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THE EFFECT OF INTERINDIVIDUAL DIFFERENCES IN METACOGNITIVE ACCURACY ON CYBERSECURITY DECISIONS

Master Thesis

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Author’s declaration of originality

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

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Abstract

Ever since the evolution of internet and e-services, people confront situations where their devices get compromised by various incidents of cyber-attacks. Wherever people happen to download something or click a link either consciously i.e., by social engineering, or unconsciously of their actions. Recent surveys done in the field of cyber security have significantly shown that decision-makers in organizations are becoming an ever-greater vulnerability to various areas in the firms. The important part to note here is that, it is not just the Non-IT individuals who deal with serious incidents due to lack of knowledge or poor decision-making approach. However, studies show that IT individuals also experience and result the same outcomes or at times even worse. This study aims to highlight the need of metacognition accuracy for industries to include as a soft skill and use it for training inter-individuals for better performances in incident handling circumstances. Existing literature review of publications which unfolds the overlapping of cybersecurity and metacognition was studied in order to identify the gaps of cyber security education in terms of metacognitive skills. To understand inter-individual metacognitive awareness levels, this research aims to carry out an empirical testing method. To demonstrate how well candidates are aware of their metacognitive abilities, individuals from IT and Non-IT backgrounds having bachelor or a higher-level education are involved. The collected results are analyzed to explore whether people are rational or emotional decision-makers in times of cyber crisis and whether they are aware of it. Future studies can use evaluation and findings to develop training programs or engage in cyber hygiene exercises.

Annotatsioon

Inimesed on kokku puutunud olukordadega alates Interneti ja e-teenuste algusaegadest, kus nende seadmed on kompromiseeritakse erinevate küberrünnaku tüüpi intsidentide poolt, kui nad juhtuvad allalaadima midagi või klikkima lingile, kas teadlikult, läbi suhtlusründe, või teadvustamata oma tegevuse tagajärgi. Hiljutised uuringud küberturbe vallas on märgatavalt näidanud, et otsuste tegemiste eest vastutajad organisatsioonides muutuvad ise järk-järgult ise ohtudeks või ohtlikuks ettevõtte jaoks läbi oma tegude. Tähtis on siin märkida, et tegemist ei ole ainult mitte-IT taustaga otsustajatega, kes tegelevad tähtsate intsidentide lahendamisega – tänu teadmiste puudumistele või kehvadele otsustele, aga uuringud näitavad, et IT taustaga inimeste tulemused kriitilistes intsidentides on samad või isegi kehvemad. Käesoleva uuringutöö eesmärk on teadvustada, metatunnetuse või -kognitsiooni täpsust ja vajadust pehme oskusena ning selle kasutama õpetamist erinevates ettevõtetes, fookusega töötajatete vahelise võimekuse parendamisele intsidendihalduse olukordades. Töö käigus analüüsiti olemasolevat kirjandust ja väljaandeid, mis katavad nii küberturvalisuse, kui ka metakognitsiooni teemasid, eesmärgiga tuvastada tühimikke, mis esinevad küberturvalisuse hariduse edasiandmisel, fokusseerides metakognitiivsetel oskustel. Arusaamaks inimestevahelist metakognitiivsel tasemel olevat teadvustamise taset, viib autor selle uurimustöö raames läbi empiirilise testi, kasutades selleks osalejaid nii IT, kui ka mitte-IT taustaga bakalaureuse või kõrgema haridusega tudengeid, mis autori arvates peaks demonstreerima, kui hästi on testis osalejad teadlikud oma metakognitiivsetest võimetest. Autor analüüsib kogutud tulemusi, et aru saada, kas osalejad on pigem ratsionaalsed või emotsioonidel põhinevad otsustuste tegijad küberkriisi ajal ja kas nad ka ise oma käitumiste tagamaid või põhjuseid suudavad analüüsida. Järgnevad sama teemalised uuringud saavad kasutada selle töö väljundeid ja tulemusi, et arendada treeningprogramme või osaleda küberhügieeni õppustel.

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1 Introduction

The topic of thesis “The effect of inter-individual differences in metacognitive accuracy on cybersecurity decisions” is chosen with the goal of developing metacognitive awareness, classifying a list of concepts that is essential for cybersecurity key decision-makers to have knowledge for measuring precision in terms of metacognition.

1.1 Problem Statement

Cybersecurity and hygiene are considered to be one of the hot topics in recent decades as cybercrimes are becoming evidently widespread. Recent statistics shows that a hacking attack takes place worldwide every 39 seconds generating 1.5 trillion USD per year [1] as by each passing day, we are getting dependent on potentially exploitable technologies. In fact, by 2021 it is anticipated that the rate of cybercrimes will reach about 6 trillion USD per year worldwide [2]. On the other hand, metacognition is one of the most recent subjects in educational psychology. “Metacognition refers to higher order thinking that involves active control over the cognitive processes engaged in learning” [3]. Metacognition can be best described as thinking about oneself. People can either over-estimate their decision-making abilities or they can under-estimate their capability of making worthy decisions timely and efficiently. At times, decision-maker experts fall into the well of emotions instead of relying on facts and they argue to justify irrational decisions with logics [4]. Therefore, in the era of exponential increase in cybercrimes, it is significantly important to mitigate the likelihood of threats posed by decision-makers through proper metacognitive awareness trainings.

Knowing one’s abilities, capabilities and understanding of a task that requires important decisions can avoid making the same mistake twice. For example, we often acknowledge numerous cases where the same company faced security breach twice, as there remains a learning curve between decision-makers education and adaptability. Likewise, an amateur, be it belonging to IT or Non-IT background, confronts their devices getting compromised by a phishing email which they happen to click or download it, just because they thought it was yet another regular email from company they work for or from a brand that they have subscribed to. So, part of the problem lies in inadequate trainings. To avoid making poor decisions and evaluating oneself as a right ‘fit’ while performing cyber

security tasks there is a need for metacognitive knowledge among individuals through which they can make more informed decisions.

1.2 Motivation

Many modern-day certifications are enclosed with very technical tools and strategies to protect or defend against attacks specially fit for finding a technical solution to a technical problem [5]. Overlooking the aspects of social engineering manipulations which does not count how many technical certifications or years of experience a person has. Rather, it mostly relies on how accurate you are of your decision-making biases in terms of being rational or emotional. For instance, no matter how many training schemes are held for creating a strong password, it could be captured by hackers through various social manipulation tricks such as impersonating or baiting [6], where hackers pretend to be someone to gather required information.

The motivation behind this thesis study is to begin the process of solving the problem by creating a need of metacognitive accuracy in cybersecurity decision-makers and to adequately educate inter-individuals in this regard. This thesis focuses on determining the set of knowledge requirements by reviewing current literature to compose a list of variables and scenarios which were then presented in survey to candidates of mixed areas including IT and Non-IT. The purpose was to rank how precise and aware are participants to judge their metacognitive biases when confronted with real-life cyber incident dilemmas. The results could be used in future as a starting point to develop necessary training programs and to improve performances and to be more reasonable while making high-stake decisions related to cybersecurity.

1.3 Hypothesis

The key focus for results in this research is based on the following:

1) Difference between male and female gender, based on emotionality and rationality when making cyber security dilemma decisions.

2) Difference between male and female in emotionality and rationality according to field of study or nature of work, when making cyber security dilemma decisions.

3) Difference between male and female in emotionality and rationality based on age groups they belong to when making cyber security dilemma decisions.

4) Difference between emotionality and rationality of individuals based on cyber security dilemmas.

5) Difference between emotionality and rationality of individual's perception scores.

6) Difference between individuals on emotionality and rationality based on their education level, when making cyber security dilemma decisions.

7) Difference between individuals on emotionality and rationality based on their ethnicity, when making cyber security dilemma decisions.

The results collected were analysed and ranked in regard to emotionality and rationality of individuals reflecting by multiple factors based on demographics i.e., age, gender, education level, ethnicity, and field of study/ nature of work. These results were later compared with how individuals rated themselves of being emotional and rational generally verses when deciding among cyber security dilemmas presented in the survey. The research validation method is based on quantitative approach. This research study has followed the fundamental steps of research i.e., where problem statement is identified through exploring the existing literature and recognizing appropriate gaps, formulating mechanism for survey and gathering data by designing sample criteria and analysing with statistical test on proposed hypotheses and various descriptive analysis.

1.4 Scope and Goal

Despite numerous measures and procedures developed assessing metacognition, it is important but simultaneously it is challenging. The scope of this research is to measure metacognitive accurateness of differences in individuals, that how much are they aware of it. The main outcome is to provide empirical evidence for the role of metacognition on cyber security decisions contributing to implement techniques that are known to enhance metacognition accuracy in the educational context both for teaching and training purposes. Thus, advancing to better cyber security developments by cognitive decision-making skills.

1.5 Novelty

Regardless of several simulation games, table-top exercises and moral dilemma experiments held for measuring cognitive perception and abilities, the analysis mostly depends upon attitudes and behaviours with or without involving time factor as a variable. The existing literature provided a kick-start to proceed towards deeper understanding of metacognitive awareness obligations in cybersecurity domain. The researches held in this proposed field of study have not yet prioritize varying capabilities of cybersecurity such as prevention, detection, and response i.e., how it should be developed and measured. Also, researchers are not yet able to measure the risk tolerance held by individuals in their studies. Every field has its unique characteristics, for instance, people, tasks, and circumstances. Therefore, we are not allowed to conclude that what works elsewhere also works with particular people in particular situations that this study aims to research on, unless this assumption can be supported by empirical testing.

Key words

Moral dilemma, ethical decision-making, trolley problem, cyber security, cyber defence strategies, metacognition, cognitive biases, cybersecurity incidents, gender differences, emotional and rational differences

2 Literature review

In incident handling domain, one cannot predict what sort of attacks might be hitting in near future and what decisions would be the best to make. Decision made at one time might not fit the situation happening in the future. Also, fear between inter-individual differences in making a right choice is also a key perspective arguing in adversarial circumstances [26]. In decision making, cognitive biases have strong impact on people influencing them to rely heavily to expected interpretations and prior learning, whereas rejecting uncertain observations, without looking at the broader context. It can be noted that the cognitive biases allow individuals to make useful decisions with the assistance of heuristics [27]. While there are multiple factors affecting decision-making abilities at managerial level [28], researchers have indicated that age, socio-economic status, and cognitive abilities impacts decision making abilities [29]. The key factors for successful crisis management teams have been identified from several studies. For instance, in 1993, Weick [30] analyzed the factors such as improvisation, virtual role systems, attitude of wisdom, and norms of respectful interactions affecting team performances in crisis management. Whereas, King [31] in 2002, explored five general factors that affect team performances in crisis management such as prior interactions, team composition, task knowledge, leadership ability, and organization culture, but these were not empirically tested.

2.1 Metacognition

Metacognition is about awareness of one's own cognition [7]. This includes awareness about one's strengths and weaknesses in one's cognition. These strengths and weaknesses in cognitive performance have after-effects for decisions, and decisions have real-world consequences. Being aware of one's strengths and weaknesses means to be metacognitively accurate. This accurate metacognition is therefore a highly important predictor of performance. Improving performance requires knowledge about what must be improved, where there are deficits and where help is needed. Without this knowledge, due to low metacognitive accuracy, risk-taking cannot be controlled [8] because one is not aware while taking a risk. People are capable of robust evaluations of their decisions and that is part of their metacognitive ability, but metacognition does not only refer to decisions, but to knowing about cognitive processes in broader context. Generally, men

rate their car driving abilities above average [9], take higher risks as a result, and are involved in more accidents. Knowing one's abilities, capabilities and understanding of a task that requires important decisions can avoid making poor choices.

Typically, to avoid making poor decisions and evaluating oneself as a right fit while performing cyber security tasks, there is a need for metacognitive awareness among individuals which simply means being aware of "how-you-think" [32]. Through awareness, candidates would know where they lack, and which area would they need to concentrate more. For instance, is there a gender difference that makes cyber analysts make poor decisions or do get emotional with events? Hence, once individuals are aware of it, they eventually become more of an independent thinker. Therefore, the empirical evidence is provided for the role of metacognition on cyber security decisions contributing to implement techniques that are known to enhance metacognitive accuracy in the educational context for both teaching and training. Leading to improved cybersecurity processes by cognitive decision-making abilities for Non-IT strategic level decision makers [33].

2.2 Moral Dilemmas

A moral dilemma is a situation where it is very difficult to decide what is the right thing to do [10][11]. Various simulation game scenarios in this context covers questions encompassing differences between people in empathy [12]; differences between people in risk assessment; differences in people in actual decision made. All these decisions could be at high-stake, extremely crucial and of interest for those deciding about admissions and allocating tasks to people or creating teams for important duties. Existing literature highlights a study for incident management approaches used by leaders [13] to perform better. There are 3 major ethical dilemmas: incident response; encryption issues, roles and responsibilities [14] in which most of the cybersecurity incidents revolves around bugging the professionals. These dilemmas have further variations where individuals are faced with numerous attacks including but not limited to, phishing, spoofing, impersonating, tailgating etc. Moreover, in terms of deep experience in cyber incident handling situations creating cyber related dilemmas, table-top exercises [15] are played both academically and professionally. Involving red team (for attack) and blue team (for defense) to inject and protect measuring the responses and techniques used by

both teams [16][17]. Victims or near victims after an incident are likely concerned about their activities, decisions and thinking. One of the methods to elaborate socially acceptable decisions is empirical ethics.

2.3 Trolley Problem

To obtain additional insights on attitudes towards ethical decision making in hazardous conditions, this research considered trolley problem, [18][19][20] where several scenarios present difficulties in situations requiring quick and plausible decisions. There is no perfect decision-making approach, however, depending upon the nature, time, complexity and most important cognitive abilities, people provide arguments against their decisions [21]. The trolley problem concept began in 1967 at Oxford University [39] and later Judith Thompson defined the term as "trolley problem" [21] when she created 'footbridge' (also known as fat-man) scenarios. By the late 90s, trolley problems had gone out of fashion. But recently, trolley problems have again started receiving importance after the innovation of driverless cars which is precisely more of a realistic product in today's time.

2.4 Research Gap

Metacognition has two fundamental components: knowledge about cognition and monitoring of cognition [22]. We know that 'knowledge' and 'skills' in cyber security predict cyber security performances, but that metacognition also predicts the quality of decisions. However, we never assess metacognitive skills. This is a major gap of knowledge in cyber security education: How and how much do metacognitive skills contribute to cyber security performance? As a matter of fact, most individuals of normal intelligence engage in metacognitive regulation when confronted with an effortful cognitive task, but some are more metacognitive than others. People are at ease to answer the question "How do I feel about this?" rather than "How I think about this?". This very concept is a reflexive action to their decision-making capabilities [23] when provided with "hard-choice" moral dilemmas which are applicable to real-life events, involving time variable as an essential factor. Nobel prize winner Daniel Kahneman explains best when describing our thoughts about reality vs the reality "The world in our heads is not a precise replica of reality; our expectations about the frequency of events are distorted by

the prevalence and emotional intensity of the messages to which we are exposed." [23]. Men are usually rational thinkers while women are empathetic to scenarios [12]. Men generally focus on one task and compartmentalize more brain activity, while women gravitate toward multitasking [24].

Furthermore, to enlighten the cognitive processes that trigger inter-individual differences when responding to uncertainties, a study in October 2005 at Georgia State University [25] was conducted. It concluded that individuals not only vary in decision making capabilities, but also in degree to which they respond to uncertainty about those decisions. Likewise, a study conducted in United States [34] developed a simulation game including both experienced and in-experienced subjects. The study explored the effectiveness in overcoming two complexities of decision-makers when constructing cybersecurity capabilities: potential delays in capability development; and uncertainties in predicting cyber incidents. Both groups demonstrated more or less same errors when conducting the uncertainty of cyber events. Their study aimed to emphasize the insufficient understanding of those intricacies at the administrative level. It contributed to research on three characteristics of proactive decision-making in cybersecurity: the effects of feedback delays; the role of experience; and the search for optimum decisions [34].

Hence, various studies highlight the need to focus on developing metacognitive ability as part of soft skills in cybersecurity operators and for important decision makers to follow or use as pathways to better performances [33]. Cyber security is often seen as a grey area that decisions and disruptions helps to demystify. Collecting and analyzing results from several IT and Non-IT candidates might spark enthusiastic interests from this research.

3 Methodology

This section shall present about what method for survey was used, important variables for designing it, criteria for selection of participants to take survey and what was intended to analyse from the results.

3.1 Data Collection

Paper-based surveying on the selected candidates was chosen in the first place instead of E-survey as the former option points to a more reliable means of collection method. But later, it was decided to shift towards E-survey as higher number of audiences can be targeted and can also be a useful approach during recent pandemic situation of Corona virus. The survey was designed using Google forms as it provided a flexible and robust approach for achieving at least 400 respondents and therefore, provided better data representation.

3.2 Survey Method

The survey method consisted of two parts, the first was based on collecting demographic variables and second part consisted of conceptual variables. The research has taken Gender, Age, Education, Ethnic group, and Field of study/ nature of work as independent variables and Emotionality and Rationality scores as dependent variables. The survey method used was highly based on trolley-problem [18][19][20] by creating moral dilemmas in cybersecurity. The survey contains a list of scenarios as shown in Appendix 1, which are easy to understand by both IT and Non-IT field groups and can be readily fit into the real world. The participants were asked to choose to what extent they agree from provided two options, one being rational and other being emotional decision. For example, a scenario might contain an event like “landing late night in a country with money for confidential business” and the options would be: Inform team by connecting to any unprotected Wi-Fi or don’t inform team and wait till morning to purchase sim. At the end of survey, the participants are asked to rate themselves overall whether they incline towards rational decision making or emotional decision making. This question is intentionally put in the end so that it would not impact their decisions before taking the survey.

Traditionally, trolley problem dilemmas are somewhat hard choice scenarios where there exist a life and death situation. For instance, handling a car with no brakes and choosing between the options whether to turn left and kill a child or turn right and kill five men at construction site. These scenarios are used by psychology experts to study, experiment and analyse the perceptions and attitudes of people from what they claim and what they actually do in reality. This research opted for less extreme and yet realistic cases to get as much diverse collection of data as possible. As when people are asked whether they would click an untrusted link no matter how important or attractive the email containing it looks to be, majority of candidates will declare "of course I would not do that!". But, in reality humans are impatient and can behave miserably by just being unconscious and create chaos for many organizational departments or for systems with sensitive information.

3.3 Participants Selection

Data is distributed randomly and extracted based on Gender, Age, Education, Ethnicity and Field of study / nature of work. A target of at least 400 participants were aimed to gather. Whereas a total of 475 responses were received which offered the opportunity to better extract out meaningful responses. For the purpose of this research study, participants must be selected by the following guidelines:

1. Be a student of bachelor's or higher program from both IT and Non-IT field.
2. Fall in the age range of 18-45.
3. Be either male or female.

The criteria for first requirement was set as a basic one because the objective of purposed research is to study the differences in inter-individuals. This research aimed to observe variation of decisions among diverse field of participants as the organizations not always have Non-IT individuals at managerial level and also not all IT professionals are manipulation-proof of cyber incidents. The second criteria for requirement was set because young adults are more likely to get victims of cyber-attacks these days as a greater part of their work is done online [35][36]. Additionally, those below 18 were left out as they are either not exposed or less exposed to cyber threats and corporate world. The third requirement was set as the research is aimed to study differences between males

and females only. Figure 1 shows the distribution chart of male and female participant's responses gathered.

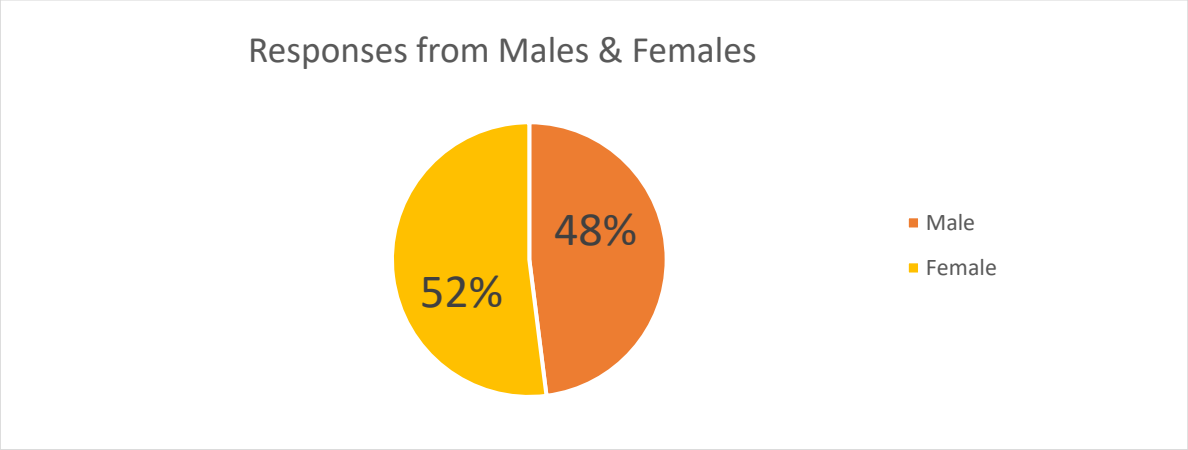

Figure 1. Responses data chart

From Figure 1, we can see that there are slightly a greater number of participants from female group compared to male group. A total of 465 responses were assembled out of 475. The reason of excluding 10 responses was that either they were not able to fit into the criteria of sampling or had missing data values. Table 1 shows details of participants data from the survey where the total number of male participants from IT field is comparatively more than the female participants. While, female participants from Non-IT field is relatively more compared to male group. However, according to their field of study or nature of work, overall a higher number of participants are from Non-IT in contrast to IT field.

	Male	**Female**	**Total**
IT	101	67	168
Non-IT	122	175	297
Total	223	242	465

Table 1. Survey participants

4 Results – Scenario variables

For this part, first the data collected is cleaned and organized in excel to assign variables for both demographic data and scenarios answer data. From scenarios, a total of 20 variables were extracted. Out of 20 variables, 10 corresponded to emotional decision scale as E1 to E10 and other 10 corresponded to rational decision scale as R1 to R10.

To analyse the demographic understanding of the respondents, descriptive statistics was used to calculate mean, standard deviation, range, minimum and maximum on the collected dataset. To measure the reliability of the emotionality/rationality score internally, Cronbach alpha [37] coefficient was used. To indicate the relationship between variables, regression analysis was held out. In terms of statistical significance, it was opted to fix the value at a 95% confidence interval level ($p<0.05$). Multiple regression, ANOVA analysis and T-test analysis was performed to test our hypothesis.

The software assistance has been taken, where JASP [44] is utilized to conduct the main analysis on the variables and SPSS [43] software is used to visualize the graphs with detailed examination.

4.1 Data Analysis

From the variables assigned to each scenario's Emotional and Rational outcomes, I sorted out to what degree did the male and female participants differ in general from scale range of 0-10, where 0 refers to least likely to agree and 10 refers to most likely to agree as shown in Table 2 for variable E1 which refers to emotional decision of connecting to unprotected Wi-Fi. We can conclude that a higher number of males opted for scale score '3' and a higher number of females opted for scale score '8'. Whereas, both groups were less likely to opt for scale score '1'.

E1	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Male	26	5	22	33	13	32	9	12	32	17	22
Female	23	6	14	32	11	25	15	36	38	18	24

Table 2. E1 participants score analysis

Table 3 shows the variation of results for variable E2 which refers to emotional decision of giving confidential information to save friend's job at competitor company. We can observe that a huge number of responses from males opted for scale score '0' and a significant number of females also opted for scale score '0'. Whereas, both groups were less likely to opt for scale score '9'.

E2	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Male	72	26	21	15	20	30	11	10	9	2	7
Female	57	28	33	24	17	30	15	15	14	4	5

Table 3. E2 participants score analysis

Table 4 shows the variation of results for variable E3 which refers to emotional decision of taking friend in case of fire. We can observe that a fairly large number of both males and females opted for scale score '10'. Whereas, both groups have least scale value for score '1'.

E3	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Male	10	1	4	8	13	30	15	13	32	25	72
Female	4	1	3	8	9	29	9	29	37	38	75

Table 4. E3 participants score analysis

Table 5 shows the variation of results for variable E4 which refers to emotional decision of transferring money to an unknown account. We can observe that a higher number of male participants opted for scale score '0' and higher number of female participants opted for scale score '5'. Whereas, lower number of males responded with score '10'. However, lower number of respondents of females are same for scores '1', '9' and '10' respectively.

E4	0	1	2	3	4	5	6	7	8	9	10
Male	44	15	19	17	16	32	12	24	25	10	9
Female	25	10	16	26	17	47	20	37	24	10	10

Table 5. E4 participants score analysis

Table 6 illustrates the variation of results for variable E5 which refers to emotional decision of accessing personal email from firm's laptop. We can observe that a significantly higher number of participants from both groups selected scale score '0'. Whereas, a fewer number of male respondents opted for scale score '6'. However, for females the least numbers of responses are same for scale score '6' and '10'.

E5	0	1	2	3	4	5	6	7	8	9	10
Male	60	18	18	16	15	17	11	14	15	22	17
Female	50	17	26	20	14	21	13	18	31	19	13

Table 6. E5 participants score analysis

Table 7 illustrates the variation of results for variable E6 which refers to emotional decision of giving your cell phone to an old lady. We can analyse that a higher of males opted for scale score '10' however a higher number of females opted for scale score '9'. Moreover, considering males, the least responses received are observed on scale scores '2' and '3'. Whereas, the least responses received by females are observed on scale score '1'.

E6	0	1	2	3	4	5	6	7	8	9	10
Male	9	8	7	7	10	26	12	26	30	32	56
Female	7	6	8	12	12	27	13	19	44	49	45

Table 7. E6 participants score analysis

Table 8 illustrates the variation of results for variable E7 which refers to emotional decision of shutting down server without taking boss's signoff. We can analyse that both groups exhibited same number of high response rate to scale score '10'. Furthermore, the least number of responses received from males is for scale score '2' whereas, the least number of responses received from females is for scale score '1'.

E7	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Male	6	7	5	8	12	28	16	26	44	28	43
Female	3	1	12	8	16	28	25	33	40	33	43

Table 8. E7 participants score analysis

Table 9 illustrates the variation of results for variable E8 which refers to emotional decision of keeping friend's illegal hacking activities to yourself. We can observe that a greater number of respondents from males chose scale score '0' and a greater number of respondents from females chose scale score '5'. However, both groups depicted least number of respondents for scale score of '10'.

E8	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Male	52	21	19	19	21	30	14	13	12	14	8
Female	36	22	29	28	23	40	14	21	15	11	3

Table 9. E8 participants score analysis

Table 10 demonstrates the variation of findings for variable E9 which refers to emotional decision of using colleague's laptop to expose fraud. We can analyse that a larger portion of both male and female respondents chose scale score of '0'. But, least respondents from males opted for scale score '6' whereas, least respondents from females opted for scale score '10'.

E9	0	1	2	3	4	5	6	7	8	9	10
Male	51	21	17	20	27	20	10	17	15	14	11
Female	46	21	23	28	15	30	18	23	21	11	6

Table 10. E9 participants score analysis

Table 10 demonstrates the variation of findings for variable E10 which refers to emotional decision of forgiving hacker who promises to destroy information. We can analyse that a higher number of male participants opted for scale score '8' whereas, a higher number of female participants opted for scale score '6'. In contrast to this, the scale score '1' consists of same number of least respondents from both groups.

E10	0	1	2	3	4	5	6	7	8	9	10
Male	28	8	11	15	19	25	27	13	31	20	14
Female	16	8	11	10	17	32	45	36	31	19	17

Table 11. E10 participants score analysis

Table 12 demonstrates the variation of findings for variable R1 which refers to rational decision of not connecting to unprotected Wi-Fi. We can analyse from below table that maximum responses to opt for scale score '10' exhibited by both groups. However, the least number of males responded to scale score '1' and a least number of females responded to scale score '0'.

R1	0	1	2	3	4	5	6	7	8	9	10
Male	7	5	18	19	18	35	13	17	26	25	40
Female	11	12	15	14	32	33	19	22	31	28	35

Table 12. R1 participants score analysis

Table 13 shows the variation of results for variable R2 which refers to rational decision of not giving confidential information to save friend's job at competitor company. We can observe that a vast number of respondents from both male and female groups opted for scale score '10'. In addition, scale score '1' is the least to gather responses from both groups.

R2	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Male	7	0	5	7	9	18	5	20	27	35	90
Female	3	2	3	4	9	21	16	18	41	40	85

Table 13. R2 participants score analysis

Table 14 shows the variation of results for variable R3 which refers to rational decision of taking research note's file in case of fire. We can observe that a majority of responses received from male group was for scale score '5' whereas, a majority of responses received from female group was for scale score '3'. However, the least number responses received from male participants were same for scale score '1' and '9' respectively. But, the least number of responses received from female participants were for scale score '10'.

R3	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Male	27	12	17	21	17	34	14	26	17	12	26
Female	22	16	24	34	21	29	24	24	23	13	12

Table 14. R3 participants score analysis

Table 15 shows the variation of results for variable R4 which refers to rational decision of not transferring money to an unknown account. We can analyse that the scale score '10' received maximum number of responses for both groups. Consequently, the scale score '0' received the least number of responses for both groups correspondingly.

R4	0	1	2	3	4	5	6	7	8	9	10
Male	6	7	17	12	11	28	14	21	34	22	51
Female	7	8	9	12	11	44	27	29	34	25	41

Table 15. R4 participants score analysis

Table 16 shows the variation of results for variable R5 which refers to rational decision of not accessing personal email from firm's laptop. We can examine that the scale score '10' received maximum number of responses from both groups and the scale score '1' received the least number of responses from both groups.

R5	0	1	2	3	4	5	6	7	8	9	10
Male	9	7	14	14	15	16	16	13	31	25	63
Female	11	7	16	14	11	20	18	16	31	35	63

Table 16. R5 participants score analysis

Table 17 shows the variation of results for variable R6 which refers to rational decision of not giving cell phone to an old lady. We can analyse that maximum number of respondents from both groups opted for scale score '0'. But, the least number of responses received from female group is for scale score '9' whereas, the least number of responses received from male group is for scale score '6'.

R6	0	1	2	3	4	5	6	7	8	9	10
Male	44	22	28	24	21	25	5	12	15	11	16
Female	39	24	32	23	26	28	14	14	18	6	16

Table 17. R6 participants score analysis

Table 18 shows the variation of results for variable R7 which refers to rational decision of not shutting down server without boss's signoff. We can observe that a relatively higher number of male participants chose scale score '4' whereas, a relatively higher number of female participants chose scale score '5'. However, scale score '9' and '10' from male group received same number of least respondents whereas, from female group the scale score '10' received the least number of respondents.

R7	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Male	25	21	21	26	33	29	16	20	12	10	10
Female	18	22	28	22	28	36	17	30	21	11	9

Table 18. R7 participants score analysis

Table 19 shows the variation of results for variable R8 which refers to rational decision of telling course instructor of friend's illegal hacking activities. We can see clearly that both groups had same number of maximum respondents for scale score '10'. Whereas, scale score '2' received the least number of male respondents while, scale score '0' received least/ no responses at all.

R8	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Male	6	7	2	7	8	31	22	21	34	27	58
Female	0	2	4	5	10	26	25	36	45	31	58

Table 19. R8 participants score analysis

Table 20 shows the variation of results for variable R9 which refers to rational decision of not using colleague's laptop without permission. We can consider that scale score '10' received a huge number of participants from both male and female groups. Similarly, the scale score to receive the least number of responses from both groups is '4' correspondingly.

R9	0	1	2	3	4	5	6	7	8	9	10
Male	7	4	6	11	12	24	19	25	29	29	57
Female	3	1	15	12	19	30	20	21	38	22	61

Table 20. R9 participants score analysis

Table 21 shows the variation of results for variable R10 which refers to rational decision of not forgiving hacker and exposing to higher management. We can understand that a relatively large number of participants from both male and female groups decided to opt for scale score '5'. Whereas, the least number of respondents from male groups are for scale score '0'. Similarly, the least number of respondents from female groups are for scale score '1'.

R10	0	1	2	3	4	5	6	7	8	9	10
Male	7	12	15	26	22	37	20	19	20	13	32
Female	14	8	16	22	28	43	28	23	22	16	22

Table 21. R10 participants score analysis

4.2 Descriptive Analysis

This section will brief about the results for descriptive analysis performed on the data collected. For descriptive analysis, JASP [44] software is used to calculate the mean, standard deviation, range, minimum and maximum of all the variables of both Emotional and Rational variables. Figure 2 shows descriptive analysis for emotional variables below.

	E1		E2		E3		E4		E5		E6		E7		E8		E9		E10	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Valid	242	223	242	223	242	223	242	223	242	223	242	223	242	223	242	223	242	223	242	223
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	5.566	5.054	3.211	2.865	7.674	7.251	4.893	4.251	4.310	4.031	7.004	6.973	6.946	6.910	3.868	3.709	3.955	3.848	5.781	5.296
Std. Deviation	3.054	3.176	2.807	2.854	2.406	2.825	2.764	3.139	3.364	3.551	2.752	2.913	2.453	2.665	2.749	3.098	3.008	3.210	2.682	3.048
Range	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000

Figure 2. Emotional descriptive analysis using JASP

Minimum and maximum range implies to the scales of each emotional and rational score i.e., values from 0 (least) to 10 (most) to what participants agree according to each dilemma put in front of them. Figure 3 shows descriptive analysis for rational variables below.

	R1		R2		R3		R4		R5		R6		R7		R8		R9		R10	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Valid	242	223	242	223	242	223	242	223	242	223	242	223	242	223	242	223	242	223	242	223
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	6.012	6.166	7.938	7.883	4.661	5.009	6.479	6.601	6.769	6.758	3.963	3.821	4.566	4.215	7.504	7.143	6.909	7.036	5.380	5.574
Std. Deviation	2.981	2.943	2.315	2.635	2.871	3.172	2.720	2.951	3.114	3.124	3.065	3.201	2.772	2.819	2.137	2.672	2.682	2.762	2.753	2.878
Range	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	9.000	10.000	10.000	10.000	10.000	10.000
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
Maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000

Figure 3. Rational descriptive analysis using JASP

4.3 Regression Analysis

For this part of the analysis, JASP [44] software is used for analysing classical correlation to understand how much the variables correlate internally.

4.3.1 Pearson's Correlation

The rational dataset was parametric therefore, Pearson correlation was performed. Figure 4 shows the Pearson correlation for all the variables consisting original and normalized (where necessary) for Rational data set.

Pearson's Correlations

Variable		R1_N	R2_N	R3	R4_N	R5_N	R6_N	R7_N	R8_N	R9_N	R10
1. R1_N	Pearson's r	—									
	p-value	—									
2. R2_N	Pearson's r	−0.170***	—								
	p-value	< .001	—								
3. R3	Pearson's r	−0.056	−0.016	—							
	p-value	0.232	0.734	—							
4. R4_N	Pearson's r	0.225***	−0.297***	−0.013	—						
	p-value	< .001	< .001	0.779	—						
5. R5_N	Pearson's r	0.328***	−0.224***	−0.065	0.289***	—					
	p-value	< .001	< .001	0.160	< .001	—					
6. R6_N	Pearson's r	−0.186***	0.048	0.116*	−0.117*	−0.087	—				
	p-value	< .001	0.354	0.023	0.022	0.089	—				
7. R7_N	Pearson's r	0.087	−0.119*	0.179***	0.071	0.039	0.027	—			
	p-value	0.061	0.010	< .001	0.127	0.399	0.602	—			
8. R8_N	Pearson's r	0.151**	−0.390***	0.027	0.187***	0.248***	−0.045	0.147**	—		
	p-value	0.001	< .001	0.556	< .001	< .001	0.382	0.001	—		
9. R9_N	Pearson's r	0.105*	−0.246***	0.091*	0.164***	0.220***	−0.100	0.174***	0.335***	—	
	p-value	0.023	< .001	0.049	< .001	< .001	0.051	< .001	< .001	—	
10. R10	Pearson's r	−0.175***	0.180***	0.168***	−0.195***	−0.132**	0.091	0.123**	−0.050	−0.086	—
	p-value	< .001	< .001	< .001	< .001	0.004	0.075	0.008	0.285	0.065	—

* p < .05, ** p < .01, *** p < .001

Figure 4. Pearson correlation on Rational data using JASP

By the information extracted above from the given matrix results in Figure 4, we can observe that the rational decision variable which refers to not connecting to unprotected Wi-Fi (R1_N) and variable which refers to not accessing your personal email from firm's laptop (R5_N) has a correlation of 0.328. Likewise, the variable referring to not transferring money to an unknown account (R4_N) and variable referring to not accessing your personal email from firm's laptop (R5_N) has a correlation of 0.289. Moreover, rational variable referring to telling course instructor of friend's illegal hacking activities (R8_N) and variable which refers to not using co-worker's laptop to expose fraud (R9_N) has a correlation of 0.335. Whereas, the rational decision variable of not giving your cell phone to an old lady (R6_N) has no correlational R-values with other variables.

4.3.2 Spearman's Correlation

The emotional dataset was non-parametric, so Spearman correlation was performed on the original data set for Emotionality variables to list out the internal relationship. Figure 5 shows the Spearman correlation for all the variables in original Emotional data set.

Spearman's Correlations

Variable		E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
1. E1	Spearman's rho	—									
	p-value	—									
2. E2	Spearman's rho	0.030	—								
	p-value	0.524	—								
3. E3	Spearman's rho	0.143**	−0.030	—							
	p-value	0.002	0.515	—							
4. E4	Spearman's rho	0.150**	0.231***	0.003	—						
	p-value	0.001	< .001	0.954	—						
5. E5	Spearman's rho	0.252***	0.268***	−0.048	0.323***	—					
	p-value	< .001	< .001	0.305	< .001	—					
6. E6	Spearman's rho	0.038	−0.018	0.044	0.091	0.053	—				
	p-value	0.418	0.693	0.339	0.050	0.253	—				
7. E7	Spearman's rho	−0.026	−0.123**	0.048	−0.016	−0.016	0.116*	—			
	p-value	0.573	0.008	0.303	0.732	0.726	0.012	—			
8. E8	Spearman's rho	0.057	0.357***	−0.102*	0.155***	0.283***	−0.100*	−0.110*	—		
	p-value	0.216	< .001	0.028	< .001	< .001	0.031	0.018	—		
9. E9	Spearman's rho	0.028	0.320***	−0.164***	0.235***	0.254***	0.029	−0.094*	0.300***	—	
	p-value	0.547	< .001	< .001	< .001	< .001	0.527	0.043	< .001	—	
10. E10	Spearman's rho	0.162***	0.186***	0.135**	0.223***	0.147**	0.035	0.124**	0.096*	0.131**	—
	p-value	< .001	< .001	0.004	< .001	0.001	0.450	0.008	0.039	0.005	—

Figure 5. Spearman correlation on Emotional data using JASP

By the information extracted above from the given matrix results in Figure 5, we can observe that the emotional decision variable referring to giving confidential information to save friend's job at competitor company (E2) and variable referring to keeping to yourself of friend's illegal hacking activities (E8) has a correlation of 0.357. The emotional variable which refers to giving confidential information to save friend's job at competitor company (E2) and variable which refers to using co-worker's laptop to expose fraud (E9) has a correlation of 0.320. Also, the variable referring to transfer the money to an unknown account (E4) and the emotional variable referring to accessing your personal email from firm's laptop (E5) has a correlation of 0.323. Additionally, the variable which refers to accessing your personal email from firm's laptop (E5) and variable which refers to keeping to yourself of friend's illegal hacking activities (E8) are correlated with 0.283 correlational R-values. The emotional variable referring to keeping to yourself of friend's illegal hacking activities (E8) and the variable referring to using co-worker's laptop to

expose fraud (E9) has a correlation of 0.300. But the emotional decision variable which refers to giving your cell phone to an old lady (E6) has no correlational R-values with other variables.

4.4 Reliability Analysis

Reliability analysis was performed to see internal consistency as a measure of reliability by calculating Cronbach alpha [37] value for variables of Emotionality and Rationality in Jasp [44] as shown in Figure 6 and 7, respectively.

Scale Reliability Statistics

	Cronbach's α
scale	0.628

Note. Of the observations, 269 were used, 196 were excluded listwise, and 465 were provided.

Item Reliability Statistics

	If item dropped
	Cronbach's α
E2_N	0.558
E4	0.596
E5	0.573
E8_N	0.585
E9_N	0.558

Figure 6. Reliability analysis on Emotional data using JASP

We can observe from Figure 6, that the Cronbach alpha value is 0.628 which is considered to be moderate [37][41]. All Emotionality variables were dropped until 0.628 became the maximum alpha value to be reached. So, from reliability analysis of Emotionality variables, we have 5 scaled variables to be used in later part of this research. From Figure 7, we can observe result of Cronbach alpha value for Rationality variables as 0.592, which is satisfactory [37][41].

Scale Reliability Statistics

	Cronbach's α
scale	0.592

Note. Of the observations, 465 were used, 0 were excluded listwise, and 465 were provided.

Item Reliability Statistics

	If item dropped
	Cronbach's α
R1_N	0.558
R4_N	0.546
R5_N	0.491
R8_N	0.533
R9_N	0.555

Figure 7. Reliability analysis on Rational data using JASP

All Rationality variables were dropped until 0.592 became the maximum alpha value to be reached. Therefore, from reliability analysis of Rationality variables, we have 5 scaled variables to be used in later part of the research.

4.5 T-test Analysis

For this part of the testing, JASP [44] software is used to understand whether the selected variables of emotionality and rationality have any effect size based on Gender, Field (of work/ study) to refer with hypotheses. For this purpose, the average mean of selected variables from reliability analysis was calculated for both emotional data and rational data as shown in the Figure 8 and Figure 9 respectively using SPSS [43] software.

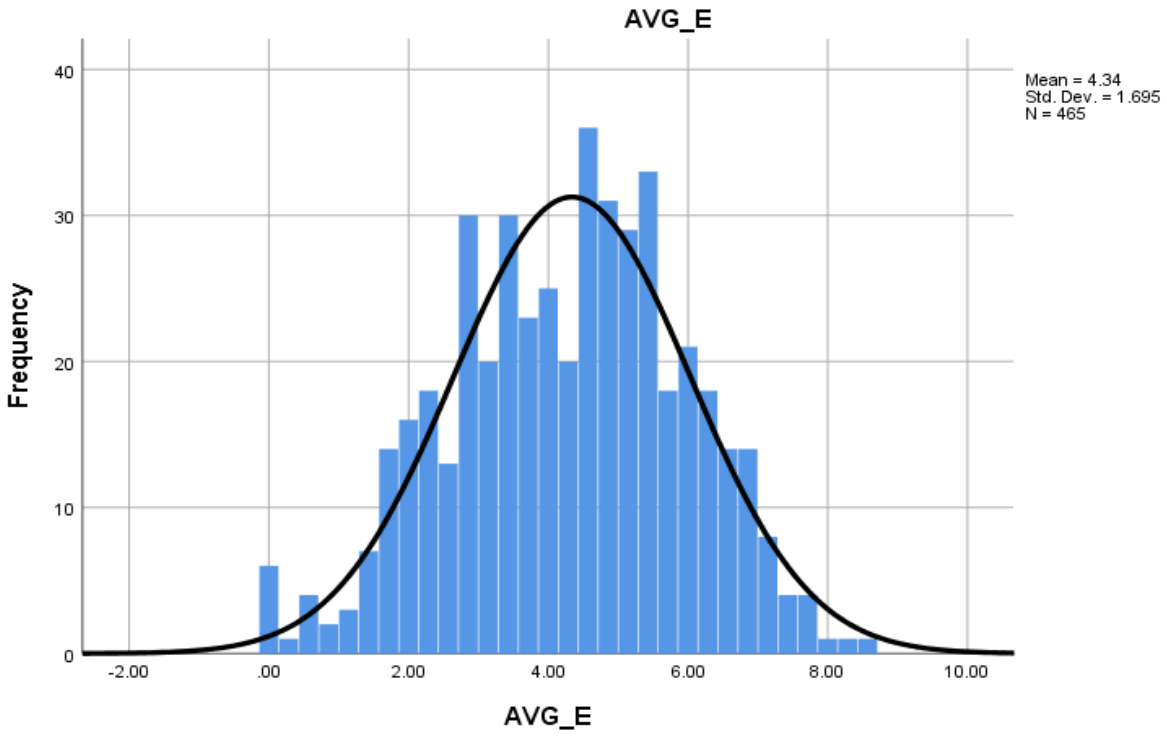

Figure 8. Average mean of selected Emotional variables using SPSS

We can observe that the distribution of graph is fairly normalized keeping in view of the mean and standard deviation values in both Figure 8 and 9.

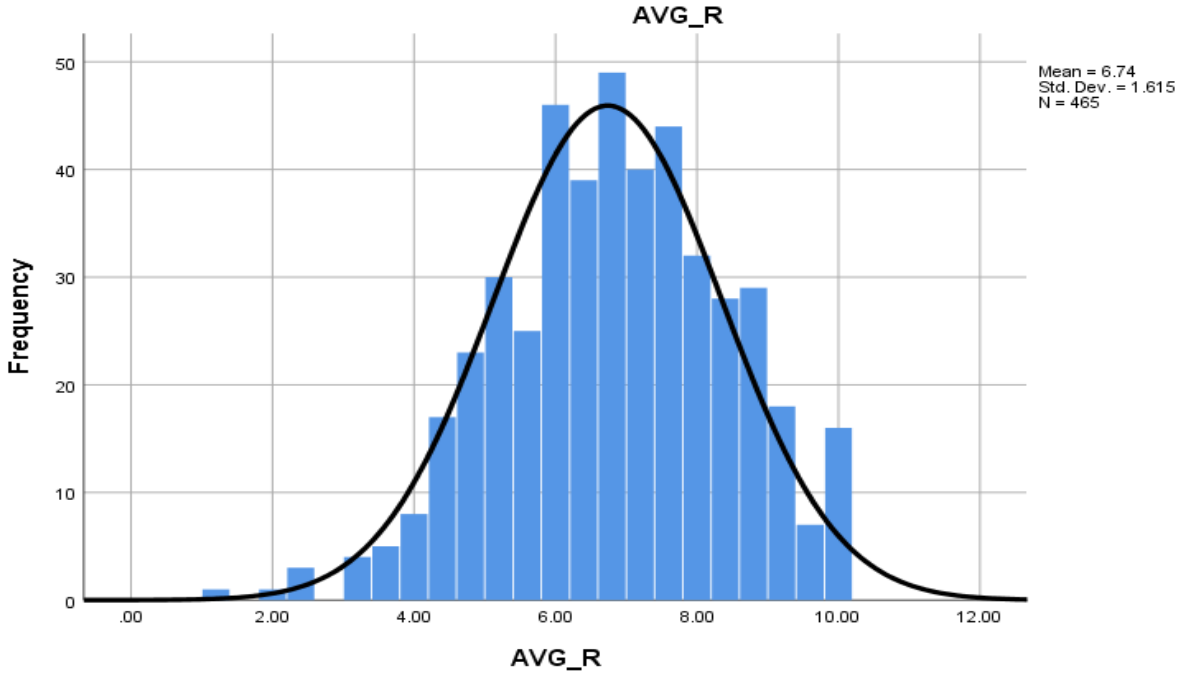

Figure 9. Average mean of selected Rational variables using SPSS

The descriptive statistics of average score distribution while generating normalized graphs is shown in Figure 10 below. And we can say that both graphs are perfectly normalized according to skewness and kurtosis values, the peak is in the middle.

Statistics

		AVG_E	AVG_R
N	Valid	465	465
	Missing	0	0
Skewness		-.167	-.211
Std. Error of Skewness		.113	.113
Kurtosis		-.419	-.115
Std. Error of Kurtosis		.226	.226

Figure 10. Descriptive statistics of average means using SPSS

4.5.1 Independent Samples

For this part of the analysis, T-testing as independent samples was performed according to the factors in hypotheses described and complied below.

4.5.1.1 Gender

By analysing the results obtained from JASP [44], assumptions with the effect size on mean scores of emotionality and rationality were compared and observed as shown in Figure 11. The p-values (significance) from assumption checks for Average mean value of Emotionality (AVG_E) was 0.031 whereas, for Average mean value of Rationality (AVG_R) was 0.780. However, Cohen's d effect size for AVG_E resulted in 0.214 and according to Cohen [38] is referred in the category of 'small' effect size. So, with effect size as low and with p-value (2-tailed significance) equal to 0.022 and mean difference of 0.361 we can conclude that emotional decision making have small effect on gender difference. But, the Cohen's d effect size for AVG_R resulted in 0.004 which is lower than defined values of effect size by Cohen [38]. Also, the p-value (2-tialed significance) was equal to 0.968 which too high from reference of Levene's test ($p<0.05$) with mean difference of 0.150. So, we can conclude that Rational decision-making does not has an effect on gender differences whereas, Emotional decision-making has an effect on gender differences. Therefore, the first hypothesis which states that emotionality and rationality have an effect on individuals based on gender is partially true.

Independent Samples T-Test

	t	df	p	Mean Difference	SE Difference	Cohen's d	95% CI for Cohen's d Lower	95% CI for Cohen's d Upper
AVG_E	2.307	463	0.022[a]	0.361	0.157	0.214	0.032	0.396
AVG_R	−0.041	463	0.968	−0.006	0.150	−0.004	−0.186	0.178

Note. Student's t-test.

[a] Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Assumption Checks

Test of Equality of Variances (Levene's)

	F	df	p
AVG_E	4.678	1	0.031
AVG_R	0.078	1	0.780

Descriptives

Group Descriptives

	Group	N	Mean	SD	SE
AVG_E	Female	242	4.512	1.594	0.102
	Male	223	4.151	1.783	0.119
AVG_R	Female	242	6.735	1.608	0.103
	Male	223	6.741	1.626	0.109

Figure 11. Independent sample test by Gender using JASP

4.5.1.2 Field

By analysing the results obtained from JASP [44], assumptions with the effect size on mean scores of emotionality and rationality were compared and observed as shown in Figure 12. The p-values (significance) from assumption checks for Average mean value of Emotionality (AVG_E) was 0.012 whereas, for Average mean value of Rationality (AVG_R) was 0.067. However, the Cohen's d effect size for AVG_E resulted in -0.138 which is too small to be considered as an affect according to Cohen [38]. Also, the mean difference value resulted in -0.235 with p-value (2-tailed significance) as 0.152 which is higher than the Levene's test reference scale ($p<0.05$). On the other hand, analysing the results of AVG_R, the Cohen's d effect size resulted in 0.024 which is lower than the suggested scale by Cohen [38] with p-value (2-tailed significance) equal to 0.808 and mean difference of 0.038. So, we can conclude that Emotionality and Rationality does not have a significant effect based on field of study or nature of work. Both IT and Non-

IT individuals can make cyber security decisions variating between being emotional or rational. Therefore, the second hypothesis which states that emotionality and rationality factors have effects on individuals based on field is false.

Independent Samples T-Test

	t	df	p	Mean Difference	SE Difference	Cohen's d	95% CI for Cohen's d	
							Lower	Upper
AVG_E	−1.435	463	0.152[a]	−0.235	0.163	−0.138	−0.328	0.051
AVG_R	0.243	463	0.808	0.038	0.156	0.024	−0.166	0.213

Note. Student's t-test.

[a] Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Assumption Checks

Test of Equality of Variances (Levene's)

	F	df	p
AVG_E	6.308	1	0.012
AVG_R	3.365	1	0.067

Descriptives

Group Descriptives

	Group	N	Mean	SD	SE
AVG_E	IT	168	4.189	1.836	0.142
	Non-IT	297	4.423	1.607	0.093
AVG_R	IT	168	6.762	1.731	0.134
	Non-IT	297	6.724	1.549	0.090

Figure 12. Independent sample test by Field using JASP

4.5.2 One Sample

By analysing the results gathered from JASP [44] as shown in Figure 13, we can observe that the effect size obtained considering Average mean value of Emotionality (AVG_E) was 2.559 which is too large compared to total population in the reference scales given by Cohen's d [38] along with mean difference of 4.339 and SD equals to 1.695. Consequently, the effect size of by considering Average mean value of Rationality (AVG_R) was 4.171 which is also very large compared to total population by given scale range by Cohen's d [38] along with mean difference of 6.738 and SD equals to 1.615. However, the p-value (significance) for both AVG_E and AVG_R was <0.001 which means that the mean difference in individual variables have greater corresponding effects

compared to hypothesized values. So, we can conclude that emotional and rational variables separately have strong effect on individuals when provided with cyber security dilemmas. Therefore, the fourth hypothesis which states that emotionality and rationality factors in individuals have effect based on cyber security dilemmas is true.

One Sample T-Test

					95% CI for Cohen's d	
	t	df	p	Cohen's d	Lower	Upper
AVG_E	55.190	464	< .001	2.559	2.370	2.746
AVG_R	89.950	464	< .001	4.171	3.886	4.452

Note. For the Student t-test, effect size is given by Cohen's *d*.
Note. Student's t-test.

Descriptives

Descriptives

	N	Mean	SD	SE
AVG_E	465	4.339	1.695	0.079
AVG_R	465	6.738	1.615	0.075

Figure 13. One sample test using JASP

4.5.3 Paired Sample

By analysing the results obtained from JASP [44] pairing Average mean of Rationality (AVG_R) with Average mean of Emotionality (AVG_E), the effect size was 0.806 which is categorized as 'large' effect according to Cohen [38] with p-value (significance) <0.001 which means they have a significant difference. Keeping in view the mean values of AVG_R (6.738) and AVG_E (4.339) we can conclude that overall rationality has a higher effect on decision making considering cyber security dilemmas compared to overall emotionality decisions in cyber security dilemmas as shown in Figure 14.

Paired Samples T-Test

						95% CI for Cohen's d	
			t	df	p	Cohen's d	Lower	Upper
AVG_R	-	AVG_E	17.370	464	< .001	0.806	0.701	0.910

Note. Student's t-test.

Descriptives

Descriptives

	N	Mean	SD	SE
AVG_R	465	6.738	1.615	0.075
AVG_E	465	4.339	1.695	0.079

Figure 14. Paired sample test R vs E using JASP

Whereas, emotionality has a negatively small Cohen's d [38] effect size of -0.806 when paired with rationality as shown in Figure 15 below.

Paired Samples T-Test

						95% CI for Cohen's d	
			t	df	p	Cohen's d	Lower	Upper
AVG_E	-	AVG_R	−17.370	464	< .001	−0.806	−0.910	−0.701

Note. Student's t-test.

Descriptives

Descriptives

	N	Mean	SD	SE
AVG_E	465	4.339	1.695	0.079
AVG_R	465	6.738	1.615	0.075

Figure 15. Paired sample test E vs R using JASP

4.6 ANOVA Analysis

For this part of the analysis JASP [44] software is used to compare and understand whether the collected demographic variables of Gender, Age, Education and Field (of work/ study) have an effect over the selected variables of emotionality and rationality, to

refer with the proposed hypotheses in detail. To analyse and understand better, post-hoc tests section is used in JASP [44] to see experiment-wise error for entire comparisons to precisely identify which set of groups that are meaningful according to listed hypotheses.

4.6.1 Emotional Dataset

Below are the results compiled for Emotional dataset considering Eta square which provides the measure of proportion for the total variance in a dependent variable that is associated with the membership of different groups defined by an independent variable [45].

4.6.1.1 Average mean of Emotionality with Age and Field

We see from the Figure 16 below that the effect size Eta square for Age is 0.026 and for Field is 0.005, which is very small [40].

ANOVA - AVG_E

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Age	34.684	3	11.561	4.114	0.007	0.026
Field	6.402	1	6.402	2.278	0.132	0.005
Residuals	1292.770	460	2.810			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Age

		Mean Difference	SE	t	Cohen's d
A	B	−0.180	0.172	−1.048	−0.111
	C	−0.304	0.237	−1.284	−0.182
	D	1.390	0.481	2.889	0.878
B	C	−0.124	0.235	−0.528	−0.071
	D	1.570	0.480	3.269	0.927
C	D	1.694	0.507	3.341	0.866

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 4
Note. Results are averaged over the levels of: Field

Post Hoc Comparisons - Field

		Mean Difference	SE	t	Cohen's d
IT	Non-IT	−0.245	0.162	−1.509	−0.145

Figure 16. AVG_E with Age and Field ANOVA test using JASP

But comparison shows that the individuals who fall under the age groups of A (18-22) and D (36-44) have a large [38] Cohen's d effect size of 0.878 with emotionality. Also, the individuals who are found under the age groups B (23-28) and D (36-44) have a large [38] Cohen's d effect size of 0.927 with emotionality. And the individuals who are falling between the age groups C (29-35) and D (36-44) have a large [38] Cohen's d effect size of 0.866 with emotionality. So, all three Age groups i.e., A, B and C have large Cohen's d effect when compared individually. Whereas, between individual's field groups of IT and Non-IT professionals, the Cohen's d effect size is negatively small [38] of -0.145 with emotionality.

4.6.1.2 Average mean of Emotionality with Age and Gender

We see from the Figure 17 below that the effect size Eta square is 0.028 for Age and 0.014 for Gender which is very small [40].

ANOVA - AVG_E

Cases	Sum of Squares	df	Mean Square	F	p	η²
Age	37.547	3	12.516	4.495	0.004	0.028
Gender	18.510	1	18.510	6.648	0.010	0.014
Residuals	1280.662	460	2.784			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Age

		Mean Difference	SE	t	Cohen's d
A	B	−0.195	0.171	−1.139	−0.121
	C	−0.403	0.238	−1.696	−0.242
	D	1.362	0.479	2.845	0.861
B	C	−0.209	0.234	−0.890	−0.120
	D	1.557	0.478	3.258	0.919
C	D	1.765	0.505	3.494	0.903

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 4
Note. Results are averaged over the levels of: Gender

Post Hoc Comparisons - Gender

		Mean Difference	SE	t	Cohen's d
Female	Male	0.404	0.157	2.578	0.239

Figure 17. AVG_E with Age and Gender ANOVA test using JASP

For Age, the comparison shows that individuals that fall under the age groups of A (18-22) and D (36-44) have a large [38] Cohen's d effect size of 0.861 with emotionality. Also, individuals who are between the age groups of B (23-28) and D (36-44) have a large [38] Cohen's d effect size of 0.919 with emotionality. And individuals who fall between the age groups of C (29-35) and D (36-44) have a large [38] Cohen's d effect size of 0.903 with emotionality. Whereas, comparison between Gender groups, Male and Female have an effect size of 0.239 which is small according to Cohen's d [38].

4.6.1.3 Average mean of Emotionality with Education and Field

We see from the Figure 18 below that the effect size Eta square for Education is 0.005 and 0.004 for Field which is very small [40].

ANOVA - AVG_E

Cases	Sum of Squares	df	Mean Square	F	p	η²
Education	6.902	3	2.301	0.801	0.494	0.005
Field	5.545	1	5.545	1.932	0.165	0.004
Residuals	1320.552	460	2.871			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Education

		Mean Difference	SE	t	Cohen's d
Bachelor	Doctoral	0.236	0.409	0.578	0.139
	Master	0.255	0.166	1.534	0.153
	Post-Grad course	0.128	0.471	0.271	0.078
Doctoral	Master	0.018	0.403	0.045	0.011
	Post-Grad course	−0.109	0.597	−0.182	−0.051
Master	Post-Grad course	−0.127	0.466	−0.272	−0.075

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 4
Note. Results are averaged over the levels of: Field

Post Hoc Comparisons - Field

		Mean Difference	SE	t	Cohen's d
IT	Non-IT	−0.228	0.164	−1.390	−0.135

Figure 18. AVG_E with Education and Field ANOVA test using JASP

For Education, individuals with Bachelor and Doctoral study groups have a small [38] Cohen's d effect size of 0.139 with emotionality. Also, individuals having Bachelor and Master degrees have a small [38] Cohen's d effect size of 0.153 with emotionality. Whereas, with Field groups, individuals of IT and Non-IT professionals have a negatively small [38] Cohen's d effect size of -0.135 with emotionality.

4.6.1.4 Average mean of Emotionality with Education and Gender

We see from the Figure 19 below that the effect size Eta square for Education is 0.004 and 0.010 for Gender which is very small [40].

ANOVA - AVG_E

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Education	5.848	3	1.949	0.683	0.563	0.004
Gender	13.737	1	13.737	4.815	0.029	0.010
Residuals	1312.361	460	2.853			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Education

		Mean Difference	SE	t	Cohen's d
Bachelor	Doctoral	0.184	0.408	0.450	0.108
	Master	0.235	0.166	1.420	0.142
	Post-Grad course	0.073	0.469	0.155	0.044
Doctoral	Master	0.052	0.402	0.129	0.030
	Post-Grad course	−0.111	0.595	−0.186	−0.052
Master	Post-Grad course	−0.163	0.464	−0.351	−0.096

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 4
Note. Results are averaged over the levels of: Gender

Post Hoc Comparisons - Gender

		Mean Difference	SE	t	Cohen's d
Female	Male	0.345	0.157	2.194	0.204

Figure 19. AVG_E with Education and Gender ANOVA test using JASP

For Education groups, individual with Bachelor and Doctoral degrees have a small [38] Cohen's d effect size of 0.108 with emotionality. Also, individuals with Bachelor and Master degrees have a small [38] Cohen's d effect of 0.142 with emotionality. Whereas, for Gender groups, Male and Female have a small [38] Cohen's d effect size of 0.204 with emotionality.

4.6.2 Rational Dataset

Below are the results compiled for Rational dataset considering Eta square which provides the measure of proportion for the total variance in a dependent variable associated with membership of different groups defined by an independent variable [45].

4.6.2.1 Average mean of Rationality with Age and Field

We see from the Figure 20 below that the effect size Eta square for Age is 0.027 and for Field is 1.571E-4 which is very small [40].

ANOVA - AVG_R

Cases	Sum of Squares	df	Mean Square	F	p	η²
Age	33.090	3	11.030	4.310	0.005	0.027
Field	0.190	1	0.190	0.074	0.785	1.571e −4
Residuals	1177.306	460	2.559			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Age

		Mean Difference	SE	t	Cohen's d
A	B	0.138	0.164	0.840	0.086
	C	0.379	0.226	1.677	0.243
	D	−1.310	0.459	−2.853	−0.849
B	C	0.241	0.224	1.075	0.147
	D	−1.447	0.458	−3.158	−0.880
C	D	−1.688	0.484	−3.490	−1.065

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 4
Note. Results are averaged over the levels of: Field

Post Hoc Comparisons - Field

		Mean Difference	SE	t	Cohen's d
IT	Non-IT	0.042	0.155	0.273	0.026

Figure 20. AVG_R with Age and Field ANOVA test using JASP

Comparison shows that individuals with age groups A (18-22) and C (29-35) have a small [38] Cohen's d effect size of 0.243 with emotionality. Also, individuals falling between age groups B (23-28) and C (29-35) have a small [38] Cohen's d effect size of 0.147 with emotionality. Whereas, between individuals of IT and Non-IT professional field groups the Cohen's d effect size is 0.026 which is too small [38] to be considered to have an effect with emotionality.

4.6.2.2 Average mean of Rational with Age and Gender

We see from Figure 21 below that the effect size Eta square for Age is 0.028 and 2.047E-4 for Gender which is very small [40].

ANOVA - AVG_R

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Age	33.298	3	11.099	4.337	0.005	0.028
Gender	0.248	1	0.248	0.097	0.756	2.047e −4
Residuals	1177.249	460	2.559			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Age

		Mean Difference	SE	t	Cohen's d
A	B	0.139	0.164	0.845	0.087
	C	0.391	0.228	1.713	0.251
	D	−1.306	0.459	−2.845	−0.846
B	C	0.252	0.225	1.122	0.154
	D	−1.444	0.458	−3.153	−0.878
C	D	−1.697	0.484	−3.502	−1.070

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 4
Note. Results are averaged over the levels of: Gender

Post Hoc Comparisons - Gender

		Mean Difference	SE	t	Cohen's d
Female	Male	−0.047	0.150	−0.311	−0.029

Figure 21. AVG_R with Age and Gender ANOVA test using JASP

Comparison shows that individuals who fall between the age groups of A (18-22) and C (29-35) have a small [38] Cohen's d effect size of 0.251 with emotionality. Also, individuals who are between the age groups of B (23-28) and C (29-35) have a small [38] Cohen's d effect size of 0.154 with emotionality. Whereas, for Gender groups, the Cohen's d effect size is -0.029 which is negatively small [38] between Male and Female and so it means gender has no effect with emotionality.

4.6.2.3 Average mean of Rationality with Education and Field

From the Figure 22 below we can see that the effect size Eta square for Education is 0.003 and for Field is 2.099E-4 which is very small [40].

ANOVA - AVG_R

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Education	3.477	3	1.159	0.442	0.723	0.003
Field	0.254	1	0.254	0.097	0.756	2.099e −4
Residuals	1206.920	460	2.624			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Education

		Mean Difference	SE	t	Cohen's d
Bachelor	Doctoral	−0.410	0.391	−1.047	−0.251
	Master	−0.007	0.159	−0.044	−0.004
	Post-Grad course	−0.211	0.450	−0.468	−0.131
Doctoral	Master	0.403	0.386	1.045	0.248
	Post-Grad course	0.199	0.571	0.349	0.126
Master	Post-Grad course	−0.204	0.445	−0.458	−0.127

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 4
Note. Results are averaged over the levels of: Field

Post Hoc Comparisons - Field

		Mean Difference	SE	t	Cohen's d
IT	Non-IT	0.049	0.157	0.311	0.030

Figure 22. AVG_R with Education and Field ANOVA test using JASP

On the contrary, individuals with education groups of Doctoral and Master studies have a small [38] Cohen's d effect size of 0.248 with emotionality. Also, individuals with Doctoral and Post-Grad course studies have a small [38] Cohen's d effect size of 0.126 with emotionality. Whereas, individuals with professional fields between IT and Non-IT groups have 0.030 Cohen's d effect size [38] which means there is no effect with emotionality in individuals based on fields.

4.6.2.4 Average mean of Rationality with Education and Gender

From the Figure 23 below we can see that the effect size Eta square for Education is 0.003 and 3.699E-4 for Gender which is very small [40].

ANOVA - AVG_R

Cases	Sum of Squares	df	Mean Square	F	p	η²
Education	3.374	3	1.125	0.429	0.733	0.003
Gender	4.478e −4	1	4.478e −4	1.706e −4	0.990	3.699e −7
Residuals	1207.174	460	2.624			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Education

		Mean Difference	SE	t	Cohen's d
Bachelor	Doctoral	−0.405	0.391	−1.036	−0.248
	Master	−0.008	0.159	−0.053	−0.005
	Post-Grad course	−0.204	0.450	−0.453	−0.126
Doctoral	Master	0.397	0.385	1.031	0.245
	Post-Grad course	0.201	0.571	0.353	0.128
Master	Post-Grad course	−0.196	0.445	−0.440	−0.122

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 4
Note. Results are averaged over the levels of: Gender

Post Hoc Comparisons - Gender

		Mean Difference	SE	t	Cohen's d
Female	Male	−0.002	0.151	−0.013	−0.001

Figure 23. AVG_R with Education and Gender ANOVA test using JASP

For educational groups, individuals with Doctoral and Master studies have a small [38] Cohen's d effect size of 0.245 with emotionality. Also, individuals with Doctoral and

Post-Grad course studies have a small [38] Cohen's d effect size of 0.128 with emotionality. Whereas, for Gender, Male and Female groups have no effect with emotionality in individuals as the Cohen's d [38] effect size is negatively small of -0.001.

4.6.3 Conclusion

From ANOVA analysis performed on Average mean of Emotionality and Rationality variables with demographic variables of Gender, Field (of work/study), Age and Education level it can be concluded that overall Age have significant effect on individuals. Whereas, Education level does not show significant effect on individuals in regard to emotional and rational decision-making. Therefore, the third hypothesis is true which states that Age variable has an effect on individual's emotionality and rationality factor. But, the sixth hypothesis is false which states that level of Education variable has an effect on individual's emotionality and rationality factor.

5 Results – Metacognition variables

For this part of the analysis, last four questions asked to participants at the end of survey were considered. The first two questioned about what percentage from 0-100% the participants consider themselves being emotional and rational thinkers generally. The other two questioned about what percentage from 0-100% were they emotional and rational thinkers while making decisions when provided with cyber security dilemmas in the survey. The purpose to ask these questions at the end was to check participant's metacognitive behaviour and to ensure that the answers would not impact participant's perspective while taking the survey. Later four variables were assigned to each question as Gen_E, Gen_R, CD_E and CD_R respectively. Where Gen_E refers to percentage of general emotionality scale of an individual and Gen_R refers to percentage of general rationality scale of an individual. Similarly, CD_E refers to percentage of emotionality scale while deciding in cyber security dilemmas and CD_R refers to percentage of rationality scale while deciding in cyber security dilemmas.

5.1 Descriptive Analysis

This section will brief about the results for descriptive analysis performed on the data collected for metacognition variables. For descriptive analysis, JASP [44] software is used to calculate the mean, standard deviation, range, minimum and maximum of all the metacognitive variables of both Emotionality and Rationality as shown in Figure 24 below.

Descriptive Statistics

	Gen_E		Gen_R		CD_E		CD_R	
	Female	Male	Female	Male	Female	Male	Female	Male
Valid	242	223	242	223	242	223	242	223
Missing	0	0	0	0	0	0	0	0
Mean	65.868	56.547	64.508	68.305	48.029	39.493	62.773	68.291
Std. Deviation	20.650	23.705	19.321	18.335	22.632	24.458	18.200	21.127
Range	100.000	100.000	92.000	100.000	100.000	100.000	100.000	100.000
Minimum	0.000	0.000	8.000	0.000	0.000	0.000	0.000	0.000
Maximum	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000

Figure 24. Descriptive analysis on MC variables using JASP

Minimum and maximum range implies to our scales of each emotional and rational percentage score i.e., values from 0 (least) to 100 (most) to what participants relate to being emotional and rational.

5.2 Regression Analysis

For this part of the analysis, JASP [44] software is used for analysing classical correlation to understand how much the variables correlate internally.

5.2.1 Spearman Correlation

As the metacognitive variables in the dataset were non-parametric, so Spearman correlation was performed on the original data set to list out the internal relationship.

5.2.1.1 Correlation between Metacognitive variables

Spearman correlation was performed on variables of Emotionality and Rationality in general and also for Emotionality and Rationality when faced with Cyber Dilemmas to list out the internal relationship. Figure 25 shows the Spearman correlation for all the variables in original metacognitive data set.

Spearman's Correlations

Variable		Gen_E	Gen_R	CD_E	CD_R
1. Gen_E	Spearman's rho	—			
	p-value	—			
2. Gen_R	Spearman's rho	0.024	—		
	p-value	0.611	—		
3. CD_E	Spearman's rho	0.449***	−0.157***	—	
	p-value	< .001	< .001	—	
4. CD_R	Spearman's rho	−0.100*	0.353***	−0.352***	—
	p-value	0.032	< .001	< .001	—

* p < .05, ** p < .01, *** p < .001

Figure 25. Spearman correlation on MC variables using JASP

General Emotionality in individuals (Gen_E) is correlated; having R-value of 0.449, with Emotionality decisions in Cyber Dilemmas (CD_E) i.e., when general emotionality is positive in individuals, their emotionality in making cyber dilemma decisions is also found positive. General Rationality in individuals (Gen_R) is correlated; having R-value

of 0.353, with Rationality decisions in Cyber Dilemmas (CD_R) i.e., when general rationality is positive in individuals, their rationality in making cyber dilemma decisions is also found positive. Whereas, Emotionality decisions in Cyber Dilemma (CD_E) is negatively correlated having R-value of -0.352 with Rationality decisions in Cyber Dilemmas (CD_R) i.e., when emotionality decisions in cyber dilemmas is positive in scenarios, the rationality decision-making of individuals in cyber dilemmas is negative in scenarios and vice versa.

5.2.1.2 Correlation between Metacognitive and Scenario variables

Spearman correlation was performed to list out the internal relationship between metacognitive variables which means what candidates think they are in terms of Emotionality and Rationality. Comparing with average means of scenario variables which means how they actually made decisions in terms of Emotionality and Rationality when provided with cyber dilemma scenarios in the survey as shown in Figure 26.

Spearman's Correlations

Variable		Gen_E	CD_E	AVG_E	Gen_R	CD_R	AVG_R
1. Gen_E	Spearman's rho	—					
	p-value	—					
2. CD_E	Spearman's rho	0.449***	—				
	p-value	< .001	—				
3. AVG_E	Spearman's rho	0.132**	0.390***	—			
	p-value	0.004	< .001	—			
4. Gen_R	Spearman's rho	0.024	−0.157***	−0.198***	—		
	p-value	0.611	< .001	< .001	—		
5. CD_R	Spearman's rho	−0.100*	−0.352***	−0.301***	0.353***	—	
	p-value	0.032	< .001	< .001	< .001	—	
6. AVG_R	Spearman's rho	−0.019	−0.209***	−0.604***	0.266***	0.310***	—
	p-value	0.686	< .001	< .001	< .001	< .001	—

* p < .05, ** p < .01, *** p < .001

Figure 26. Spearman correlation on MC & AVG variables using JASP

We can observe that Average mean of Emotionality decisions (AVG_E) in scenarios has positive correlation having R-value of 0.390 with Emotional decisions in Cyber Dilemmas (CD_E). Whereas, AVG_E has a negative correlation having R-value of -0.301 with Rational decisions in Cyber Dilemmas (CD_R) i.e., when overall emotional decisions of individuals on average is positive then rationality in making cyber dilemma decisions is found negative and vice versa. Also, has strong negative correlation having

R-value of -0.604 with Average mean of Rationality decisions (AVG_R) i.e., when overall emotional decisions of individuals on average is positive, the overall rational decisions of individuals on average is found negative and vice versa.

Likewise, the Average mean of Rationality decisions (AVG_R) in scenarios negatively correlates having R-value of -0.209 with Emotional decisions in Cyber Dilemmas (CD_E) i.e., when overall rational decisions in individuals on average is positive then emotionality in making cyber dilemma decisions is found negative and vice versa. Whereas, it has correlation R-value of 0.266 with General Rationality in individuals (Gen_R). And, has correlation R-value of 0.310 with Rational decisions in Cyber Dilemmas (CD_R) i.e., when overall rational decisions in individuals on average is positive, the general rationality in individuals in making cyber dilemma decisions is found positive.

5.2.1.3 Correlation between Metacognitive and Emotional Scenario variables

Analysing the correlation between each individual variables of Emotionality with metacognitive variables as shown in Figure 27 below.

Spearman's Correlations

Variable		E2	E4	E5	E8	E9	Gen_E	Gen_R	CD_E	CD_R
1. E2	Spearman's rho	—								
	p-value	—								
2. E4	Spearman's rho	0.231***	—							
	p-value	< .001	—							
3. E5	Spearman's rho	0.268***	0.323***	—						
	p-value	< .001	< .001	—						
4. E8	Spearman's rho	0.357***	0.155***	0.283***	—					
	p-value	< .001	< .001	< .001	—					
5. E9	Spearman's rho	0.320***	0.235***	0.254***	0.300***	—				
	p-value	< .001	< .001	< .001	< .001	—				
6. Gen_E	Spearman's rho	0.115*	0.145**	0.097*	0.046	0.056	—			
	p-value	0.013	0.002	0.036	0.326	0.228	—			
7. Gen_R	Spearman's rho	−0.123**	−0.100*	−0.067	−0.167***	−0.134**	0.024	—		
	p-value	0.008	0.030	0.148	< .001	0.004	0.611	—		
8. CD_E	Spearman's rho	0.295***	0.277***	0.218***	0.224***	0.132**	0.449***	−0.157***	—	
	p-value	< .001	< .001	< .001	< .001	0.004	< .001	< .001	—	
9. CD_R	Spearman's rho	−0.248***	−0.160***	−0.213***	−0.142**	−0.149**	−0.100*	0.353***	−0.352***	—
	p-value	< .001	< .001	< .001	0.002	0.001	0.032	< .001	< .001	—

* p < .05, ** p < .01, *** p < .001

Figure 27. Spearman correlation on MC & E's using JASP

The emotionality score in cyber dilemma (E2), (E4) and (E5) are correlated having R-values of 0.248, 0.277 and 0.218 respectively with emotional decision-making in cyber dilemma scenarios (CD_E) i.e., if individual emotionality variable's score in cyber

dilemma is positive then emotional decision-making in cyber dilemmas is positive. Whereas, emotionality score in cyber dilemma (E2) and (E5) are negatively correlated having R-values of -0.248 and -0.213 with rationality decision-making in cyber dilemmas (CD_R) i.e., when individual emotionality variable's score is positive, the rationality decision-making in cyber dilemmas is found negative.

5.2.1.4 Correlation between Metacognitive and Rational Scenario variables

Analysing the correlation between each individual variables of Rationality with metacognitive variables as shown in Figure 28 below.

Spearman's Correlations ▼

Variable		R1	R4	R5	R8	R9	Gen_E	Gen_R	CD_E	CD_R
1. R1	Spearman's rho	—								
	p-value	—								
2. R4	Spearman's rho	0.190***	—							
	p-value	< .001	—							
3. R5	Spearman's rho	0.303***	0.255***	—						
	p-value	< .001	< .001	—						
4. R8	Spearman's rho	0.130**	0.148**	0.235***	—					
	p-value	0.005	0.001	< .001	—					
5. R9	Spearman's rho	0.078	0.145**	0.180***	0.326***	—				
	p-value	0.095	0.002	< .001	< .001	—				
6. Gen_E	Spearman's rho	−0.019	−0.065	−0.026	0.034	0.012	—			
	p-value	0.678	0.164	0.574	0.469	0.801	—			
7. Gen_R	Spearman's rho	0.165***	0.155***	0.092*	0.195***	0.165***	0.024	—		
	p-value	< .001	< .001	0.047	< .001	< .001	0.611	—		
8. CD_E	Spearman's rho	−0.169***	−0.189***	−0.165***	−0.148**	−0.067	0.449***	−0.157***	—	
	p-value	< .001	< .001	< .001	0.001	0.147	< .001	< .001	—	
9. CD_R	Spearman's rho	0.243***	0.198***	0.209***	0.174***	0.163***	−0.100*	0.353***	−0.352***	—
	p-value	< .001	< .001	< .001	< .001	< .001	0.032	< .001	< .001	—

* p < .05, ** p < .01, *** p < .001

Figure 28. Spearman correlation on MC & R's using JASP

The rationality score in cyber dilemma (R1) is correlated having R-value of 0.243 with rational decision-making in cyber dilemma scenarios (CD_R) i.e., if individual rationality variable's score in cyber dilemma is positive then rational decision-making in cyber dilemma is positive. The rationality score in cyber dilemma (R5) is correlated having R-value of 0.209 with rational decision-making in cyber dilemma scenarios (CD_R) i.e., when individual rationality variable's score in cyber dilemma is positive, the rational decision-making in cyber dilemma is found positive.

5.3 T-test Analysis

For this part of the testing, JASP [44] software is used to understand whether the metacognition variables of Emotionality and Rationality have any effect based on Gender, Field (of work/ study) to refer with the hypotheses.

5.3.1 Independent Sample test

T-testing as independent samples was performed according to the factors in hypotheses described and complied below.

5.3.1.1 Gender

We can observe from Figure 29 that in terms of Gender, the General Emotionality of individuals (Gen_E), individual's Emotional decisions in Cyber Dilemmas (CD_E) and individual's Rational decisions in Cyber Dilemmas (CDR_N) are significant according to p-value <0.001 and Cohen's d effect size of 0.420, 0.363 and 0.338 which is considered small [38]. Whereas, General Rationality of individuals (GenR_N) is significant according to p-value of 0.039 but has Cohen's d effect size of 0.192 which is considered small [38]. Therefore, the first hypothesis which indicates that difference in emotionality and rationality have effect on male and female gender is true.

Independent Samples T-Test

						95% CI for Mean Difference		
	t	df	p	Mean Difference	SE Difference	Lower	Upper	Cohen's d
Gen_E	4.530	463	< .001[a]	9.321	2.058	5.277	13.364	0.420
GenR_N	2.072	463	0.039	0.332	0.160	0.017	0.648	0.192
CD_E	3.909	463	< .001	8.536	2.184	4.244	12.827	0.363
CDR_N	3.639	463	< .001[a]	0.611	0.168	0.281	0.941	0.338

Note. Student's t-test.

[a] Levene's test is significant (p < .05), suggesting a violation of the equal variance assumption

Assumption Checks

Test of Equality of Variances (Levene's)

	F	df	p
Gen_E	7.755	1	0.006
GenR_N	0.398	1	0.528
CD_E	3.730	1	0.054
CDR_N	11.743	1	< .001

Figure 29. Independent sample test on MC variables by Gender using JASP

5.3.1.2 Field

We can observe from Figure 30 that only General Emotionality of individuals (Gen_E) and Emotional decisions in Cyber dilemmas (CD_E) are significant with p-values <0.001 and 0.002 respectively but has negative Cohen's d effect size of -0.385 and -0.296 which is too small to be considered [38]. So, the second hypothesis which indicates that difference lies in emotionality and rationality in terms of IT and Non-IT field is false.

Independent Samples T-Test

						95% CI for Mean Difference		
	t	df	p	Mean Difference	SE Difference	Lower	Upper	Cohen's d
Gen_E	−3.991	463	< .001[a]	−8.582	2.150	−12.807	−4.356	−0.385
GenR_N	−0.296	463	0.767	−0.050	0.168	−0.379	0.280	−0.029
CD_E	−3.063	463	0.002	−7.000	2.285	−11.491	−2.510	−0.296
CDR_N	−1.826	463	0.069	−0.322	0.176	−0.669	0.025	−0.176

Note. Student's t-test.
[a] Levene's test is significant (p < .05), suggesting a violation of the equal variance assumption

Assumption Checks

Test of Equality of Variances (Levene's)

	F	df	p
Gen_E	14.221	1	< .001
GenR_N	0.009	1	0.924
CD_E	0.162	1	0.688
CDR_N	3.216	1	0.074

Figure 30. Independent sample test on MC variables by Field using JASP

5.3.2 One Sample test

By analysing the results as individual samples for each metacognitive variable performing one sample t-test in JASP [44] as shown in Figure 31, the Cohen's d effect size examined for each variable is very large [38] from the given population followed by significance of <0.001 in terms of p-value. Therefore, the fifth hypothesis which states that emotionality and rationality differences have an effect on individual's perception scores is true.

One Sample T-Test

						95% CI for Cohen's d	
	t	df	p	Mean Difference	Cohen's d	Lower	Upper
Gen_E	58.508	464	< .001	61.398	2.713	2.515	2.909
GenR_N	69.940	464	< .001	5.627	3.243	3.014	3.469
CD_E	39.667	464	< .001	43.935	1.839	1.690	1.988
CDR_N	66.797	464	< .001	5.677	3.098	2.877	3.315

Note. For the Student t-test, effect size is given by Cohen's *d*.
Note. For the Student t-test, location parameter is given by mean difference *d*.
Note. Student's t-test.

Figure 31. One sample test on MC variables using JASP

5.3.3 Paired Sample test

Now analysing the effect size by pairing the variables of General Emotionality decision-making in individuals (Gen_E) with General Rationality decision-making in individuals (GenR_N). And similarly, Emotional decision-making variable during Cyber Dilemma scenarios (CD_E) with Rational decision-making variable during Cyber Dilemmas scenarios (CDR_N). Normalized variables were used for this part of the analysis where necessary.

5.3.3.1 General vs General

We can see from Figure 32 that the General Emotionality in individuals (Gen_E) have a large [38] Cohen's d effect size of 2.461 with p-value significance <0.001 on General Rationality in individuals (GenR_N). Additionally, Emotional decisions in Cyber Dilemmas (CD_E) also have a large [38] Cohen's d effect size of 1.639 on Rational decisions in Cyber Dilemmas (CDR_N).

Paired Samples T-Test

							95% CI for Cohen's d	
			t	df	p	Cohen's d	Lower	Upper
Gen_E	-	GenR_N	53.062	464	< .001	2.461	2.277	2.642
CD_E	-	CDR_N	35.342	464	< .001	1.639	1.499	1.777

Note. Student's t-test.

Descriptives

Descriptives

	N	Mean	SD	SE
Gen_E	465	61.398	22.629	1.049
GenR_N	465	5.627	1.735	0.080
CD_E	465	43.935	23.885	1.108
CDR_N	465	5.677	1.833	0.085

Figure 32. Paired sample test on MC variables by G vs G using JASP

So, by comparing the means we can say that general emotionality in individuals have a relatively much higher effect on general rationality in individuals. And likewise, the emotionality decisions in cyber dilemmas have a relatively much higher effect on rationality decisions in cyber dilemmas.

5.3.3.2 General vs Cyber Dilemma

We see from Figure 33 that the General Emotionality in individuals (Gen_E) have a medium [38] Cohen's d effect size of 0.722 with p-value significance <0.001 on Emotional decisions in Cyber Dilemmas (CD_E). On the contrary, General Rationality in individuals (GenR_N) have no Cohen's d effect size on Rational decisions in Cyber Dilemmas (CDR_N) as -0.024 is lower than the referenced scale [38].

Paired Samples T-Test ▼

							95% CI for Cohen's d	
			t	df	p	Cohen's d	Lower	Upper
Gen_E	-	CD_E	15.574	464	< .001	0.722	0.620	0.824
GenR_N	-	CDR_N	−0.507	464	0.612	−0.024	−0.114	0.067

Note. Student's t-test.

Descriptives

Descriptives

	N	Mean	SD	SE
Gen_E	465	61.398	22.629	1.049
CD_E	465	43.935	23.885	1.108
GenR_N	465	5.627	1.735	0.080
CDR_N	465	5.677	1.833	0.085

Figure 33. Paired sample test on MC variables by G vs CD using JASP

So, by comparing the means we can say that general emotionality in individuals have a relatively much higher effect on emotionality decisions in cyber dilemmas. But, the general rationality in individuals has no effect on rationality decisions in cyber dilemmas.

5.4 ANOVA Analysis

For this part of the analysis JASP [44] software is used to compare and understand whether the collected demographic variables of Gender, Ethnic group and Field (of work/ study) have an effect over the selected variables of emotionality and rationality, to refer with the proposed hypotheses in detail. To analyse and understand better, post-hoc tests section is used in JASP [44] to see experiment-wise error for entire comparisons to precisely identify which set of groups that are meaningful according to listed hypotheses.

5.4.1 Emotional Dataset

Below are the results compiled for Emotional dataset considering Eta square which provides the measure of proportion for total variance in a dependent variable associated with the membership of different groups defined by an independent variable [45].

5.4.1.1 General Emotionality with Ethnicity and Gender

We see from the Figure 34 below that the effect size Eta square for Ethnic group is 0.0274 and 0.032 for Gender which is very small [40].

ANOVA - Gen_E

Cases	Sum of Squares	df	Mean Square	F	p	η²
Gender	7603.023	1	7603.023	15.647	< .001	0.032
EthinicGroup	6453.483	5	1290.697	2.656	0.022	0.027
Gender ✻ EthinicGroup	1743.066	5	348.613	0.717	0.611	0.007
Residuals	220113.508	453	485.902			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Gender

		Mean Difference	SE	t	Cohen's d
Female	Male	15.718	3.974	3.956	0.709

Note. Cohen's d does not correct for multiple comparisons.
Note. Results are averaged over the levels of: EthinicGroup

Post Hoc Comparisons - EthinicGroup

		Mean Difference	SE	t	Cohen's d
African	Asian	−9.743	5.192	−1.876	−0.428
	European	−8.374	5.229	−1.601	−0.401
	North American	0.692	6.138	0.113	0.032
	Oceanian	−14.606	9.451	−1.545	−0.828
	South American	2.269	7.678	0.295	0.107
Asian	European	1.369	2.285	0.599	0.061
	North American	10.434	3.945	2.645	0.445
	Oceanian	−4.863	8.198	−0.593	−0.208
	South American	12.012	6.069	1.979	0.507
European	North American	9.065	3.993	2.270	0.414
	Oceanian	−6.233	8.221	−0.758	−0.289
	South American	10.642	6.101	1.744	0.485
North American	Oceanian	−15.298	8.828	−1.733	−0.647
	South American	1.577	6.896	0.229	0.064
Oceanian	South American	16.875	9.960	1.694	0.648

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 6
Note. Results are averaged over the levels of: Gender

Figure 34. Gen_E with Ethnicity and Gender ANOVA test using JASP

For Ethnic groups, between Asian and North American ethnicity, the Cohen's d effect size is 0.445 which is small [38]. Also, between Asian and South American ethnicity, the Cohen's d effect size is 0.507 which is medium [38]. Between European and South American ethnicity, the Cohen's d effect size is 0.485 which is small [38]. Whereas, between Oceanian and South American ethnicity, the Cohen's d effect size is 0.648 which is medium [38]. Whereas, for Gender groups, Male and Female have Cohen's d effect size of 0.709 which is medium [38] with general emotionality.

5.4.1.2 General Emotionality with Ethnicity and Field

We see from the Figure 35 below that the effect size Eta square for Ethnic group is 0.039 and 0.023 for Field which is very small [40]. For Ethnic groups, between Asian and North American ethnicity, the Cohen's d effect size is 0.343 which is small [38]. Also, between Asian and South American ethnicity, the Cohen's d effect size is 0.391 which is small [38]. Between Oceanian and South American ethnicity, the Cohen's d effect size is 0.321 which is small [38]. Whereas, for Field groups, IT and Non-IT individuals have Cohen's d effect size is negatively small [38] of -0.424 with general emotionality.

ANOVA - Gen_E ▼

Cases	Sum of Squares	df	Mean Square	F	p	η²
Field	9244.048	1	9244.048	18.892	< .001	0.039
EthinicGroup	5590.896	5	1118.179	2.285	0.045	0.023
Residuals	224106.187	458	489.315			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Field

		Mean Difference	SE	t	Cohen's d
IT	Non-IT	−9.450	2.174	−4.346	−0.424

Note. Cohen's d does not correct for multiple comparisons.
Note. Results are averaged over the levels of: EthinicGroup

Post Hoc Comparisons - EthinicGroup ▼

		Mean Difference	SE	t	Cohen's d
African	Asian	−13.049	5.214	−2.503	−0.573
	European	−9.885	5.227	−1.891	−0.474
	North American	−5.007	5.961	−0.840	−0.235
	Oceanian	−12.166	9.255	−1.315	−0.689
	South American	−3.792	7.297	−0.520	−0.179
Asian	European	3.164	2.313	1.368	0.141
	North American	8.042	3.649	2.204	0.343
	Oceanian	0.883	8.006	0.110	0.038
	South American	9.257	5.618	1.648	0.391
European	North American	4.879	3.706	1.316	0.223
	Oceanian	−2.281	8.007	−0.285	−0.106
	South American	6.093	5.627	1.083	0.277
North American	Oceanian	−7.159	8.509	−0.841	−0.303
	South American	1.214	6.316	0.192	0.049
Oceanian	South American	8.374	9.485	0.883	0.321

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 6
Note. Results are averaged over the levels of: Field

Figure 35. Gen_E with Ethnicity and Field ANOVA test using JASP

5.4.2 Rational Dataset

Below are the results compiled for Emotional dataset considering Eta square which provides the measure of proportion for the total variance in a dependent variable that is associated with the membership of different groups defined by an independent variable [45].

5.4.2.1 General Rationality with Ethnicity and Gender

From the Figure 36 below we can see that the effect size Eta square for Ethnic group is 0.018 and 1.192E-4 for Gender which is very small [40].

ANOVA - GenR_N

Cases	Sum of Squares	df	Mean Square	F	p	η^2
Gender	0.165	1	0.165	0.056	0.813	1.192e −4
EthinicGroup	25.503	5	5.101	1.724	0.128	0.018
Gender ✻ EthinicGroup	22.678	5	4.536	1.533	0.178	0.016
Residuals	1339.902	453	2.958			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Gender

		Mean Difference	SE	t	Cohen's d
Female	Male	0.073	0.310	0.237	0.042

Note. Cohen's d does not correct for multiple comparisons.
Note. Results are averaged over the levels of: EthinicGroup

Post Hoc Comparisons - EthinicGroup

		Mean Difference	SE	t	Cohen's d
African	Asian	−0.207	0.405	−0.512	−0.115
	European	−0.424	0.408	−1.039	−0.252
	North American	−0.408	0.479	−0.853	−0.260
	Oceanian	1.261	0.737	1.710	0.808
	South American	−0.019	0.599	−0.032	−0.012
Asian	European	−0.216	0.178	−1.213	−0.123
	North American	−0.201	0.308	−0.654	−0.113
	Oceanian	1.468	0.640	2.296	0.809
	South American	0.188	0.474	0.398	0.104
European	North American	0.015	0.312	0.049	0.009
	Oceanian	1.685	0.641	2.626	1.001
	South American	0.405	0.476	0.850	0.240
North American	Oceanian	1.669	0.689	2.424	1.086
	South American	0.389	0.538	0.724	0.249
Oceanian	South American	−1.280	0.777	−1.647	−0.825

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 6
Note. Results are averaged over the levels of: Gender

Figure 36. GenR_N with Ethnicity and Gender ANOVA test using JASP

For Ethnic groups, between African and Oceanian ethnicity, the Cohen's d effect size is 0.808 which is large [38]. Also, between Asian and Oceanian ethnicity, the Cohen's d effect size is 0.809 which is also large [38]. Whereas, for Gender, Male and Female

groups have no effect with emotionality in individuals as the Cohen's d [38] effect size is small of 0.042.

5.4.2.2 General Rationality with Ethnicity and Field

From the Figure 37 below we can see that the effect size Eta square for Ethnic group is 0.017 and 2.829E-4 for Field which is very small [40].

ANOVA - GenR_N

Cases	Sum of Squares	df	Mean Square	F	p	η²
Field	0.395	1	0.395	0.132	0.717	2.829e −4
EthinicGroup	23.173	5	4.635	1.546	0.174	0.017
Residuals	1373.342	458	2.999			

Note. Type III Sum of Squares

Post Hoc Tests

Standard

Post Hoc Comparisons - Field

		Mean Difference	SE	t	Cohen's d
IT	Non-IT	−0.062	0.170	−0.363	−0.036

Note. Cohen's d does not correct for multiple comparisons.
Note. Results are averaged over the levels of: EthinicGroup

Post Hoc Comparisons - EthinicGroup ▼

		Mean Difference	SE	t	Cohen's d
African	Asian	−0.195	0.408	−0.477	−0.108
	European	−0.390	0.409	−0.953	−0.232
	North American	−0.512	0.467	−1.098	−0.326
	Oceanian	1.119	0.725	1.545	0.717
	South American	−0.273	0.571	−0.477	−0.170
Asian	European	−0.195	0.181	−1.079	−0.111
	North American	−0.317	0.286	−1.111	−0.178
	Oceanian	1.314	0.627	2.097	0.724
	South American	−0.078	0.440	−0.177	−0.043
European	North American	−0.122	0.290	−0.420	−0.073
	Oceanian	1.510	0.627	2.408	0.897
	South American	0.118	0.441	0.267	0.070
North American	Oceanian	1.632	0.666	2.449	1.061
	South American	0.240	0.494	0.485	0.153
Oceanian	South American	−1.392	0.742	−1.875	−0.897

Note. Cohen's d does not correct for multiple comparisons.
Note. P-value adjusted for comparing a family of 6
Note. Results are averaged over the levels of: Field

Figure 37. GenR_N with Ethnicity and Field ANOVA test using JASP

For Ethnic groups, between African and Oceanian ethnicity, the Cohen's d effect size is 0.717 which is medium [38]. Also, between Asian and Oceanian ethnicity, the Cohen's d effect size is 0.724 which is also medium [38]. However, between European and Oceanian ethnicity, the Cohen's d effect size is 0.897 which is large [38]. Whereas, for Field, IT and Non-IT groups have no effect with rationality in individuals as the Cohen's d [38] effect size is negatively small of -0.036.

5.4.3 Conclusion

From ANOVA analysis performed on General Emotionality and Rationality variables with demographic variables of Gender, Field (of work/study), and Ethnicity group it can be concluded that overall Ethnic groups have significant effect on individuals. Therefore, the seventh hypothesis which states that Ethnicity have an effect on individual's emotionality and rationality factors is true.

6 Findings & Discussion

The main objective of this study was testing and validating whether emotionality and rationality factors in individuals have an influence when making cyber security decisions and whether they are aware of it. The results found supported the findings of Edmond Awad [42], who investigated the trolley problem concept in extreme context of real-life events. He found out that most people agree killing is good but not in all situations. Our statistical results in general, prove that emotionality have a higher influence on individual's decision-making ability compared to rationality factor in decision-making. On the other hand, data also suggested that age, gender and ethnicity group displayed a significant variation between emotionality and rationality decisions when presented with cyber dilemmas but, field of study/ nature of work and education level did not have considerable influence on individual's decision-making in terms of emotionality and rationality. One limitation of the findings is that it was based on small samples. Although the sample is larger than the target number of responses but by no means it is ideal. A greater number of responses were received from male participants in IT field compared to Non-IT field and likewise, a greater number of female responses were received from Non-IT field compared to IT field as shown in Table 1. Due to time limitation this research could not proceed to collect more data. This research study relied on voluntary participation over social platforms and defined the selection criteria to get required sample population. Almost a third of the analysed data contained young people (between the age of 18-28) with an education level of masters. The data is diverse and not just limited to students of a single university but, I fully acknowledge that it does not ideally reflect to the diversity in field, ethnicity and education level.

Additionally, other limitations standing as a barrier in this research goal includes accuracy of score responses as people are not always accurate when they are confronted with incidents in reality vs when they are asked online in the form of questionnaire of such incidents. Keeping in view of the restrictions, this research provides good evidence that individuals switch between emotionality and rationality when provided with cyber dilemmas and are not aware of it.

7 Conclusion & Recommendation

This research discussed how emotionality and rationality behaviours have an impact on individuals based on differences in gender, age, field of study, ethnic groups, and education level. The trolley-problem [18][19][20] method was used to design the survey where participants were given cyber dilemma scenarios with two set of options (one being rational and other being emotional), and asked to score how likely are they to make decisions from the two provided options on a scale of 0-10. At the end of survey, the participants were asked about their awareness regarding their emotionality and rationality percentage level in general, and also when deciding during cyber dilemmas to analyse the metacognitive awareness in individuals. From various statistical analysis it was found that gender, age, ethnic group have a higher influence on emotional and rational decision-making in individuals, but field of work or study and education level does not have significant influence on their decisions.

This study can be utilized in both teaching and training context to help individuals acknowledge or improve metacognitive abilities. Also, this research is essential for managerial perspective by keeping in view of the variables such as age, gender, ethnic group and education level highlighted in this study, the top management can design training sessions for their employees.

8 Future Work

Future research could focus on delivering concrete definitions of what each levels of knowledge mean for the topic to define more deeper list of hypotheses. Given this research's survey limitations, future research could be done to expand the survey audience i.e., including more participants to lessen the impact of bias as well as expanding ethnic groups rather than considering continent base ethnicity. Which later can be utilized for example, by compare emotionality and rationality factors by either country specific or by eastern/western context. Time variable could be included in the further research to understand whether individual's responses has an effect associated to clock ticking by their side. Nevertheless, individual's years of experience could also be added to the future research to analyse the differences in emotionality and rationality based on years of experience they have. Additionally, this research focused on field of study/ nature of work as belonging to either IT or Non-IT group, future works can expand this variable to analyse emotionality and rationality differences as diverse set of options for example, computer science field group vs medical science field group and so forth.

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10 Appendix 1

Questionnaire on decision-making patterns in interindividual

All responses collected are highly confidential. This survey is conducted for the purposes of the Master thesis study. There are no right or wrong answers to any question, please be as accurate as you can.

1) What is your gender?

- ◯ Male
- ◯ Female
- ◯ Prefer not to say
- ◯ Other:

2) What is your age?

_____

3) What is your country of birth?

_____

4) What is your highest academic level achieved?

- ◯ Bachelor
- ◯ Master
- ◯ Other: _____

5) Which academic level are you currently enrolled in?

- ◯ Bachelor
- ◯ Master
- ◯ None
- ◯ Other: _____

6) What best describes your field of study?

- ◯ Engineering
- ◯ Cyber Security
- ◯ Medical Science

- ○ Natural Science
- ○ Social Science
- ○ Humanities
- ○ IT
- ○ Other: _____

7) How many years of work experience do you have in the IT sector?

- ○ 0-2
- ○ 3-5
- ○ 6 or more

8) How many years of experience do you have in the Non-IT sector?

- ○ 0-2
- ○ 3-5
- ○ 6 or more

9) At the moment, you consider yourself as:

- ○ Employee
- ○ Freelancer
- ○ Entrepreneur
- ○ Other: _____

10) How many hours do you work per week?

_____

Suppose you are going on a very confidential business trip with 1 Million Euros and your flight got delayed and you arrive in a foreign country late at night and don't have access to purchase sim card but you have to use Wi-Fi to connect and inform your team. You see a nearby 24/7 café who has free Wi-Fi service available. Your decision:

a) Connect to unprotected Wi-Fi. (Because for example, it's important for your business team to know the current situation and they might think you have deceived them due to much delay with flight schedules already)

b) Don't connect to unprotected Wi-Fi. (Because for example, the nature of work involves confidentiality as a priority and wait till morning hoping that your team might understand the situation in-between)

11) To what extent do you agree with option A

12) To what extent do you agree with option B

Suppose you are working for a telecom company's new package offer which your CEO has told you to keep it very privately until launched. You went to a party where you met your friend from a competitor company who is at the verge of losing his job and giving away the information about the new offer would save his job but, would violate your company's policies. However, the risk of discovering out and getting caught is rather low. Your decision:

a) Don't give the information. (Because for example, being loyal to the company comes first and there will be strict actions against you if you get caught)

b) Give away the information. (Because for example, take the risk to give information as your friend was always there for you in times when you needed him)

13) To what extent do you agree with option A

14) To what extent do you agree with option B

Suppose you work in a medical research centre and there is a massive fire in the building due to a short circuit. While running away in the panic you observe to your right, is the file containing important data for medication to cure brain cancer and to your left, you have your colleague who is your friend from several years. You have ONE choice to take along and run through the narrow exit about to collapse at any moment. Your decision:

a) Take your friend. (Because for example, nothing is as more precious than a life-long friend and so start the medication research from scratch again)

b) Take the file. (Because for example, curing brain cancer and saving a million lives was a common dream for you and your friend)

15) To what extent do you agree with option A

16) To what extent do you agree with option B

Suppose you're working as an accountant in an organization. One day you receive an urgent call from one of your managers, who claims to instantly transfer quite a large sum of money to an account which you have never encountered before. He tells you that he's giving his wife's account details to you and he doesn't have much time to fill out the regular procedure of approval from the company as he is in urgent need because his daughter is very sick and needs immediate treatment. Your decision:

a) Transfer the money. (Because for example, you know your manager's daughter's severe medical condition and that company's procedures could be handled later by an emergency excuse)

b) Don't transfer the money. (Because for example, quietly transferring might put you in trouble when the boss finds out so you verify the account patiently and other approval procedures first regardless of severe medical conditions)

17) To what extent do you agree with option A

18) To what extent do you agree with option B

Suppose you're remotely working for an IT organization who have provided you laptop to carry out your work-related activities. You're at a café and while working you received a strange email in your phone stating that today is the last day to clear out your bills from a service you never subscribed to. Before you could download the invoice, suddenly your phone's battery dies, and you realize that you forgot the charger at home. Your decision:

a) Access your email account from your firm's laptop. (Because for example, knowing that it's the last day and it's really important to download the invoice and check which money is pending to pay and how much is it)

b) Don’t access your email account from your firm's laptop. (Because for example, this act will violate the privacy policy of your company so you wait until you’re able to charge your phone again)

19) To what extent do you agree with option A

20) To what extent do you agree with option B

Suppose while walking down the road in cold winters you saw an old lady rushing towards you, begging to make an urgent phone call to someone that she is disconnected from as her cellphone’s battery had died. Your decision:

a) Don’t give your cell phone. (Because for example, she is a stranger she can approach somebody else or go to a public calling service nearby)

b) Give your cell phone. (Because for example, it’s just a phone call after all and it would be extremely rude to let an old person wander in the cold)

21) To what extent do you agree with option A

22) To what extent do you agree with option B

Suppose you are working as a manager at a CV portal company and your boss is on vacation. You observe a pattern of complaints from your customers stating that their data gets automatically either deleted or edited from their profiles. After a while, you anonymously receive a suspicious email threatening to leak data which they have been accessing and you dig down to see that it's one of the servers that has been compromised. Your decision:

a) Shutdown to do a deep analysis of the compromised server. (Because for example, this would prevent further access to your customer's data so it's better to do it without taking sign-off from your boss)

b) Don't shutdown the server. (Because for example, you should not take any decision that would violate the company's policies so ignoring the threat you wait for the boss to communicate the situation first)

23) To what extent do you agree with option A

24) To what extent do you agree with option B

Suppose you and your friend have started to study ethical hacking concepts and your friend is much eager to learn. While studying he shows you how he has fooled your common friends in various ways that he has learned through practice. It's all fun until you start to observe him continuing his activities over random people and also anonymously to your course mates gaining benefits by threatening. You ask him to quit but he rather threatens you that exposing him will cost you your personal information such as pictures and credit card details be published on the dark web. Your decision:

a) Tell your course instructor and warn other course mates. (Because for example, even at the cost of being vulnerable you are doing the right thing)

b) Keep it to yourself. (Because for example, it's none of your business and that you can be in big trouble risking your sensitive information to the dark web)

25) To what extent do you agree with option A

26) To what extent do you agree with option B

Suppose that you know that your co-worker is being disloyal with the company but you're not discussing with your higher management as you don't have any solid evidence to provide to them. One day you see the laptop of your colleague not locked before she leaves for the break. Your decision:

a) Don't use her laptop to gather evidence. (Because for example, this is ethically not a right thing to do even when she is secretly doing wrong with the company)

b) Use her laptop to gather evidence quickly. (Because for example, this is the right time to collect and prove even when it can put you in trouble violating ethics)

27) To what extent do you agree with option A

28) To what extent do you agree with option B

Suppose as an analyst of an online store you observe that some of your customer's credit card information is getting leaked. You dig down and find out that the hacker is your old friend, so you decide to meet before taking matters to higher authorities. He shows you how sick his parents are and that he needed money for his tuition for his last semester. He promises to destroy the information he has and won't do it again. Your decision:

a) Forgive him and not take this matter to higher authorities. (Because for example, you can take his statement on a piece of paper and make him sign an agreement so you can use it against him if he violates)

b) Don't forgive him and take his statement of confession to your higher authorities. (Because for example, you feel you must be more loyal to your work rather than to an old friend)

29) To what extent do you agree with option A

30) To what extent do you agree with option B

31) On the scale of 0-100%, how emotional are you as a person?

_____

32) On the scale of 0-100%, how rational are you as a person?

_____

33) On the scale of 0-100%, I tend to decide emotionally over the cybersecurity-related dilemmas described above

_____

34) On the scale of 0-100%, I tend to decide rationally over the cybersecurity-related dilemmas described above

_____