Software Quality Matrix

Legend codes used in cells below: x = not evaluated (gray); D = highly directly related (green); d = directly related (light green); I = highly inversely related (red); i = inversely related (pink); (blank) = not related (white); X = implemented (VizzAnalyzer).

Category	Sub-Category	Metric	Suitability	Accuracy	Interoperability	Security	Functionality Compliance	Maturity	Fault-tolerance	Recoverability	Reliability Compliance	Understandability for Reuse	Learnability for Reuse	Operability for Reuse - Programmability	Attractiveness for Reuse	Re-Usability Compliance	Time Behavior	Resource Utilization	Efficiency Compliance	Analyzability	Changeability	Stability	Testability	Maintainability Compliance	Adaptability	Installability	Co-existence	Conformance	Replaceability	Portability Compliance	VizzAnalyzer
Complexity	size	LOC			d	d	x	i	d	d	x	I	i	i	D	x	i	i	x	I	I	i	I	x	I				i	x	X
	interface C.	SIZE 2			d	d	x	i	d	d	x	I	i	i	D	x	i	i	x	I	I	i	I	x	I				I	x	X
		NOM			d	d	x	i	d	d	x	I	i	i	D	x	i		x	I	I	i	I	x	I				I	x	X
	structural C.	CC			d	d	x	i	d		x	I	i	i	D	x	i		x	I	I	i	I	x	I				I	x	X
		WMC			d	d		i			x	I	i	i	D	x	i		x	I	I	i	I	x	I				I	x	X
		RFC					x	i			x	I	i	i	D	x			x	I	I	i	I	x	I				i	x	X
Architecture & Structure	Inheritance	DIT			d	d	x				x	I	i	i	D	x			x	I	I	i	I	x	I				I	x	X
		NOC					x	d			x	D	D	D	D	x				i	i	i	i		i				I	x	X
	Coupling	Ca			d	i		i		i			d	d	d														I		X
		CBO			d	i			i	i		I	i	i	I		i			I	I	i	I		I						X
		CDBC			d	i			i	i		I	i	i	I		i			I	I	i	I		I						X
		CDOC			d	i			i	i		I	i	i	I		i			I	I	i	I		I						X
		Ce			d	i			i	i		I	i	i	I		i			I	I	i	I		I						X
		CF			d	i			i	i		I	i	i	I		i			I	I	i	I		I						X
		DAC			d	i			i	i		I	i	i	I		i			I	I	i	I		I						X
		I			d	i			i	i		I	i	i	I		i			I	I	i	I		I						X
		LD			i	d		d		d		D	d	d	D		d	d		D	D	D	D		D						X
		MPC			d	i			i	i		I	i	i	I		i			I	I	i	I		I						X
		PDAC			d	i	x		i	i		I	i	i	I		i			I	I	i	I		I						X
	Cohesion	LCOM					x	I			x	I	i	i	I	x	i			I	I	i	I	x	I				i	x	X
		ILCOM					x	I			x	I	i	i	I	x	i			I	I	i	I	x	I				i	x	X
		TCC					x	D			x	D	d	d	D	x	d			D	D	D	D	x	D				d	x	X
Design	Documentation	LOD					x	i			x	I	I	i	I	x				I	I	i	I	x	I				I	x	X

Legend

not evaluated (gray)	
highly directly (green)	directly related (light green)
highly inversely (red)	inversly related (pink)
not related	

VizzAnalyzer metric suite: http//www.arisa.se
X   implemented
-          not yet

Cell: G16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling to other system parts may be directly related to interoperability, since they are used/interacted with from other parts of the system.

Parts showing a high (outgoing) efferent coupling may be directly related to interoperability, since they are using/interacting with other parts of the system.

Cell: H16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be inversely related to security, since they can be influenced in many ways from other parts of the system.

Parts showing a high (outgoing) efferent coupling may be inversely related to security, since they can be affected by security problems in other parts of the system.

Cell: J16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be not related to maturity, since even a mature system might have high or low optimum values.

Parts showing a high (outgoing) efferent coupling may be not related to maturity, since even a mature system might have high or low optimum values.

Yet it could be possible to assume, that mature software has values close to optimum (low).

Cell: K16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be inversely related to fault-tolerance, since a local fault might be propagated to other parts of the system.

Parts showing a high (outgoing) efferent coupling may be inversely related to fault-tolerance, since they can be affected by faults in other parts of the system.

A fault should stay local to the part of the system it occurs, not affecting other parts over high coupling. Yet it does not allow direct conclusions about maintaining a desired performance level in case of operational faults or infringement of a specified interface.

Cell: L16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may have no impact on recoverability, since other parts may not affect it.

Parts showing a high (outgoing) efferent coupling may be inversely related to recoverability, since their data is distributed in other parts of the system making their recovery difficult.

Low coupling should support recoverability, since problems stay local, not affecting to big parts of the system.

Cell: N16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be not related to understandability, since other parts do not affect them.

Parts showing a high (outgoing) efferent coupling may be highly inversely related to understandability, since they are using other parts of the system, which need to be understood as well.

Understandability is decreased, when software has a high coupling. Since not only local aspects need to be considered, but also all coupled parts. Outgoing (efferent) coupling has more impact than incoming (afferent) coupling.

Cell: O16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be directly related to learnability, since other parts of the system using them serve as examples.

Parts showing a high (outgoing) efferent coupling may be inversely related to learnability, since they are using other parts of the system, which need to be understood as well.

Learnability might be decreased, when software has a high coupling. Since not only local aspects need to be considered, but also all coupled parts. Outgoing (efferent) coupling has more impact than incoming (afferent) coupling. Yet incoming coupling includes that there are many examples on how to use the particular part of the system.

Cell: P16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be directly related to programmability, since other parts of the system using them serve as examples.

Parts showing a high (outgoing) efferent coupling may be inversely related to learnability, since they are using other parts of the system, which represent dependencies.

Operability might be decreased, when software has a high coupling. Since not only local aspects need to be considered, but also all coupled parts. Outgoing (efferent) coupling has more impact than incoming (afferent) coupling. Yet incoming coupling includes that there are many examples on how to use the particular part of the system.

Cell: Q16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be directly related to attractiveness, since other parts of the system use them might show a good re-usability.

Parts showing a high (outgoing) efferent coupling may be highly inversely related to attractiveness, since they are using other parts of the system, which need to be understood as well, and represent dependencies.

Attractiveness for re-use might decrease with increased coupling. Since high coupling is not desired in object orientation.

Cell: S16

Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be not related to time behavior, since execution during test or operation stays local.
Parts showing a high (outgoing) efferent coupling may be inversely related to time behavior, since they are using other parts of the system, thus execution during test or operation does not stay local, but might involve huge parts of the system.

High coupling might decrease time behaviour, since it is likely that involving one part of the system includes many other parts, thereby prolonging execution time.

Cell: T16
Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be not related to resource utilitzation, since execution during test or operation stays local.
Parts showing a high (outgoing) efferent coupling may be inversely related to resource utilization, since they are using other parts of the system, thus execution during test or operation does not stay local, but might involve huge parts of the system.

High coupling might decrease time behaviour, since it is likely that involving one part of the system includes many other parts, thereby increasing resource utilitzation.

Cell: V16
Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be not related to analysability, since other parts do not affect them.
Parts showing a high (outgoing) efferent coupling may be highly inversely related to analyzability, since they are using other parts of the system, which need to be analyzed as well.

Analyzabiliy decreases with high coupling (in particular efferent coupling), since more parts of the system need to be considered. Not only local parts.

Cell: W16
Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be not related to changability, since other parts do not affect them.
Parts showing a high (outgoing) efferent coupling may be inversely related to changeability, since they are using other parts of the system, which might need to be changed as well.

Changeability decreases with high coupling (in particular afferent coupling), since effects of changes dont stay local.

Cell: X16
Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be inversely related to stability, since other parts are affected by them.
Parts showing a high (outgoing) efferent coupling may be not related to stability, since they are using other parts of the system, which are not affected.

Stability decreases with high coupling, since modifying a system having high coupling is likely to make a system unstable.

Cell: Y16
Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be not related to testability, since other parts are not affected.
Parts showing a high (outgoing) efferent coupling may be highly inversely related to testability, since they are using other parts of the system, increasing the number of possible test paths.

Testability decreases with high coupling (efferent coupling), since many new independent execution pathes need to be tested. Testing is not only local, but includes many other modules.

Cell: AA16
Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be not related to adaptability, since other parts do not affect them.
Parts showing a high (outgoing) efferent coupling may be inversely related to adaptability, since they are using other parts of the system, which might need to be adapted as well.

Adaptability decreases with high coupling (in particular efferent coupling). Since parts depent on many other parts of the system, adaptations are likely not to be local, but system wide.

Cell: AE16
Comment: Rüdiger Lincke:

Parts of a system showing a high afferent (ingoing) coupling from other system parts may be highly inversely related to replaceability, since other parts depend on it.
Parts showing a high (outgoing) efferent coupling may be not related to replaceability, since they are only using other parts of the system.

Replaceability might decrease with high coupling. Parts being frequently used by other parts of the system have a broad interface and a rich behavior, which is difficult to replace.

Cell: J27
Comment: Rüdiger Lincke:

Parts of a system showing a high cohesion may be highly directly related to maturity, since a mature system ought to have high cohesion values.

Cell: N27
Comment: Rüdiger Lincke:

Parts of a system showing a high cohesion may be highly directly related to understandability for reuse, since they implement only one concept.

Cell: O27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be highly directly related to learnability, since they implement only one concept.

Cell: P27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be highly directly related to programmability, since they implement only one concept.

Cell: Q27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be highly directly related to attractiveness for reuse, since they implement only one concept.

Cell: S27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be directly related to time behavior, since they implement only one concept, and dont do any unrelated time consuming tasks.

Cell: T27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be directly related to resource utilization, since they implement only one concept, and dont do any unrelated resource utilization.

Cell: V27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be highly directly related to analyzability, since they implement only one concept.

Cell: W27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be highly directly related to changeability, since they implement only one concept.

Cell: X27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be highly directly related to stability, since they implement only one concept.

Cell: Y27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be highly directly related to testability, since they implement only one concept.

Cell: AA27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be highly directly related to adaptability, since they implement only one concept.

Cell: AE27
Comment: Rüdiger Lincke:

     Parts of a system showing a high cohesion may be directly related to replaceability, since they implement only one concept.