

Table 3 Further results of  $RQ_1$  using sematic, structural, and combined methods

Semantic : A = 0, B = 1;

Structural: A = 1, B = 0,  $\alpha = 0.7$ ,  $\beta = 0.1$ ,  $\gamma = 0.2$ ;

Combined A = 0.9, B = 0.1,  $\alpha = 0.6$ ,  $\beta = 0.2$ ,  $\gamma = 0.2$ ;

System	method	mean	median	Std.dev	Compared method	p-Value	Effect-size
Elasticsearch	Semantic	0.6688	0.6933	0.0713	Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
	Structural	0.9237	0.9145	0.0707	Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
	Combined	0.8466	0.8599	0.1518	Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Android-async-http	Semantic	0.7123	0.7456	0.1415	Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
	Structural	0.9165	0.9021	0.1350	Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
	Combined	0.8645	0.8745	0.1352	Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Iosched	Semantic	0.5986	0.6124	0.1347	Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
	Structural	0.9515	0.9354	0.1395	Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
	Combined	0.8459	0.8554	0.1427	Semantic vs Structural	<b>&lt;0.01</b>	0.9(High)
Libgdx	Semantic	0.7005	0.7125	0.1375	Combined vs Structural	<b>0.0106</b>	0.6(Medium)
	Structural	0.8856	0.8844	0.1186	Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
	Combined	0.8715	0.8843	0.1121	Semantic vs Structural	<b>&lt;0.01</b>	0.9(High)
Android-annotations	Semantic	0.6844	0.7123	0.1252	Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
	Structural	0.8679	0.8741	0.1190	Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
	Combined	0.7854	0.7945	0.1061	Semantic vs Structural	<b>&lt;0.01</b>	0.9(High)
Okhttp	Semantic	0.5842	0.6012	0.1046	Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
	Structural	0.9531	0.9554	0.1086	Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
	Combined	0.8284	0.8427	0.1146	Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
RxJava	Semantic	0.7419	0.7561	0.1204	Combined vs Structural	<b>&lt;0.01</b>	0.6(Medium)
	Structural	0.8699	0.8425	0.1218	Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
	Combined	0.8562	0.8745	0.1199	Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)

System	method	mean	median	Std.dev
Spring-framework	Semantic	0.5766	0.5789	0.1205
	Structural	0.9552	0.9367	0.1093
	Combined	0.7925	0.8214	0.1213
Zxing	Semantic	0.5547	0.5678	0.1217
	Structural	0.9106	0.8715	0.1269
	Combined	0.8546	0.8642	0.1202
MPAndroidChart	Semantic	0.5884	0.5973	0.1321
	Structural	0.8947	0.9154	0.1262
	Combined	0.8453	0.8543	0.1197
Netty	Semantic	0.6955	0.7124	0.1287
	Structural	0.8556	0.8745	0.0752
	Combined	0.8792	0.8874	0.0736
Guava	Semantic	0.5623	0.6041	0.0730
	Structural	0.8919	0.9014	0.0741
	Combined	0.8426	0.8647	0.0632
Junit	Semantic	0.5748	0.5974	0.0747
	Structural	0.8729	0.8845	0.0663
	Combined	0.7598	0.7684	0.0736
Presto	Semantic	0.6841	0.6848	0.0813
	Structural	0.9412	0.9354	0.0736
	Combined	0.8482	0.8745	0.0746
Glide	Semantic	0.6006	0.6124	0.1366
	Structural	0.9259	0.9014	0.1205
	Combined	0.8642	0.8694	0.1204

Compared method	p-Value	Effect-size
Combined vs Structural	<b>&lt;0.01</b>	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.9(High)
Combined vs Structural	<b>0.015</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)

System	method	mean	median	Std.dev
Disruptor	Semantic	0.5447	0.5674	0.1046
	Structural	0.9195	0.9014	0.1261
	Combined	0.8354	0.8415	0.0683
Stetho	Semantic	0.5998	0.6024	0.0747
	Structural	0.9163	0.9184	0.0811
	Combined	0.8245	0.8425	0.0636
Titan	Semantic	0.5114	0.5274	0.0663
	Structural	0.8996	0.9123	0.0713
	Combined	0.8047	0.8104	0.0742
Fastjson	Semantic	0.5956	0.6012	0.1453
	Structural	0.9063	0.9145	0.1333
	Combined	0.8856	0.8943	0.1304
AndroidAsync	Semantic	0.4756	0.4875	0.1188
	Structural	0.8859	0.8945	0.1319
	Combined	0.7716	0.7845	0.1290
gradle	Semantic	0.4825	0.5124	0.1321
	Structural	0.9348	0.9147	0.1312
	Combined	0.8123	0.8047	0.1202
HoloEverywhere	Semantic	0.5687	0.5894	0.1321
	Structural	0.9354	0.9254	0.1333
	Combined	0.8156	0.8047	0.1350
Storm	Semantic	0.5989	0.6124	0.1262
	Structural	0.8956	0.9015	0.1287
	Combined	0.8584	0.8674	0.1283

Compared method	p-Value	Effect-size
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)

System	method	mean	median	Std.dev
Guice	Semantic	0.6567	0.6675	0.1252
	Structural	0.9195	0.9157	0.1186
	Combined	0.7892	0.8014	0.1331
Dubbo	Semantic	0.6412	0.6547	0.1046
	Structural	0.9354	0.9234	0.0876
	Combined	0.8664	0.8741	0.0780
Orientdb	Semantic	0.5779	0.5846	0.0895
	Structural	0.9741	0.9648	0.2490
	Combined	0.8024	0.8124	0.1296
Neo4j	Semantic	0.5987	0.6414	0.1265
	Structural	0.9475	0.9527	0.2078
	Combined	0.8741	0.8842	0.1575
jna	Semantic	0.5647	0.5843	0.0745
	Structural	0.9254	0.9341	0.1536
	Combined	0.8162	0.8214	0.1245
Smile	Semantic	0.5269	0.5387	0.2071
	Structural	0.8853	0.8941	0.2248
	Combined	0.8453	0.8542	0.0854
Tachyon	Semantic	0.5623	0.5781	0.1574
	Structural	0.8941	0.9014	0.2104
	Combined	0.7555	0.7638	0.0945
ExoPlayer	Semantic	0.5584	0.5615	0.0715
	Structural	0.8778	0.8741	0.1577
	Combined	0.8416	0.8512	0.1257

Compared method	p-Value	Effect-size
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	0.0109	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	0.0170	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)

System	method	mean	median	Std.dev
Grails	Semantic	0.5698	0.5718	0.1947
	Structural	0.9294	0.9323	0.1684
	Combined	0.8145	0.8245	0.1751
Mockito	Semantic	0.7234	0.7354	0.0954
	Structural	0.8956	0.9244	0.0748
	Combined	0.8612	0.8741	0.0894
Mongo-java-driver	Semantic	0.5748	0.6014	0.0725
	Structural	0.8724	0.8841	0.1547
	Combined	0.7489	0.7354	0.1372
Hibernate-orm	Semantic	0.5974	0.6287	0.0941
	Structural	0.8962	0.9015	0.1574
	Combined	0.7952	0.8354	0.0978
Deeplearning4j	Semantic	0.6894	0.7024	0.1994
	Structural	0.9579	0.9641	0.1541
	Combined	0.8245	0.8345	0.2154
Hazelcast	Semantic	0.5875	0.6048	0.1754
	Structural	0.9452	0.9354	0.1258
	Combined	0.8661	0.8715	0.0814
Jadx	Semantic	0.5279	0.5475	0.1269
	Structural	0.9147	0.9041	0.0974
	Combined	0.7951	0.8041	0.1085
Blueprints	Semantic	0.5127	0.5241	0.1475
	Structural	0.8989	0.9101	0.1052
	Combined	0.8354	0.8425	0.0841

Compared method	p-Value	Effect-size
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	0.0142	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.9(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.9(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.6(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)

System	method	mean	median	Std.dev
Quasar	Semantic	0.5879	0.6015	0.0715
	Structural	0.9124	0.9017	0.0954
	Combined	0.7894	0.8015	0.1075
Cucumber-jvm	Semantic	0.6673	0.6871	0.1217
	Structural	0.9311	0.9214	0.1350
	Combined	0.8115	0.8054	0.1372
Webmagic	Semantic	0.6874	0.6948	0.1872
	Structural	0.8695	0.8741	0.1147
	Combined	0.7891	0.8054	0.1058
Zookeeper	Semantic	0.7030	0.7025	0.2105
	Structural	0.9056	0.9241	0.1974
	Combined	0.8415	0.8541	0.1453
ninja	Semantic	0.7458	0.7624	0.1758
	Structural	0.8945	0.9057	0.2048
	Combined	0.7895	0.8154	0.0974
Rundeck	Semantic	0.7486	0.7541	0.0845
	Structural	0.9415	0.9312	0.0736
	Combined	0.8415	0.8546	0.1205
Moco	Semantic	0.5877	0.6157	0.1057
	Structural	0.9236	0.9157	0.1074
	Combined	0.8005	0.8245	0.0941
Flyway	Semantic	0.5748	0.5846	0.1205
	Structural	0.9517	0.9478	0.1093
	Combined	0.8641	0.8457	0.1197

Compared method	p-Value	Effect-size
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.9(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)

System	method	mean	median	Std.dev
Flume	Semantic	0.6712	0.6842	0.1255
	Structural	0.9091	0.8944	0.1086
	Combined	0.8145	0.8214	0.0745
Astyanax	Semantic	0.6178	0.6015	0.0742
	Structural	0.9364	0.8943	0.0876
	Combined	0.8726	0.8641	0.0865
Syncany	Semantic	0.6248	0.6175	0.0826
	Structural	0.9145	0.9235	0.1262
	Combined	0.8451	0.8354	0.1199

Compared method	p-Value	Effect-size
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.9(High)
Combined vs Structural	<b>&lt;0.01</b>	0.7(Medium)
Combined vs Semantic	<b>&lt;0.01</b>	0.8(High)
Semantic vs Structural	<b>&lt;0.01</b>	0.8(High)