Gamers' Total Experience and Game Motivation for Further Education Digital Manpower

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Abstract—Digital Manpower is very necessary in Thailand today as the growth of technology continues to increase. For example, tech giant Gartner has announced new technology trends every year including 2022, announcing the following technology trends: Total Experience, Composable Application, Decision Intelligence, Hyperautomation, Distributed Enterprises, Autonomic Systems, Generative AI, AI Engineering etc. The application of technology in daily life is increasing. The development of Digital Manpower is therefore very important in order to increase the knowledge and expertise of the country's people in technology. From the statistics, the country has increased internet usage in many ways. For example, from the statistics in 2021, Thai children playing games were number 1 in the world, and in 2022, Thai children playing games are in 2nd place in the world. But the problem faced with Thai education today is that children like to play games and think that they can study in the field of computers. But, in fact, students are not directed into the technology field taking into account their own aptitudes. causing the study to be not fully effective and some leave their courses midway. Therefore, this research is interested in the confirmation factors of children playing games by collecting data on Gamers' Total Experience and Game Motivation in order to analyze the data and discover the confirmation factors that direct the admissions to various computer disciplines. What direction and aptitude do you need to be able to enter a group of computer science disciplines in order to become a Digital Manpower in the country's future development. The researcher has collected data from a sample of 630 people from all six groups in computer science. The confirmation factor was analyzed by the LISREL program. It was found that each group of computer disciplines had different confirmation factors.

Keywords—confirmatory factor analysis, total experience, motivation, gamers, education digital manpower

1 Introduction

Modern technology has changed the daily life of many people in the business sector, industrial sector or even the education sector itself which has used technology to answer many questions. This makes it necessary to track the movement of technology in the market for education in order for it to be to be effective and not out of date, as tech

leaders like Gartner are continuously inventing new technologies such as those in 2022. The technology trends were announced: Total Experience, Composable Application, Decision Intelligence, Hyperautomation, Distributed Enterprises, Autonomic Systems, Generative AI, AI Engineering, Cloud-native platform, Privacy-enhancing computation, Cybersecurity Mesh and Data Fabric [1]. To be a guideline for determining the way to use the technology in this research, Total Experience technology has been applied to collect data on various aspects of student gaming experiences. Total Experience technology together with Gamer Motivation [2] has been used to analyze various factors of students who like to play games in the subjects related to computer learning. The idea is to help reduce the problem of students becoming unhappy with the subject of their choice during school or studying and causing the efficiency of their study to decrease, affecting the future. In general, the problem of the grade 12 students who like to study in the computer field was that they like to play games and only use the internet when they choose to study. From statistics, it is found that Thailand is ranked No. 1 in gaming in the world, representing 96.6% in 2021, probably because the speed of Thailand's home internet is also ranked as No. 1 in the world [3]. The gaming ranking in Thailand was second in the world in 2022 at 94.7% [4]. According to statistics, Thailand has a huge interest in gaming and internet usage, but, when studying for a bachelor's degree in computers, many are learning in the wrong field.

Therefore, in this research, Exploratory Factor Analysis and Confirmation Factor Analysis were studied (Confirmatory Factor Analysis) by collecting various experiences of students studying at the bachelor's degree level in computer disciplines with good grades within six groups in the computer fields described in the Research Methodology. Various data were analyzed to confirm the structural factors of the computer field group and whether there were any factors that resulted in more direct learning by analyzing the data obtained to develop a system (Intelligent Composable Education System: ICES). This is to be a guideline system that allows students in grade 12 to use it as information for decision-making in studying at the bachelor's level so that they can study at full efficiency according to their own aptitudes and preferences, resulting, in the future, in a group of people who are Digital Manpower as the main force in the development of the country.

2 Theoretical background

2.1 Gamers' total experience

Definition of a Gamer: gamers like to compete in a game in which they are interested [5] and they enjoy the immersive experience of fluidity and concentration. It forms a connection to the story of the game that gives a great enjoyment to playing [6]. It is a person who plans to play different games to give himself an edge over his opponents and to use it to win. Competitors, as quickly as possible, [7] create awareness of the game until they experience a level of expertise. Gamers will play games for fun, relaxation and participation in the game. Playing games with other people can be very social [8]. The majority of gamers are individuals who rarely move because they are playing video games for long periods of time. They can be obese or have a lot of

visceral fat [9] but will be someone who takes the game seriously as if it were part of life. But in the real world, it is the opposite. Most gamers do not see their own worth. Due to different environments that look at gamers in different perspectives [10], it can be concluded that gamers are competitive in terms of aptitude for the game they are interested in, which is to create a perception and understanding of the game until the expertise becomes an experience. Gamers are the ones who plan to play different games in order to give themselves an edge over their opponents and use it during their wins as quickly as possible. The attributes of most gamers are that their gameplay is taken seriously so gamers will rarely move their bodies but will sit and play games for a long time. The aim of gamers is to play games for fun, relaxation, participation in the game and inspiration. Playing games with other people introduces a social aspect to the game.

Definition of a Total Experience: it is an all-encompassing experience creation strategy that enhances shared experiences by linking key components, for example, in business it brings together key components such as User Experience (UX), Customer Experience (CX), Multi Experience (MX) and Employee Experience (EX) [11]. There are empirical data surveys to obtain accurate data and interpretations, thus requiring serious data collection and in-depth extraction of the original data [12]. It is also a study of the data in many different perspective dimensions to examine the relationship between the data [13] in order to result in an overall analysis. That knowledge will be used to develop and improve the components to achieve the desired goals [14–15] For example, in the work of Voulgari and Lavidas [16], the Total Experience was taken to study curriculum design and teaching styles with the students who were doing a study on the behavior and preferences in playing games. This is one of the best ways to reach students. The results found that it can be identified as a guideline that can be applied to create a curriculum design and teaching style to support students as well.

Therefore, Gamers' Total Experience is the study of gaming behavior and other perspective dimension behaviors of students who like to play games. In order to bring all the data obtained for analysis, knowledge gained from the analysis can be used to develop and improve the components to achieve the desired goals. In this study, four areas were studied: data gamer characteristics, gamers' enjoyment when playing games, style and activity when playing games and activity frequency when playing games.

2.2 Game motivation

Game Motivation has evolved in this area of research, but in 2011 Hamlen [17] outlined five areas of gaming motivation strategy: Psychological, Visceral, Cognitive, Physical and Game Characteristics. Each aspect was further subdivided into eighteen sub-areas. Later, in 2014, a study by Dindar and Akbulut [18] examined patterns of motivation for playing online among Turkish gamers. The main motivation was divided into three main and ten sub-motivations, of which the three main motivations were Achievement, Social and Immersion. In 2015, research by Dalisay et al. [19] and Shceck et al. [20] also studied gaming motivation and concluded the same three aspects of gaming motivation in 2014. In 2017, Flunger [21] conducted a study on gaming motivation. Incentives to play games were to extract knowledge and to create a tool for business modeling. According to studies, the elements used in business modeling are

Unobstructed Play, Social Interaction and Competition & Economic Rationale. A study by Yee [22] looked at board game motivation from a study outlining the four main motivations of board game gamers: Conflict, Immersion, Strategy and Social. In 2018, Smadja [23] conducted an in-depth study to measure gamers' enjoyment and motivation to play. The study found that gamers' motivations were measured in six key areas: Immersion, Creativity, Action, Social, Mastery and Achievement. In the 2020s Kirk and Manley's research [24] and, in 2021, Denton's study [25], the motivation for gaming of gamers was also divided. There are six main motivations and ten minor motivations as well. Therefore, in this study, six areas of Game Motivation were studied: Immersion, Creativity, Action, Social, Mastery and Achievement.

2.3 Education digital manpower

With the changing technology, the country has changed a lot. The government has upgraded education to be more modern. One of the strategies for developing the country is to produce skilled people in technology. By definition it is Digital Manpower. Therefore, people were developing countries to change to digital citizenship's lifelong learning, which consists of three skills: digital literacy, digital competency and digital intelligence [26] to help achieve lifelong learning and many countries have adopted this technology. For example, in their research Hamal and Faddouli [27] used intelligent systems developed on deep learning techniques to analyze student responses in MOOCs. The medical community has adapted as well. Eumbunnapong et al. [28] researched the development of an intelligent digital learning platform to enhance digital health literacy so that people can learn health information through intelligent systems Therefore, it can be seen that education to produce practitioners in the digital force is extremely important. In this study, a corroborative factor was analyzed using a holistic approach to the gamer's experience and motivation in the gamer's gaming task. Six Education Digital Manpower fields were analyzed as well as the research [29]. These include Information Technology, Business Computer, Computer Science, Graphic Animation and Multimedia, Computer Innovation Engineering, and Network Engineering and Security.

3 Research methodology

After analyzing and synthesizing the data of the Gamers' Total Experience component, the Game Motivation component and the Education Digital Manpower component, [29] this research was a corroborative factor analysis. The research process was divided into three steps according to the research objectives as follows:

– **Phase 1** It is the process of creating a tool and assessing the consistency of the questionnaire tool. Before testing, the data were collected with a sample of 630 people. The experts in assessing the consistency of the questionnaire were five experts with at least five years' experience, with expertise in Education Digital Manpower, Game Motivation and Gamers' Total Experience, then the results were analyzed to determine the questionnaire's accuracy. The questionnaire was improved according to the advice of experts and then collecting the data occurred in Phase 2.

– **Phase 2** It is the process of using questionnaires to collect data from a sample of 630 people. The sample selected were bachelor's degree students with good grades in six computer fields 1) Information Technology related fields 2) Branches related to Business Computer 3) Branches related to Computer Science 4) Branches related to Graphic Animation and Multimedia 5) Branches related to Computer Innovation Engineering and 6) Branches related to Network Engineering and Security. The following results were obtained: Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), for which the analysis process is in Phase 3.
– **Phase 3** It was an Exploratory Factor Analysis and Confirmatory Factor Analysis which was derived from Phase 2. Exploratory Factor Analysis uses a statistical analysis program called Package for Social Sciences (SPSS) and Confirmatory Factor Analysis uses a statistical analysis program. A statistical analysis called LISREL analyzes the data and finds structural relationships.

4 Results

4.1 The results of creating the tool and assessing the consistency of the questionnaire tool

The results of the assessment of the consistency of the questionnaire tool by five experts, evaluating a total of 49 factors in the field of Game Motivation and Gamers' Total Experience to collect data with the Education Digital Manpower group that can be divided into six groups related to the computer field. From the assessment of the conformity of the questionnaire tool by five experts, it was found that this questionnaire tool was consistent at 0.95. This was interpreted as the questionnaire being of high accuracy. All 49 factors can be collected as shown in Table 1.

Table 1. Factors in the questionnaire tool

No	Subject Factor	Abbreviation
1	Gender	DC1
2	Age	DC2
3	Are you currently studying in any field of computer science?	DC3
4	Your Own GPA.	DC4
5	How many days do you spend playing games a week?	DC5
6	How many days do you spend at least 30 minutes playing games in a week?	DC6
7	What level of gamer do you think you are?	DC7
8	What games are you currently playing?	DC8
9	What devices do you play games on?	DC9
10	Accumulating large in-game resources or having a large amount in-game money.	SG1
11	Do whatever it takes to earn stars or trophies or unlocks to play various games.	SG2
12	Find new ways to play games.	SG3
13	Find a good, powerful weapon.	SG4

(Continued)

Table 1. Factors in the questionnaire tool *(Continued)*

No	Subject Factor	Abbreviation
14	Make it the most powerful in the game.	SG5
15	Do you like characters with interesting background stories and personalities?	SG6
16	Take the time to practice and master the game.	SG7
17	Love the complex game storyline.	SG8
18	Domination over other players.	SG9
19	Get to know the main characters and all the behind-the-scenes stories.	SG10
20	Complete all possible missions and achievements in the game.	SG11
21	Do you like many customizations such as colors/patterns/skins, etc?	SG12
22	Pretending to be another person or place.	SG13
23	Try to get every item in the game.	SG14
24	Do you like to face difficult challenges that may require effort to be successful in the game?	SG15
25	Play the game on the highest difficulty.	SG16
26	Immerse yourself in the game world and different locations in the game.	EG1
27	Competing with other players.	EG2
28	It's fun to play games with lots of blood and gore.	EG3
29	Fast and intense gameplay.	EG4
30	Use of guns and explosives.	EG5
31	Impersonate another character/person.	EG6
32	Representing chaos and destruction.	EG7
33	Gameplay that requires long-term planning and strategy.	EG8
34	Gameplay leading to shared goals with other players.	EG9
35	Gameplay that requires careful decision-making.	EG10
36	Compete with other players in duels or matches.	EG11
37	A game that requires a lot of thought and planning.	EG12
38	Group with other players.	EG13
39	Fast response time gaming.	EG14
40	Develop things in the game to be more developed.	EG15
41	Help other players.	EG16
42	Consistently moving and exciting gameplay.	EG17
43	Try doing a lot of things such as testing what the game world can do for us.	AG1
44	Mainly focusing on increasing stats/levels.	AG2
45	Learning from other players to improve your own gameplay.	AG3
46	Explore the game world just to explore the in-game details.	AG4
47	Spend a lot of time customizing your character/city/spaceship.	AG5
48	Experiment with world things to see what happens in the real world.	AG6
49	It takes a lot of thought and effort in the character creation process.	AG7

From Table 1, a total of 49 factors were assessed for questionnaire conformity, and from the table, the abbreviation of factor names was given to make it easier to explain the next topic.

4.2 The results of data collection from a total sample of 630 people

The results came from collecting data from a sample group of 630 general undergraduate students in Thailand who were studying the six disciplines related to computer science as mentioned above. The bachelor's degree had a GPA of more than 2.50. This was enabled with the cooperation of many university networks, including Khon Kaen University, R M U T R: Rattanakosin University Salaya Campus, Rattanakosin Campus, Bophimuk Chakrawat Campus, Wang Klai Kangwon Campus, King Mongkut's University of Technology North Bangkok, Chiang Mai University, Prince of Songkla University, R M U T R:Pranakorn University, R M U T R:Suvarnabhumi University, Nakhon Pathom PSU, Mahasarakham University, Rajamangala University of Technology Tawan-ok Chakrabongse Bhuwanat area and Nakhon Si Thammarat Rajabhat University, a total of thirteen universities across the country from the north to the south. In collecting this data, it took a period of two months.

4.3 The results of exploratory factor analysis and confirmatory factor analysis

The results of the data analysis. Exploratory Factor Analysis by SPSS and Confirmatory Factor Analysis by LISREL showed that:

From the exploratory factor analysis. It was found that the factors corresponding to the overall characteristics of people studying computer related fields, abbreviated TNLG, were SG1, SG2, SG5, SG6, SG9, SG13, SG15, EG4, EG5, EG7, EG8, EG9, EG10, EG11, EG12, AG4, AG5, AG7. The KMO and Bartlett's Test statistic is 0.943 as shown in Table 2.

Table 2. Analyzing results KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's Test of Sphericity		
	Approx. Chi-Square	df	Sig.
0.943	9345.496	780	0.000

From Table 2, the Exploratory Factor Analysis showed that the KMO statistic had a statistical value of 0.943, interpreting the results that the analyzed data were appropriate, with a KMO statistic closer to 1 were highly appropriate. Bartlett's Test the Sig. value is less than or equal to 0, indicating that the data obtained are suitable for analysis and extraction of the elements. Therefore, nineteen elements were taken for Confirmatory Factor Analysis to verify whether the elements were able to confirm the structure of the elements correctly. The results of the Confirmatory Factor Analysis revealed that the structure of all nineteen elements could be confirmed as a factor consistent with those studying in computer-related fields, as shown in Tables 3–5 and the structural relationship is shown in Figure 1 as follows:

Table 3. Covariance matrix of factors corresponding to the overall characteristics TNLG

Items	SG1	SG2	SG3	SG5	SG6	SG9	SG13	SG15	EG4	EG5
SG1	1.034									
SG2	0.519	1.106								
SG3	0.397	0.462	1.085							
SG5	0.442	0.549	0.429	1.120						
SG6	0.137	0.099	0.128	0.224	1.232					
SG9	0.328	0.409	0.359	0.535	0.324	1.836				
SG13	0.297	0.262	0.234	0.273	0.338	0.786	1.542			
SG15	0.371	0.436	0.451	0.483	0.168	0.97	0.299	1.107		
EG4	0.285	0.240	0.222	0.351	0.310	0.360	0.263	0.320	1.037	
EG5	0.271	0.211	0.190	0.320	0.227	0.332	0.309	0.314	0.674	1.428
EG7	0.230	0.244	0.158	0.333	0.255	0.402	0.352	0.246	0.459	0.610
EG8	0.230	0.230	0.313	0.246	0.244	0.440	0.282	0.298	0.304	0.241
EG9	0.261	0.247	0.267	0.250	0.240	0.293	0.158	0.263	0.388	0.381
EG10	0.180	0.236	0.290	0.235	0.281	0.382	0.232	0.334	0.870	0.338
EG11	0.286	0.278	0.282	0.288	0.201	0.378	0.209	0.254	0.385	0.370
EG12	0.230	0.315	0.321	0.306	0.233	0.401	0.217	0.315	0.347	0.313
AG4	0.192	0.600	0.185	0.178	0.379	0.300	0.540	0.119	0.396	0.352
AG5	0.065	0.036	0.022	0.175	0.215	0.176	0.168	0.253	0.246	0.233
AG7	0.069	0.028	0.021	0.176	0.324	0.092	0.132	0.044	0.251	0.224

Table 4. Covariance matrix of factors corresponding to the overall characteristics TNLG

Items	EG7	EG8	EG9	EG10	EG11	EG12	AG4	AG5	AG7
EG7	1.229								
EG8	0.211	1.208							
EG9	0.207	0.565	0.999						
EG10	0.245	0.588	0.523	0.960					
EG11	0.214	0.438	0.508	0.437	1.211				
EG12	0.160	0.668	0.532	0.611	0.530	1.141			
AG4	0.304	0.267	0.246	0.252	0.205	0.272	1.133		
AG5	0.153	0.251	0.187	0.217	0.101	0.149	0.396	1.106	
AG7	0.139	0.253	0.256	0.178	0.080	0.120	0.378	0.530	1.245

Table 5. Covariance matrix of factors corresponding to the overall characteristics TNLG

Index Value	Abbreviation	Criterion	Statistical Value	Results
Chi-Square	χ^2	p > 0.05	0.000	Not Fit
Chi-Square Relative	χ^2/df	< 2.00	338.07/131	Marginal Fit
Goodness of Fit Index	GFI	> 0.90	0.947	Good Fit
Adjusted Goodness of Fit Index	AGFI	> 0.90	0.924	Good Fit
Root Mean Square Residual	RMSR	< 0.08	0.077	Good Fit
Root Mean Square Error of Approximation	RMSEA	< 0.05	0.049	Good Fit
Standardized Mean Square Residual	SRMR	< 0.06	0.070	Not Fit

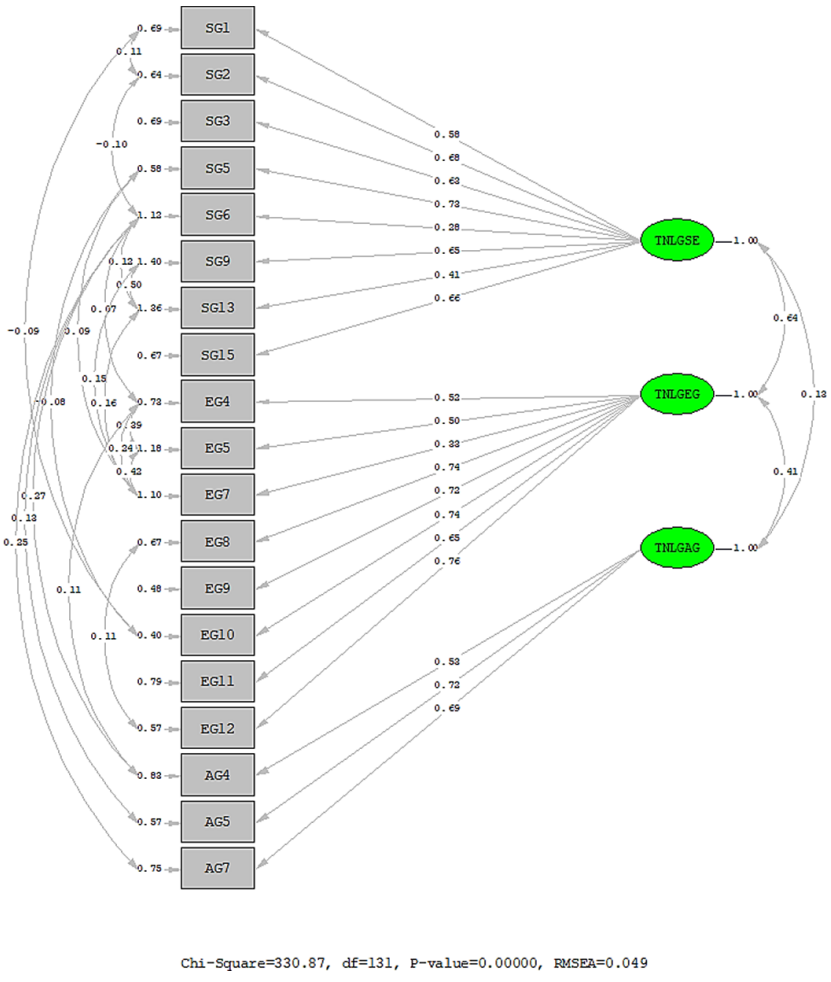

Fig. 1. Structural relationship of people studying in computer-related fields

Analysis from exploratory factor analysis. It was found that the factors corresponding to the characteristics of each group were 1) the abbreviation of information technology related to IT 2) the abbreviation of business computer related to BC 3) the field of computer science used abbreviated as CS 4) a field of Graphic Animation and Multimedia is abbreviated as GAM 5) a branch of Computer Innovation Engineering is abbreviated as CIE and 6) a branch of Network Engineering and Security is abbreviated. that the NES found that there were factors corresponding to the characteristics of each group, as shown in Table 6 and the KMO and Bartlett's Test statistic of each branch as in Table 7.

Table 6. Factors corresponding to the characteristics of each field group

Field	Factors Corresponding to the Characteristics of Each Group
IT	SG4 SG7 SG14 EG1 EG2 EG4 EG5 EG8 EG9 EG10 EG11 EG12 EG13 EG14 EG15 EG16 EG17 AG1 AG3 AG4 AG5
BC	SG2 SG4 SG8 SG9 SG11 SG12 SG13 SG14 EG4 EG5 EG6 EG7 EG10 AG2 AG4 AG6
CS	SG1 SG2 SG3 SG5 SG9 SG11 SG15 SG16 EG2 EG3 EG4 EG6 EG7 EG8 EG9 EG15 EG17 AG1 AG2 AG3 AG6
GAM	SG1 SG2 SG3 SG4 SG5 SG7 SG8 SG9 SG11 SG13 SG15 SG16 EG2 EG3 EG4 EG5 EG7 EG9 EG10 EG11 EG12 EG13 EG14 EG16 AG2 AG3
CIE	SG4 SG14 EG1 EG2 EG4 EG8 EG9 EG10 EG11 EG12 EG13 EG14 EG15 EG16 EG17 AG1 AG2 AG3 AG5 AG7
NES	SG2 SG4 SG5 SG6 SG7 SG8 SG10 SG12 SG14 SG15 SG16 EG1 EG3 EG4 EG8 EG9 EG10 EG13 EG17 AG1 AG2 AG3 AG4

Table 6 shows the results of the Exploratory Factor Analysis of the factors corresponding to the characteristics of each branch. It was found that the information technology-related branches had the factors corresponding to the characteristics of the following branches, namely SG4, SG7, SG14, EG1, EG2, EG4, EG5, EG8, EG9, EG10, EG11, EG12, EG13, EG14, EG15, EG16, EG17, AG1, AG3, AG4, and AG5. Business Computer-related branches have factors that correspond to the characteristics: SG2, SG4, SG8, SG9, SG11, SG12, SG13, SG14, EG4, EG5, EG6, EG7, EG10, AG2, AG4 and AG6 and other fields can be viewed as shown in the table.

Table 7. Factors corresponding to the characteristics of each field group

Field	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's Test of Sphericity		
		Approx. Chi-Square	df	Sig.
IT	0.843	2473.199	780	0.00
BC	0.818	2135.110	780	0.00
CS	0.786	1880.226	780	0.00
GAM	0.865	2524.373	780	0.00
CIE	0.786	2066.165	780	0.00
NES	0.822	2331.446	780	0.00

From Table 7, the Exploratory Factor Analysis revealed that the KMO statistic for each branch showed that branches related to Graphic Animation and Multimedia had KMO values closest to 1 with a value of 0.865, followed by fields related to Information Technology with a KMO of 0.843 respectively as shown in the table. Bartlett's Test has a Sig. value less than or equal to 0, indicating that the data obtained is suitable for analysis and extraction of elements in all disciplines. Therefore, the components shown in Table 6 are used for confirmatory analysis. Factor Analysis is to check whether the elements can confirm the structure of the elements correctly. The result of Confirmatory Factor Analysis can be shown in Table 8, and the picture showing the structural relationship of each field can be shown in Figures 2–7.

Table 8. Factors corresponding to the characteristics of each field group

Field	χ^2 (p > 0.05)	χ^2/df (< 2.00)	GFI (> 0.90)	AGFI (> 0.90)	RMSR (< 0.08)	RMSEA (< 0.05)	SRMR (< 0.06)
IT	0.078	204.19/177	0.864	0.822	0.049	0.038	0.046
	Good Fit	Good Fit	Marginal Fit	Marginal Fit	Good Fit	Good Fit	Good Fit
BC	0.067	116.40/95	0.890	0.843	0.068	0.047	0.056
	Good Fit	Good Fit	Marginal Fit	Marginal Fit	Good Fit	Good Fit	Good Fit
CS	0.007	225.70/177	0.846	0.799	0.079	0.047	0.059
	Not Fit	Good Fit	Marginal Fit	Marginal Fit	Good Fit	Good Fit	Good Fit
GAM	0.002	349.27/279	0.802	0.755	0.079	0.049	0.060
	Not Fit	Good Fit	Marginal Fit	Marginal Fit	Good Fit	Good Fit	Good Fit
CIE	0.011	198.86/156	0.849	0.797	0.0687	0.051	0.059
	Not Fit	Good Fit	Marginal Fit	Marginal Fit	Good Fit	Good Fit	Good Fit
NES	0.000	314.11/207	0.788	0.717	0.0958	0.071	0.091
	Not Fit	Good Fit	Marginal Fit	Marginal Fit	Not Fit	Not Fit	Not Fit

From Table 8, Confirmatory Factor Analysis of each group of disciplines revealed that the five discipline groups that could confirm the structure of the components were: Information Technology-related fields, Business Computer-related fields, Computer Science-related fields, Graphic Animation and Multimedia-related fields, and Computer Innovation Engineering-related fields, but Network Engineering-related fields and Security can group corresponding attributes, but cannot confirm the structure of the elements.

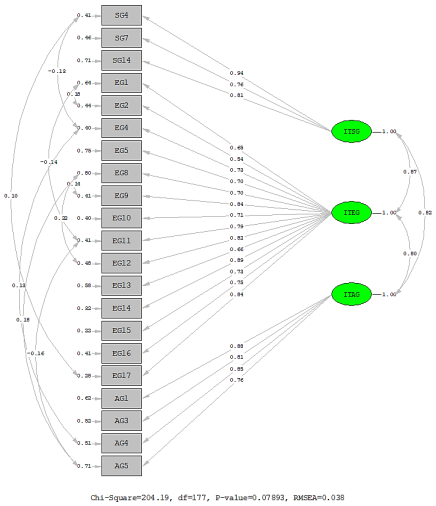

Fig. 2. Structural relationships fields groups IT

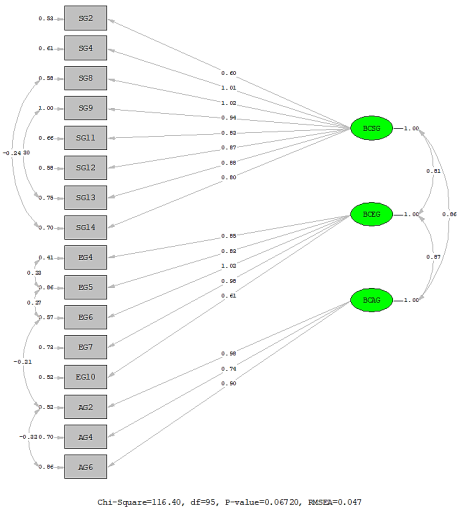

Fig. 3. Structural relationships fields groups BC

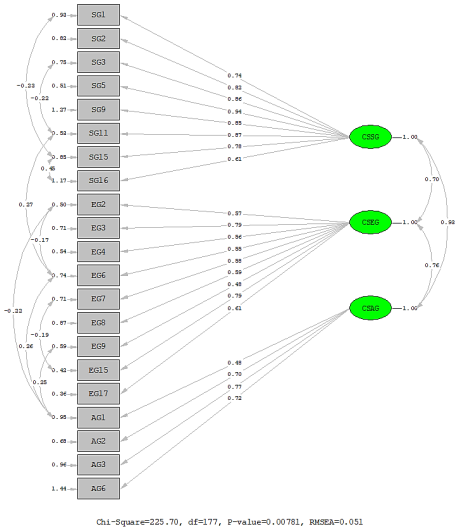

Fig. 4. Structural relationships fields groups CS

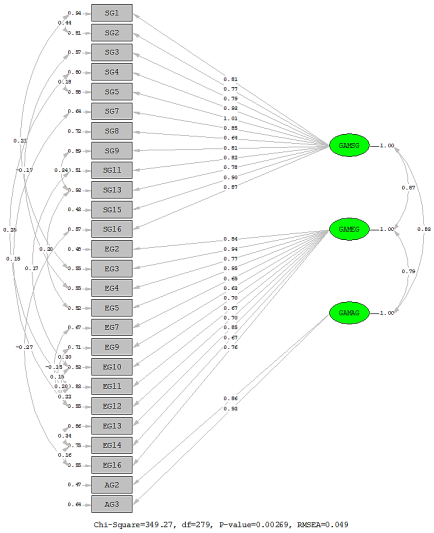

Fig. 5. Structural relationships fields groups GAM

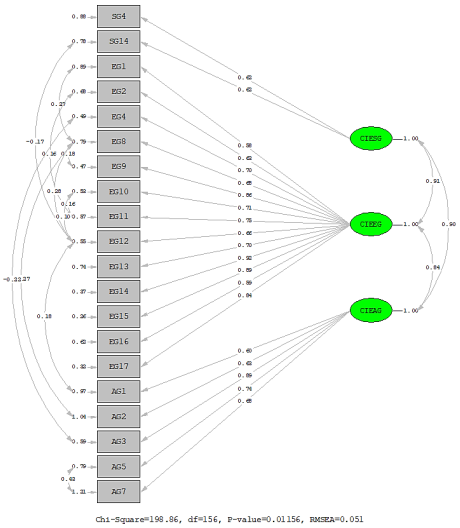

Fig. 6. Structural relationships fields groups CIE

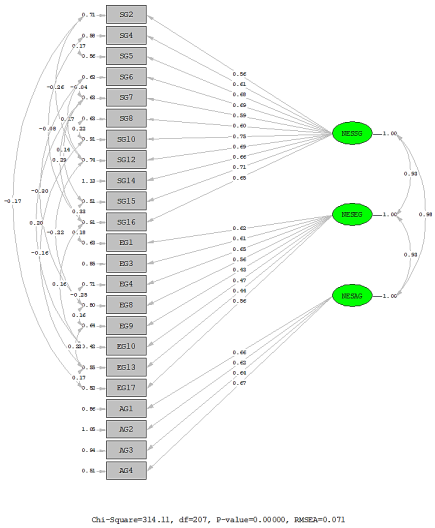

Fig. 7. Structural relationships fields groups NES

5 Discussion

This is an exploratory factor analysis and corroborative factor analysis of the digital workforce who are still at the bachelor's degree level taking all elements of the gaming experience and gaming motivation. The following are the results of the overall survey factor analysis. From a sample of 630 bachelor's degree students across the country, it was found that those who studied computer-related fields show factors that correspond to the attributes derived from all elements of the gaming experience and gaming motivation: SG1, SG2, SG5, SG6, SG9, SG13, SG15, EG4, EG5, EG7, EG8, EG9, EG10, EG11, EG12, AG4, AG5, and AG7, and when the factors were analyzed for the confirmation factor, it was found that the structure of the components could be confirmed to be consistent with the cohort of people studying in the computer-related field as a whole. Moreover, in this research, there was further analysis in that the exploratory factor analysis and the corroborative factor analysis were done by separating the computer disciplines into six groups and the survey factors of each group of disciplines were analyzed. The differences are as follows: branches related to Information Technology have factors corresponding to branch characteristics: SG4, SG7, SG14, EG1, EG2, EG4, EG5, EG8, EG9, EG10, EG11, EG12, EG13, EG14, EG15, EG16, EG17, AG1, AG3, AG4, and AG5. The Business Computer-related branches have factors corresponding to their characteristics: SG2, SG4, SG8, SG9, SG11, SG12, SG13, SG14, EG4, EG5, EG6, EG7, EG10, AG2, AG4, and AG6 Computer Science related fields have Factors corresponding to branch characteristics are SG1, SG2, SG3, SG5, SG9, SG11, SG15, SG16, EG2, EG3, EG4, EG6, EG7, EG8, EG9, EG15, EG17, AG1, AG2, AG3, and AG6 groups. The Graphic Animation and Multimedia related field has factors corresponding to its characteristics: SG1, SG2, SG3, SG4, SG5, SG7, SG8, SG9,

SG11, SG13, SG15, SG16, EG2, EG3, EG4, EG5, EG7, EG9, EG10, EG11, EG12, EG13, EG14, EG16, AG2, and AG3. The Computer Innovation Engineering disciplines have factors corresponding to their characteristics: SG4, SG14, EG1, EG2, EG4, EG8, EG9, EG10, EG11, EG12, EG13, EG14, EG15, EG16, EG17, AG1, AG2, AG3, AG5, and AG7, and the Network Engineering and Security-related branch of the SG2, SG4, SG5, SG6 branch, SG7, SG8, SG10, SG12, SG14, SG15, SG16, EG1, EG3, EG4, EG8, EG9, EG10, EG13, EG17, AG1, AG2, AG3, and AG4 show that the structure of the elements can be confirmed as a factor consistent with the characteristics of the people studying in the field. There are only five groups of disciplines which are Information Technology-related fields, Business Computer-related fields, Computer Science-related fields, Graphic Animation and Multimedia-related fields, and Computer Innovation Engineering-related fields, but Network Engineering-related fields and Security can group corresponding attributes but cannot verify the structure of the element.

Future research could use the structural relationships of each group of disciplines to develop an intelligent composable education system by using gamers' total experience and game motivation for further education digital manpower to serve as a guideline for students. Grade 12 likes to play games and is interested in studying in computer related fields but does not know which field to study. This system will provide guidelines to study directly according to their own preferences and aptitudes, resulting in effective learning. This will translate as a digital force to develop the country in the future.

6 Conclusion

This research made known the essence and variables that make the gamers. For those who've already decided they want to pursue a Bachelor's degree and the field that they wish. This is an important question that all gamers want to answer if they are suitable to study in any field. At the same time, universities require students to choose a course that meets their aptitudes and needs. As well as graduates themselves will be able to work directly with the desired agency. The nation will receive digital manpower that meets the needs of the country's development. The scarcity of digital workforce in every field will result in those who choose to continue from Grade 12 to a bachelor's degree in a field that matches the actual field. have graduated to work in accordance with their own expectations and labour market demands. An experience and motivation of gamers will be one of the conditions that can be used to predict further education of this group in the future.

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8 References

[1] Gartner. (2022). "Gartner identifies the top strategic technology trends for 2022," Retrieved from https://www.gartner.com/en/newsroom/press-releases/2021-10-18-gartner-identifies-the-top-strategic-technology-trends-for-2022

[2] Gartner. (2022). "Our gamer motivation model," Retrieved from https://quanticfoundry.com/

[3] S. Kemp. (2021). "Digital 2021: Thailand," Retrieved from https://datareportal.com/reports/digital-2021-thailand

[4] S. Kemp. (2022). "Digital 2022: Thailand," Retrieved from https://datareportal.com/reports/digital-2021-thailand

[5] C. Mazur, J. Ayers, J. Humphrey, G. Hains, and Y. Khmelevsky. "Machine learning prediction of gamer's private networks (GPN®S)," Advances in Intelligent Systems and Computing, Vol. 1289, April, pp. 107–123, 2021. https://doi.org/10.1007/978-3-030-63089-8_7

[6] I. C. Teng, "How can avatar's item customizability impact gamer loyalty?" Telematics and Informatics, Vol. 62, January, 101626, pp. 1–12, 2021. https://doi.org/10.1016/j.tele.2021.101626

[7] K. Zagata, J. Gulij, Ł. Halik, and B. Medyńska-Gulij, "Mini-map for gamers who walk and teleport in a virtual stronghold," ISPRS International Journal of Geo-Information, Vol. 10, No. 2, pp. 1–17, 2021. https://doi.org/10.3390/ijgi10020096

[8] R. King, and T. De La Hera, "Gamer perception of endorsements from Fortnite Streamers on YouTube," In International Conference on the Foundations of Digital Games (FDG '20), September 15–18, Bugibba, Malta., pp. 1–3, 2020. https://doi.org/10.1145/3402942.3403026

[9] A. K. Rambaran, and K. S. Alzghari, "Gamer's thrombosis: A review of published reports," Ochsner Journal, Vol. 20, No. 2, pp. 182–186, 2020. https://doi.org/10.31486/toj.19.0058

[10] Y. G. Liao, T. T. Lham, E. C. T. Cheng, and I. C. Teng, "Impacts of real-world need satisfaction on online gamer loyalty: Perspective of self-affirmation theory," Computers in Human Behavior, Vol. 103, April 2019, pp. 91–100, 2020. https://doi.org/10.1016/j.chb.2019.09.016

[11] Walkme. (2022). "Total experience," Retrieved from https://www.walkme.com/glossary/total-experience/

[12] A. J. Pietersen, K. J. Coetzee, D. Byczkowska-Owczarek, F. Elliker, and L. Ackermann, "Online gamers, lived experiences, and sense of belonging: Students at the university of the free state, Bloemfontein," Qualitative Sociology Review, Vol. 14, No. 4, pp. 122–137, 2019. https://doi.org/10.18778/1733-8077.14.4.08

[13] K. H. Leng, and Y. D. Pyun, "Development of a scale to measure gamer experiences in sport video games," International Journal of Sport Management and Marketing, Vol. 18, No. 5, pp. 417–429, 2018. https://doi.org/10.1504/IJSMM.2018.094348

[14] H. M. Rezvani, and D. Khabiri, "Gamers' behaviour and communication analysis in massively multiplayer online games: A survey," 2nd National and 1st International Digital Games Research Conference: Trends, Technologies, and Applications, DGRC, pp. 61–69. https://doi.org/10.1109/DGRC.2018.8712055

[15] P. Alexander, "KNOWing how to play: Gamer knowledges and knowledge acquisition," Computers and Composition, Vol. 44, pp. 1–12, 2017. https://doi.org/10.1016/j.compcom.2017.03.004

[16] I. Voulgari, and K. Lavidas, "Student Teachers' game preferences, game habits, and attitudes towards games as learning tools," Proc. 14th Int. Conf. Game Based Learn. ECGBL 2020, September, pp. 646–654, 2020, https://doi:10.34190/GBL.20.175

[17] R. K. Hamlen, "Children's choices and strategies in video games," Computers in Human Behavior, Vol. 27, No. 1, pp. 532–539, 2011. https://doi.org/10.1016/j.chb.2010.10.001

[18] M. Dindar, and Y. Akbulut, "Motivational characteristics of Turkish MMORPG players," Computers in Human Behavior, Vol. 33, pp. 119–125, 2014. https://doi.org/10.1016/j.chb.2014.01.016
[19] F. Dalisay, J. M. Kushin, M. Yamamoto, I. Y. Liu, and P. Skalski, "Motivations for game play and the social capital and civic potential of video games," New Media and Society, Vol. 17, No. 9, pp. 1399–1417, 2015. https://doi.org/10.1177/1461444814525753
[20] K. Shceck, Y. D. Lee, and B. K. Pyo, "The relationship between the five factor personality model and motivations for play in MMORPGs," Indian Journal of Science and Technology, Vol. 8, No. 21, pp. 1–9, 2015. https://doi.org/10.17485/ijst/2015/v8i21/78457
[21] R. Flunger, A. Mladenow, and C. Strauss, "The free-to-play business model," ACM International Conference Proceeding Series, December, pp. 373–379, 2017. https://doi.org/10.1145/3151759.3151802
[22] N. Yee. (2017). "Board game motivation model: Handy reference chart & slides," Retrieved from https://quanticfoundry.com/2017/01/12/board-game-handy-reference/
[23] I. Smadja. (2018). "The best vision is insight: How do you measure players' fun?" Retrieved from https://uxdesign.cc/the-best-vision-is-insight-how-do-you-measure-players-fun-93e7b2aa25d7
[24] S. Kirk, and J. A. Manley, "The active video game paradox," International Journal of Serious Games, Vol. 7, No. 1, pp. 3–21, 2020. https://doi.org/10.17083/ijsg.v7i1.341
[25] M. Denton. (2021). "Gamer motivation framework: Not all games are created equal (part 2)," Retrieved from https://www.gamify.com/gamification-blog/not-all-games-are-created-equal-pt2
[26] P. Pornpongtechavanich, and P. Wannapiroon, "Intelligent interactive learning platform for seamless learning ecosystem to enhance digital citizenship's lifelong learning," International Journal of Emerging Technologies in Learning (iJET), eISSN: 1863-0383, Vol. 16, No. 14, pp. 232–248, 2021. https://doi.org/10.3991/ijet.v16i14.22675
[27] O. Hamal and N. E. Faddouli, "Intelligent system using deep learning for answering learner questions in a MOOC," International Journal of Emerging Technologies in Learning (iJET), Vol. 17, No. 2, pp. 32–42, 2022. https://doi.org/10.3991/ijet.v17i02.26605
[28] K. Eumbunnapong, P. Wannapiroon, and P. Pornpongtechavanich, "An intelligent digital learning platform to enhance digital health literacy," International Journal of Emerging Technologies in Learning (iJET), Vol. 17, No. 4, pp. 95–111, 2022. https://doi.org/10.3991/ijet.v17i04.27907
[29] P. Pornpongtechavanich, P. Nilsook, and P. Wannapiroon, "Intelligent composable education system," 2022 Research, Invention, and Innovation Congress: Innovative Electricals and Electronics (RI2C), Bangkok, Thailand, pp. 178–184, 2022. https://doi.org/10.1109/RI2C56397.2022.9910265

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