

Can software be
healthy?

Jesus M.
Gonzalez-Barahona

What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Can software be healthy?

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Universidad Rey Juan Carlos
@jgbarah <http://jgbarah.github.io/presentations>

SoHeal 2019
Montreal (Canada), May 28th 2019

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

*Health,
what is health?
Can anyone be healthy
at all?*

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Speaker: What do we want?

Crowd: Patience!

Speaker: When do we want it?

Crowd: Right now!!!

Adapted from a well known joke
by Eugenio (Spanish humorist).

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

The theory

*Software should behave
according to requirements,
be cheap to maintain,
be easy to use,
have good performance,
...*

“We want software of good quality”

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

The practice

In most cases...

- Functionality: shallow verification
- Requirements: from nonexistent to incomplete
- Maintainability: very expensive
- Usability: many facets
- Performance: only a relative target

“Good enough”, depending on the stakeholder

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Improving quality



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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

The quest for quality

“Traditional” approach in software engineering:

- Product quality
(ISO 9126, CISQ)
- Process quality
(ISO 9001, CMM)

Follow the rules, increase quality

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

CISQ (code) quality model

- reliability
- efficiency
- security
- maintainability

`https://www.it-cisq.org`

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

CISQ (code) quality model

SOFTWARE QUALITY CHARACTERISTIC	CODING PRACTICES UNIT LEVEL	ARCHITECTURAL PRACTICES SYSTEM LEVEL
RELIABILITY	<ul style="list-style-type: none"> • Protecting state in multi-threaded environments • Safe use of inheritance and polymorphism • Resource bounds management, Complex code • Managing allocated resources, Timeouts 	<ul style="list-style-type: none"> • Multi-layer design compliance • Software manages data integrity and consistency • Exception handling through transactions • Class architecture compliance
PERFORMANCE EFFICIENCY	<ul style="list-style-type: none"> • Compliance with Object-Oriented best practices • Compliance with SQL best practices • Expensive computations in loops • Static connections versus connection pools • Compliance with garbage collection best practices 	<ul style="list-style-type: none"> • Appropriate interactions with expensive or remote resources • Data access performance and data management • Memory, network and disk space management • Centralized handling of client requests • Use of middle tier

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Measuring quality

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

There are other motivations

What if the focus is “knowing” instead of “improving”

- comparison
- tracking
- self-awareness

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

There are other subjects

What if the people are also important?

- the builders
- the evaluators

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

The builders

Specially important in FOSS:

- diverse people working together
- different motivations, agendas...
- the sense of community

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

The evaluators

Different goals / interests
mean
different definitions of “good”

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

And we still have the context...

Software is not used in a vacuum:

- legalese
- support
- economy
- ecosystem
- ...

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

A bit of history

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

OpenBRR



Business Readiness Rating™

A Framework for Evaluating Open Source Software

STEERING COMMITTEE

Larry Augustin, Open Source Strategist
Michael Goulde, Forrester Research
Peter Kronowitt, Intel
Murugan Pal, SpikeSource

Josh Berkus, PostgreSQL
Marc Hedlund, O'Reilly CodeZoo
George Pace, Prudential Financial
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Improving quality

Measuring quality

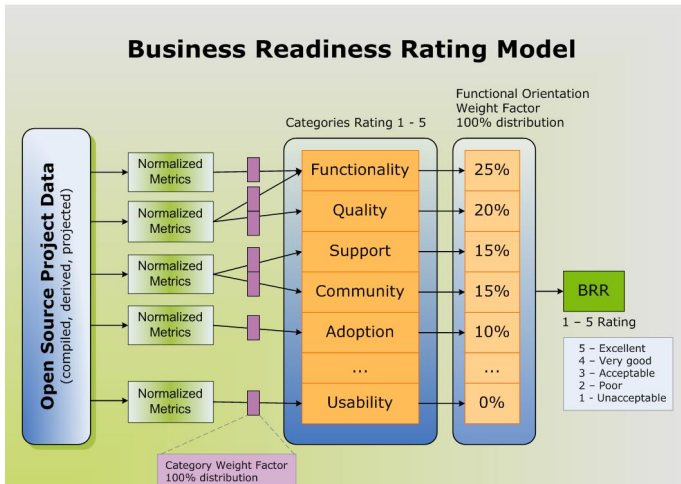
A bit of history

Software health

Some ideas

Concluding...

OpenBRR



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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...



QSOS



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What do we want?

Improving quality

Measuring quality

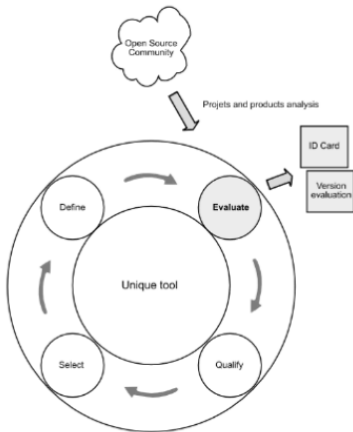
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Software health

Some ideas

Concluding...

QSOS



- ID card and version evaluations;
- Scoring of criteria on three major axis:-
 - Functional coverage;
 - Risks from customer perspective;
 - Risks from Atos Origin perspective;
- Weighted metrics for product scoring;

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

QSOS

Intrinsic robustness

- Maturity
- Adoption
- Development Roadmap
- Activity
- Development independence

Integration

- Adherence to standards
- Interface with other products

Technical adaptability

- Modularity

Industrialised solution

- Services
- Documentation
- Quality Assurance
- Exploitability

Strategy

- Licence
- Copyright owners
- Modification of source code
- Roadmap
- Sponsor

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What do we want?

Improving quality

Measuring quality

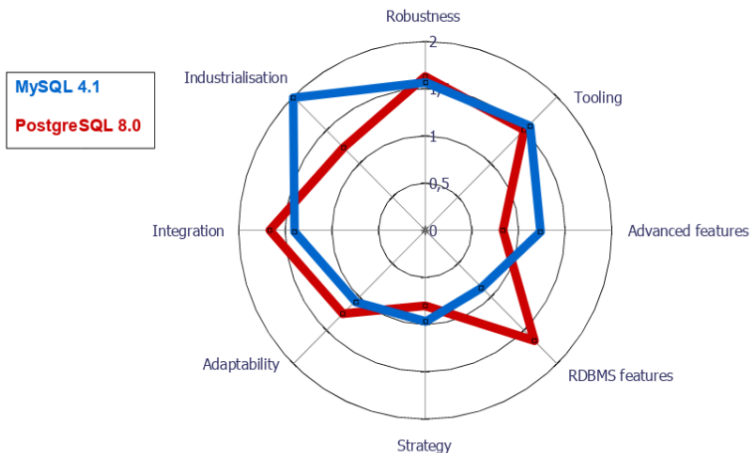
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Software health

Some ideas

Concluding...

QSOS



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What do we want?

Improving quality

Measuring quality

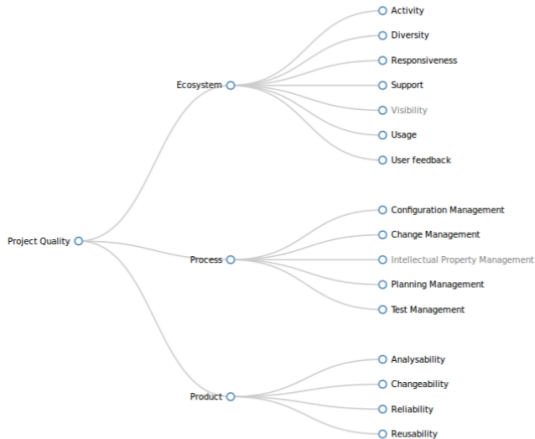
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Software health

Some ideas

Concluding...

Polarsys Quality Model



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What do we want?

Improving quality

Measuring quality

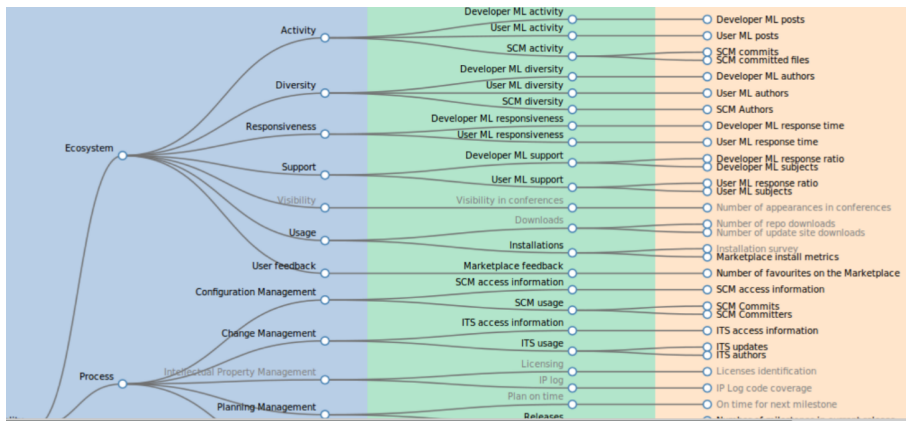
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Software health

Some ideas

Concluding...

Polarsys Quality Model



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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Software health



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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

*“A set of **characteristics**
of a software **project**
and its **context**
determining its capability for producing
software of good quality,
according to certain **criteria***

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

What is software health?

A concept applied to a **project**

- Criteria to define quality
- Characteristics that allow for that quality
- Time spot for measuring

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

What is software health?

A concept applied to a **project context**

- Important issues happen in the surroundings
- Examples: training, business, use
- Interrelations in large ecosystems
(competition, cooperation: coevolution)

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

The context: ecosystem

A project in a certain ecosystem:

- Health linked to the health of the ecosystem
Mutual impact (positive or negative)
- Example: attraction of new developers
- Example: common modules
- Example: availability of skills
- Example: marketing and usability

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Measuring software health

- Quantify quality criteria
- Find indicators that summarize criteria
- Find values for them that characterize health
- Track their evolution

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Example

- Criteria for quality: minimize unfixed errors
- Indicator: unfixed bug reports
- Healthy value: X unfixed bug reports per KLoC
- Alarm when number below X

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

The causes for health

*The really interesting matter
is to know the causes
for variation in indicators*

Example: unfixed bug reports are minimized by
good code review

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Some ideas

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

On the shoulders of giants

Systems are composed of many modules:

- Dependencies matter
- Overall health dependent all components
- In some cases, dependent on the most unhealthy component
- Projects and communities: interdependent

Assessing the overall health of a complete system

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Making decisions for tomorrow

Many systems are in production for many years:

- Prediction on future health
- Not all aspects are equally relevant
(example: fixing bugs vs. new functionality)
- Important: understanding dynamics
(extending past to future is not good
enough)

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Integrating metrics with development

Can health be yet another factor to consider?

- It could be an indicator for every stakeholder
- Computed frequently, so that it is up to date
- Published widely, so that everyone is aware

Include health in the data for decision making

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Working with stakeholders

- Builders
- Integrators
- Users

Health for different actors
for different purposes

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...



<http://chaoss.community>

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Understanding dynamics

How do specific actions impact
on the health model
for a software development system?

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Towards a new research framework

Define health conditions

Find out how to measure indicators of health

Study deviations from healthy conditions

Learn how to help to go back to healthy

Include all of this in the development process

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Simple example

Health condition: no regressions

Indicators: tests failing

Deviations: old errors appear

Mitigation: automatic testing

Continuous integration system

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Beyond opinions

Evidence that the indicator shows deviation from healthy condition

Evidence of mitigation:

- condition go back to healthy
- indicator go back to normal

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Concluding...

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Can we do this
in non-trivial cases?

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What do we want?

Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...

Software health may provide
a good framework
for structuring research,
producing useful analysis,
and producing actionable outputs

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Improving quality

Measuring quality

A bit of history

Software health

Some ideas

Concluding...



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