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Paper of the Year for 2017

Academic Influence of Social Network Sites on the Collegiate Performance of Technical College Students

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Abstract - Social network sites (SNS) is an emerging phenomenon that is here to stay. The popularity and the ubiquity of the SNS technology is undeniable. Because most SNS are free and easy to use people from all walks of life and from almost any age are attracted to that technology. College age students are by far the largest segment of the population using SNS. Since most SNS have been adapted for mobile devices, not only do you find students using this technology in their study, while working on labs or on projects, a substantial number of students have been found to use SNS even while listening to lecture. This study found that SNS use has a significant negative impact on the grade point average of college students

particularly in the first semester. However, this negative impact is greatly diminished by the end of the third semester partly because the students have adjusted satisfactorily to the challenges of college or because they have learned how to adequately manage their time. It was established that the kinds of activities the students are engaged in during the SNS use are the leading factor affecting academic performance. Of those activities, using SNS during a lecture or while studying is the foremost contributing factor to lower academic performance. This is due to “cognitive” or “information” bottleneck, a condition in which the students find it very difficult to multitask or to switch between resources leading to inefficiency in information retention and thus, educational performance.

Categories and Subject Descriptors

K.3.2 [Computers and Education]: *Computer and Information Science Education*

General Terms

Social network analysis, Security, regression analysis, Grade Point Average

Keywords

Social network sites, social network analysis, correlation of determinants, correlation of coefficient, regression coefficient, cognitive dissonance, psychological engagement, f-statistic

1 INTRODUCTION

Although social network sites (SNS) have been around since 1997 [1], it wasn't until 2005 – 2006 when Facebook was introduced to the rest of the world for anyone with an email address that we saw an exponential proliferation in the number of people who adopted, explored and used this social service [1], [2]. Since then, SNS, has become ubiquitous with a projected three billion users world-wide to be connected to SNS by 2020 [3]. Whereas the world's top five SNS are Facebook, YouTube, Instagram, Twitter and [3], in North America, the top SNS are Facebook, Instagram, Pinterest, Twitter and LinkedIn [4]. In the United States,

Facebook account for seventy-nine percent of all users of SNS [4]. Further in the United States, the majority of the people who use SNS are individuals between ages 18 and 29 (88 percent of users) who possess some level of college education (82 percent of users) [4], [5].

SNS are platforms that allow users to share all sorts of information about themselves, their friends and families; to keep in contact with new people; to share files, load and upload pictures, share links and other pertinent information that their followers or friends might find it useful to know [6], [7]. SNA data can be downloaded and analyzed to produce a treasure trove of information for researchers and academics alike who are interested in studying the characteristics of social groups, an area known as social network analysis (SNA).

Social network analysis has been used in the past to determine what impact, if any that SNS use have on the academic performance or grade point average (GPA) of college students. Several researchers have found that SNS use by students have a net positive effect on the GPA of college students [8], [9]. Other researchers have determined that the use of SNS significantly negatively impacts the GPA of college students as a lack of student engagement as well as multitasking and switching which reduces a person's cognitive resources to accomplish a diversity of tasks successfully [10] – [15]. Still further studies have established no correlation whatsoever between college students' grades and the use of social network sites like Facebook [16], [17].

Numerous studies have already been done on the dynamics that affect college students' grade point average especially in their freshman year when they are most vulnerable to academic success or student attrition. Among other variables, there is empirical evidence to prove high school grade point average (HSGPA) is one of the key predictors of academic performance of first year college students [18] – [20]. Meanwhile, other factors that could impact college GPA include: academic self-efficacy and optimism [21]; achievement motivators [22]; student engagement [8], [9], [23], [24]; and even differing pedagogical approaches to teaching in the high schools [25].

Past studies on the impact of social network sites (SNS) and academic performance of college students have focused primarily on four-year colleges except for a study by Evans et al. that was implemented in a community college environment [26]. However, there has not been any research work to date to determine if a correlation exists between high school grade point average and the use of SNS in two-year technical colleges. This study is an attempt to fill that gap.

In this study, the focus is on whether a college student's academic performance is affected by the usage of social network sites. While there is empirical data supporting high school grade point average, Facebook usage and college academic performance, the use of other social network sites are yet to be established.

The primary objectives of this study are:

R1: *Does the use of SNS impact the academic GPA of students in the first two years of college?*

R2: *Does the amount of time students use SNS impact their GPA?*

R3: *Does the kind of activity students are engaged in while using SNS affect their academic performance in the classroom*

2 LITERATURE REVIEW

In this section, an overview of the various factors that can be used to predict a student's academic grade point average in college is presented. This is absolutely important specifically because college students are most vulnerable to dropping out and student attrition in their first two years of college.

There are a significant number of factors that impact the academic performance of college students. For the purpose of this study, the impact of academic performance on college is examined. Then, an overview of the influence of student engagement to learning is presented. Finally, SNS is evaluated to determine its effect on learning.

2.1 Predicting College of Academic GPA

2.1.1 Academic Performance

A substantial amount of work has been done on academic success in high school, performance on standardized tests, and its association with students' academic success in college along with student attrition. These studies have found that both high school academic success and the scores on standardized tests are two of the most significant predictors of success in college [20], [21], [27] – [30]. A study by Johnson and Wolfe found that high school grade point average, SAT scores and self-control account for 19%, 5% and 9% of the variance of college GPA, respectively [31]. Zwick and Sklar did a similar study on minority students which yielded similar results [32]. However, Camara and Michaelides believe that with so many high school students currently having GPAs reaching in excess of 4.0, standardized exams have thus become more reliable and valid in predicting students' academic success in college [19], [33].

2.1.2 Student Engagement

In a cross-sectional review of many of the research studies relating to success of college students, Braxton concluded that there are eight domains of indicators of student success in college [34]. These include: academic attainment [24], [35]; acquisition of general education [36]; development of academic competence [37]; development of cognitive skills and intellectual dispositions [8]; occupational attainment [38]; preparation of adulthood and citizenship [37]; personal accomplishments [39]; and personal development [8].

Kuh and his colleagues were challenged by the National Postsecondary Education Cooperative to review the literature and to compile a report that would provide an informed perspective on policies, programs and best practices that can make a difference to acceptable student performance in postsecondary education [40], [41]. They proposed that success in postsecondary education be defined broadly by academic achievement, engagement in educationally purposeful

activities, satisfaction, acquisition of desired knowledge, skills and competencies, persistence, attainment of educational objectives, and post college performance [9].

It is imperative to observe that student engagement is an overarching, overriding dynamic to student success in college. Student engagement can be described as the time and effort students devote to activities that are “empirically linked” to desired learning outcomes and objectives [41]. Research has shown that students gained more from their studies when they devote more time and energy to the task at hand [8], [24], [35], [41], [42]. The time spent on tasks was underscored by Astin in a longitudinal study of student development dubbed “student involvement theory” in which he posits that the greater the quality and quantity of the physical and psychological energy a student invests in his college experience the greater the amount of student learning and personal development [24], [35], [39].

2.1.3 Social Networking Sites (SNS) and learning

SNS is ubiquitous. It is predominantly common among 18 – 29-year olds [4], [43]. Facebook has become the defacto SNS of choice for college students [4], [44], [45]. Not only do college students spend an appreciable amount of time on these SNS at their homes and dorms, they also surreptitiously use SNS in the classroom. Some professors have resorted to banning the use of social media in the classroom because they believe it is detrimental to learning in the classroom. Other professors are unable to ban the use in the classroom and as such have reluctantly resorted to incorporating the technology in the classroom learning environment.

With the proliferation of SNS among high school and college students, a significant amount of research has been done to examine the impact that SNS usage has on the academic performance of these students. Kirschner and Karpinski found that non-Facebook users had reported a higher-grade point average (GPA) than Facebook users [13]. They believed this was due to poor time management skills by the students, although Alloway surmised that SNS use innately creates a proclivity to procrastinate [46]. Junco also compared SNS usage and college GPA. Junco found a significantly negative relationship between time spent on Facebook

and freshman GPA [5], [10], [11], [47]. In addition, it was found that there is an association between the kind of activities and GPA [47]. Ophir observed that switching (multitasking) requires a person to juggle his or her limited cognitive resources to accomplish the different task successfully which leads to greater inefficiency [12]. In a related study, Fox et al. found a negative relationship between students who IMing and reading comprehension and overall GPA. They found that the more time students spend on Instant Messaging (IM) the lower their reading scores and consequently, the lower their GPA [48]. The lowering comprehension can be comparable to texting whilst driving.

Further, a number of researchers have linked the use of SNS and GPA to the negative effects of multitasking [10], [14], [15], [47]. Fried [15] and Lauricella [14] suggested that considerable multitasking on off task activities considerably affect student learning. Other researchers have penned this multitasking effect as “cognitive bottleneck”. Cognitive bottleneck or information bottleneck is a constraint in which one focuses on more than one activity at a time. This interferes with memory decisions and often leads to memory leakage or forgetting and redoing of associated tasks [49] – [52]. This can negatively impact student grades.

3 RESEARCH DESIGN

In this section, a description of the participants along with how the data obtained for publication was gathered.

3.1 Participants

From 2014 – 17 Thaddeus Stevens College of Technology (TSCT) has been named and or awarded the Aspen Prize for Excellence as the top two-year college in Pennsylvania as well as one of the top 150 in the country [53]. The student population is primarily from the lower socio-economic status (SES) and the majority of the students live on campus. A total of 150 students from over 18 programs voluntarily participated in the online survey. The students were not offered any incentives to complete the survey. They were also reminded that their participation is voluntary as an analysis of the survey results will be published.

By a significant margin, the students in the survey primarily used Facebook and YouTube in both high school and college. More students in college used Instagram and LinkedIn than in high school (see Figure 1 and Figure 2 below).

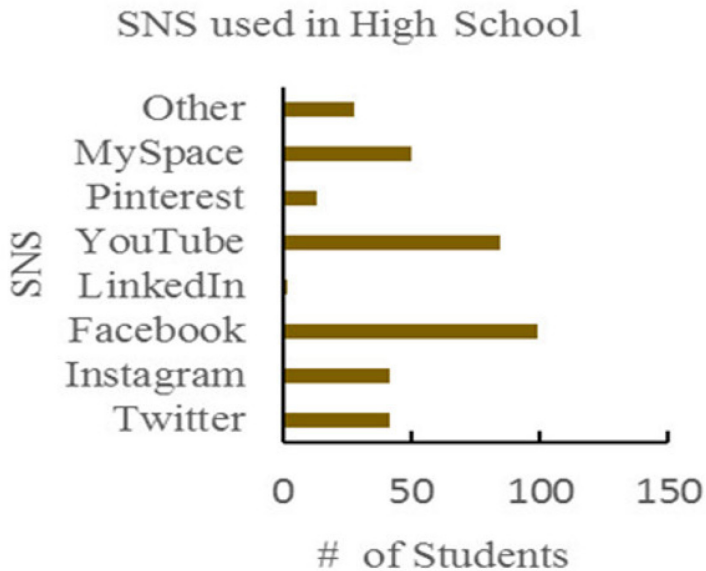


Figure 1: SNS Used in High School

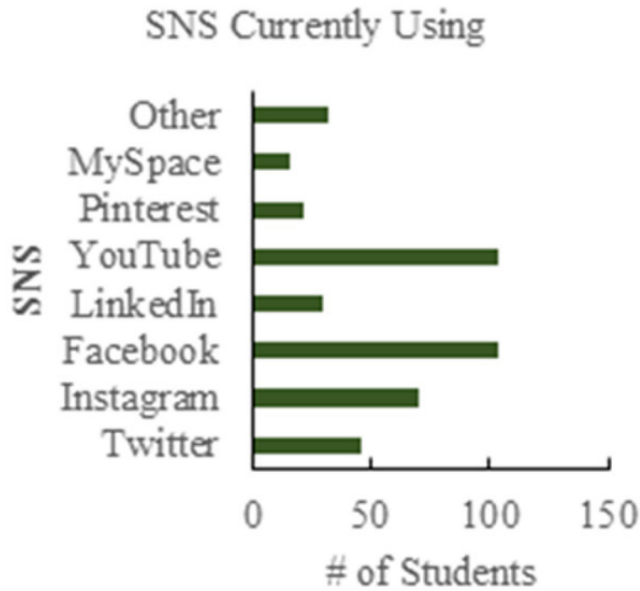


Figure 2: SNS Use in College

3.2 Research Design

The survey consisted of 16 multiple choice / multiple grid questions. It was created and designed using Google Forms. The survey questions addressed 11 different areas including: SNS usage; names of SNS websites used; how frequently they use SNS websites; the amount of time spent daily on SNS; how often they use their mobile phones to visit SNS during lecture; do they have special times for using and visiting SNS; their academic GPA at the end of high school and that of the first three semesters of college; do they have specific reasons for using SNS; and what is their age, gender and ethnicity.

Once the survey was completed, the data was downloaded into an excel spreadsheet for analysis. Upon the data download and cleansing, r programming was used for the data visualization. In all, 142 students from 18 programs responded to the survey. Eighty-four percent of the respondents were males, which is typical of

the technical college. In other to determine whether the students' academic grades had declined or not, each student was asked to provide a range for the high school grade point average (HSGPA) as well as the range for their college academic GPA for their first three semesters at TSCT. Table 1 below gives a summary of the students' academic GPA.

# of Participants	Academic Grade Point Average			
	< 1.99	2.0 – 2.64	2.7 – 3.64	3.7 – 4.0
HSGPA	5	24	83	30
Semester 1	2	22	69	49
Semester 2	3	23	74	42
Semester 3	4	26	72	40

Table 1: Summary of Participants and GPA

3.3 Procedure

At the beginning of the spring semester (January, 2017) an email was sent to a certain number of the sophomore college faculty informing them of the survey and the need to encourage their students to participate in it. They were asked to allow the students 20 minutes of their time to complete the 16-item questionnaire between February 13 and 24. The survey was created using Google Forms. Once the form was completed, a hyperlink was generated. This hyperlink was included in an email addressed to the faculty of the various programs on January 27. Once the due date had expired, the data was downloaded to an .xls file for processing. Numeric values or attributes were given to the responses to determine whether

correlations existed. Regression analysis and data visualizations were then calculated using r programming.

4 EXPERIMENTAL RESULTS AND DISCUSSION

4.1 Does the use of SNS impact the academic GPA of student in the first two years of college?

Here six different responses were analyzed to determine the academic impact through the end of the first semester in their sophomore year. The six different responses include: whether or not they have SNS accounts; did they use SNS in high school; what current SNS they are using; how often they visit these SNS; when were they introduced to SNS and; for how long they have been using SNS.

Using the linear model for the HSGPA, we observed a highly significant P ($> |t|$) value and high t -value (15.819). As a result, the null hypotheses should be rejected. The F -distribution of 1.767 also implies that there is a relationship between HSPGA and SNS use. The main factors that affect the GPA are the number of SNS sites visited and, to a lesser extent, when the students were introduced to SNS. However, because the coefficient of determination (r^2) is so small (0.07283), then the strength of the association between the variables is not very strong.

```
Coefficients:
      Estimate Std. Error t value Pr(>|t|)
(Intercept)  3.43356    0.19804  17.337 <2e-16 ***
HAS.SNS      0.17558    0.11016   1.594  0.1133
CURR.SITES   0.07822    0.04219   1.854  0.0659 .
HS.SITES     -0.08735    0.04534  -1.926  0.0562 .
REGULAR      0.02857    0.03444   0.829  0.4083
INTRO        -0.08000    0.04079  -1.961  0.0519 .
YEARS        -0.08528    0.06961  -1.225  0.2226
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.525 on 135 degrees of freedom
Multiple R-squared:  0.08541, Adjusted R-squared:  0.04476
F-statistic: 2.101 on 6 and 135 DF, p-value: 0.05706
```

Figure 3: Freshman 1st Semester Linear Model

Figure 3 above presents the regression model for the first college semester. It can be observed that a correlation exists between SNS use and academic grade point average in each semester. It should be noted however, that the coefficient of determination and the F-distribution is larger in the first semester of college than any of the other semesters. This implies that there is a stronger correlation in the first semester of college. In addition, the p-value is also smaller in the first semester than the other semesters as well, which confirms our assumption. It should be noted that by the end of the third semester in college, the strength of the association is marginally significant at all. In fact, a close examination of the residual graphs for each of the semesters depicts a regular pattern and a residual centered on the mean. By far, the best pattern is between high school and the first semester which is a clear indication of the existence of a correlation between the variables.

4.2 Does the amount of time students use SNS impact their GPA?

Here, the goal is to determine the regularity of the respondents' visits to the SNS, how much time they spend on the social networking sites per day, and how frequently they visit the SNS per week and its impact on academic grade point average. In addition, the ratings the respondents provided of their SNS use over the

past year is also used in the calculation. Table 2 below offers a synopsis of the coefficient results.

GPA	t value	Standard Error	R²	F-statistics	p-value
HS	25.131	0.13194	0.02595	1.226	0.3028
1 st Semester	25.729	0.12856	0.02348	1.106	0.349
2 nd Semester	24.780	0.13169	0.00701	0.3247	0.8075
3 rd Semester	22.601	0.13696	0.02466	1.163	0.3263

Table 2: Coefficient Values

Overall, a correlation exists between academic grade point average and the regularity of the student visit on social networking sites. A close examination of Table 2, illustrates slightly large p-values. This is a clear indication that the correlation between the response variables and the predictor is not vastly significant. It can be perceived by the large 0.8075 p-value of the SNS in the second college semester that SNS does not reflect any significance in the respondents' academic grade point average. Further, the small values of the r² undoubtedly attest to a weak correlation among the variables. For example, the r-squared value for the second semester is 0.00701 which is relatively low in comparison with the other semesters. What is most intriguing is that the SNS correlation in the second college semester

is considerably weaker than that of the third semester. It can will be observed that all except the residuals for the third semester depict nearly straight lines with no residuals centered on the mean. This is a strong indication of a poor fit – in other words there is no strong correlation.

4.3 Does the kind of Activity the students are engaged in while using SNS affect academic performance in the classroom?

In this section, the kinds of activities the students are engaged in while using SNS is examined to determine whether it has a detrimental effect on the learning process in the classroom. Specifically, SNS use is analyzed to establish if it has any impact on the students' studying habits and their aptitude to retain information at the same time, because the capability of the student to study effectively have a significant influence on their college academic performance. It is imperative to comprehend whether the seemingly insidious habit of using SNS during lectures might be more detrimental to learning in the classroom than we anticipated.

Using a linear regression model, it can be observed that a high degree of correlation exists between the activities and academic performance at the high school level. Specifically, using SNS during lecture or at special times have the highest negative influence on academic GPA. Further, an increase in the frequency of SNS use or even increases in the use of SNS during lecture or while studying will cause an inverse but reduction in the HSGPA. With the high F-statistic (2.085), it is concluded that a correlation exists as well. However, due to the small coefficient of determination (0.098), it can be deduced that the strength of the association between SNS use and academic performance is relatively low. In the second semester, based on the small standard error values along with the values for the F-statistic and the p-value for the t-test, it can be fairly formulated that the coefficients are significant for the model. As such, there is a level of correlation between the dependent and independent variables. However, the most substantial activities that affect academic performance appear to be using SNS during a lecture and while studying.

In the third semester of college, the coefficient figures for the activities are significantly different when compared to the second semester. Whereas a correlation exists in both semesters, it can be observed that the F-statistics and the r^2 for the third semester is substantially larger than that of the second semester. This suggests that the association between the relationships is more significant in the third semester and that the strength of this association is also stronger in the third semester than the second semester. Furthermore, the p-value in the second semester (0.7059) is more than twice the size of that in the third semester (0.3224), again demonstrating that the relationship is more meaningful in the third semester compared to that of the second semester.

5 DISCUSSION, IMPLICATIONS, LIMITATIONS AND CONCLUSION

5.1 Discussion

Overall, the results of the study provide empirical evidence that a correlation exists between college students' SNS use and their academic performance. Based on the analysis of the results, the impact of SNS on academic GPA is greatest in the first semester and is very minimal by the end of the third semester of college. In general, the results highlighted the kinds of activities the students are engaged in while using SNS is a crucial aspect in their academic grade point average. Below is a discussion of the research results.

5.1.1 Research Question I

R1: *Does the use of SNS impact the academic GPA of students in the first two years of college?*

The analysis of the research illustrates a positive correlation between the use of SNS and student academic performance from high school to college. However, it was found that the strength between grade point averages and the other independent variables were stronger in the first semester of college compared to the third semester. In fact, by the end of the third college semester, the impact of SNS on academic performance is relatively non-existent. A possible explanation for this

phenomenon could be that the students are becoming more comfortable with the social network technology while also adjusting to the college environment. Most importantly, it is not just having an SNS account that have the greatest impact on students' grades but rather it is when they were introduced to SNS, the kind of site they are using as well as how regularly they visit the sites.

5.1.2 Research Question 2

R2: *Does the amount of time students use SNS impact their GPA?*

The results of the study confirm that the more time the students spend on SNS the lower their academic performance. This can be attributed to poor time management skills and a propensity to procrastinate [5], [10], [11], [46]. This is more critical in the students' first semester of college as they have to learn to adjust to the higher level of work, different studying habits and overall more or frequent assignments. But the amount of time used on SNS is less of a factor in the second semester as compared to the first and third semesters of college. This could be because the students might be using SNS less regularly or they have more time to concentrate on their school work or they have adjusted to the rigors of the college environment.

5.1.3 Research Question 3

R3: *Does the kind of activity the students are engaged in while using SNS affect their academic performance in the classroom?*

The analysis of the results provide empirical evidence that the kind of activities the students are engaged in during SNS use has a significant effect on the academic performances of the college students. For instance, using SNS while working on labs or on projects does not have any major impact on learning. However, using SNS during a lecture or while studying have a more profound influence on academic grade point average because it calls for higher student engagement and involvement. Further, using SNS in a lecture calls for a greater level of multitasking and switching on the student's cognitive capacities [12], [24], [43].

5.2 Implications

The results of the study provide supportive evidence for previous research [10], [11], [13], [46], [47], [54] on the negative impact of SNS use on the academic performance of college students. This negative impact is greater during the first couple of semesters of college, in particular the first semester, as the students grapple with the rigors of study and their new environments. By the end of the third semester of college, there is very little effect of SNS on academic performance. However, it is the activities that students are engaged during SNS use that significantly affect their grade point average. For example, using SNS during lectures have a negative effect on learning as well as academic performance.

Since students spend two years in most technical colleges (and community colleges as well), it is imperative that college faculty and administrators understand this inhibitor to academic performance and to provide an environment whereby the students' grades will not falter during the course of their studies because, unlike a four-year college, they have very little time to restore and improve their grade point once it has fallen. Furthermore, prior to their graduation, college students are supposed to receive and demonstrate a certain level of skills to make them productive citizens. If they are not reaching that level of competency and proficiency in the necessary areas, then the system has failed them.

Further, it can be very helpful if faculty can provide opportunities to utilize SNS in the teaching learning activities. That way, students would be less likely to use SNS in the classroom where the impact of SNS is most noticeably negative.

5.3 Limitations

There are some limitations to this study. First of all, the sample size of the research study is very small and the environment may be different from many other colleges. Moreover, the study was done with a limited number of college sophomores. The study could yield different results if a larger number of students from a cross sectional colleges is surveyed.

Furthermore, some students take harder classes and their major is more difficult than others. In addition, some faculty provide a better methodology for student engagement and learning than others. Hence, a student's academic performance can be an overarching attitude of teaching in the classroom, the student's ability, peer tutoring, and so on, and not the use of the SNS technology per se.

5.4 Conclusion

Social network sites are an emerging phenomenon that is here to stay. The popularity and ubiquity of the SNS technology is undeniable. As the technology continues to grow we may well see a convergence of the technology with teaching methodologies in the classrooms. Moreover, as students find more and generic uses of these applications, it is likely that this technology will continue to compete with college students' activities for learning and how they prepare for their classes; the structure, methodology and the approach utilized by the faculty in making the teaching and learning environment most constructive and conducive for the students; and of course, the benefits and the academic output that these students yielded from the combinations of all these emergent systems. It behooves college faculty and educational administrators to factor this SNS technology into their strategic planning in order to maximize the students' potential to design a learning that is more complete and productive.

Since two-year technical college students amass all the knowledge and skills to make them productive employees within four semesters, it is highly important that college administrators understand the factors affecting student performance in the classroom and develop means to mitigate these elements. Not only is this important for learning but it is also very critical for student college retention, an area that continues to plague both two- and four-year colleges.

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