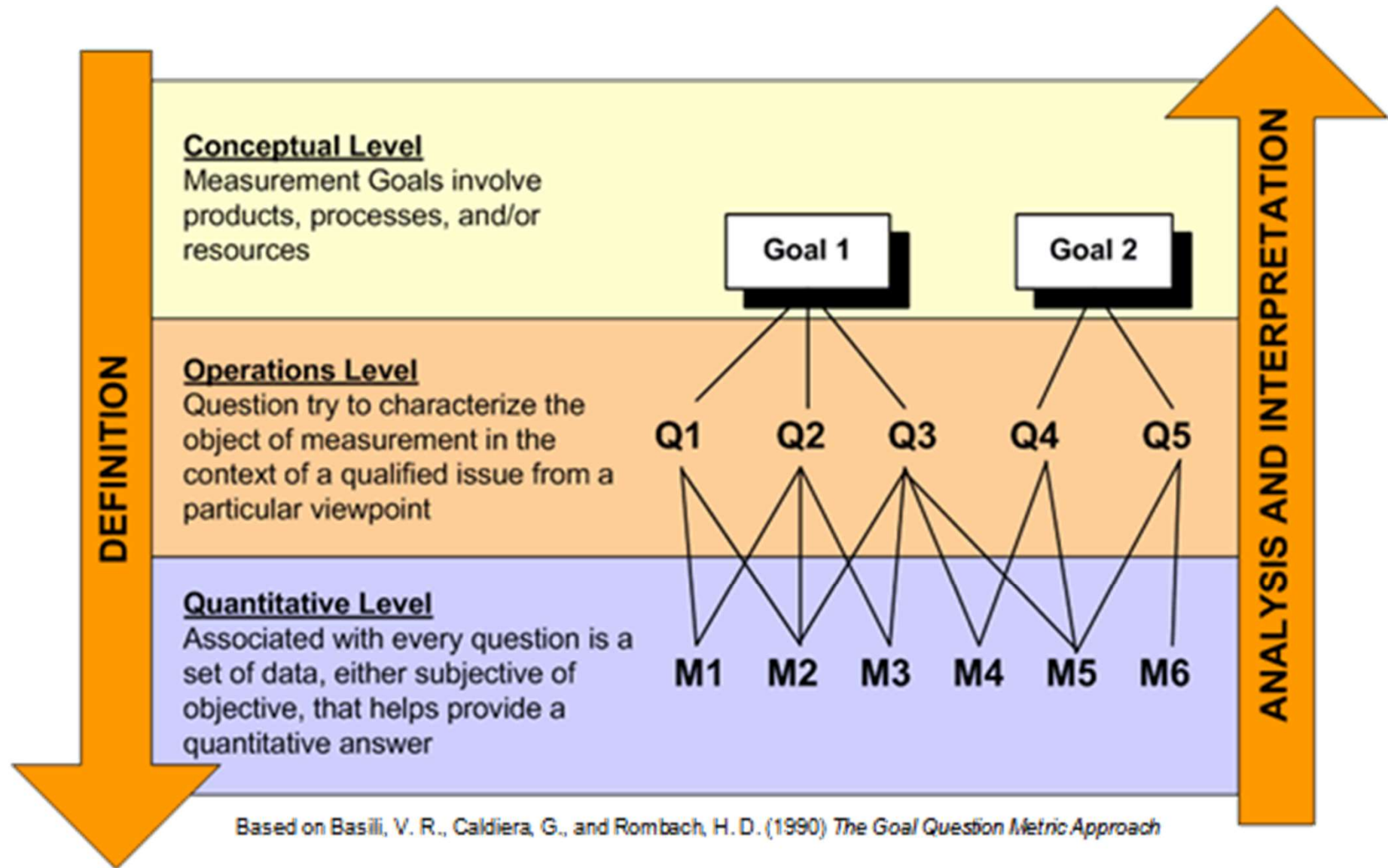
Successful Metrics Programs

Start with the End in Mind

Goal-Question-Metric (Basili)

- **Goal:** What do you want to know (improve)?
(Or... what did the last project REALLY cost?)
- **Question:** How do we find the answer?
- **Metric:** What metric(s) will provide the information to answer the question and meet the goal?

GQM Diagram²



Identify Key Metrics

- Once the goals and question are established, THEN the metrics, measures and data are determined
- Determine from where the metrics will be sourced (5W's and How)
- In cases where the organization does not have the metrics to address the question, then the source(s) to provide the data will have to be developed – or sourced using Historical...

Simple example

Question: what is the **monthly productivity rate** for our software development teams?

Metric: **Productivity Rate** (Output / Input)

- Output = Delivered Product Size (units are FP or SLOC or COSMIC FP or SP)
- Input = Monthly Effort (units are person hours or person months)
- Productivity= $FP / \text{Person Month}$

Determine Required Resources

Resources include:

- **People:** individuals who will collect, analyze and present the data
- **Budget / Costs** (labor cost, equipment, tools, software)
- **Tools** (Data gathering, Analytics, Repository, Reporting)
- **Marketing** (Explain Goals, Metrics, Benefits)



Develop Processes and Procedures

- Measurement should SUPPORT the gathering, analysis, reporting and storage of the metrics
- Processes and procedures to:
 - Identify the infrastructure and data gathering plan
 - Detail what is to be collected, & how it is to be collected,
 - Pinpoint the gold source(s) of each metrics
 - Outline how and when the data is to be collected, analyzed, reported and stored/archived

Develop and Present Data

- Once the processes and procedures have been developed and data collection has begun, the metrics team develops the analysis to be conducted on the measurement data collected and determines how, when and to whom the data is to be presented
- Different audiences will have different reporting needs and the metrics team should verify with their stakeholders that the data they are receiving is appropriate, relevant, timely and actionable

Periodically Evaluate and Revise Program

- Once the measurement program has been implemented, it should be evaluated periodically (quarterly, semi-annually, annually) to identify issues and opportunities for improvement
- This is necessary because as the needs of the business and stakeholders change, the metrics team wants to ensure that the data collected and presented provides value to the stakeholder. Otherwise, it is a waste of resources.

Tips to Ensure Successful Implementation of a Software Measurement Program

- Start with a pilot program
 - Find a small, low visibility, low priority project or group of projects to begin implementation of the program
 - Do not use a major program that is strategically important to your organization's success as your pilot
- Tailor the program to your organization's maturity level
 - Don't try to implement complex processes and data gathering if your organization is not at least a CMMI Level 3.

Tips to Ensure Successful Implementation of a Software Measurement Program

- For the pilot, keep it simple!
 - Select a few key metrics that are easy to gather and conduct analysis
- Focus only on the important metrics that deliver the greatest business value
- Properly resource and fund your team
 - Make sure that those working on the effort are properly trained, funded and provided with the tools they need

Tips to Ensure Successful Implementation of a Software Measurement Program

- Ensure that time tracking is consistent and at the level of detail to provide the necessary data and that all time is recorded.
 - Track by SDLC phase
 - Include overtime
 - Track software maintenance by type:
 - Perfective
 - Corrective
 - Adaptive
 - Preventative

Tips to Ensure Successful Implementation of a Software Measurement Program

- Socialize and educate from the bottom up
 - Inform all stakeholders of the benefits the measurement program will provide, particularly those that directly impact them
- Hold regular update meetings during the pilot to keep stakeholders informed of progress as well as any challenges or changes the program is facing
- Stress the importance of the support of all stakeholders in the program, especially senior management
- Encourage open communications and exchange of information
- Establish a process for stakeholders to actively participate in shaping the program
- Seek outside expertise if necessary

Cautionary Advice

- Make sure that all stakeholders understand why the measurement program is important, what the goals are and how they are measured
- It is strongly recommended that a rules-based software sizing metric such as IFPUG Function Points or COSMIC Function Points be used
- If using function points as size measure Use experienced function point counters, preferably CFPS or those ready for the exam
- When training function point analysts, be sure to follow the recommended IFPUG training guidance
 - Have them take a IFPUG certified training class
 - Observer experienced counter
 - Count under guidance of experienced counter
 - Perform counts validated by experienced counter
 - Prepare for exam

ICEAA CEBoK-S tie-in

- Data-founded estimates are the most defensible – CEBoK-S provides best practice guidance
- ROM estimates can be made through analogy to historical data (own data, ISBSG, Commercial Tools)
- Cross-checks are important (based on data)
- Expert opinion is NOT a primary or mature cost estimating approach (use as cross-check or last resort if there are NO DATA)

ICEAA CEBoK-S update

- 10 modules specific to Software Cost and Schedule estimating
- Multiple approaches for different software intensive programs (i.e., procured vs custom vs hybrid)
- Builds on CEBoK principles
- Certification available SCEC
- See www.iceaaonline.com for details
- **Quality Plus Technologies, Inc. (Carol Dekkers, SCEC) is licensed to provide SCEC Preparation training (3 days)**

Conclusions

- Development of a software measurement program can provide many benefits to an organization including:
 - Increased productivity
 - More efficient use of resources
 - Increased product quality
 - Improved employee morale
 - Measurement programs more than pay for themselves

Resources

- International Cost Estimating and Analysis Association (ICEAA) <https://www.iceaaonline.com/>
- International Function Point User Group (IFPUG) <http://ifpug.org/>
- International Software Benchmarking Standards Group (ISBSG) <http://www.isbsg.org>
- Software Engineering Institute (SEI) www.sei.cmu.edu
- Systems and Software Consortium <http://www.software.org/>



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THANK YOU

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