

Test-Retest Reliability of Psychographic Self-Evaluation Questionnaire (PSEQ)

M Khalid Shaikh¹

Assistant Professor, Department of Computer Science, Federal Urdu University of Arts, Science & Technology, Karachi, Pakistan

Muhammad Qasim Nizamani²

Assistant Professor, Department of Media & Communication Studies, University of Sindh, Jamshoro, Sindh, Pakistan

SujoMeghwar³

Assistant Professor, Department of Geography, University of Sindh, Jamshoro, Sindh, Pakistan.

Pinial Khan Butt⁴

Assistant Professor, PGDIT Coordinator, Information Technology Center, Sindh Agricultural University, Tando Jam, Pakistan

Javeed Ali Soomro⁵

Assistant Professor, Centre for Health & Physical Education, University of Sindh, Jamshoro, Sindh, Pakistan

Shahid Ali Shaikh⁶

Assistant Professor, Centre for Pure and Applied Geology University of Sindh, Jamshoro, Sindh, Pakistan

Abstract

The objective of this research was to determine the test-retest reliability of Psychographic self-evaluation questionnaire designed for forming teams of Software Engineering students for undertaking the final year projects. The participants (n=100) of this research received the questionnaire whilst seated during a class lecture; respondents were retested on the same questionnaire 7 weeks later. The participants were the students of semester 7 that had started their final year project in Jan 2019. Cohen's kappa value was computed for 27 questions (selected using the factor analysis from out of 128 total questions), responses of which were recoded into trichotomies variables. Response rate was 100% for both the test and retest questionnaire. For the 27 individual questionnaire items, the range of k value was 0.65-0.90 ($P < 0.01$). The test-retest reliability of individual items was found to be high, suggesting that responses of the students were stable over the brief period of time on Psychographic self-evaluation questionnaire.

Keywords: Test-retest, Psychographics, Team-formation, Engineering Education, KSAO

1. Introduction

Psychographics is normally used as a lifestyle measure; it is used for identifying

consumers' buying patterns and classifying them into segments. Psychographic segmentation is different from demographic segmentation as it segments people along psychological dimensions. This field of research does not capture the demographics instead psychographic questionnaires studies the qualitative attributes and presents the quantitative data about the subjects [1]. These Psychographic questionnaires are popular because of their predictive power [2], which makes them an ideal tool for their use in evaluating individuals on certain characteristics. The term psychograph was coined by Emanuel Demby in 1965 [3]; he defined this term as "the use of psychological, sociological, and anthropological factors such as benefits desired, self-concept and lifestyle to segment the subjects"[2]. The length of a Psychographic questionnaire is less than ordinary which allows such questionnaires to capture the intricacies of participant's beliefs and behavior based on the provided questions[1].

Table 1: Psychographics vs Demographics [2]

Psychographics	Demographics
Attitudes/values	Age/Gender
Lifestyle	Income
Buying Habits	Ethnicity
Opinions/Interests	Physical location

Shaikh [2] studied the use of Psychographics for forming capstone teams for Software Engineering [4] and Computer Engineering students [5]. The idea behind using the Psychographics for software/computer

engineering student's capstone team building was that if a marketer can use the Psychographics for segmenting the subjects (in groups of potential customers) on the basis of those aspects of their lifestyle that corresponds to their likelihood of buying a particular product, than in much the same way, psychographics can also be used for evaluating a subject's those aspects of life and professional abilities that makes them ideal for having them on a team or a group for a particular project. Shaikh[1] proposed 128 criterions for "segmenting" students into teams that may undertake an engineering project as a self-managing team. A Psychographic self-evaluation questionnaire was also developed that consisted of the questions formed around the proposed 128 tem building criteria. Since such a use of Psychographics is innovative in nature becauseit has previously only been used for consumer segmentation, therefore, the Psychographic instrument developed for forming student teams needs various statistical testing that includes reliability testing to ascertain its fitness for usage outside of the marketing domain.

As mentioned above, the Psychographic self-evaluation questionnaire is based on 128 criteria-centric questions; these questionsassess a student's suitability in 9categories of knowledge, skills, abilities and other factors [1, 6]. It has been found that the criterions and the Psychographic self-evaluation questionnaire are effective in assisting the formation of the cohesive teams that were also found to be better than those teams that were not formed using these criterions [4]. This current research was

undertaken to assess the test-retest reliability of the Psychographic self-evaluation questionnaire. Test-retest reliability measures the ability to reproduce the same results of the same test when administered to the same subjects on repeated trials. A test would be considered as reliable if the test results are not significantly different from the results produced upon repetition. This test is used in other Psychographic studies, such as [7] and in Engineering Education [8, 9].

2. Method

The sample size is set to $n=100$ for this research in order to produce at least 95% confident intervals. The response rate expected was 100% because the research was conducted with the existing students of the department of Computer Science, Federal Urdu University of Arts, Science & Technology, Karachi Pakistan, where the author is currently employed. The sample consisted of students from male and female genders. Their ages ranged from 17 to 21 years. The subjects were the students of Bachelor of Science – Software Engineering (semester 7). The students were informed about this research a week prior to the first administration of the questionnaire. The students were given ample time to fill the questionnaire. On average, the students were able to fill the questionnaire that consisted of 128 questions, in 25 minutes. For the retest questionnaire, the questions were placed in reverse order – last question became the first question and so on. There was no other difference between the test and retest questionnaires.

Researchers reporting the reliability of Psychographic variables have generally applied reliability analysis at two levels: the aggregate level and the individual level [7]. For this research, the individual level variable is opted for reliability analysis. Although the students were required to answer all the questions on both the test and retest questionnaire, however for the Cohen's Kappa testing, 27 questions were selected in all. In a separate and earlier research, 84 questions were identified using factor analysis which were responsible for the variability. Three questions for each category from these 84 factors/questionnaire items were selected on the basis of the possibility of their recoding into trichotomies variables. The selected questionnaire items were analyzed for test-retest reliability. No cases of missing data were found when the questionnaires were finally checked. The reliability of each of the 27 questions was compared using Cohen's kappa statistic (k). The kappa statistic measures the agreement "over and above the chance agreement that inevitably occurs" [10].

Fig. 1: kappa Statistic Measure Formula

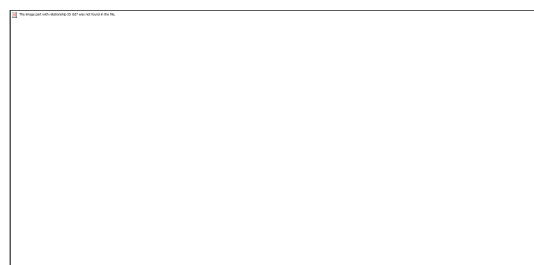


Figure 1 shows the kappa statistics measure formula. p_0 is the concordance observed and p_e the concordance expected by chance.

Values of the kappa statistic between 0.00 and 0.20 are considered to be slight agreement; those between 0.21 and 0.40 fair agreement; those between 0.41 and 0.60 moderate agreement; those between 0.61 and 0.80 substantial agreement; and those between 0.81 and 1.00 almost perfect agreement.

3. Results

The test and retest questionnaires were filled in the same environment 7 weeks apart. The demographic details of the respondents is shown in the table 2.

Table 2: Demographic details of the respondents (n = 100)

Demographics	N
Gender	
Male	74
Female	36
Age	
Under 18	3
18 – 20	84
21	13

Total questions in each of these categories: Interpersonal/Social Skills, Conflict Management, Collaborative Problem Solving, Individual Self-management, Personality, Project Management, Task work, Software Development Process, and Work Analysis and Reflection were 21, 7, 16, 21, 9, 13, 20, 11 and 10 respectively. Table 3 enlists the questions that were selected for test-retest analysis, and the respective k values.

Table 3: Test-retest reliability for individual questionnaire items

KSAOs	Individual Items	k values	P
Interpersonal/ Social Skills	1. Cultural Conditioning: I am culturally conditioned i.e. I can work with people from own and different background?	0.68 5	0.0 1
	2. Dependable: I never give excuses for the tasks that are my responsibility.	0.75 5	0.0 1
	3. Diligent: I don't give up on tasks such as course assignments, daily preparation for exams etc. easily.	0.67 6	0.0 1
Conflict Management	1. Handles Conflicts: I turn moments of conflicts into moments of positive engagement and bargain.	0.78 3	0.0 1
	2. Intellectual: I read literature	0.77 1	0.0 1
		0.86 5	0.0 1

	<p>apart from the curriculum prescribed ones so that my knowledge can assist me in resolving future conflicts.</p> <p>3. Curious: I don't abandon interest in tasks at hand quickly.</p>			nt	<p>ideas in writing well and make really well describing power point slides or Word documents.</p> <p>2. Effective organizer: I can organize project meetings with teachers and industry representatives on my own effectively.</p> <p>3. Exhibit self-discipline: I am punctual, diligent and decent and don't suffer from mood swings in daily and project life.</p>	0.79 9 0.69 7	0.0 1 0.0 1
Collaborative Problem Solving	<p>1. Key Issues: I can prioritize and focus on issues that need immediate attention.</p> <p>2. Collaboration: I work with everyone on the project and the stakeholders skillfully.</p> <p>3. Collective efficacy: I don't believe in individual performance and motivate everyone to participate actively.</p>	0.72 5 0.65 0.82 5	0.0 1 0.0 1 0.0 1	Personality	<p>1. Mentor Others: People like to talk to me when they are losing hope in their work and I like to help them in those moments.</p> <p>2. Sense of Humor: I can</p>	0.77 4 0.80 1 0.83 6	0.0 1 0.0 1 0.0 1
Individual Self-manageme	<p>1. Effective writer: I convey my</p>	0.82 9	0.0 1				

	<p>provoke laughter and provide amusement especially in times of pressure.</p> <p>3. Psychological Safety: I believe in the safety of interpersonal risk taking within team.</p>				<p>control over the amount of time spent on specific activities.</p> <p>3. Creating clear work procedures: I can identify the tasks and activities and I can delineate the procedure to achieve those tasks and activities such as information gathering, normalization etc.</p>		
Project Management	<p>1. Project Importance: I have the ability to ascertain the project importance – (Project Importance refers to the strategic, competitive, or financial importance a project has to the company at the time the team is being assembled).</p> <p>2. Time Management: I have the skills of planning and exercising conscious</p>	<p>0.89 3</p> <p>0.79 7</p> <p>0.80 6</p>	<p>0.0 1</p> <p>0.0 1</p> <p>0.0 1</p>	Task work	<p>1. Task interdependence: I have the ability to determine how information, materials and expertise will be shared between team members assigned to interdependent tasks and I can elaborate roles for people involved in</p>	<p>0.87 3</p> <p>0.66 8</p> <p>0.67 1</p>	<p>0.0 1</p> <p>0.0 1</p> <p>0.0 1</p>

	<p>the work.</p> <p>2. Technical Competence: I have the right technical competencies for a software technology projects as a whole.</p> <p>3. Multitasking: Productivity: I like to use every second of a minute to strive to get the best results and I am sincere with my work.</p>				<p>spiral, prototyping, agile, incremental etc.</p> <p>3. Understands the business model of mobile commerce: I have understanding /trainings in mobile commerce?</p>		
				Work Analysis and Reflection	<p>1. Managing Risks: I have working knowledge of managing risk and training on certain risk management standards such as ISO.</p> <p>2. Breadth of Perspective: I prefer to know my task completely and other's task and interdependence with mine moderately to better grasp the importance of my work.</p> <p>3. Creative: I can</p>	<p>0.79 7</p> <p>0.66 7</p> <p>0.76 1</p>	<p>0.0 1</p> <p>0.0 1</p> <p>0.0 1</p>
Software Development Process	<p>1. Team Processes: I have a plan to achieve missions and goals of the project and vision for team and its members to grow, develop and improve over time.</p> <p>2. Software Processes: I have working knowledge of software processes such as waterfall,</p>	<p>0.78 5</p> <p>0.75 4</p> <p>0.90 0</p>	<p>0.0 1</p> <p>0.0 1</p> <p>0.0 1</p>				

	produce new ideas and improvise solution to unique problems.		
--	---	--	--

Each (27 items) question's responses were recoded into trichotomies responses with 0 = No opinion, 1 = Disagree, 2 Agree. Original responses to the selected questions were 1 = Strongly disagree, 2= Quite a bit agree with assumption 1, 3 = Moderately agree with assumption 1, 4 = A little agree with assumption 1, 5 = No Opinion, 6= A little agree with assumption 9, 7 = Moderately agree with assumption 9, 8 = Quite abit agree with assumption 9, 9= Strongly agree.

Among all respondents, the k value for all the categories (Interpersonal/Social Skills, Conflict Management, Collaborative Problem Solving, Individual Self-management, Personality, Project Management, Task work, Software Development Process, and Work Analysis and Reflection) was found to be between 0.65 and 0.90. However, the gender based visual assessment of the values had revealed that the k value for responses of the female students has lied between 0.78 and 0.90, whereas for the male students, the range of k value is found to be between 0.65 and 0.83;this observation of greater stability in responses of females is often visible in such research [11]; see table 4. No relation was found between the ages and the k value.

Table 4:Gender specific k Value Range

Demographics	N	k Value Range
Gender		
Male	74	0.65 – 0.83
Female	36	0.78 – 0.90

4. Discussion

Shaikh [1] developed a Psychographic self-evaluation questionnaire, which in-turns is based on the 128 team building criteria that he proposed for forming capstone teams for software and computer engineering students. The questionnaire consisted of 9 categories, and the 128 team building criteria were distributed among these categories. The questionnaire employed the concept of Psychographics from the field of marketing. Psychographics is basically the study of lifestyle of consumers. However, Psychographic self-evaluation questionnaire proposed by Shaikh not only evaluates the lifestyle of the students but also their capability as a software and computer engineer. It would be more appropriate to say that the questionnaire evaluates that aspect of the lifestyle of a student which pertains to his *capability of working as a software engineer* and which may interest a manager while forming a team of software engineers. This is akin to the use of Psychographics in marking, where a researcher is interested in evaluating those aspects of the lifestyle of a consumer that pertains to the better marketing of his specific product, such as life insurance [12], and voting [13],etc.Since, it is innovative to use Psychographics outside the domain of marketing, therefore, it is also necessary to test the reliability and validity of any instrument developed for employing

Psychographics outside of that domain. This research was one effort for testing the reliability of the Psychographic self-evaluation questionnaire developed to form the teams of computer and software engineering students for capstone projects.

The research examined the test-retest reliability of the Psychographic self-evaluation questionnaire. Although, a software is already developed through which the students may record their responses to the questionnaire items individually but as a class [5], however, for this research the students were given the printed copies of the questionnaire that they had filled manually. The students were required to answer all the questions. However, only 27 questionnaire items were selected for Cohen's Kappa test-retest reliability statistic. These 27 questions were selected from a group of 84 questions that were identified using the factor analysis (which will be presented in a research paper separately).

The test-retest reliability of the selected questions was found to be in the range of 0.65 and 0.90. The k values are in the range of "substantial" to "near perfect" agreement range. Results were better in case of 36 female students that participated in this research. The k value for the female students was in the range of "near perfect". These results suggest that the responses to the Psychographic self-evaluation questionnaire are stable enough to be used for forming capstone teams. None of the questions selected for this research resulted in a perfect agreement ($k = 1.00$) though.

5. Conclusion

Test-retest administration of the Psychographic self-evaluation questionnaire to the students of Bachelor of Science – Software Engineering (Semester 7) revealed statistically significant correlations in all categories for individual studentscores, over a 7-week interval. The responses of the female students however were found more stable than the responses of the male students. The test-retest correlations ranged from 0.65 to 0.90 which is an indication of the good test-retest reliability (stability of scores over time) for the tested instrument.

References

1. M.K. Shaikh, Team Building Criteria for Self-Managing Computer Science Student's Capstone Project, *DoctoralDiss.*, 2018 (URL: www.mkhalidshaikh.com/psq_.pdf)
2. K. Fuhr, Psychographic questionnaires: a comparative review of scales and structures, *Masters' Thesis*, 2015, Kansas State University, USA
3. E. H. Demby, Psychographic revisited: The birth of a technique", *Marketing Research*, 6(2),1994, pp. 26.
4. M.K. Shaikh and K. Ahsan, *Psychographd: A Team building Platform for SE students*, *International Journal of Engineering Education*, 34(6), 2018, pp. 1969-1975
5. M.K. Shaikh and K. Ahsan, A Psychographic Self-evaluation Questionnaire for Team Formation, *International Journal of Engineering Education*, 36(1), 2020,96-100

6. M.K. Shaikh and K. Ahsan, KSAO Framework for Computer Science capstone student project teams, *Sindh University Research Journal*, 50(1), 2018, pp. 53 – 58
7. A. C. Burns and M. C. Harrison. A test of the reliability of psychographics. *Journal of Marketing Research*, 16(1), 1979, pp. 32-38.
8. G. A. Livesay and K. C. Dee. Test-retest reliability of the index of learning styles for first-year engineering students. *Proceedings of the 2005 American Society for Engineering Education Annual Conference & Exposition*
9. R. M. Felder and J. Spurlin. Applications, reliability and validity of the index of learning styles. *International Journal of Engineering Education* 21(1), 2005, pp. 103-112.
10. Cohen J. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, 20(1), 1960, pp. 37-46.
11. L. Boulton, C. Boulton, P. Pirie, and J. T. Pacala. Test-retest reliability of a questionnaire that identifies elders at risk for hospital admission. *Journal of the American Geriatrics Society* 42(7), 1994, pp. 707-711.
12. T.S. Sin, and L. C. Chee. A preliminary study on the relationship between psychographic factors and the purchase of life insurance. *IJMS*, 24(1), 2017, pp. 1-22.
13. J. Gordon, When data crimes are real crimes: voter surveillance and the

Cambridge Analytica conflict.
MastersDiss. 2019.