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MULTI-GROUP ANALYSIS OF FACTORS DETERMINING USER'S COMMITMENT IN MOBILE SOCIAL NETWORK GAMES

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ABSTRACT

Social Network Game genre is a game in which people connect to each other by utilizing a mobile platform, and interact with each other while enjoying related contents. It has now become a popular game. The purpose of this study is to find significant factors that have effects on the commitment of M-SNGs. We also conduct multi-group comparison test to study the difference in factors of models between 2012 and 2016. We use structural equation model analysis with SmartPLS 3.0 and compare models of different times. This study is to give academicians and practitioners insight about its effects and implications. The results showed that there was a significant difference between the two groups only in the relationship between competition-commitment and social interaction-commitment. This study is to give academicians and practitioners insight about its effects and implications.

Keywords: *Mobile Social Network Game, Commitment, Social Factors, Social-Game Factors, Game Factors*

1. INTRODUCTION

Social Network Game (SNG) is a game that actively uses the connections of users formed through the Social Network Services (SNS). SNG is a service that combines the advantages of Social Network Services with the fun of games. With the spread of SNS such as Facebook, SNG market has also grown rapidly. As a representative characteristic of SNG, "social" characteristics are given priority. SNG has a game design that allows existing users to naturally attract other users, and design games to limit the use of games without friends.

The expansion of mobile social network game (M-SNG) with the appearance of smartphone. M-SNGs are defined that mobile game utilizing the user's contacts belonging to mobile messenger based SNS such as Kakaotalk. M-SNGs are played through social network from mobile and are typically characterized by multiplayer and asynchronous game play mechanics [1]. For example, users can see whose playing and instantly get in on the action. Also, users can check top their friends' best scores and dominate the leaderboard.

The biggest feature of M-SNG is not human-computer interaction of existing mobile games. It is a Human and Human Interaction system that interacts with users through SNS platform. That is, the user can communicate with each other based on the SNS by transmitting the item to the other party or sending a game invitation message while executing the game [2]. Therefore, this study focuses on the interactions among users, so it is assumed that users will not simply play games for fun, but they will commit to games by the relationships and influences among other users.

M-SNG is a game genre that has made great progress in Korea in 2012. In Korea, the potential of the mobile game market has exploded with the advent of SNG games using smart phone-based mobile messengers. In the first two months of its appearance on the mobile platform, 'Ani-Pang' became a national game with 10 million users per day, 2 million concurrent users, and 2,000 downloads [3]. One of the reasons for the success of M-SNGs is that word-of-mouth via mobile messenger worked. This was a kind of leaning 'because it is a popular game that most people around the world are doing nowadays.'

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Since 2015, however, there have been a lot of games being released, the weakness of one game has been weakening, and too many people have started to feel tired due to too many (game related) mobile messages. Because of this, the influence of M-SNG is not the same as before.

This study developed model to explain why people are immersed in M-SNGs. A dependent variable is commitment. Independent variables are classified into three groups (game factors, social-game factors, and social factors). M-SNGs began in 2012, and have become popular and have embedded in our daily lives at 2016. There are differences in the behavior of users' commitment when M-SNGs came out, compared to when it was popularized. The purpose of this study is to make a comparative study of game user's behavior between 2012 and 2016.

2. THEORETICAL BACKGROUD AND HYPOTHESES

2.1 Commitment

M-SNGs are not a game that takes a long time, unlike online games. It is playing with the restriction of the time within limit of 5 minutes or less. Playing M-SNGs require a high concentration in a short time. Therefore, this study uses a commitment than flow. Commitment refers to whether the players feel psychologically attached to the game and want to continue playing the game long-term [4]. The commitment experience was proposed by Hoffman and Novak [5] as an essential concept to understand consumer navigation behaviors in the online environment such as World Wide Web (WWW). They emphasized that the frequent visits of the web site are high when the internet user's immersion is high and that they should make full use of the immersion to make successful marketing activities. Commitment refers to a state in which the present state of experience is felt as an optimal experience, which is called order or balance of consciousness [5].

Existing studies about SNGs and M-SNGs that have studied item purchase [6], free to play [7], flow experience [8], acceptance [9-10] and continuous intention to use [11]. Most existing studies research the adoption of game using TAM (technology acceptance model) and a lot of studies focus on the SNGs running on PC such as Facebook game [12]. However, this study focus on commitment of M-SNGs in the state of game experience unlike previous studies. In this study, we define that the more individuals are connected, the longer the time to concentrate on the game, the more immersed in the social network game.

2.2 Playfulness

When users are playing a game, users feel playfulness, difficulty to the game, and completion of the game [9, 13-14]. Playfulness is defined as the degree of curiosity that users acquire while interacting with each other through technology [15]. The playfulness is that the user will have access to the technique for a certain period of time, and when the state continues, the user will continue the activity with the joy and joy of using it. Therefore, this study assumes that the individual's playfulness obtained through the SNG has a positive effect on the M-SNG usage commitment.

H1: Playfulness will positively affect the commitment of M-SNG.

2.3 Design Aesthetics

The design elements of the game have increased in value as a representative element of the game. Some research has shown that users are pleased if aesthetic senses are met, as well as the need to play games [16-17]. Cyr et al [17] research that user satisfy design aesthetics such as game characters, music, and background design, they feel pleasure of the game.

In M-SNG, character design of game, background music, and simple game UI are important. In this study, we will see that users make a positive evaluation about the game through the design elements felt in the game and it affects the feeling of commitment of the game. In this study, playfulness and design are set as game elements based on existing research.

H2: Design Aesthetics will positively affect the commitment of M-SNG.

2.4 Competition

Socio-game factors are the unique features M-SNGs. It has features to combination of social factors and game factors. Competition, social interaction, and social identity are contained in socio-game factors.

M-SNGs can check user's best scores, and can send messages which proud of their scores or

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'hearts'. Hearts are points in order to play the game. M-SNG can compete with friends who have real relationships with each other through competing games. You can see the rankings of friends who are already playing together in real time, which raises not only the scoring but also the high score competition. And when you raise the heat like this, the user's average skill level and level naturally reach to the high level, and the competition is burned even more.

Lin et al. [14] study suggests that pleasure increases by providing stimuli that cause missions or competition in the game. In the M-SNG game, message delivery and systematic factors that encourage users to compete in the high rankings and scoring among the users induce the individual to immerse themselves in the game by stimulating the user to use the game and stimulating the fun. In other words, this study argues that this behavior positively affects the pleasure and motivation to play the game stimulating the user's competitive psychology.

H3: Competition will positively affect the commitment of M-SNG.

2.5 Social Interaction

Interactivity has been suggested as a potential factor that influences the perceived-enjoyment-related construct [18]. Moon and Kim [15] also suggested that instant feedback to user stimuli leads to increased enjoyment and flow. Players usually want close interaction with the other users and game system in order to gain a playful experience. Competition and social interactivity have positive impact on two mediating variables like as enjoyment and motivation.

Interaction refers to the state in which two or more individuals come together and communicate by emotionally influencing each other [19]. Interactions that occur within a game are activities in which multiple users interact with each other through chat rooms and interact with one another in order to perform a mission. However, in M-SNGs, it is difficult to engage in a chat room or a mutual opinion because it is not a game in which a long period of time is invested like a general online game. To complement this, the 'Heart / Clover Message' is continuously exchanged among the users, as shown in the following figure, causing mutual interaction. The 'heart message' is not simply an item that operates a social network game, but rather a medium for sustaining interactions among users. As the amount of messages is increased, the amount of messages exchanged by users around the game increases, and the interaction increases.

In this study, we hypothesized that systematic factors such as messages that cause SNG interaction have a positive effect on commitment in M-SNG.

H4: Social Interaction will positively affect the commitment of M-SNG.

2.6 Social Identity

Social identity reflects one's conception of self in terms of the relationship to another person or group [20]. According to Kelman [21], an individual's identity is defined as occurring when he or she maintains or grows to a position where he or she is satisfied and has an influence on another person or group. Zhou et al. [22], social status reflects the concept of self in a relationship that occurs within an individual or a group, and argues that the greater the influence of an individual or group within the group, the higher the participation in the community.

On the first screen of a social network game, a list of participants, scores, and rankings of participants participating in the game are displayed. Also, once a week, the users who are in the top level within the game receive the rewards. In this study, we argue that the higher the score and rank of the participating SNG, the more influence the user has on the game, and the higher the level of the user, the longer the user will stay in the game. In other words, the score and the rank obtained in the game are not a simple list, but it is claimed that the value of the individual and the influence within the group are given. This study describes social identity is a status of M-SNGs such as score, ranking, and level. Therefore, H5 is as follows.

H5: Social Identity will positively affect the commitment of M-SNG.

2.7 Subjective Norm

Social factors are a factor explaining the influence of groups or others in using M-SNG games. The purpose of this study is to investigate the influence of the user on the others in the group, social pressure, and to divide the factors into subjective norm and critical mass.

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Subjective norm is found to affect users' intention to play online games [13]. Subjective norm, group norm and social identity were included as the determinants of user desire and intention [23]. Subjective norm reflects the effect of significant others' opinions on a user's behavior. Zhou et al. [22] suggest that if an individual or group that has a strong influence on him or her is invited to participate in an online community, then the individual will participate in the community even if the group does not have a positive perception. In other words, as the activities taking place within the group are diversified, the influence of the other person is stronger than the will of the individual himself / herself.

In this study, 'invitation message' will be explained. The invitation message forms a communication between users by sending a message to the user who is not using the game and inducing the use. The game user sends an invitation message to a user who has not yet played the game to stimulate motivation for participating in the game. The more individuals who receive the message, the greater the immersion of the game due to the influence of the public on the participation of the game. In addition, if a user who sends an invitation message has a strong influence on him / herself, he / she will use it because of his / her influence even if the user can not recognize the game. Therefore, H5 is as follows.

H6: Subjective norm will positively affect the commitment of M-SNG.

2.8 Critical Mass

Previous studies have examined that the effects of network externality on IT adoption and innovation [13]. According to Metcalfe's law, when a user increases a certain level gradually and then goes beyond a critical mass, the cost increases exponentially and thereafter, the value of the group increases rapidly. The greater the number of users who use a product or service, the higher the value of the use and the externality (or effect) of the network.

In order to explain these characteristics, this study will be described as a variable called a critical mass. Perception of critical mass is rapidly strengthened as more people participate in M-SNGs. Therefore, in this study, we try to establish that the more users who use M-SNG, the more influence on individual's SNG commitment.

H7: Critical Mass will positively affect the commitment of M-SNG.

3. RESEARCH MODEL

The purpose of this study is to investigate how gaming factors, socio-game factors, and social factors affect the immersion of users of social network games for those who have used social network games based on KakaoTalk, a mobile messenger in Korea.

The main element of the social network game is a game that combines social attributes. It is a mutually supportive and growing structure, and it has a strong infectivity due to its characteristics of inviting friends and enjoying it together. In addition, the game is constantly played through user interaction, and interaction between users is possible without accessing the game at the same time. Social property is a characteristic of social network game, and it is a base factor that not only enjoys pleasure and fulfillment by executing quests like general game and compensates accordingly, but also keeps motivation to be. Based on this research, this study aims to add social aspects of social network games as well as games.

Based on the above literature review, following model is proposed figure 1.

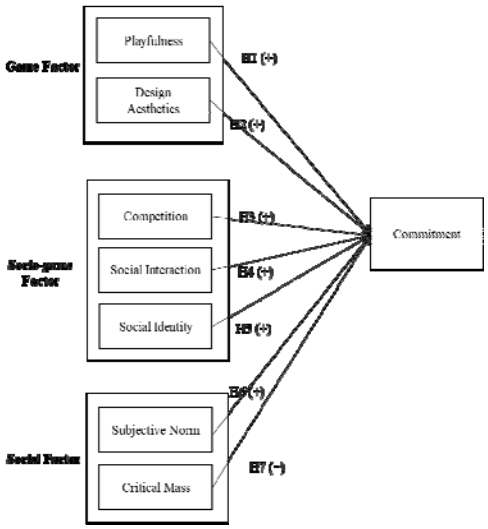

Figure 1: Research Model

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4. METHODS

We conduct multi-group comparison test to study the difference in factors of models between time t and time t1. Time t is October, 2012 and time t1 is April, 2016. We survey two different groups of time t and time t1 people with the same model. This study is to empirically test the research model using data collected from M-SNGs' users. Initial survey and second survey were conducted form M-SNGs users and Kakaotalk users in Korea. Most participants are university students because M-SNGs are the most popular game in twenties. Initial data was collected total of 197 participants from October to November, 2012. Second data was collected total of 190 participants from April to May, 2016.

Table 1 summarized the profiles of the respondents for 2012. Table 2 summarized the profiles of the respondents for 2016 using SPSS 18.0. Table 1 showed that 50.3% of males and 49.7% of females participants. The age range of 57.4% in 20s, and 37.1% in 10s. In the occupation, 93.5% of students were the most. Table 2 showed that 54.7% of males and 45.3% of females participants. The age range of 88.4% in 20s. In the occupation, 90.5% of students were the most.

Table 1. Results of demographic analysis for 2012

2012			
Measure		Frequency	%
Gender	Male	99	50.3
	Female	98	49.7
Age	10s	73	37.1
	20s	113	57.4
	30s	2	1.0
	40s	3	1.5
	over 50s	6	3.0
Occupation	Students	184	93.5
	Office worker	4	2.0
	others	9	4.5
Education	High School	77	39.1
	Attending Univ.	109	55.3
	Graduated Univ.	9	4.6
	Graduate School	2	1.0
Total		197	100

Table 2. Results of demographic analysis for 2016

2016			
Measure		Frequency	%
Gender	Male	104	54.7
	Female	86	45.3
Age	10s	4	2.1
	20s	168	88.4
	30s	6	3.2
	40s	9	4.7
	over 50s	3	1.6
Occupation	Students	172	90.5
	Office worker	15	7.9
	other	3	1.6
Education	High School	1	0.5
	Attending Univ.	164	85.8
	Graduated Univ.	3	1.6
	Graduate School	23	12.1
Total		190	100

4.1 Measurements

The questionnaires of game factors were developed from the literature [11, 15, 23]. The scale items for Socio-game factors were developed from Chang [8] and Lin et al. [14]. The scale items for Social factors were developed from Hsu and Lu [13]. Likert scale, ranging from "disagree strongly" (1) to "agree strongly" (7).

5. RESULTS

5.1 Measurement Model

The validity of the measure model is evaluated by investigating convergent validity, reliability and discriminant validity using SamrtPLS 3.0.

First, we evaluated the internal consistency reliability. The traditional standard for internal consistency is Cronbach's alpha. The Cronbach's alpha value satisfies the reference value of 0.7 or more in both 2012 and 2016 models.

Second, composite reliability (CR) and average variance extracted (AVE) values were verified to evaluate convergent validity. The outer loading values of the indicators were also checked. In general, the outer loading value is 0.7 or more, and the CR value is 0.7 or more. The AVE value is 0.5

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or more [24]. All criteria were met as in Appendix 1 and 2.

Finally, we tested the discriminant validity, whose purpose is to identify if the constructs differ from each other [24]. The square root of each construct AVE value must be greater than the highest correlation with other constructs by comparing the square root of each construct AVE value with the latent variable correlation. The results of the discriminant validity analysis are shown in Appendix 3 and 4.

5.2 Structural model

Reliability and validity were verified through measurement model analysis and structural model analysis was conducted through Smart PLS 3.0. The results of the structural model analysis are shown in Figure 2 and Table 3.

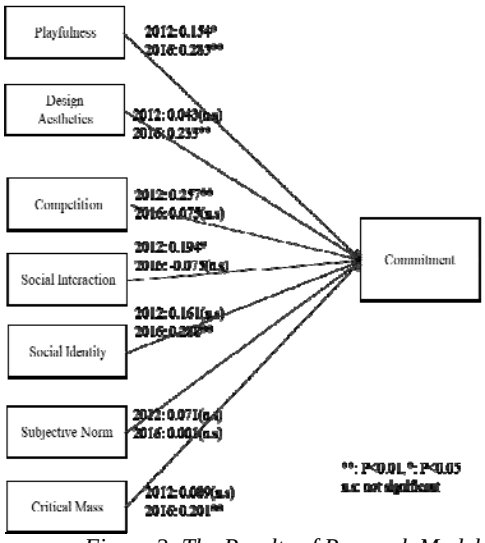

Figure 2: The Results of Research Model

Table 3. Results of Hypotheses test

	2012		2016	
Path	E.S	p-Values	E.S	p-Values
PL->COM	0.154	0.020	0.285	0.000
DA->COM	0.043	0.531	0.233	0.004
CP->COM	0.257	0.000	0.075	0.338
SI->COM	0.194	0.022	-0.075	0.378
SO->COM	0.161	0.084	0.288	0.001
SN->COM	0.071	0.291	0.001	0.985
CM->COM	0.089	0.168	0.201	0.002

First, the results for the 2012 model are as follows. Playfulness affects commitment (b = 0.154) and competition has a positive impact on commitment (b = 0.257). Also, social interaction has an effect on commitment (b = 0.194). H1, H3 and H4 were supported.

Second, the results for the 2016 model can be summarized as follows. Four hypotheses were adopted among the seven hypotheses. Playfulness affected the commitment positively (b=0.285). Therefore, H1 was supported. Design Athletics affected the commitment positively (b=0.233) and H2 was supported. Social Identity affected the commitment positively (b=0.288). The effect of critical mass on commitment was statistically significant (b=0.201). Therefore, H7 was supported.

5.3 Multi-group Analysis

We use multi-group analysis with SmartPLS 3.0 and compare two models of different times (t1 and t2). The results of the multi-group comparison test indicated shown as Table 4. To verify whether the difference in path coefficient between groups is statistically significant, we performed the analysis using the formula proposed by Chin et al [25].

The results showed that there was a significant difference between the two groups only in the two relationships. The impact of the engagement on the commitment was high in the 2012 M-SNG users, which was statistically significant. On the other hand, for users in 2016, there was no impact on the commitment. In addition, the path that social interaction affects commitment is statistically significant. In other words, it means that users felt stronger social interaction with M-SNG in 2012 than in 2016.

Table 4. Results of Multi-group Analysis

Path	Path Coefficients-diff	P-values
PL->COM	0.130	0.915
DA->COM	0.190	0.964
CP->COM	0.181	0.035
SI->COM	0.269	0.011
SO->COM	0.127	0.844
SN->COM	0.070	0.233
CM->COM	0.112	0.889

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6. DISCUSSION

The purpose of this study was to investigate the factors affecting commitment to M-SNG. We wanted to analyze the difference between 2012 when M-SNG was popular and 2016 when M-SNG was not popular. The analysis of structural model analysis is as follows.

First, Game Factors were stronger in 2016 than in 2012. Game factors include playfulness and Design Aesthetics. In both 2012 and 2016, playfulness has a positive impact on commitment. It seems that users play a more important role in the playfulness of M-SNG in 2016 than in 2012. Design Aesthetics was also adopted only in 2016. In recent years, users seem to be more immersed in games that take advantage of the game's own characteristics.

Second, Secondly, competition and social interaction were adopted in 2012 for socio-game factor, and only social identity was adopted in 2016. This shows that at the time of the M-SNG in 2012, the interaction and competition between acquaintances became important. On the other hand, in 2016, it is important that their game rank and game status in M-SNG is important.

Third, social factors were all rejected in 2012 and only critical mass was adopted in 2016. In the fortress's M-SNG game, it seems that the more users, the more immersed.

Finally, the difference between the groups by year was found only in Hypothesis 3 and Hypothesis 4. While competition and interaction between acquaintances were important at the time of M-SNG in 2012, M-SNG reflects that the two factors are rather unimportant in recent years as fashion disappears. Therefore, if we look at the results of the 2016 structural model, we need to focus on the structure and design elements of the game itself that can improve the quality of the game, induce it through marketing to make it more accessible to people, it means that you have to structure well.

In M-SNG games, users are able to send heart messages to each other. They often spend days and nights without heartbeat, and they often feel disagreeable, so interaction factors seem to be low. Mobile games have a much larger number of games released compared to the past, and the number of games played by users is relatively small. Users who have encountered various games have been choosing their favorite games based on their own experiences, and recently they are interested in mid-core games that require more time and effort than casual games. So it seems that the socio-game factor is not affected in 2016.

7. CONCLUSIONS

This study has the following implications in terms of academic or practical. First, we studied commitment. It is significant that the factors that have the greatest influence on the commitment of M-SNG are identified. Second, the main determinants of commitment are 2012 and 2016, with significant differences in competition and social interaction. Recently, user feel that game factors are more important. Game production companies will need to consider factors to raise interest. Third, there are implications that the research model was created and empirically tested to understand the behavior of users on M-SNG. M-SNG companies have to develop an appropriate strategy based on the variables presented in this study.

However, the limitations of this study were to compare the year by the analysis of the difference between groups, and to look at from a long-term point of view that users in 2012 and users in 2016 are not the same. In addition, other demographic factors (gender, age, use experience, etc.) are also important factors but not analyzed in this study. Therefore, in future research, it is necessary to examine the demographic factors and the control factors or the difference between groups according to the game. In addition, it is also necessary to examine the various factors that can influence commitment.

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Appendix 1. The results of measurement model for 2012

b2012					
Factors	Indicators	Estimate	Cronbach Alpha	CR	AVE
Playfulness	PL1	0.890	0.887	0.930	0.815
	PL2	0.923			
	PL3	0.894			
Design Aesthetics	DA1	0.913	0.904	0.940	0.838
	DA2	0.897			
	DA3	0.937			
Competition	CP1	0.920	0.907	0.941	0.843
	CP2	0.920			
	CP3	0.913			
Social Interaction	SI1	0.922	0.905	0.941	0.841
	SI2	0.942			
	SI3	0.886			
Subjective Norm	SN1	0.894	0.889	0.931	0.818
	SN2	0.919			
	SN3	0.900			
Social Identity	SO1	0.947	0.924	0.952	0.868
	SO2	0.924			
	SO3	0.924			
Critical Mass	CM1	0.926	0.888	0.931	0.817
	CM2	0.923			
	CM3	0.861			
Commitment	COM1	0.897	0.907	0.942	0.844
	COM2	0.947			
	COM3	0.911			

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Appendix 2. The results of measurement model for 2016

2016					
Factors	Indicators	Estimate	Cronbach Alpha	CR	AVE
Playfulness	PL1	0.884	0.830	0.895	0.741
	PL2	0.797			
	PL3	0.897			
Design Aesthetics	DA1	0.914	0.874	0.922	0.887
	DA2	0.908			
	DA3	0.856			
Competition	CP1	0.936	0.924	0.952	0.868
	CP2	0.945			
	CP3	0.914			
Social Interaction	SI1	0.918	0.897	0.936	0.830
	SI2	0.946			
	SI3	0.869			
Subjective Norm	SN1	0.837	0.872	0.922	0.797
	SN2	0.923			
	SN3	0.916			
Social Identity	SO1	0.963	0.957	0.972	0.921
	SO2	0.967			
	SO3	0.949			
Critical Mass	CM1	0.944	0.936	0.959	0.887
	CM2	0.958			
	CM3	0.923			
Commitment	COM1	0.937	0.916	0.947	0.856
	COM2	0.943			
	COM3	0.895			

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Appendix 3. Results of discriminant validity in 2012

	COM	CP	CM	DA	PL	SO	SI	SN
COM	0.919							
CP	0.471	0.918						
CM	0.315	0.265	0.904					
DA	0.350	0.304	0.266	0.916				
PL	0.367	0.426	0.331	0.359	0.903			
SO	0.450	0.355	0.276	0.301	0.165	0.932		
SI	0.413	0.203	0.190	0.415	0.113	0.509	0.917	
SN	0.345	0.213	0.192	0.287	0.131	0.500	0.455	0.905

Appendix 4. Results of discriminant validity in 2016

	COM	CP	CM	DA	PL	SO	SI	SN
COM	0.925							
CP	0.491	0.932						
CM	0.435	0.344	0.942					
DA	0.482	0.395	0.250	0.893				
PL	0.499	0.570	0.203	0.353	0.861			
SO	0.499	0.421	0.405	0.339	0.240	0.960		
SI	0.392	0.395	0.334	0.404	0.292	0.668	0.911	
SN	0.395	0.298	0.415	0.384	0.256	0.582	0.568	0.893