Code Quality in Agile Methods: A Study on Group Development

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Introduction

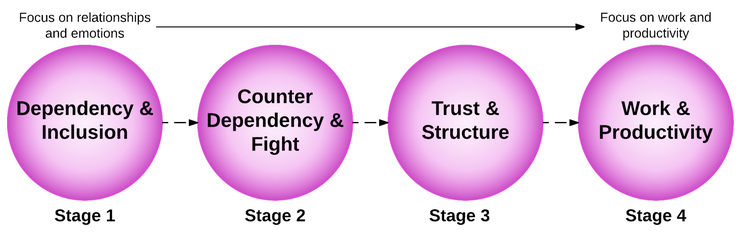
Group Development, a Psychology field, researches why and how small groups change over time and the output produced.

Agile Methods are software development techniques increasing in the scenario due to its ability to adapt to the market needs as well as delivering a high quality code in a shorter period of time.

Since Agile groups are formed by a small quantity of people, would the quality of the code developed be related to the effectiveness and productivity of themselves?

Group Development

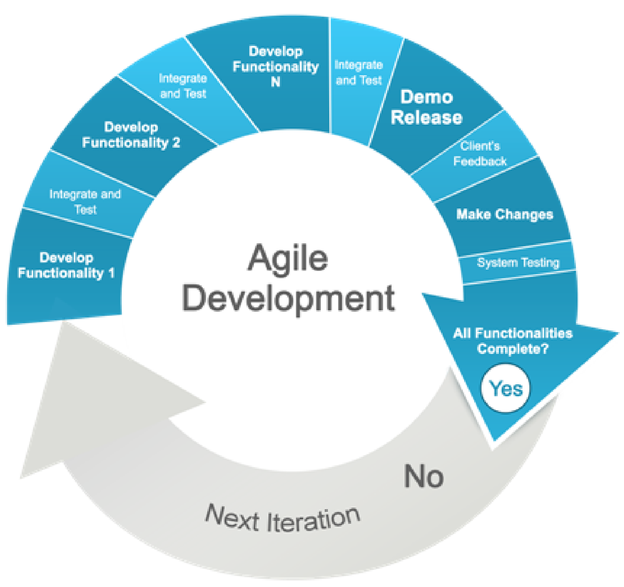
The Integrated Model of Group Development (IMGD), presented by Wheelan and Hochberger [1], describes how a group evolve around a set of stages across time.



Later, Wheelan and Hochberger [1] were able to measure the maturity level of a group through a survey, the Group Development Questionnaire (GDQ). The fourth part of GDQ measures work and productive of a group.

It was already shown that is possible to correlate the fourth part of GDQ, work and productive, with the effectiveness in a variety of sectors, e.g., intensive care faculty saves more lives [2] and high school staff leads to a better performance of their students [3] when their GDQ4 score is higher.

Agile Methods



Agile Development is a group methods that promotes adaptive planning, evolutionary development, early delivery, continuous improvement, and encourages rapid and flexible response to change [4].

Method

- This research was conducted in a class of Laboratory of Extreme Programming at IME-USP;
- The sample was composed by a total of 40 students divided into 7 groups;
- Each individual answered a survey containing 15 questions regarding GDQ4 and 3 about the quality of the code;
- Pearson's correlation was used to measure the relation between in which scale the group is in the stage 4 and the code quality;
- Furthermore, each question from both categories were correlated by Pearson's test between themselves to verify if exists a relation between themselves.
- Cohen states that the threshold values to verify how strong is the relation is different in the field of Social Science [5]: those values for *r* is weak (0.1), medium (0.3) and strong (0.5).

Individual Questions Corr.

Pearson's Corr. Significance	Quality 1 (N = 39)	Quality 2 inv. (N = 37)	Quality 3 inv (N = 36)
GDQ4 2 (N = 40)	0.291	0.347	0.045
	0.072	0.035	0.794
GDQ4 3 (N = 40)	0.498	0.097	-0.076
	0.001	0.568	0.657
GDQ4 5 (N = 40)	0.299	0.311	0.041
	0.064	0.061	0.812
GDQ4 8 (N = 40)	0.488	0.318	-0.087
	0.001	0.055	0.615
GDQ4 11 (N = 40)	0.309	0.253	-0.29
	0.056	0.13	0.086
GDQ4 12 (N = 39)	0.348	0.141	-0.319
	0.032	0.412	0.062
GDQ4 13 (N = 40)	0.136	0.143	-0.327
	0.41	0.398	0.052
GDQ4 15 (N = 40)	0.022	-0.119	-0.497
	0.896	0.482	0.002

Significance < 0.05

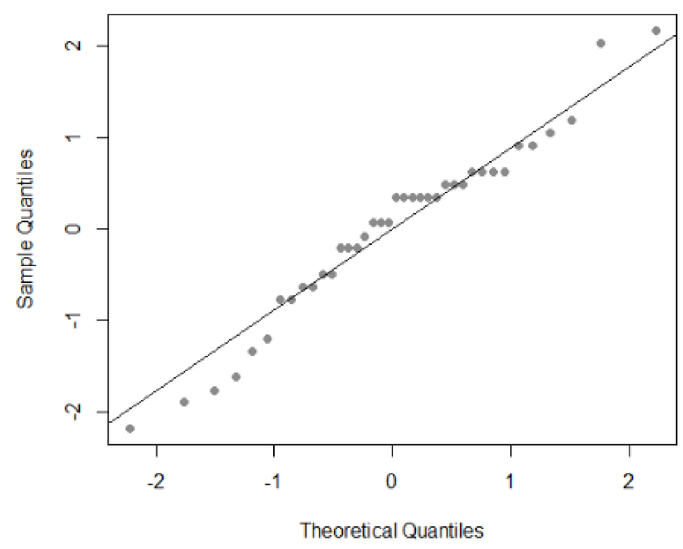
0.05 < Significance < 0.06

0.06 < Significance < 0.1

- **CQ 01/GDQ4 03:** The more the group gets and gives feedbacks about its effectiveness and productivity, better is the code quality;
- **CQ 01/GDQ4 08:** The more the group encourages high performance and quality work, better is the code quality;
- **CQ 02 inv/GDQ4 02:** The more the group accomplishes its goals, less code maintenance is needed;
- **CQ 02/GDQ4 05:** Better is the method of making decision of the group, less code maintenance is needed;
- **CQ 03 inv/GDQ4 13:** The more the group has access and utilizes technical and people resource, the more code refactoring is needed;
- **CQ 03 inv/GDQ4 15:** The more the group is encouraged to subgroup, the more code refactoring is needed;

Stage 4 and Code Quality Corr.

It is possible to check in the quantil-quantil graph from the standardized residuals below that the points settle near the reference line, which indicates that the sample appears to come from a normal population.



The observed value from **Pearson's Correlation** between the quality of the code developed by groups using Agile Methods and developers perceptions of effectiveness and productivity was **0.277**. It represents a **medium positive correlation** between both variables.

From the evidence to the normality hypothesis was carried out the **ANOVA test**. The test indicated, with a **p-value of 0.0922**, **there isn't a significant difference** in the quality of the code developed by groups in different scales of how productive and efficient.

References

[1] S. Wheelan and J. Hochberger, *Validation Studies of the Group Development Questionnaire*, in Small Group Research. Vol. 27, No. 1, pp. 143-170, 1996.

[2] S. Wheelan, C. Burchill and F. Tilin, *The Link Between Teamwork and Patients' Outcomes in Intensive Care Units*, in American Journal of Critical Care. Vol. 12, No. 6, pp. 527-534, 2003.

[3] S. Wheelan and F. Tilin, *The Relationship Between Faculty Group Development and School Productivity*, in Small Group Research. Vol. 30, No. 1, pp. 59-81, 1999.

[4] *What is Agile Software Development?*, in http://www.agilealliance.org/the-alliance/what-is-agile/. Retrieved in November 2015.

[5] J. Cohen, *Quantitative Methods in Psychology*, in Psychological Bulletin. Vol. 112, No. 1, pp 155-159, 1992.

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