

Relationships between Success Skills for Young Professionals and Competency Enhancement in University Education: from the Perspective of PROG Test Measurements

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Job satisfaction, career autonomy, and self-learning are important for young professionals to have a successful career. To analyze relationships among these factors in their professional life and university education, we surveyed 1,548 respondents who graduated between 2013 and 2016 from 13 universities in Japan. All respondents had taken the PROG test, which measures generic skills from two aspects, literacy and competency, in their third year of university. Their answers regarding career awareness, learning, and activities at university were analyzed in relation to their PROG test scores. PROG literacy scores during university did not correlate with post-graduate job performance, but a higher PROG competency score led to higher job satisfaction and motivation. The respondents' self-evaluations showed that their enthusiasm for coursework and activities and their proactive experiences and sense of growth while in university positively related to the attainment levels of literacy, competency, and subject mastery. These analysis results suggest that learning and activities during university to increase competency can increase young professionals' job satisfaction and career autonomy, which are important in managing transformations in job requirements and concepts regarding Industry 4.0 and Industry 5.0. jobs.

1. Introduction

The Fourth Industrial Revolution (Industry 4.0), driven by digitalization and automation technologies, is transforming job requirements and concepts ^{[1][2]}. The Fifth Industrial Revolution (Industry 5.0), proposed by the European Commission as a new concept to advance Industry 4.0 innovations, is predicted to further transform the jobs and skill profiles of workers ^[3]. These transformations due to Industry 4.0 and Industry 5.0 involve substantial changes in the demand for knowledge and skills and indispensable implications for higher education. Many studies have demonstrated a growing gap between higher education systems and the future needs and demands of the labor market due to rapid technological advances ^{[4][5][6]}. Moreover, many students are expected to prepare for newly emerged occupations or positions of the future. Under these circumstances, many higher educational institutions have realized the need to reform the present traditional education system to manage the growing gap between academia and the needs and demands of the labor market.

Because of Industry 4.0 and Industry 5.0, educational programs and curriculums must evolve such that students can enhance their ability to apply, analyze, and create with what they learn in classrooms. In other words, the abilities acquired in university education should be more than memorizing and understanding a curriculum subject. Thus, many universities, as part of their educational goals, are striving to cultivate students' abilities to think logically and utilize knowledge to solve problems practically and enhance their behavioral

characteristics while interacting in authentic environments ^[6]. However, attaining and assessing these educational outcomes is difficult. Although providing educational programs linked to positive career development is a role of university education, few studies have quantitatively investigated university education outcomes in terms of how they affect students' career development after graduation ^[7].

2. The Purpose of This Study

In improving the quality of university education, the visualization of learning outcomes is required, and each university is endeavoring to quantify or visualize these outcomes through various innovations. There are multifaceted approaches to the visualization of learning outcomes, but the most important aspect is to apply a long-term perspective regarding the effects of education to determine how university education is useful after graduation. In this sense, clarifying how the university education that young professionals receive affects their careers after graduation is crucial. Also valuable is identifying the connection between their university education and career development factors such as job satisfaction and career autonomy.

Thus, we conducted a nationwide survey targeting university graduates with some work experience 3–5 years after graduation. We analyzed the situation of graduates in terms of their satisfaction with their student life at university, the skills and abilities they acquired while at university, and their current professional life. We also analyzed the survey

data to determine how their competencies and skills had been cultivated at universities, directly and indirectly, and the influence of career development factors (e.g., self-evaluation on job performance and job satisfaction), which are essential to career success. In the analysis, we used survey respondents' scores on the PROG test in their third year of university to quantitatively investigate the relationship between their skills and abilities acquired from university education and the career development factors. We used their third-year test scores because many universities have them take the PROG test to demonstrate their levels of generic skills before job-seeking activities in their fourth year.

3. PROG Test

The PROG test is designed to measure the student's level of the generic skills and attitudes required in society (hereafter, generic skills) regardless of major or specialization. It is a two-part assessment of the student's generic skills: literacy and competency. Literacy is the ability to solve problems based on knowledge. Competency is a behavioral trait acquired through experience. The literacy part measures the student's ability to apply knowledge and to continue learning. The competency part measures the student's behavioral traits acquired through experience and the ability to transfer the acquired skills to any job. Tables 1 and 2 show the list of abilities measured by the literacy and competency parts of the PROG test, respectively ^[8].

Table 1. PROG test for literacy: skills measured

| Literacy: Thinking skills required for the problem-solving process | |
|--|---|
| Skill Components | Definition |
| Information-gathering skills | Ability to identify appropriate information sources from a wide range of perspectives, collect and research information using appropriate means, and organize and store this information appropriately |
| Information analysis skills | Ability to organize and analyze facts and information objectively and from multiple perspectives, not based on assumptions or speculation, and to understand the hidden structure that integrates these facts and information to determine the true nature of the information. (includes verbal and non-verbal processing skills) |
| Problem-identifying skills | Ability to perceive phenomena and events from various angles and perspectives, consider the mechanisms and causes hidden in the background, and discover issues that need to be resolved |
| Conception ability | Ability to conceptualize the process of problem-solving while considering various conditions and constraints and to envision the risks and measures that might be implemented in the process |

The PROG test objectively scores students' literacy and competency levels, and its measurement validity has been demonstrated in statistical analyses of a large volume of data.

Many of the literacy and competency measurement tools involve subjective assessments conducted by test examiners and evaluators; therefore, their validities can be weak. To prevent subjectivity and validity problems in literacy and competency measurements, the PROG test has one question with no apparent correct answer. In its original questions based on realistic scenarios, the PROG test instructs the test-taker to seek optimal solutions for the scenarios and measures the test-taker's ability to think logically and practically to solve problems by utilizing experience and knowledge, not simply confirming knowledge. Collected data from young leaders employed globally are used as a reference to evaluate student's answers. This database, the model of judgment criteria and behavior they have selected for each question, is used to determine how statistically different students' answers are from the model, and the differences are transformed into the literacy and competency levels of the student ^[9].

Table 2. PROG test for competency: three skills measured

| Competency skill 1: Interpersonal basic skills (ability to build trust with others and participate in a team) | |
|--|--|
| Skill Components | Definition |
| Affinity | Ability to take an interest in people and to empathize with and trust them |
| Cooperative ability | Ability to understand roles and help each other |
| Leadership | Ability to advocate opinions and enhance the team |
| Competency skill 2: Self-control basic skills (ability to control emotions and motivation) | |
| Skill Components | Definition |
| Emotional control | Ability to control emotions appropriately |
| Confidence-building ability | Ability to know the self and inspire confidence |
| Action persistence | Ability to work proactively and complete tasks |
| Competency skill 3: Basic skills for managing problems (ability to think and act to solve problems) | |
| Skill Components | Definition |
| Problem-finding ability | Ability to gather information and understand the essence |
| Planning ability | Ability to set goals and make plans |
| Practical ability | Ability to put thoughts into action and reflect |

Because of the PROG test's objective measurements of literacy and competency, as well as its advantage in qualitatively visualizing the outcomes of educational programs, many higher educational institutions in Japan have adopted it. Since 2012, more than 1.29 million students from universities and junior colleges have taken the PROG. From 2012 to September 2021, including technical colleges, vocational schools, and companies, 1.41 million PROG tests have been taken ^[9].

4. Survey Method

We conducted an internet-based survey from April 21, 2020, to February 22, 2021. A survey participation request was sent to 12,844 working adults who took the PROG test in their third year of university: 13.0% (1,548 working adults) answered the questionnaire. The details of the respondents, including gender, the year of university graduation, and their majors, are in 4.1. The details of the questionnaire are in 4.2.

4.1 Questionnaire respondents

The working adults had graduated between 2013 and 2016 from 13 universities nationwide: 779 males and 752 females (17 did not identify a gender). Table 3 summarizes the respondents' majors at university.

Table 3. Survey respondents' majors at university

| Major | # of Respondents |
|------------------------------------|------------------|
| Humanities or liberal arts | 420 |
| Social science | 562 |
| Science or engineering | 366 |
| Medical or health-related sciences | 74 |
| Other | 126 |
| Total | 1548 |

4.2 Questionnaire items

The questionnaire had 11 categories. Categories 1–3 asked questions regarding basic attributes, such as age, gender, university major, years since graduation, and academic performance in the third year of junior high school and high school and at university graduation. Categories 4–8 asked questions about being university graduates. After extracting similar question items from survey questions used for many universities, we created our questions by focusing on the commonly observed items. The questions in categories 9 and 10 were from the Working Person Survey administered by Recruit Works Institute^[10].

Categories 4–7 asked about experiences and satisfaction during university. Categories 8–9 asked about the respondent's jobs and careers, including questions about job satisfaction and career autonomy. Categories 11 and 12 asked about the abilities acquired in university and required in society. Question items regarding the respondents' experiences in university and their jobs and careers are summarized in Tables 4 and 5, respectively.

Table 4. Survey items regarding while in university

| Category 4: Attitude and level of enthusiasm for coursework and activities while in university |
|--|
| Q1. Coursework in specialized subjects |
| Q2. Coursework in liberal arts subjects |
| Q3. Learning a foreign language |
| Q4. Graduation thesis |
| Q5. Club/circle activity |
| Q6. Part-time job |
| Q7. Job-seeking |

| Category 5: Learning experience and sense of growth while in university |
|---|
| Q1. Speak up in class |
| Q2. Didn't understand the classes |
| Q3. Discussed with other students |
| Q4. Participated in voluntary study groups |
| Q5. Felt closer to the faculty |
| Q6. Consulted with faculty and staff about my career |
| Q7. Had a sense of growth while in university |
| Category 6: Significance of the graduation thesis |
| Q1. General completion of specialized subject education |
| Q2. Experience in learning liberal arts |
| Q3. Discussions with various people |
| Q4. Communicate my view |
| Q5. Experience in task completion |
| Q6. Proactive learning attitude |
| Category 7: Satisfaction with subjects and activities while in university |
| Q1. Coursework in specialized subjects |
| Q2. Coursework in liberal arts subjects |
| Q3. Learning a foreign language |
| Q4. Graduation thesis |
| Q5. Teachers' teaching procedures |
| Q6. Club/circle activity |
| Q7. Friendships |
| Q8. Part-time job |
| Q9. Job-seeking |
| Q10. Total satisfaction |

Table 5. Survey items: jobs and careers

| Category 8: Jobs and careers 1 |
|--|
| Q1. Career after graduation |
| Q2. Current employment status |
| Category 9: Jobs and careers 2 |
| Q1. Type of industry |
| Q2. Type of occupation |
| Q3. The company's scale |
| Q4. Type of industry |
| Category 10: Job satisfaction and career awareness |
| Q1. Learning activities outside the workplace |
| Q2. A sense of growth in the workplace |
| Q3. Sense of career prospects |
| Q4. Job motivation level |
| Q5. Job evaluation |
| Q6. Job satisfaction |

In Category 11, we used 17 indicators for the abilities acquired at university, and we requested a subjective evaluation (5-point scale), such as "To what extent do you think you acquired the following abilities at university?" Table 6 summarizes these 17 ability indicators, and they correspond to the categories of skills and abilities that the PROG test measures. In Category 12, the respondents were asked to indicate their perspectives on a 5-point scale regarding to what extent each ability in the 17 indicators is required in society.

Table 6. The 17 ability indicators of the survey for Categories 11 & 12

| |
|---|
| |
| Q1. Affinity |
| Q2. Cooperative ability |
| Q3. Leadership |
| Q4. Emotional control |
| Q5. Confidence-building ability |
| Q6. Action persistence |
| Q7. Problem-finding ability |
| Q8. Planning ability |
| Q9. Practical ability |
| Q10. Specialized knowledge (Knowledge learned in specialized university courses) |
| Q11. General liberal arts background (Knowledge learned in college liberal arts courses) |
| Q12. Foreign language proficiency (Ability to use foreign languages) |
| Q13. Data science skills (Ability to think mathematically and analyze and utilize data) |
| Q14. Information-gathering skills |
| Q15. Information analysis skills |
| Q16. Problem-identifying skills |
| Q17. Conception ability |

Note: Definitions of Q1–9 and Q14–17 are the same as those listed in Tables 1 & 2.

Factor analysis identified three factors for the 17 ability indicators, as shown in Table 7. The numbers in Table 7 indicate the strength of each indicator's influence on each indicator. Thus, a common latent factor is between indicators with large absolute values. Based on the factor analysis for each indicator, our interpretation is as follows: Factor 1, competency skill items; Factor 2, literacy skill items; and Factor 3, coursework attainment items. Therefore, using these 17 ability indicators to investigate the attainment levels for competency, literacy, and coursework was statistically reasonable.

Table 7. Literacy and competency skills acquired in college and their factors

| 17 ability indicators | Factor 1* | Factor 2** | Factor 3*** |
|--------------------------------------|--------------|--------------|--------------|
| Q1. Affinity | 0.746 | -0.123 | 0.071 |
| Q2. Cooperative ability | 0.782 | -0.048 | 0.064 |
| Q3. Leadership | 0.771 | -0.002 | -0.052 |
| Q4. Emotional control | 0.732 | -0.051 | -0.020 |
| Q5. Confidence-building ability | 0.919 | -0.029 | -0.011 |
| Q6. Action persistence | 0.806 | 0.007 | -0.001 |
| Q7. Problem-finding ability | 0.419 | 0.402 | 0.004 |
| Q8. Planning ability | 0.488 | 0.343 | 0.002 |
| Q9. Practical ability | 0.647 | 0.167 | 0.004 |
| Q10. Specialized knowledge | -0.001 | 0.026 | 0.387 |
| Q11. General liberal arts background | -0.008 | 0.067 | 0.810 |
| Q12. Foreign language proficiency | 0.160 | -0.006 | 0.397 |
| Q13. Data science skills | -0.166 | 0.592 | 0.165 |
| Q14. Information-gathering skills | -0.032 | 0.844 | 0.071 |
| Q15. Information analysis skills | -0.051 | 0.964 | -0.021 |
| Q16. Problem-identifying skills | 0.038 | 0.906 | -0.070 |
| Q17. Conception ability | 0.107 | 0.794 | -0.165 |

* Factor 1: Competency (Q1-Q9)

** Factor 2: Literacy (Q11-Q13)

*** Factor 3: Coursework (Q10-Q17)

5. Survey Result and Analysis

The survey result was analyzed using the PROG test data of the respondents' tests in their third year of university. The main focus was the relationships between respondents' competency scores and career development factors. The scores of their self-evaluation for course subject attainments were also analyzed. Finally, we conducted a portfolio analysis of competency skill components in relation to needs and attainments reported by the respondents for the 17 ability indicators of the survey.

5.1 Relationship between competency scores and career development factors

The relationships between respondents' competency scores and career development factors were analyzed to determine how their PROG test competency and literacy scores in their third year of university and their attainment level of subject mastery affected their professional life after graduation. The relationships among career development factors were also analyzed. The path analysis results are illustrated in the diagram in Figure 1. The direction of an arrow in Figure 1 indicates a cause-and-effect relationship, and a number on the arrow shows a correlation coefficient between the cause and the effect, which indicates the degree of influence of the cause on the effect. Figure 1 demonstrates the multiple relationships, explained in the following paragraphs.

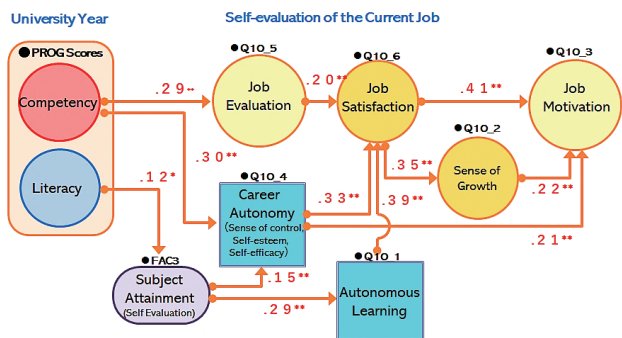


Figure 1. Diagram of relationships among the PROG scores, subject mastery self-evaluation, and career success factors (Note: Q10_#: corresponds to the question number of Category 10, and FAC3 denotes Factor 3 in Table 7.)

As shown in Figure 1, the competency scores of the PROG test during university years affected the self-evaluation of the current job and were related to career autonomy, an individual's ability to manage their career and life. Moreover, the literacy scores of the PROG test did not directly affect the self-evaluation of current job performance but did affect young professionals' career autonomy and autonomous learning. The respondent's self-assessment of the mastery level of a subject affected the self-evaluation of job satisfaction and job performance. For the relationships among career development factors, high job satisfaction was directly related to high job motivation, and high job evaluation led to high job satisfaction. In addition, the degree of job satisfaction was related to autonomy (career autonomy and autonomous learning) in the workplace, eventually leading to job motivation.

5.2 Relationship between PROG test scores and course subject attainments

Tables 8 and 9 show the relationships among the three attainment factors self-evaluated by the respondents (literacy, competency, and subject mastery), their attitudes toward activities and experience, and their sense of growth during their university years. Because the respondents' answers regarding attitude and a sense of growth were self-evaluations, we used self-evaluations for the three attainment factors. In Tables 8 and 9, the plus sign (+) and the minus sign (-) represent that an item in the left column ("Degree of enthusiasm" in Table 8 or "Experience and growth" column in Table 9) directly influenced the attainment factor (competency, literacy, or subject mastery) but that other items in the column did not. The plus sign denotes positive correlation, and the minus sign denotes a negative correlation. A blank in Tables 8 and 9 denotes that a correlation was observed but was mediated by other factors, and no direct relationship was recognized. The abbreviation ns means no correlation was observed between each item in the column and the attainment factor in the row.

Table 8 shows that the self-evaluation levels for the three attainment factors were related to the levels of enthusiasm for university activities, coursework in liberal arts and specialized fields, foreign language learning, and graduation theses. The attainment factors did not show a direct relationship with the enthusiasm levels for activities other than coursework,

such as club activities and part-time jobs. We also analyzed the responses to the questions in Category 7 (satisfaction with university subjects and activities) to determine the relationships between the three attainment factors and respondents' satisfaction with club activities and part-time job experience. There was no direct relationship between the attainment factors and these activities.

Table 8. Correlation among three attainment factors (self-evaluation) and commitment and enthusiasm for activities while in university

| | self-evaluated attainment factor | | |
|-----------------------------|----------------------------------|----------|-----------------|
| Degree of enthusiasm | Competency | Literacy | Subject Mastery |
| Specialized subjects | + | + | + |
| Liberal arts subjects | + | + | + |
| Learning a foreign language | + | + | + |
| Graduation thesis | + | + | + |
| Club/circle activity | | | |
| Part-time job | | | ns |
| Job-seeking | | ns | ns |

As shown in Table 9, the three attainment factors were positively related to proactive experiences, such as speaking up in class, discussing with other students, participating in voluntary study groups, and building good relationships with faculty and staff. The table also shows that a sense of growth was directly related to the three abilities.

Table 9. Correlation among three attainment factors (self-evaluation) and university experiences and a sense of growth while in university

| | self-evaluated attainment factor | | |
|--|----------------------------------|----------|-----------------|
| Experience and growth | Competency | Literacy | Subject mastery |
| Spoke in class | + | + | + |
| Didn't understand the classes | - | - | |
| Discussed with other students | + | + | + |
| Participated in voluntary study groups | + | + | + |
| Felt close to the faculty | + | + | + |
| Consulted with faculty and staff about my career | + | + | + |
| Had a sense of growth while in university | + | + | + |

5.3 Generic skills for jobs

Figure 2 is a scatter diagram of the 17 indicators of abilities. For each indicator, the degree of attainment (self-evaluation) is on the horizontal axis, and the degree of need is on the vertical axis for each indicator. We classified the 17 indicators

into five groups: knowledge and skills related to university coursework, three competency skill areas (interpersonal basic skills, self-control basic skills, basic skills for managing problems), and problem-solving skills. Indicators in the same group tended to be close together in the diagram.

Based on the diagram, the analytical results are as follows:

1. The nine indicators, skill components measured by the competency part of the PROG test (Table 2), are in the upper right compartment. Because their values are above the average values of all the indicators for the necessity level for a working adult and the attainment level while in university, the respondents assessed that they acquired these generic skills necessary for working adults before graduation.

2. The respondents perceived that leadership, planning, and emotional control skills were relatively difficult to acquire during university; among these, the ability to control emotions, despite its high degree of necessity, was slightly below the average of the attainment levels.

3. The four literacy items, skill components measured by the literacy part of the PROG test (Table 1), are grouped near the intersection of the averages. Their necessity levels are not as high as their competency skill items, and their attainment levels while in university are slightly lower than the average value of all the indicators.

4. The four indicators for knowledge and skills related to university coursework are scattered and much lower than the competency and literacy items for the necessity and attainment levels. In particular, the indicator of foreign language skills is in a very low position for the necessity level for a working adult and the attainment level while in university.

after graduation. The analysis results show that motivation is expected to influence performance in combination with ability. In other words, motivation coupled with ability is expected to influence performance outcomes.

Some studies have demonstrated that practical skills such as competencies are cultivated mainly by active learning in extracurricular activities and working experience during university [11][12][13]. However, our results show that cultivating these skills is possible but depends on how students engage in classes. The literature has demonstrated that extracurricular activities and part-time jobs positively contribute to skill development [11][12][13]. However, our results demonstrate that the content of these activities for a student is important. In other words, activity content that is valuable and meaningful to students induces their positive attitude and commitment toward the activity, including coursework, and eventually leads to successful career development.

The portfolio analysis of competency skill components in relation to the needs and attainment levels of 17 ability indicators shows that the university graduates perceived that they acquired higher skills in the competency components (Table 2) than in the literacy components (Table 1) and the proficiency acquired in class subjects. Moreover, the attainment level of emotional control was slightly below the average despite the high degree of need for emotional control. This indicates that the inability to manage stress might be a recent issue in university education. The levels of data science skills were recognized by the respondents despite necessity scoring higher than other skills acquired through course subjects in liberal arts and specialized subjects.

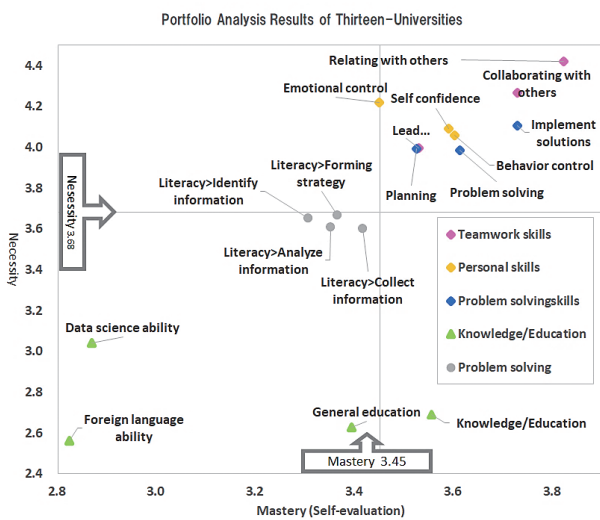


Figure 2. Portfolio analysis of competency skill components in relation to needs and attainments for the 17 ability indicators of the survey

6. Discussion

The effect of university education on generic skills and career development after graduation was not quantified because the outcomes of university education tended to focus on the aspects of coursework attainment, such as subject test scores and course grades. By expanding the scope of educational outcomes to include generic skills, we investigated connections between university education and professional life

7. Conclusion

The employment environment of workers who recently graduated from university, typified by JOB-type employment, is undergoing major changes [9][13]. In this environment, university graduates must become professionally independent of organizations and companies, starting in their early working stage. In this sense, university students must develop various skills during their university years, which directly and indirectly influence their future careers. An analysis of PROG test scores from 2014 to 2020 of university students presented in The PROG White Paper 2021 [15] shows a downward trend in PROG test competency scores for self-control basic skills. Although basic interpersonal competency skills have remained mostly unchanged, competency skills such as leadership, emotional control, and planning have a declining trend. These skills are often mentioned as skills whose enhancement is expected more to manage recent changes in the job market.

The analysis results of this study reaffirm that student's enthusiasm and proactive attitudes toward learning and activities while in university lead to career development after graduation. Positive attitudes toward coursework and outside class activities, including working part-time, can cultivate a sense of growth in the workplace, which can lead to job motivation. This implies the importance of a support system that encourages students to implement an independent and proactive approach to learning opportunities in class and outside class. The outcomes of university education should be considered from a perspective

of a student-centered support system for enhancing student's career development after graduation, as mentioned in ^[15]. Because of the increasingly severe employment environment due to the rapid changes in society and technology, universities are increasingly required to implement individualized support measures for each student to help them engage in learning and activities proactively and positively during university. Then, students' proactive behavior during their university years can enhance their ability to manage unprecedented changes due to the progress of globalization and accelerated advances in science and technology.

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