APPENDIX A
DESCRIPTIVE STATISTICS

Descriptive statistics of the calculated measures and the contextual factors are shown in Table III. Project details are given in Table II.

TABLE II
PROJECT DETAILS

Project	Devs	Issues	Iterations	Start	End	Duration	Programming language	Purpose	Developer	License
APSTUD[a]	9	355	24	27.1.12	17.1.14	721	Java, JavaScript	IDE for web applications	Aptana	GPL
MESOS[b]	65	1091	63	15.5.14	11.5.16	726	C++	Cluster management software	APACHE	Apache-2.0
MULE[c]	32	831	93	20.2.13	12.5.16	1176	Java	Lightweight ESB and framework	MuleSoft	CPAL
NEXUS[d]	16	612	63	12.9.13	10.5.16	970	Java	Software repository manager	Sonatype	EPL-1.0
TIMOB[e]	30	168	22	3.12.11	14.3.14	831	Several	SDK for native mobile apps	Appcelerator	Apache-2.0
TISTUD[f]	15	1728	57	31.1.12	24.4.14	814	Several	IDE for native mobile apps	Appcelerator	Apache-2.0
XD[g]	31	2102	65	6.5.13	26.2.16	1025	Java	Distributed system for big data	Pivotal Software	Apache-2.0
Total	198	6887	387	–	–	6263				
Median	30	831	63	–	–	831				
Std	18.58	711.59	24.92	–	–	168.81				

[a]https://jira.appcelerator.org/
[b]https://issues.apache.org/jira/projects/MESOS/issues
[c]https://www.mulesoft.org/jira/projects/MULE/issues
[d]https://issues.sonatype.org/
[e]https://jira.appcelerator.org/projects/TIMOB/issues
[f]https://jira.appcelerator.org/
[g]https://jira.spring.io/projects/XD

APPENDIX B
NORMALITY CHECKS FOR SPC

SPC is based on normality assumptions. For this reason, we tested whether the samples of the variables of interest (i.e., velocity and focus factor) come from a normal distribution or not. The test implementation used is the one provided by `SciPy`. We ran the test for the individual velocity of each project. As a result, the data is normally distributed in APSTUD and TISTUD projects whereas it is not in DNN, MESOS, MULE, NEXUS, TIMOB, and XD. After applying log transformations to these projects, we tested them again and the result show that almost all of them are normally distributed. As we can see from the normal Q-Q plot in Figure 5, the only project that didn't show normality after the log transformation was DNN ($p < 0.001$).

Similarly, we tested whether the focus factor samples come from a normal distribution or not. The result show that data in almost all the projects are normally distributed. The only project that do not show normality is DNN. Figure 6 shows the normal Q-Q plots and p-values of the tests.

APPENDIX C
COMPARISON OF ZONES: STATISTICAL TESTING

We conducted a comparison of the zones D+, D-, and N by applying statistical testing. First, we checked the assumptions of homogeneity of variance and normality to determine whether we must apply a parametric or non-parametric test.

Table IV shows that the assumption of homogeneity of variance is violated by most of the zone groups. Levene's tests for homogeneity of variance are not significant, which indicates that the groups have different variances. Table V shows that the assumption of normality is also violated by most of the groups. The samples do not look Gaussian, according to the results obtained from applying the Shapiro-Wilk test. Since the assumptions of homogeneity of variance and normality were violated by most of the groups, we opt for a conservative approach and we conducted the non-parametric Kruskal-Wallis H Test which does not require these assumptions.

The Kruskal-Wallis H-test tests the null hypothesis that the population median of all of the groups are equal. Table VI show the results. To determine the differences among groups, we conducted post hoc pairwise test for multiple comparisons of mean rank sums (Dunn's test) using Bonferroni's one-step correction. The results are reported in Table VII.

APPENDIX D
ZONE COMPARISON OF PROJECTS BASED ON CONTEXTUAL FACTORS

A comparison of the results of the projects based on the contextual factors organized by zones of individual velocity and focus factor are shown by Figure 7 and Figure 8, respectively.

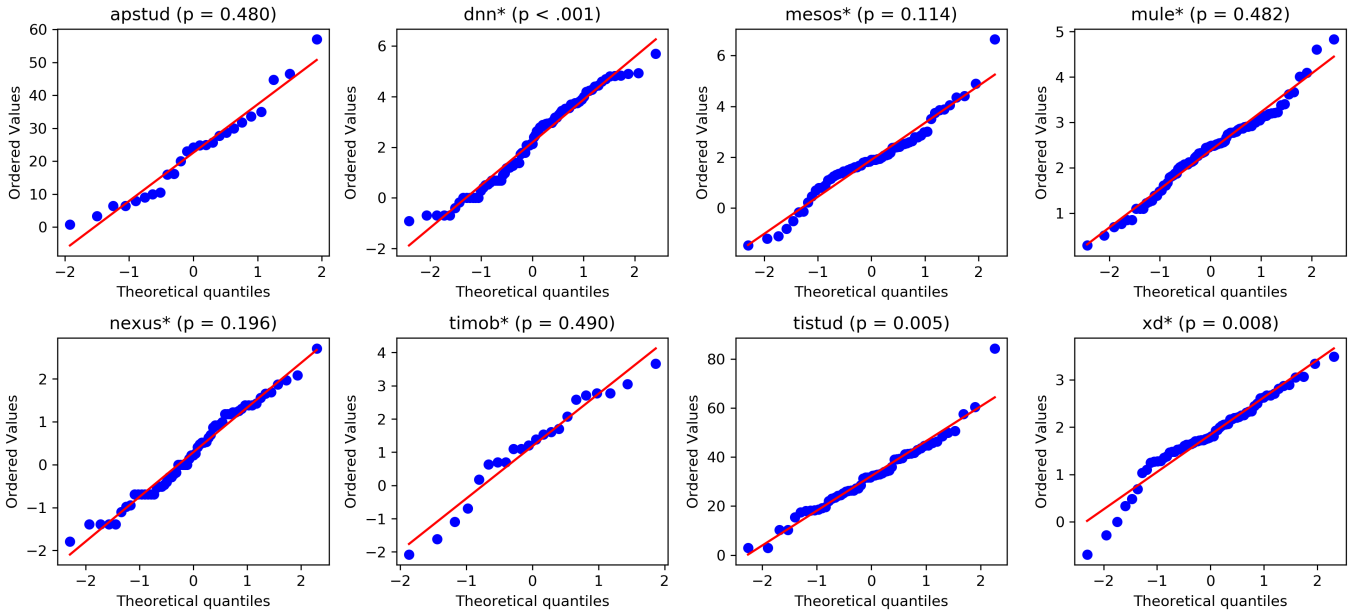

Fig. 5. Normality checks for individual velocity. The projects with log transformations were marked with *

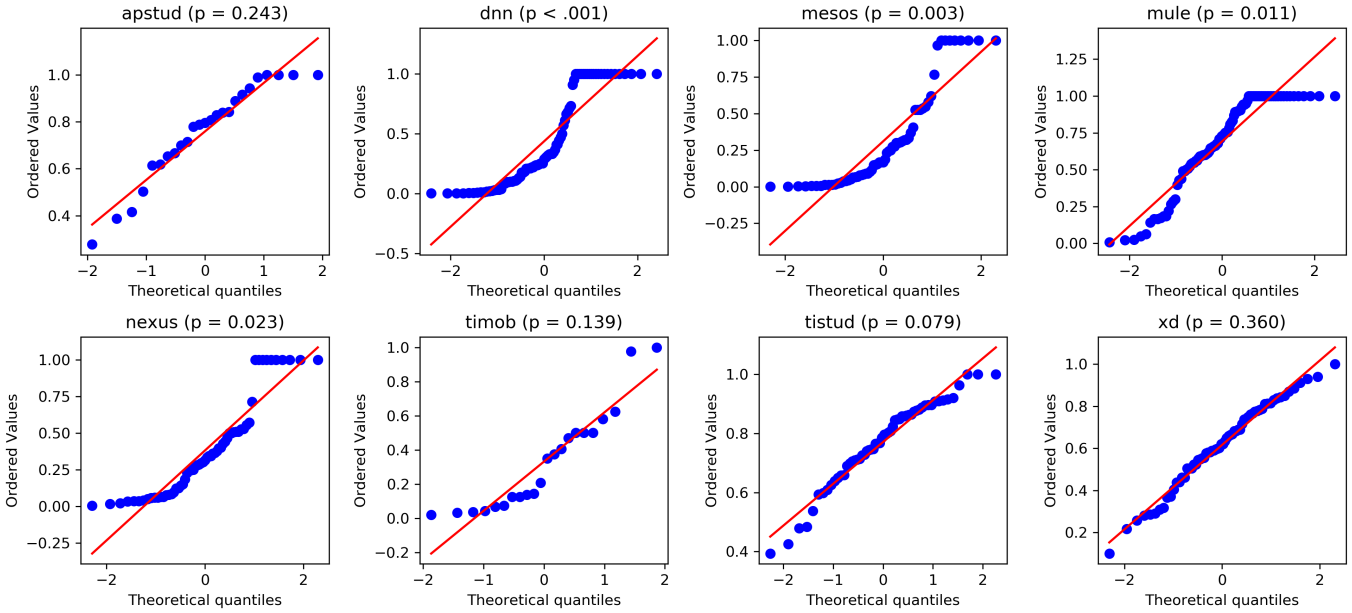

Fig. 6. Normality checks for focus factor.

TABLE III
DESCRIPTIVE STATISTICS OF CALCULATED MEASURES AND CONTEXTUAL FACTORS

Measure	Project	mean	std	50%	min	max
Velocity [Story points]	apstud	95.88	84.73	94.50	5.00	326.00
	mesos	114.17	151.96	70.00	3.00	800.00
	mule	69.28	68.08	48.00	2.00	312.00
	nexus	8.52	8.74	5.00	0.50	32.50
	timob	17.43	21.20	10.00	0.50	78.00
	tistud	137.39	70.90	130.00	18.00	345.00
	xd	92.13	84.55	69.00	1.00	492.00
Work capacity [Story points]	apstud	137.75	147.83	105.00	8.00	648.00
	mesos	2722.37	9891.58	532.00	3.00	76245.00
	mule	180.06	364.68	81.00	3.00	2591.00
	nexus	52.60	76.02	25.00	0.50	386.00
	timob	92.16	125.47	44.00	6.00	504.00
	tistud	180.28	91.09	171.00	18.00	402.00
	xd	150.34	133.80	113.00	1.00	759.00
Focus factor	apstud	0.77	0.19	0.80	0.28	1.00
	mesos	0.30	0.32	0.17	0.00	1.00
	mule	0.69	0.30	0.73	0.01	1.00
	nexus	0.38	0.32	0.31	0.01	1.00
	timob	0.33	0.29	0.28	0.02	1.00
	tistud	0.78	0.14	0.80	0.39	1.00
	xd	0.62	0.19	0.62	0.22	1.00
Individual velocity $\left[\frac{\text{Story Points}}{\text{Developer}}\right]$	apstud	22.28	14.52	23.60	0.83	57.00
	mesos	13.72	22.79	6.30	0.23	133.33
	mule	15.05	17.13	11.83	1.33	125.00
	nexus	2.20	2.46	1.25	0.17	15.00
	timob	7.50	9.35	3.67	0.12	39.00
	tistud	32.41	14.30	32.40	3.00	84.33
	xd	8.37	6.20	6.09	0.75	32.80
Iteration length [days]	apstud	16.17	8.67	14.00	3.00	49.00
	mesos	12.35	1.50	13.00	6.00	13.00
	mule	13.60	2.74	13.00	7.00	31.00
	nexus	12.57	1.74	13.00	6.00	14.00
	timob	18.27	11.70	14.00	8.00	56.00
	tistud	14.11	3.75	14.00	3.00	31.00
	xd	11.85	5.62	11.00	3.00	27.00
Turnover (newcomers)	apstud	0.06	0.06	0.05	0.00	0.20
	mesos	0.07	0.06	0.06	0.00	0.33
	mule	0.10	0.09	0.08	0.00	0.40
	nexus	0.11	0.10	0.09	0.00	0.40
	timob	0.29	0.11	0.31	0.00	0.44
	tistud	0.02	0.03	0.00	0.00	0.10
	xd	0.08	0.07	0.06	0.00	0.28
Turnover (leavers)	apstud	0.06	0.07	0.02	0.00	0.25
	mesos	0.06	0.06	0.05	0.00	0.38
	mule	0.09	0.09	0.07	0.00	0.38
	nexus	0.11	0.10	0.10	0.00	0.40
	timob	0.15	0.09	0.15	0.00	0.29
	tistud	0.03	0.04	0.00	0.00	0.20
	xd	0.08	0.07	0.07	0.00	0.30
TSI^{-1}	apstud	0.69	0.16	0.75	0.43	1.00
	mesos	0.54	0.18	0.56	0.17	1.00
	mule	0.36	0.26	0.25	0.10	1.00
	nexus	0.60	0.18	0.57	0.40	1.00
	timob	0.25	0.14	0.20	0.06	0.50
	tistud	0.87	0.14	0.83	0.56	1.00
	xd	0.52	0.10	0.55	0.32	0.75

TABLE IV
LEVENE'S TEST FOR HOMOGENEITY OF VARIANCE RESULTS

Groups	Variable	Statistic	p	Interpretation
Zones of velocity	Turnover (leavers)	3.505	0.031	Equal variances
Zones of velocity	Turnover (newcomers)	0.877	0.417	Different variances
Zones of velocity	TSI^{-1}	0.596	0.551	Different variances
Zones of velocity	Iteration length	2.715	0.067	Equal variances
Zones of focus factor	Turnover (leavers)	6.525	0.002	Equal variances
Zones of focus factor	Turnover (newcomers)	4.143	0.017	Equal variances
Zones of focus factor	TSI^{-1}	0.841	0.432	Different variances
Zones of focus factor	Iteration length	2.776	0.064	Equal variances

TABLE V
RESULTS OF THE SHAPIRO-WILK TEST FOR NORMALITY.

Measure	Factor	Zone	Statistic	p	Interpretation
Velocity	Turnover (leavers)	D+	0.599	0.000	Not normal
Velocity	Turnover (newcomers)	D+	0.801	0.010	Not normal
Velocity	TSI^{-1}	D+	0.888	0.111	Normal
Velocity	Iteration length	D+	0.734	0.002	Not normal
Velocity	Turnover (leavers)	D-	0.937	0.284	Normal
Velocity	Turnover (newcomers)	D-	0.914	0.117	Normal
Velocity	TSI^{-1}	D-	0.933	0.248	Normal
Velocity	Iteration length	D-	0.561	0.000	Not normal
Velocity	Turnover (leavers)	N	0.854	0.000	Not normal
Velocity	Turnover (newcomers)	N	0.836	0.000	Not normal
Velocity	TSI^{-1}	N	0.958	0.000	Not normal
Velocity	Iteration length	N	0.590	0.000	Not normal
Focus factor	Turnover (leavers)	D+	0.865	0.008	Not normal
Focus factor	Turnover (newcomers)	D+	0.871	0.010	Not normal
Focus factor	TSI^{-1}	D+	0.952	0.378	Normal
Focus factor	Iteration length	D+	0.423	0.000	Not normal
Focus factor	Turnover (leavers)	D-	0.837	0.188	Normal
Focus factor	Turnover (newcomers)	D-	0.864	0.275	Normal
Focus factor	TSI^{-1}	D-	0.990	0.957	Normal
Focus factor	Iteration length	D-	0.722	0.020	Normal
Focus factor	Turnover (leavers)	N	0.859	0.000	Not normal
Focus factor	Turnover (newcomers)	N	0.842	0.000	Not normal
Focus factor	TSI^{-1}	N	0.953	0.000	Not normal
Focus factor	Iteration length	N	0.592	0.000	Not normal

TABLE VI
RESULTS FROM THE KRUSKAL-WALLIS H-TESTS

Factor	Dependent variable	Statistic	p	Interpretation
Zones of velocity	Turnover (leavers)	11.854	0.003	Different medians
Zones of velocity	Turnover (newcomers)	6.240	0.044	Equal medians
Zones of velocity	TSI^{-1}	9.063	0.011	Equal medians
Zones of velocity	Iteration length	9.774	0.008	Different medians
Zones of focus factor	Turnover (leavers)	1.276	0.528	Equal medians
Zones of focus factor	Turnover (newcomers)	4.270	0.118	Equal medians
Zones of focus factor	TSI^{-1}	1.380	0.502	Equal medians
Zones of focus factor	Iteration length	4.572	0.102	Equal medians

TABLE VII
POST HOC PAIRWISE TEST FOR MULTIPLE COMPARISONS OF MEAN RANK SUMS (DUNN'S TEST).

Variable	Factor	Group1	Group2	p
Zones of velocity	Turnover (leavers)	D-	D+	0.002
Zones of velocity	Turnover (leavers)	N	D+	0.007
Zones of velocity	Turnover (leavers)	N	D-	0.395
Zones of velocity	Turnover (newcomers)	D-	D+	0.042
Zones of velocity	Turnover (newcomers)	N	D+	0.360
Zones of velocity	Turnover (newcomers)	N	D-	0.174
Zones of velocity	TSI^{-1}	D-	D+	0.013
Zones of velocity	TSI^{-1}	N	D+	0.017
Zones of velocity	TSI^{-1}	N	D-	0.854
Zones of velocity	Iteration length	D-	D+	0.010
Zones of velocity	Iteration length	N	D+	0.010
Zones of velocity	Iteration length	N	D-	0.996
Zones of focus factor	Turnover (leavers)	D-	D+	1.000
Zones of focus factor	Turnover (leavers)	N	D+	0.777
Zones of focus factor	Turnover (leavers)	N	D-	1.000
Zones of focus factor	Turnover (newcomers)	D-	D+	0.228
Zones of focus factor	Turnover (newcomers)	N	D+	0.288
Zones of focus factor	Turnover (newcomers)	N	D-	0.710
Zones of focus factor	TSI^{-1}	D-	D+	0.770
Zones of focus factor	TSI^{-1}	N	D+	1.000
Zones of focus factor	TSI^{-1}	N	D-	0.738
Zones of focus factor	Iteration length	D-	D+	0.110
Zones of focus factor	Iteration length	N	D+	0.656
Zones of focus factor	Iteration length	N	D-	0.257

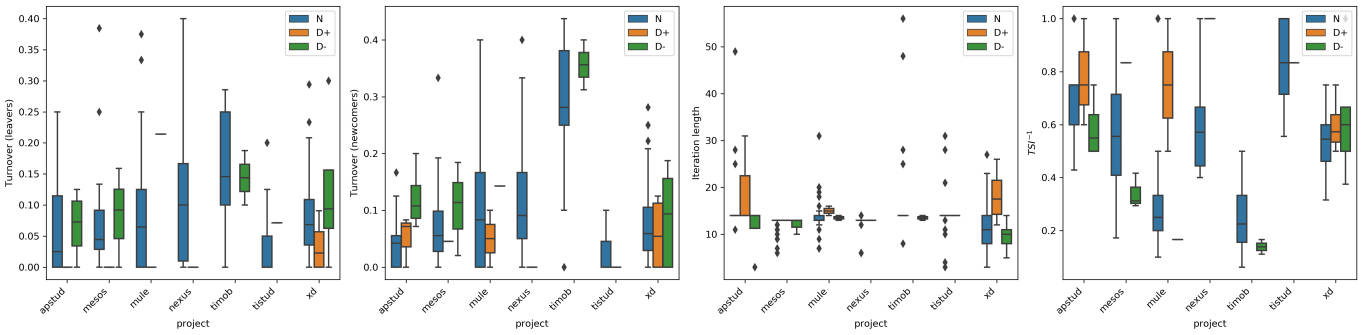

Fig. 7. Comparison of projects based on contextual factors organized by zones of individual velocity.

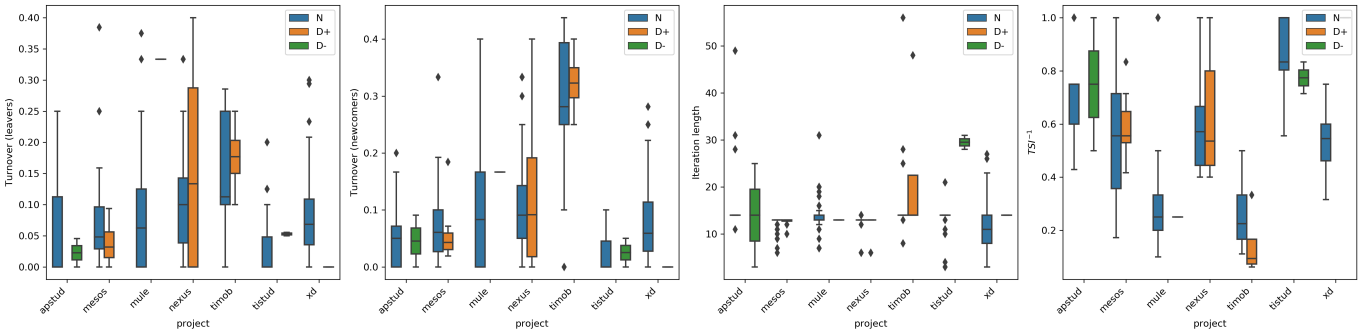

Fig. 8. Comparison of projects based on contextual factors organized by zones of focus factor.