Edited Bot

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ABSTRACT

This research paper envisages the fact that as the technology is progressing gradually in the field of human-computer interaction (HCI) with the advent of messaging platforms like WhatsApp, Slack and many others towards the development of first known chatbot (Eliza) which acted as a Rogerian psychologist, to numerous chatbots for various tasks like Twyla for customer services and many others, the HCI i.e. interaction between chatbot and humans, either individually or in a group has proliferated rapidly which in turn gives rise to the futuristic reality of chatbots and humans conjoining in certain tasks using Natural Language Processing (NLP). Our proposed study concentrates on the dynamic collaboration and compares between two of such experiences : (1) HumanHuman collaboration in which the experimenter asks the participant to collaborate with another participant so as to label the images uploaded by the experimenter (2) HumanBot collaboration in which the experimenter asks the participant to collaborate with a task bot so as to label the previous images uploaded by the experimenter. Our prime research questions from this study are: (RQ1) What are the differences between the credibility and coordination of H-H interaction and H-B interaction? (RQ2) Does the personality influence the interaction between H-H interaction and H-B interaction? The results demonstrates that there is no statistically significant relationship between personality and coordination and also between personality and credibility. Also, both the types of interaction are invariant of personality dimension.The means of coordination and credibility is higher in human bot interaction as compared to human-human interaction. So, coordination and credibility slightly increases when collaborating with a bot in performing a task. There exists a negative correlation between neuroticism and total chat duration time which states that the participants with higher neuroticism trait converse for a shorter duration of time. There exists a moderate positive correlation between credibility and coordination. So, when the credibility of performing a task increases then coordination between the participants also increases.

Chapter I.

INTRODUCTION TO THE STUDY

1. EMERGENCE OF TECHNOLOGY

The advent of technology is intermittent, rather than due to the radical advancement in the computerization, but it emanates from the need to change the legacy systems to a new era of automation. [1] From the public switched telephone network (PSTN) towards wireless communications using mobile phones and then going on to VoIP technologies for placing and receiving calls over an IPv4/IPv6 network and then placing calls via mobile assistants like Siri, Alexa, Google Assistant, and many others. Such modernization doesn't arise through an isolated quantum leap in technology but from the re-application of extant technologies in a new application dimension.

Gartner Hype Cycle 2018 of emerging technologies [2],[3] is a visual aid which describes the changing perceptions of human-related to new technologies in terms of maturity and adoption of emerging hi-tech and their prevailing realm of advancements and expectations. The five phases in the hype cycle describe how the upcoming technologies move from one stage to another and thus consists of:

- Innovation Trigger: This is the first phase of Hype Cycle, also known as technology trigger, is the stage of a breakthrough in the technological developments at the initial launch of a product or other events that spark significant interest and early adopters examines their potential gains. Example: Flying Autonomous Vehicles and Biotech are in the mind of tech enthusiasts but are quite away from their development. Conversational AI platforms, 5G, and quantum computing are reaching quite increased expectations.

- The Peak of Inflated Expectations: This phase consists of the publicity derived at the initial stage of Innovation Trigger generates a tremendous amount of interest, overenthusiasm, speculations, and unrealistic expectations. The applications of the technology can be either successful or else might be a failure. Example: biochips, autonomous mobile robots, and

brain-computer interfaces and IoT (Internet of Things) have gained a massive attraction from consumers.

- The Trough of Disillusionment: This phase arises due to the unmet expectations of consumers, media, or press, and thus, these people start losing interest in the technology, which eventually makes it obsolete. This leads to the relinquishment of the topic as well as the technology by the media. Example: Augmented Reality is at the bottom of the trough, and with the investment of more venture capital might make its way in the next developmental stages.

- The Slope of Enlightenment: In this phase, even after the abandonment of technology by the press, the companies still work on the improvements of technology and examines and experiments to figure out the potential benefits and possible application of the same. The development of hi-tech practices takes place.

- Plateau of Productivity: This is the final phase of Hype Cycle which illustrates that the technology has reached the plateau of productivity and has been widely accepted and has become stable and evolves in the next generations as well. High growth adoption by the potential audience is observed and also indicates whether it is widely applicable or only to a niche market.

The following framework [2] describes using an example of the Internet. Initially people were full of hyperbole about the internet technologies, but later on, people encountered problems with the same like spams, online predators, information glut and many others which were going to create several issues but then people settled in the middle and thus realized that the internet will change everything in the future. These phenomena give use the discernment conceptually similar to Amara's Law that is people often underestimate the long run progress and overestimate the short run progress.

Figure 1.1 Expectations in the upcoming 5+ years.
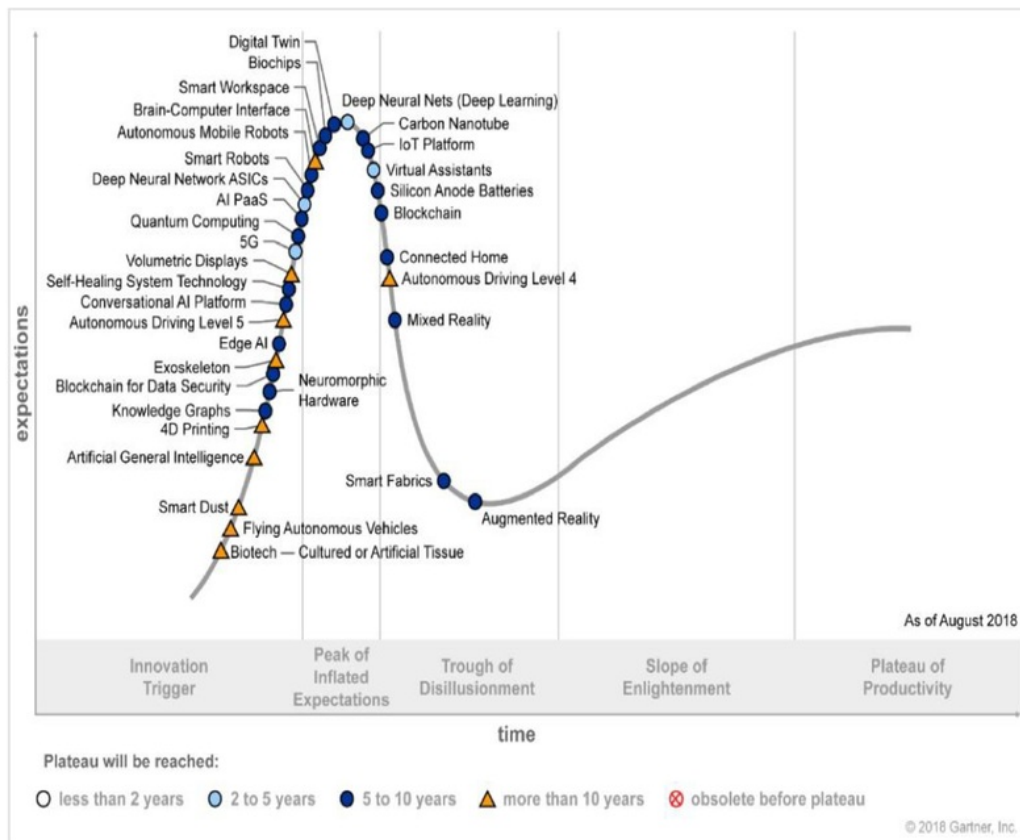
This referenced figure [2] highlights that the five phases of Gartner Hype Cycle 2018 shows how the emergence of technologies will change the perception of humans.

2. CONVERGENCE OF TECHNOLOGY

The human was closely linked to computers and machines, which lead to mechanization in the Third Industrial Revolution [4], which lead to the automation of various functions. Therefore, during that period, few tasks were performed by a human, and few tasks were automated. Due to the widespread use of multiple applications of technology in different domains and need for the interaction of computers and machines independently by the use of Artificial Intelligence lead to smartization in the Fourth Industrial Revolution. [4]

Figure 1.2 The shift in technology from Third to Fourth Revolution
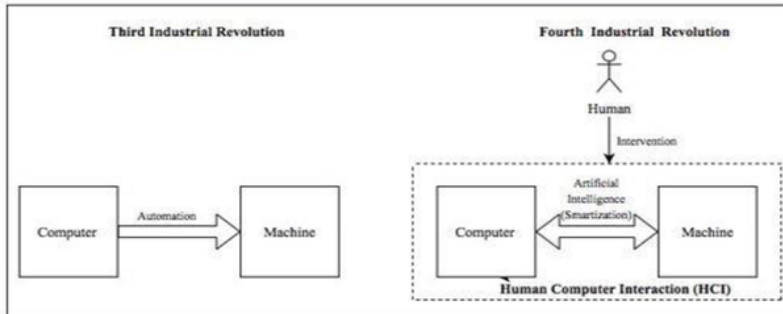
The figure illustrates that automation was the major benediction from the Third Industrial Revolution whereas a significant change was seen due to the introduction of human intervention by making use of AI which leads to HCI in the Fourth Industrial Revolution and is known as the era of Smartization.

Technological Convergence was introduced during the Fourth Industrial Revolution. Technological convergence [5] is the integration of different technologies on a shared device or platform which shares resources and information and thus interact with each other. So, Fourth Industrial Revolution experienced the introduction of Virtual Assistants/ Chatbots and many others which introduced disruptive innovation by combining and merging different technologies. The fourth revolution revolves around the fusion of existing Third Revolution technologies with digital, physical, and biological categories.

Technology convergence simplest example is a smartphone which incorporates telephone for telephony feature (voice) , camera for pictures , music player for audio , digital personal assistant for mobile assistance , internet for productivity applications, home assistant , health care applications and many others as various technologies are combined and integrated into a single device that can be accessible at anywhere, anytime and at anyplace.

Table 1.1 Technological convergence in advanced technologies

	PHYSICAL	DIGITAL	BIOLOGICAL
Advanced Technologies	1. Autonomous Vehicles 2. 3-D Printing 3. Advanced Robotics	1. IoT remote monitoring technology 2. Revolutionary technologies like Blockchain	1. Genetic engineering technology 2. Bioprinting
Megatrends	1. Wearable Internet 2. IoT 3. Implantable technology in health care	1. Connected Homs 2. Artificial Intelligence 3. Robotics and services 4. Self-driving cars	1. 3D Printing and manufacturing 2. 3D Printing and human health 3. Neurotechnology

This referenced table [4] illustrates the technologies which are undergoing convergence to make use of these technologies on a single device.

Figure 1.3 Technological convergence example of Smartphone
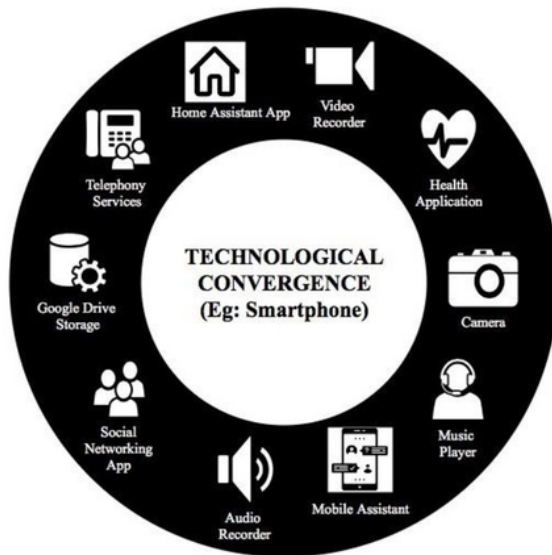
The figure illustrates that the technologies have been integrated into a single device on a common platform so that it can be used at anyplace, anytime and anywhere.

3. COLLABORATION WITH TECHNOLOGY

The emerging technology needs to collaborate with the human being to mitigate the peril associated with the modernization. Event the Human-Computer Collaboration (HCI) has increased in the current scenario by making the use of Natural Language Processing (NLP)., sermonize about how Artificial Intelligence could build an immortal dictator and the emerging technology make a considerably higher to the world hazard than an atomic fire with North Korea. Musk said " The least scary future I can think of is one where we have at least democratized AI because if one company or small group of people manages to develop godlike digital super-intelligence, they could take over the world" [6] and also added "At least when there's an evil dictator, that human is going to die. But for an AI, there would be no death. It would live forever. And then you'd have an immortal dictator from which we can never escape." [6]

Does emerging technology pose a threat to human manpower in an organization? Is it a war against Artificial Intelligence? No, even the billionaire entrepreneur Elon Musk warned the world and asked to collaborate with the emerging Artificial Intelligence to avoid the risk of losing their jobs and to make the most out of the growing technology to safeguard themselves. For example Chatbot is a result of Artificial Intelligence.[6]

So, artificial intelligence based system poses a threat to humanity as they can outperform humans at various circumscribed tasks due to its improved computational resources, computing power, and the data availability and data granularity at multiple levels and therefore the need of Agriculture [7] (including both human and machine) arises.

The artificial intelligence has several drawbacks. The artificial intelligence algorithm relies on data completeness and data integrity. If the data is inaccurate, it will lead to the training of false data, and it is biased towards the collected data. For example, Mexican restaurants are provided with poor ratings as word Mexican is associated with illegal activities.[7] Such shortcomings of AI systems are solved by Human-Computer Interaction (HCI). Human Computation and Social

Machines is an example of human and machine collaboration wherein human and computer team up with each other to solve problems in which computer performs specific tasks while a human can perform better in general functions. So, machine and human exists in a state of symbiosis. Human and computer interact with each other and delegates tasks.

A chatbot is an example of human-computer collaboration wherein human and chatbot converse on a conversational platform and performs a function allotted to them. A chatbot is a product of Artificial Intelligence (AI), is an artificial conversational entity, which is an AI program used to conduct interactive conversations like humans by making use of Natural Language Processing (NLP) via voice commands, text chat or both. The advancement in technology and growth in innovation in the field of Artificial Intelligence have to lead to an evolution of the dynamic chatbots which are used for collaborative tasks such as collaborative searches on Slack, Facebook, and many others.

4. TASK CREDIBILITY, TASK COORDINATION, AND PERSONALITY

"The elements for example task believability activities which demonstrates that colleagues confided in one another's ability task coordination and identity measurement are a piece of this examination contemplate".

How colleagues synchronize their activities to finish the group task is alluded to as group coordination that seems to be, group coordination [8] includes who among the individuals does what, just as when, where, and how they complete their assigned undertakings. Group coordination is a basic segment of fruitful group execution.

Group coordination [8] can differ on in any event two measurements: expressness and time. Colleague endeavors to facilitate may happen before collaboration starts or amid the way toward cooperating. Coordination might be inferred, in light of implicit desires and aims, or it might be

express, founded on verbal understandings or formally embraced plans that completely and assign who is to do what and when they are to do it.

"Personality" [9] gotten from the Latin expression "Persona" signifies "a cover worn by theater entertainers to speak to their job and identity in the play and the valid self which incorporates one's characteristic inspirations feeling propensities and thoughts" (Chan, 1996). Allport (1974) "characterized identity as a dynamic association inside the person of those mental frameworks that decide his novel changes in accordance with his condition".

Chapter II.
LITERATURE REVIEW

1. THEORETICAL FOUNDATION OF THE STUDY

The Wizard of Oz User Study inspected the utilization of a dynamic hunt box amid community oriented data looking for undertakings facilitated utilizing the Slack informing framework This past investigation of communitarian look in changed measurement rotates around inquiry bots that intercede progressively and analyze between two intercession types 1 the pursuit bot presents inquiries to clients to assemble the data it needs to create results and 2 the hunt bot screens the discussion among the partners, gathers the essential data, and afterward shows indexed lists with no extra contribution from the clients Does it research the impact of a hunt bot and its intercession type on members' communitarian experience the impact of an inquiry bot's mediation type on members discernments about the pursuit bot and dimension of commitment with the pursuit bot and members' impressions of a dynamic hunt bot". And as we see that "this communitarian seek is regularly researched in view of two measurements time and space the time measurement centers around whether the joint effort happens synchronously or nonconcurrently while the space measurement centers around whether the partners are colocated or remote.

The inquiry bot mediated in two distinct ways 1 by bringing data and 2 by deriving the required data from the discussion and legitimately giving list items [10]. The outcomes demonstrate that the hunt bot improved the members' communitarian experience and decreased the need to seek autonomously and members' observations about their synergistic experience were somewhat better in the condition where the inquiry bot mediated by straightforwardly giving logically important outcomes and without evoking The sort of intercession of the pursuit bot did not fundamentally influence member recognitions about the hunt bot The hunt bot asked follow-up inquiries that were significant to the undertaking and dependably delivered pertinent outcomes. The members revealed various inspirations for connecting with the inquiry bot various increases acquired from the pursuit bot and different explanations behind maintaining a strategic distance from the hunt bot members announced maintaining a strategic distance from the inquiry bot when the intercession was too early that is before understanding the assignment and past the point of no return which is

subsequent to comprehending it. The outcomes proposed that dynamic inquiry bots can improve clients cooperative experience and that the intercession type does not altogether influence clients' discernments and dimension of commitment This finding is predictable with earlier work on unique assistance frameworks and interferences. This Wizard of Oz User Study investigate have distinguished basic difficulties and open doors for rising shared operators for example inquiries concerning whether individuals connect with specialists as they do with their human partners and inquiries regarding whether a specialists conduct may impact the manner in which human associates communicate with one another.

Another research [11] on the transactive memory has discovered a positive connection between transactive memory framework advancement and gathering execution in single undertaking lab and impromptu gatherings transactive memory is a mental theory initially proposed by Daniel Wegner in 1985 as a reaction to prior speculations of bunch mind for example oblivious compliance a transactive memory framework is an instrument through which bunches all things considered encode store and recover learning firmly related research on shared mental models and ability acknowledgment underpins these discoveries.

In this investigation of transactive memory in the hierarchical gathering [11] the creator analyzed the connection between transactive memory frameworks and execution in develop proceeding with gatherings A groups transactive memory framework estimated as a blend of learning stock information specialization and transactive memory agreement is decidedly identified with group objective execution outer gathering assessments and interior group assessments the positive association with gathering execution was found to hold for both errand and external relationship transactive memory frameworks. The transactive memory structure clarifies these discoveries as wegner in 1986 presented the idea of transactive memory frameworks as an approach to see how the group arrange to take care of data issues wegner characterized the transactive memory framework as a blend of the information controlled by each and aggregate familiarity with who realizes what he contended that this framework gives people access to a dimension of skill that nobody part could would like to recall the specialists searched for gathering elements that were suggestive of the

presence of a transactive memory framework these elements included specialization of undertakings task coordination exercises and errand believability activities with proof that bunch individuals confided in one another one skill and these investigations uncovered that understudy bunches prepared as gatherings performed superior to anything bunches prepared separately and that the connection among preparing and execution was interceded by the circuitous proportion of transactive memory. In this investigation [11] of 27 groups from a few innovation organizations "a scientist found that a 15-thing self report scale intended to quantify specialization validity and coordination was related with group and director assessments of group execution".

Outside relationship learning stock transactive memory agreement information specialization clarified exceptional fluctuation in gathering execution this examination 11 gives proof that exact transactive memory is significant for the powerful working of proceeding with hierarchical gatherings and producing bunch capacities includes more than basically gathering a gathering of people with a wide scope of specific learning despite the fact that this learning base may set up a solid establishment for a fruitful gathering real gathering execution relies on how well the individual individuals can take advantage of the amassed information base and how well the individual individuals can reconfigure this learning base in new circumstances. Assignment transactive memory agreement was determined by estimating bunch accord on who was the gathering master for every one of the 11 task aptitudes via gatherings whose individuals distinguished a similar individual as a specialist on a given capacity have colossal assignment transactive memory accord as each gathering part's decision of master for every expertise was recorded and Standard deviation scores were determined to quantify bunch part accord of master recognizable proof for every capacity these 11 expertise accord scores were consolidated to make a solitary mean undertaking transactive memory agreement for the gathering for a lower standard deviation score demonstrates more prominent gathering accord and transactive memory accord is a scattering variable that is fittingly estimated utilizing standard deviation scores.

Different past looks into which connect the transactive memory with the gathering execution has concentrated on roundabout proportions of transactive memory frameworks for example bunch part impression of learning specialization validity and coordination or perceptions of gathering

practices that demonstrate more elevated amounts of specialization believability and coordination. The same is stomped in (11,15) in the equivalent.

2. COCHAT

Chatbots have drawn significant attention of late in both industry and academia. For most task completion bots in the industry, human intervention is the only means of avoiding mistakes in complex real-world cases. However, there is no existing research work modeling the collaboration between task completion bots and humans. CoChat [16] is a dialog management framework to enable effective collaboration between bots and human workers for task completion. In CoChat, the human can introduce new actions at any time to handle previously unseen cases. Extensive experiments on real-world datasets demonstrate that CoChat can relieve most of the humans' workload and get better user satisfaction rates comparing to other state-ofthe-art frameworks.

Task completion bots are attracting lots of attention from both industry and academia. They aim to help users complete specific tasks (e.g., booking movie tickets) via more natural interactions, i.e., conversations. The focus of task completion bots is to complete tasks successfully while achieving high user satisfaction. A good dialog manager is a crucial component for such task completion bots. It takes language understanding results as input and decides which action (e.g., asking for a movie name) should be considered. Therefore, the dialog manager directly controls dialog flow, determines the success/ failure of task completion, and also affects user satisfaction. In CoChat, the human can intervene in the learning process at any time, and the dialog manager can be continuously improved via learning from labeled dialog logs, humans' feedback, and users' feedback.

Figure 2.1. CoChat framework
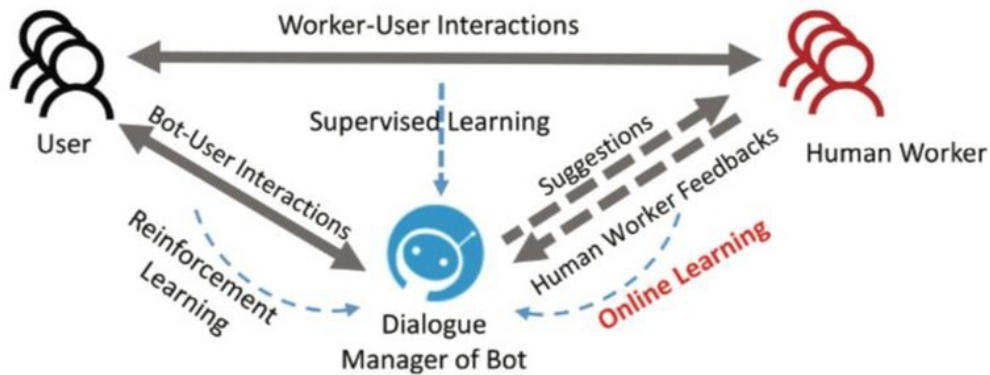
As illustrated in this referenced figure [16], the dialog manager is firstly initialized via supervised learning. After that, the bot can collaborate with human, suggest actions for them to reduce their workload, and continuously learn from their feedback via online learning. When humans are unavailable, e.g., off work, and users are willing to try the bot, the bot can directly interact with users, and its dialog manager can be further improved via reinforcement learning. Briefly, the dialog manager is continuously enhanced to maximise user satisfaction and relieve human workers' workload during collaboration.

Having human workers involved generally allows the introduction of new actions to handle complex or unseen cases, and thus raises challenges of learning further activities for the dialog manager. In previous works [17, 18], the dialog manager requires a fixed action set and then learns to select one action from it to handle each case. However, this setting is unrealistic when humans are involved in handling complex or unseen cases because new actions outside the original action set will probably be required urgently to facilitate task completion.

For example, a customer support centre may receive questions about problems in their latest product, which may have never been seen before and therefore cannot be handled by the bot. Then "tell users how to handle these new problems" becomes a new required action, and it will be provided by human workers who intervene to handle such cases. The dialog manager should also learn this further action for better suggesting actions and handling similar cases later. Such

challenges of learning new activities have not been well studied before. Though previous work can adapt to further measures by retraining their corresponding models, they suffer the risk of losing accumulated academic knowledge, as learning processes like reinforcement learning often cannot be reproduced precisely.

3. PERSONALITY

Social trade is impacted by numerous factors.[19] Several ongoing exploration advancements have taken a gander at subjects choices from the point of view of identity brain research and recommended that singular character and identity type impact subjects decisions in lab tests and our utilization of the game-theoretic way to deal with human robot connection gives a model of observational estimation of trust towards robots for this technique can be connected to a robot and future information can be effectively thought about. Examination of explicit identity attributes has indicated 20 that outgoing individual identity type subjects for coordinated towards the goal world showed more grounded than ordinary sentiments of trust with the sum sent in the trust game since elements like related involvements with robots and the subjects identity may impact the estimations respectively for the equivalent. The aftereffects of the above investigation proposed that past encounters with nonhuman operators impacted the association and the members contingent upon their identity characteristics depended the robot and furthermore outgoing person individuals were progressively open and bound to supply to a robot with a higher sum in the trust game. In this way, this examination is additionally appropriate to all the social trade Human-Computer Interaction of bots too. [19]

Another investigation's information [25] recommended that underlying impressions dependent on the human to human cooperation content may affect real connection and the outcomes that outcome from it and by and large members responded decidedly to the robot air conjuring modifiers like inviting supportive and amiable. Members would in general have various desires for the people sticking to a similar content, which prompted increasingly antagonistic attributions of the accomplice and association as confirm by the example information in the more prompt rich condition of eye to eye human correspondence members encountered an infringement of relational conver-

sational standards including suddenness correspondence of self disclosure and conversational animacy of their accomplice. Individuals may understand that robots have restricted methods for giving conduct input contrasted with people by remembering individuals balanced desires robots affirmation prompts might be amplified and lead to hyperpersonal impacts. With robots and other machine conversationalists progressively sent in normal, potential hyperpersonal impacts in HRI and Human-Machine Communication all the more for the most part warrant extra research regarding further checking the wonder indicating the limits for its activity and exploring potential consequences for social impact as view of loving and social nearness could be affected by the length of the discussion [25]. This examination on individuals' desires for beginning communications with social robots exhibits support for a human to human collaboration content since at present there has all the earmarks of being a human centric hope inclination in correspondence whereby individuals for the most part accept their correspondence accomplices will be people or human like and experience an infringement when their accomplices are less humanlike. Comprehensively, individuals try to utilize a similar judgment and association designs created for use with other individuals in their correspondence with machine accomplices.

4. CREDIBILITY AND COORDINATION

Research on transactive memory frameworks[26] the transactive memory allude to a specific division of work that creates inside a group concerning the encoding, stockpiling, and recovery of learning from various domains the meanings of transactive memory by and large contain two points of view one is the mix of individual learning, and the other is the familiarity with who recognizes what inside the group . The same is seen in ref [27-28]. A gathering bolstered by transactive memory frameworks will perceive, trust, and arrange specific information among colleagues.

Transactive memory frameworks have been considered to have a few measurements. The generally acknowledged measurements are proposed by Lewis[26]. The measurements and definition are:

i.   "pecialization: The separated structure of part information.

ii.   Credibility: Members' convictions about the precision and unwavering quality of other individuals learning.

iii.   Coordination: Effective and coordinated learning preparing.

This exploration proposes and affirms the significant capacity of the idea which prompts higher group execution and as indicated by this rationale while starting information the board ventures administrators should concentrate on representatives apparent learning fulfilment since the quintessence of information the executives is to concentrate on individuals and the manner in which individuals think and also putting workers with various sorts of ability into one group is probably not going to deliver the ideal outcomes except if they can create shared validity and organize their errands viably[26].

Another examination expressed that Lewis additionally demonstrated that the validity of undertaking execution was a significant component of transactive memory frameworks TMS and past examinations on trust propose that trust is a multidimensional build that has intellectual components like dependability as past examinations on TMS have concentrated essentially on the skill and unwavering quality part of trust as it identifies with the advancement of TMS since In that capacity we characterize perception based trust as colleagues convictions around each others capacity and unwavering quality to complete the undertaking[27]. Past research recommends that groups with very created TMS show a capacity to facilitate errands among colleagues viable"[27, 32, 33].

"Weick and Roberts contended that to organize information among colleagues they have to confide in every others abilities as Zand 27 set that when colleagues experience the low trust practices of different individuals as they are reluctant and far fetched to share data for dread that the other party will utilize the data for its addition and he further discovered that high trust groups traded thoughts all the more straightforwardly plus had more clear objectives and searched out increasingly elective activities also were progressively propelled and fulfilled were better at finding and using other individuals abilities and showed to a greater degree an eagerness to be a piece of the gathering than low trust groups for the equivalent. Huemer et al additionally contend that colleagues with higher trust are bound to cooperate agreeably and reliably and subsequently luhmann expressed

that all things considered a high level of cognizance based trust lessens the multifaceted nature among social on screen characters in this way possibly upgrading the group's undertaking learning coordination capacity.   [27]

Figure 2.2 Structural model of a transactive memory system in virtual teams
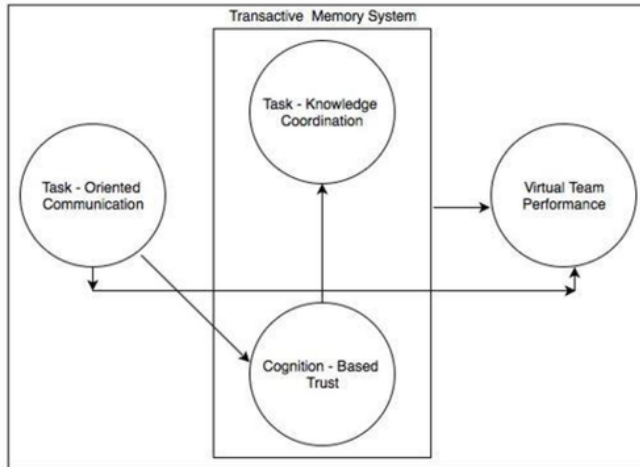
This referenced figure [27] summarizes the conceptualization of the structural aspect of TMS in virtual teams.

Powerful errand situated correspondence likewise advances group exercises that are straightforwardly identified with undertaking execution without requiring the coordination of learning and skill among colleagues that is especially valid in virtual group situations where task communication is the main method for playing out the errand. As undertaking focused correspondence is successful in PC intervened exchanges when task interdependency and vulnerability are high factors that are commonplace in virtual group settings. [27]

Trust is the primary reason why people accept something[34]. Trust can also define the way people interact with technology. The trust in technology can have various dimensions as mentioned in the figure. The human characteristics, environmental factors and lastly the technology or machines characteristics.

Figure 2.3 Trust in technology

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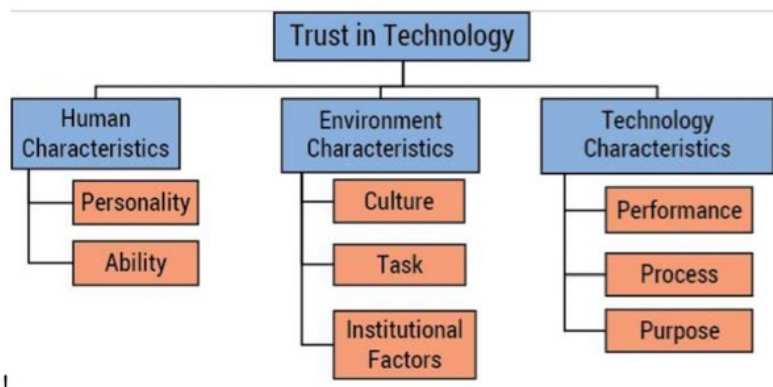
In case of technology and human collaboration, the utilization of advice is the evidence for presence of trust [35]. Competence related factors are only parameter for evaluating the technology [34].

For the development of trust between humans and machines, there is a biases which exist for the machines, where machines are expected to perfect ((i.e., with an error rate of zero) [36]. Efficiency and rationality are two parameters which humans have as expectations from the machines [37].

Trust between humans for advice is more resilient because they have a long history and experience with other humans but their trust in automation and algorthim is less experienced and hence generalization can not be made which makes one bad example salient [38].

For the trust and relationship to develop, there has not been enough time [39] and experience with technology to form a trust worthy relationship.

There is a dynamic nature of trust which changes with the growing experience of the human with the machines. The past experience contributes to the further development or depreciation of the trust in the machine.

Chapter III.
RESEARCH METHODOLOGY

1. RESEARCH PROBLEM

This research investigates the impact on credibility and coordination when users perceive that the task bot dynamically collaborate and participate in the interaction so as to complete the task that is to caption the image, and this research focuses on two types of interventions: (1) The experimenter asks the participant to collaborate with another participant so as to label the images uploaded by the experimenter i.e. Human-Human collaboration (2) The experimenter asks the participant to collaborate with a task bot so as to tag the previous photos uploaded by the experimenter, i.e., Human-Bot collaboration.

Two extra discoveries from earlier research in communitarian look rouse the investigation of dynamic connections utilizing informing stages for example Facebook Slack and right off the bat couple of examinations have discovered that visit based correspondence is a prevalent movement amid the synergistic hunt as furthermore few examinations explore that members talk about their undertakings before playing out the errand.

Q1: examine differences between the credibility and coordination of H-H interaction and H-B interaction due to the collaborative experience of participants. We address two research questions. First we center around members self-revealed recognitions about the joint effort for example their trust in the hunt bots capacity to enable believability to level and coordination level". Second we center around target proportions of the shared exertion for example task culmination time the quantity of messages traded which recommends whether there was open correspondence or errand situated correspondence just inside the group that is between members and we likewise center around members choices to draw in with the errand bots recommendations.

Q2: In the second research question we explore whether the identity of the members impacts the cooperation that is the Human Human Interaction and Human Bot Interaction as this address this question from two perspectives. First is, whether the personality of the participants affects the interactions that are human human and human bot communications respectively and whether the personality of the participants affects the kind of interactions. Second is, whether certain particular personality traits are associated with human-human and H-B interactions or else the personality remains invariant concerning the type of communications that is H-H Interaction and H-B Interaction respectively.

2. CLIENT STUDY

To explore the same, we led a lab think about with 40 sets of members partitioning them into control gathering for human human communication and exploratory gathering for human bot collaboration. The 40 sets were part into two gatherings, the control gathering and the test gathering. Thus, there were 20 sets in the control bunch which encountered the human human communication and remaining 20 sets in the trial bunch which encountered the human bot collaboration.

Members were undergrad and post grad understudies under the age gathering of 18 years to 30 years and were enlisted two by two and also each pair of members worked together on three assignments that required marking the pictures which were transferred by the experimenter. Members utilized the Slack informing stage to impart and were additionally given a google

chrome program which runs the online slack stage and furthermore a google structure was opened which comprised of post association poll identified with validity and also coordination and identity measurements which were set. As also members were situated in the diverse room and did not see each other before cooperations and were solicited not to convey outside from the slack stage and post correspondence they were uncovered with the analysis and the other client and were approached to share their criticism for their collaboration verbally just as by filling the google structure.

3. PROTOCOL OF STUDY

Prior to beginning the test, the experimenter sketched out the examination convention depicted Slack and portrayed the essential usefulness of an undertaking bot for human bot cooperation and furthermore the fundamental usefulness for human human correspondence as the vast majority of the clients didnt know about assignment bot so it was basic to clarify how bot in theoretical will work to our members. Members were informed that an errand bot is an intelligent specialist that will work together in a Slack discussion to give a name to the pictures. Members were informed that task bot inserts dynamic content for the talk legitimately in the visit window as likewise the members were informed that the assignment bot utilized in the investigation was not intended to react to explicit inquiries which were not important to the errand and could just acknowledge contribution to reaction to a progressing task bot or members' started inquiry.

Members were allocated three undertakings that expected them to name three pictures shown in Appendix 3 and facilitate towards a solitary inscription a specific picture. Every member had an individual inclination for a subtitle and they have to collaborate with one another to achieve a mark for the picture in accord as there was no time imperative for naming the three pictures participants were informed that they could use whatever means necessary to reach an agreement and were instructed not to change the browser window on their own and also not to disturb the setup of the Slack platform.

In the wake of finishing every one of the three assignments, members were approached to finish a post-task survey on credibility, coordination, and personality dimensions (Appendix 1, 2). This

questionnaire was made using Google form. Then the participants were introduced to each other, and the study was explained to them that they were conversing with another human in both the scenarios and the bot was hypothetical, and it was another participant sitting on the other end. The participants were requested not to disclose the study as the study was to be conducted on several other participants. The participants were asked for their experience and what changes would they have made if they knew that another user was not a bot but a participant in H-B interaction. Also, how interaction with a bot was different from a regular human-human communication for them and whether they were comfortable with the bot and accepted the bot responses quickly or were challenging their replies as well. In H-H interaction, participants were asked what changes would they have made if they knew the other participant beforehand and how such disclosures would have impacted in labelling the images.

We used Slack online platform to capture participants' screen activity of the chat and store the conversation in the slack platform as well as store the chat for every interaction in two documents, that is, one for the H-H interaction and another for the H-B interaction. Conversation data is collected and the linguistic variables [40] are studied so as to know the pattern or style of conversation and also a post task questionnaire is filled by the participants for studying credibility, coordination and personality variables.

4. LABORATORY TASK

The two types of interactions that is the one of H-H interaction and H-B interaction had same setup for the task collaboration task of labelling the three images. The experimenter moderated the task, and explained about the task, asked them to fill the post-task questionnaire and took their feedback about the same.

Participants completed three image labelling tasks (Appendix 3). There was no right or wrong for the images. The images were illusion images, and every participant will have a different perspective on the three different pictures. Participants were "given genderneutral names (as User 1, User 2) irrespective of the fact that whether it was a human according to the participants in H-H interaction or a bot (hypothetical) according to the participants in H-B interaction.

Objective: The participants need to collaborate virtually with each other as per the type of interaction (either human or bot) to label the three images in consensus, and there was no communication outside the Slack Platform before the experiment and during the investigation.

The participants were made to sit in two separate rooms for both the types of interaction that is one participant in the computer lab of Delhi Technological University, East Campus and the other participant in another place of Delhi Technological University, East Campus with the Experimenter. The Experimenter uploaded the three images, and the participants need to label the pictures mutually to give a single caption in the end for the image. In total, three photos were tagged on mutual consensus.

In H-H interaction, the participants were told that they need to collaborate virtually with another participant, and the participants weren't aware of who they were interacting before the experiment. Post experiment, they were revealed whom they communicated to and were asked for the feedback related to the research.

Whereas in H-B interaction, the participants were told that they need to collaborate virtually with a bot, whereas there was no bot present in actual. Both the users were advised that they are interacting with a bot, but in real, they were interacting with each other. Post experiment, they were revealed whom they communicated to and were made aware of the fact that they were not interacting to a bot, but it was another user and were asked for the feedback related to the experiment. All the participants were asked not to disclose the investigation to others as this experiment needs to be performed on other participants as well.

There were no constraints of time for this task, and participants were asked not to make spelling mistakes and to cross-check the sentence before sending it on the Slack platform. Before the experiment, participants were instructed how to use Slack platform for the task, and also they were then asked to fill the post-task questionnaire created using Google forms, and after that, they were disclosed about the experiment, and the participants involved so that the results don't get affected by such disclosures.

5. POST-TASK QUESTIONNAIRE

All the shut finished inquiries were posed to utilizing understanding proclamations with a 5 point scale with marked endpoints (unequivocally deviate (1) to firmly concur (5)). This post-task survey was created using Google forms, and the responses of the participants were recorded in the Google spreadsheet. The information like their user name, type of interaction they were involved in, whether they have prior experience with any bot was collected via the google form, and demographic questions like their course, age group and also their gender were also collected.

6. TOOLS USED

The tools used in the research study are :

i. SPSS Software was used so as to conduct Comparison between the means of the five personality traits in both H-H and H-B and also the comparison of mean was studied for credibility and others like coordination and interaction variables like duration of chat and number of messages exchanged & number of words exchanged.

ii. SPSS was also used for performing the Pearson correlation analysis between credibility, coordination, personality traits (OCEAN), and interaction variables. Also, independent samples t-test was conducted using SPSS.

iii. Regression analysis between for total chat duration per conversation was performed and neuroticism was kept as predictor variable using SPSS.

iv. Slack online platform was used to conduct the research wherein the participants collaborated with each other in order to label three images.

v. Word counter online platform was used for counting the number of words exchanged per conversation, that is, chat which was conducted on Slack.

Chapter IV
ANALYSIS AND ITS INTERPRETATION

1. DATA ANALYSIS AND FINDINGS

In our experimental design research, individual participant pair had an opportunity to experience only one interaction, that is, either H-H interaction or H-B interaction. The interaction comprised of only relevant conversation. At participant-pair level, n=20 but at the participant level, n=40. We used independent sample t-test, also known as two sample t-test , which is an inferential statistical test that will determine whether there is a statistically significant difference between the means in two unrelated groups (as the participants in each group is different) that is control group (H-H interaction) and the experimental group (human-bot communication).

2. PEARSON CORRELATION ANALYSIS FOR PERSONALITY TRAITS

Table 4.1 Pearson Correlation Coefficient For Personality Trait

Group		N Mean	A Mean	C Mean	Total Chat Duration Mean
Human - Bot Interaction	E Mean	0.377*	0.472*		
	O Mean	-0.494 **			
Human - Human Interaction	E Mean		0.348*	0.324*	
	O Mean	-0.469 **			
	N Mean				-0.42 **
	C Mean		0.342*		

** Correlation is significant at the significance level 0.01 (2- Tailed)

* Correlation is significant at the significance level 0.05 (2- Tailed)

The Pearson correlation coefficient between the big five personality traits are depicted in above in table 2, and the relationship between the personality traits are grouped for two interactions, that is, H-B interaction (or experimental group) and the H-H interaction (or control group). The above table highlights the analysis, as stated below:

i. For the experimental group, that is H-B interaction; Extraversion is positively correlated to Neuroticism where r = 0.377 and is significant at 0.05 level and the strength of the association is

medium for the same. So, the participants who had Extraversion trait also had Neuroticism traits which were related moderately.

ii. Extraversion is positively correlated to Agreeableness for both the groups, that is experimental group, (or H-B interaction) where r = 0.472, that is for the control group (or human-human communication) where r = 0.348, and are significant at 0.05 level. The strength of association for both the groups is medium, respectively. So, the strength between extraversion and agreeableness is slightly higher in the experimental group (H-B interaction).

iii. Openness is negatively correlated to Neuroticism for both the groups, that is, experimental group (or H-B interaction) where r = -0.494, and control group (or H-H interaction) where r = -0.469, and are significant at 0.05 level. Also, the strength of the association is medium for both groups. So, the strength between openness and neuroticism is approximately equal in both groups.

iv. For the control group, that is, H-H interaction, Extraversion is positively correlated to Conscientiousness, where r = 0.324 and is significant at 0.05 level wherein the strength of the association is medium. So, during H-H interaction, participant displayed a moderately positive relationship between extraversion and conscientiousness.

v. Also, for the control group (or H-H interaction), Neuroticism is negatively related to Chat Duration where r = -0.42 and is significant at 0.01 level, and the strength of the association is medium for the same. So, the participants with Neuroticism traits were found to be chatting for a shorter duration and were interacting less to label the images and were agreeing quickly.

vi. Apart from this, credibility and coordination are not at all significantly correlated with any of the personality traits at 0.01 and 0.05 level of significance.
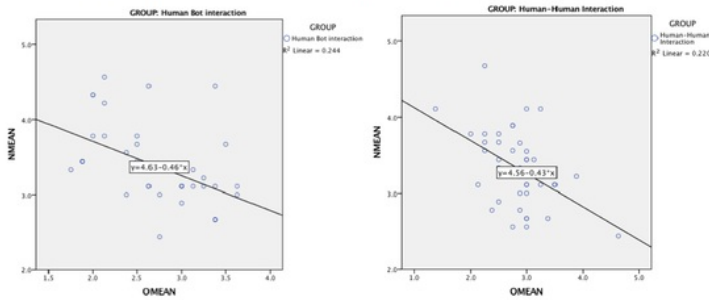
3. SCATTER PLOT DIAGRAM FOR PEARSON CORRELATION ANALYSIS FOR THE PERSONALITY TRAITS

Figure 4.1 Scatter plot of Extraversion and Agreeableness
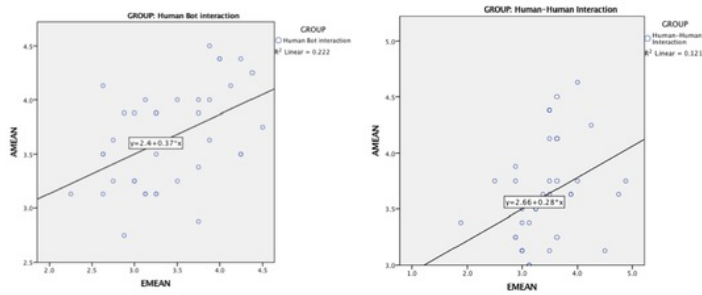
The above figure illustrates that there exists a positive moderate correlation between Extraversion and Agreeableness for both the groups.

Figure 4.2 Scatter plot of Extraversion and Agreeableness

The above figure illustrates that there exists a negative correlation between Openness and Neuroticism for both the groups wherein the strength of the association is moderate for both the groups.

Figure 4.3 Scatter plot of Extraversion and Agreeableness
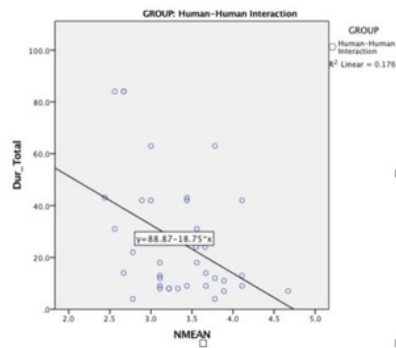
The above figure illustrates that there exists a negative moderate correlation between Neuroticism and Total Chat Duration for the control group (human-human interaction).

4. PEARSON CORRELATION ANALYSIS FOR OTHER ATTRIBUTES

Table 4.2 Pearson Correlation Coefficient For Other Attributes

Group		Total Msg Sent Mean	Total Chat Duration Mean	Total Words Sent Mean	CR Mean
Human - Bot Interaction	Total Chat Duration Mean	0.696**			
	Total Words Sent Mean	0.788**	0.887**		
	CO Mean	0.362*	0.371*	0.355*	0.564**
Human - Human Interaction	Total Chat Duration Mean	0.541**			
	Total Words Sent Mean	0.698**	0.558**		
	CO Mean				0.335*

** *Correlation is significant at the significance level of 0.01 (2- Tailed)*

* *Correlation is significant at the significance level of 0.05 (2- Tailed)*

The Pearson correlation coefficient between the three attributes, that is, total chat duration mean, total words sent mean and total msg sent mean depicted in the above table and the relationship between them are grouped for two interactions, that is, H-B interaction (or experimental group) and the H-H interaction (or control group). The above table highlights the analysis, as stated below:

i. Total chat duration mean is strongly positively correlated to Total msg sent mean for both the groups. The experimental group (or H-B interaction) where r = 0.696 and control group (or human-human communication) where r = 0.541, at 0.01 significance level and the strength of the association is quite high for both the groups.

ii. They are slightly more correlated in the experimental group (or H-B interaction) as compared to the control group (or H-H interaction).

iii.   Total words sent mean strongly positively correlated to Total msg sent mean for both the groups. The experimental group (or H-B interaction) where r = 0.788 and control group (or H-

H interaction) where r = 0.698, at 0.01 significance level and the strength of association is quite high for both the groups where they are slightly more correlated in the experimental group (or H-B interaction) as compared to the control group (or human-human communication).

iv. Total words sent mean is strongly positively correlated to Total chat duration mean for both the groups. The experimental group, where r = 0.887 and control group, where r = 0.558 and is significant at 0.01 level and the strength of association is quite high for both the groups where they are highly correlated in the experimental group (or H-B interaction) as compared to the control group (or human-human communication).

v. Apart from these attributes, coordination of participants in the task is positively correlated credibility of the task in both the groups wherein coordination is strongly correlated in the experimental group where r = 0.564 at significance level 0.01 whereas coordination is moderately correlated in control group where r = 0.335 at significance level 0.05. So, the strength of the association is high in the experimental group as compared to being moderate in the control group.

vi. Coordination is also positively correlated to Total msg sent mean, total chat duration mean and total words sent mean where r = 0.362, r = 0.371, r= 0.355 respectively, at 0.05 significance level for the experimental group (or H-B interaction).

5. SCATTER PLOT DIAGRAM FOR PEARSON CORRELATION ANALYSIS FOR OTHER ATTRIBUTES

The scatterplot diagram for various attributes, like credibility, coordination, total chat duration mean, total words sent mean and total msg sent mean, are depicting correlation with each other.

Figure 4.4 Scatter plot of Coordination and Credibility
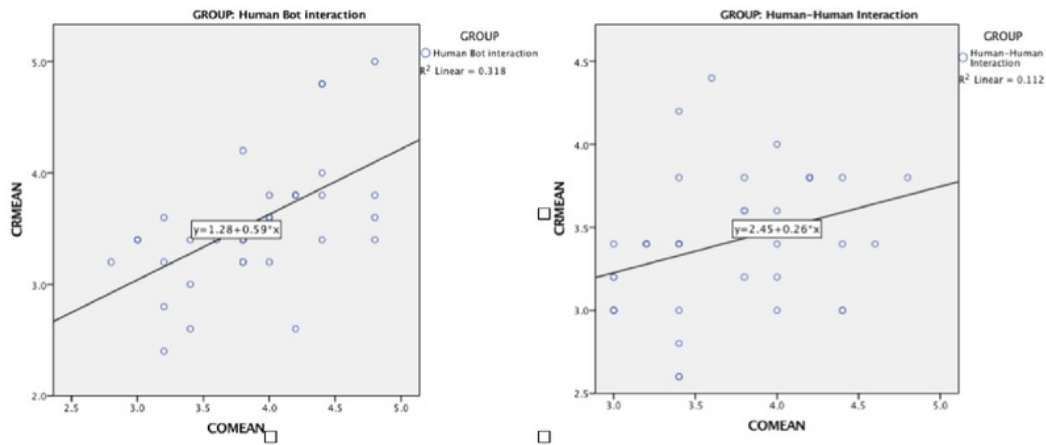
The above figure illustrates that there exists a positive correlation between Coordination and Credibility for both the groups wherein the strength of the association is high (r = 0.564) for experimental group as compared to being moderate (r = 0.335) for the control group.

The above figures represents that the data points are scattered on both the sides of the regression line wherein in the first diagram shows that the data points lies near the regression line and in the second diagram the few data points lie far away from the recession line.
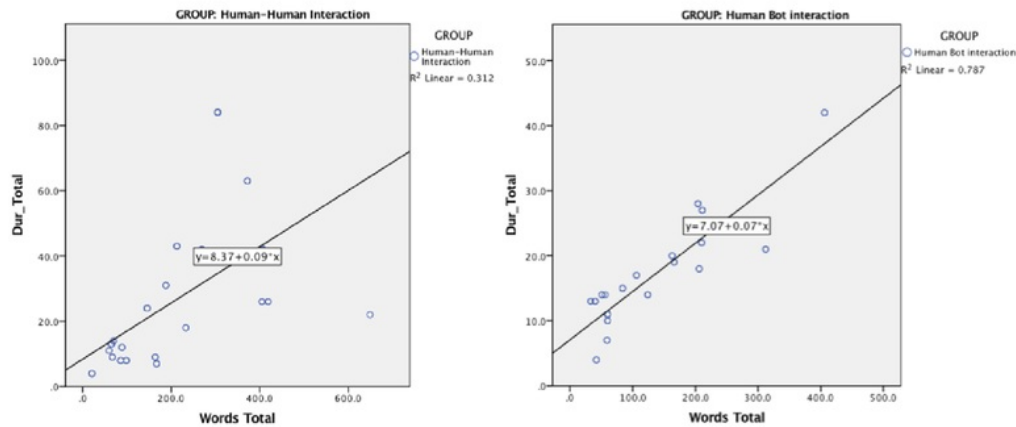
Figure 4.5 Scatter plot of Total Chat Duration Mean and Total Msg Sent Mean
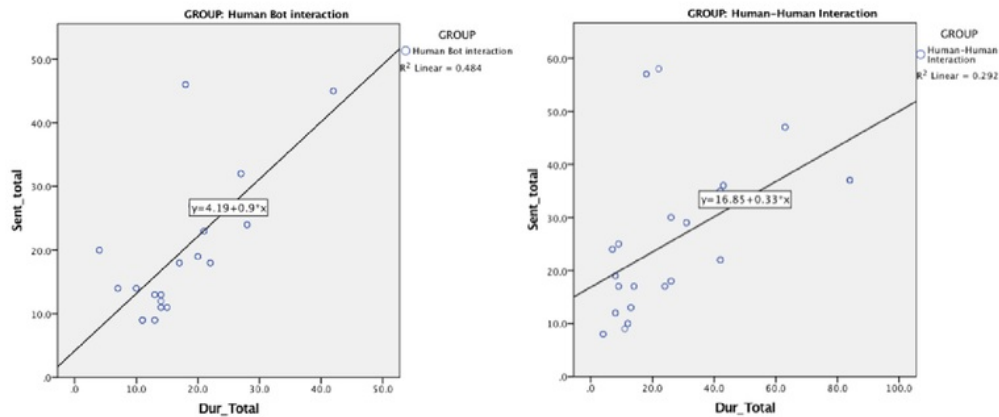
The given figure illustrates that there exists a positive correlation between Total chat duration mean and total msg sent mean for both the groups wherein the strength of the association is high for both the groups but they are slightly more correlated in the experimental group as compared to the control group.

Figure 4.6 Scatter plot of Total Word Sent Mean and Total Chat Duration Mean

This figure illustrates that there exists a positive correlation between   Total word sent mean and Total chat duration mean for both the groups wherein the strength of the association is high for both the groups but they are highly correlated in the experimental group as compared to the control group.

6. INDEPENDENT SAMPLE T TEST FOR PERSONALITY TRAITS

Two tables in the output are Group Statistics Table and Independent Samples Test Table wherein two groups, that is, experimental group (or H-B interaction) and control group (or H-H interaction).

Table 4.3 Group Statistics For Personality Attribute

Group	Control	N	Mean	Std. Deviation	Std. Error Mean
N_Mean	1	40	3.347	0.4956	0.0784
	2	40	3.360	0.5470	0.0865
O_Mean	1	40	2.817	0.5403	0.0854
	2	40	2.737	0.5852	0.0925
A_Mean	1	40	3.606	0.4646	0.0735
	2	40	3.650	0.4475	0.0708
C_Mean	1	40	3.430	0.4936	0.0780
	2	40	3.121	0.3357	0.0531
E_Mean	1	40	3.415	0.5724	0.0905
	2	40	3.380	0.5792	0.0916

The table illustrates the mean, standard deviation of the control and experimental groups which are codified in control column wherein 1 is representing H-H interaction, and 2 is describing H-B interaction.

i. The mean of neuroticism in the experimental group is N_Mean= 3.3360 and is more significant in the experimental group as compared to N_Mean= 3.347 of the control group.

ii. The mean of openness in the control group that is 2.817 and is slightly higher than O_Mean of experimental group which is 2.737. The least prevalent personality trait in both the groups is Openness as it has the lowest mean value of 2.817 for control group and 2.737 for experimental group respectively.

iii.   The agreeableness mean, A_Mean in experimental group is 3.650 and is higher than A_mean of the control group which is 3.606. The most prevalent personality trait in both the groups is Agreeableness as it has the highest mean value of 3.606 for control group and 3.650 for experimental group respectively.

iv. The conscientiousness mean, that is, C_Mean in control group is 3.430 and is higher than C_mean of the experimental group which is 3.121.

v. The mean of extraversion in control group is 3.650 and is higher than A_mean of the experimental group which is 3.606.

Table 4.4 Independent Samples Test For Personality Attribute

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
NMEAN	Equal variances assumed	.238	.627	-.116	78	.908	-.0135	.1167	-.2459	.2189
	Equal variances not assumed			-.116	77.251	.908	-.0135	.1167	-.2459	.2189
OMEAN	Equal variances assumed	3.135	.081	.633	78	.528	.0797	.1259	-.1710	.3305
	Equal variances not assumed			.633	77.507	.528	.0797	.1259	-.1710	.3305
AMEAN	Equal variances assumed	.001	.972	-.431	78	.667	-.0440	.1020	-.2471	.1591
	Equal variances not assumed			-.431	77.891	.667	-.0440	.1020	-.2471	.1591
CMEAN	Equal variances assumed	5.215	.025	3.271	78	.002	.3088	.0944	.1208	.4967
	Equal variances not assumed			3.271	68.724	.002	.3088	.0944	.1204	.4971
EMEAN	Equal variances assumed	.923	.340	.268	78	.789	.0345	.1288	-.2218	.2908
	Equal variances not assumed			.268	77.989	.789	.0345	.1288	-.2218	.2908

The table represents the results of independent sample t-test for five personality traits.

i. Levene's test for equality of variances assumes homogeneity of variances; that is, both experimental and control groups have the same variance. Since the significance of N_Mean, O_Mean, A_Mean and E_Mean has sig = 0.627, 0.081, 0.972 and 0.340 respectively, which is higher than 0.05, so equal variances are assumed. Also, the significance of C_Mean has sig = 0.025 respectively, which is lesser than 0.05, so equal variances are not assumed.

ii. Only conscientiousness mean is statistically significant as sig (2-tailed) for C_Mean = 0.002 which is lesser than 0.05, that is, sig (2-tailed) = 0.002 < 0.05.

Table 4.5 Independent Samples Test For Conscientiousness Trait

		Levene's Test for Equality of Variances		t-Test for Equality of Means						
		F	Sig	t	df	Sig (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
C_Mean	Equal variances not assumed	5.215	0.025	3.271	68.724	0.002	0.3088	0.0944	0.1204	0.4971

This table illustrated the results of conscientiousness mean which shows that statistically significant difference exists for conscientiousness trait between both the groups.

iii.   For 95 % confidence interval, only words_total is significantly different as its lower value is 0.1204 whereas its higher value is 0.4971, and their difference isn't equal to 0.

iv. The critical value for df= 68.724 is 1.6676 at 0.05 significance level. The t- value of C_Mean = 3.271 which is greater than the critical value 1.99 (for df= 70). So, C_Mean is statistically different at the significance level of 0.05 for both the groups.

v. C_Mean is statistically significantly different with mean difference of 60.3088 (equal variances not assumed) and there is significant difference in words_total mean between experimental and control groups ($t_{68.724}$ = 2.413), p < 0.05.

vi. Conscientiousness mean of control group (Mean $_{control}$ = 3.430) is greater than the conscientiousness mean of experimental group (Mean $_{experimental}$ = 3.121). So, the number of participants with conscientiousness trait is more in the control group as compared to the experimental group.

7. INDEPENDENT SAMPLE T TEST FOR OTHER ATTRIBUTES

Two tables in the output are Group Statistics Table and Independent Samples Test Table wherein two groups, that is, experimental group (or H-B interaction) and control group (or H-H interaction).

Table 4.6 Group Statistics For Other Attributes

Group	Control	N	Mean	Std. Deviation	Std. Error Mean
CoMean	1	40	3.675	0.5237	0.0828
	2	40	3.870	0.5539	0.0876
CrMean	1	40	3.410	0.4024	0.0636
	2	40	3.545	0.5782	0.0914
Sent_total	1	40	25.325	13.7717	2.1775
	2	40	19.975	11.0928	1.7539
Dur_total	1	40	24.975	20.6391	3.2633
	2	40	18.750	13.4598	2.1282
Words_total	1	40	206.975	145.868	23.0637
	2	40	138.875	102.866	16.2645

The group statistics highlight the information such as sample size which is 40 partici-pants, that is 20 pairs in each group, mean, standard deviation, and standard error mean (measures variability of sample mean) of attributes for both the groups.

These groups are codified in control column illustrated in group statistics where 1 is representing H-H interaction, and 2 is describing H-B interaction.

i. The group statistics highlight the information such as sample size which is 40 participants, that is 20 pairs in each group, mean, standard deviation, and standard error mean (measures variability of sample mean) of attributes for both the groups. So, the mean of coordination in the experimental group is Co_Mean= 3.870 and is more significant in the experimental group as compared to Co_Mean= 3.675 of the control group.

ii. Mean of total words exchanged in chat in control group is words_total= 206.975 and is higher in control group as compared to words_total= 138.875 of the experimental group which highlights the fact that participants exchanged a lot of messages and interacted more in the control group.

iii. The mean of coordination in the experimental group is Co_Mean= 3.870 and is slightly higher in the experimental group as compared to Cr s_Mean= 3.675 of the control group.

iv. The mean of credibility in the experimental group is Cr_Mean= 3.545 and is slightly higher in the experimental group as compared to Cr s_Mean= 3.410 of the control group.

v. Mean of total msgs sent in control group is sent_total= 25.325 and is higher in the control group as compared to sent_total= 19.975 of the experimental group which highlights the fact that participants interacted higher in the control group.

vi. Mean of total chat duration in control group is dur_total= 24.975 and is higher in control group as compared to dur_total= 18.750 of the experimental group which highlights the fact that participants interacted for longer duration in the control group.

Table 4.8 Independent Samples Test For Words_Total Attributes

		Levene's Test for Equality of Variances		t-Test for Equality of Means						
		F	Sig	t	df	Sig (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Words_total	Equal variances not assumed	4.589	0.035	2.413	70.099	0.018	68.10	28.2218	11.8149	124.385

This table illustrated the results of total words exchanged mean which shows that statistically significant difference exists for total words exchanged between both the groups.

v. For 95 % confidence interval, only words_total is significantly different as its lower value is 11.8149 whereas its higher value is 124.385, and their difference is not equal to zero.

vi. Total words exchanged mean of control group (Mean $_{control}$ = 206.975) is greater than the total words exchanged mean of experimental group (Mean $_{experimental}$ = 138.875). So, the average of total words exchanged for the control group is significantly more than that for the experimental group.

7. BOX PLOT DIAGRAM

The box plot diagram represents that the variances are quite different for both the two groups as the spread of observations for H-H interaction is much greater than H-B interaction for both the attributes, that are, Dur_Total and C_Mean respectively. We can see that the Levene's test is significant.

Figure 4.7 Box plot diagram for total chat duration and conscientiousness trait
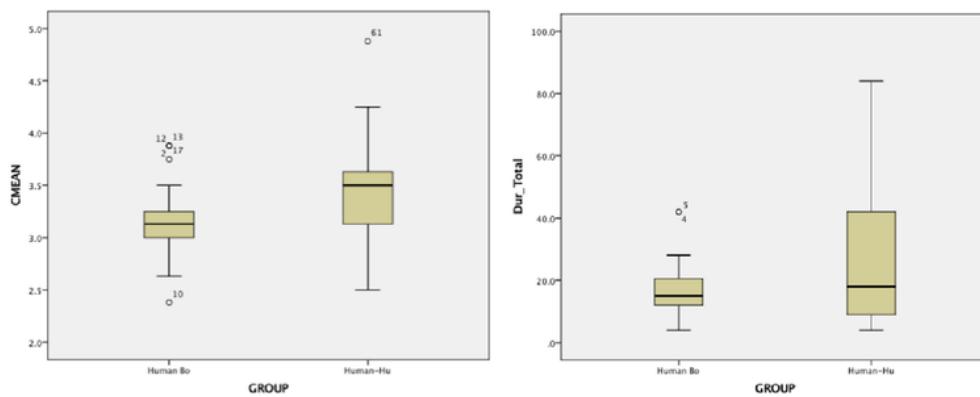
The above figures represents the box plot diagram for total chat duration and conscientiousness trait respectively wherein the differences in the length of box plot which represents the spread of variances exist which is higher for human-human interaction than human-bot interaction for both the attributes.

8. REGRESSION ANALYSIS

A simple linear regression was calculated to predict Dur_total based on personality trait, that is Neuroticism for H-H interaction, that is, for control group. A significant regression equation was found ($F_{(5, 35)}$ = 1.825, $p < 0.133$), with R^2 of 0.207. It was found that neuroticism significantly predicted duration of chat (β = -0.470, $p < 0.133$).

Table 4.9 Descriptive Statistics For Total Chat Duration Attribute

Group	Control	N	Mean	Std. Deviation
Dur_Total	1	40	26.415	22.3674
N_Mean	1	40	3.347	0.4956

This table shows the mean values i.e. 26.415, 3.347 ,and   Standard deviation i.e. 22.3674 , 0.4956 for Dur_Total and N_Mean respectively.

Table 4.10 Correlation for Total Chat Duration Attribute

Group		Total Chat Duration Mean
Human - Human Interaction	N_Mean	-0.42 **

*** Correlation is significant at the significance level of 0.01 (2- Tailed)*

This table shows that there exists a negative moderate correlation (r = -0.42) between neuroticism and total chat duration time.

Group	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Human-Human Interaction	1	0.455	0.207	0.094	21.2957

Table 4.11 Model Summary

Dependent Variable : Dur_total

Predictor Variable : (Constant), N_Mean

45.5% of variance in chat duration time is predicted from neuroticism personality trait.

Table 4.12 ANOVA

Group	Model		Sum of Sq.	df	Mean Sq.	F	Sig.
Human-Human Interaction	1	Regression	4139.220	5	827.844	1.825	0.133
		Residual	15872.731	35	453.507		
		Total		40			

Dependent Variable : Dur_total , Predictor Variable : (Constant), N_Mean

The model predicts better with neuroticism for control group i.e. human- human interaction and shows statistically significant relationship between neuroticism and total chat duration time (sig = 0.133).

Table 4.13 Coefficients

Group	Model		Unstandardized Coeff.		Std. Coeff.	t	Sig.	95% confidence interval for B	
			B	Std. Error	Beta			Lower Bound	Upper Bound
Human-Human Interaction	1	Constant	105.688	49.139		2.151	0.038	5.93	205.47
		N_Mean	-20.992	7.804	-0.47	-2.69	0.011	-36.83	-5.148

Dependent Variable : Dur_total ; Since B value is negative, it means control group with larger neuroticism mean value i.e. N_Mean had a lesser mean. The Regression line equation for total chat duration time i.e. dur_total is given below:

$$Y = 105.688 - 20.992\ X$$

Table 4.14 Residual Statistics

Group		Min	Max	Mean	Std. Dev.	N
Human-Human Interaction	**Std. Predicted Value**	-2.425	1.604	0	1	40
	Std. Residual Value	-1.816	2.107	0	0.935	40

Dependent Variable : Dur_total ; The min and max value for standard residual should not exceed -1.816 and 2.107 respectively and any value which lies outside this range are outliers.

Figure 4.8 Histogram and PP Plot for Dependent Variable : Dur_Total
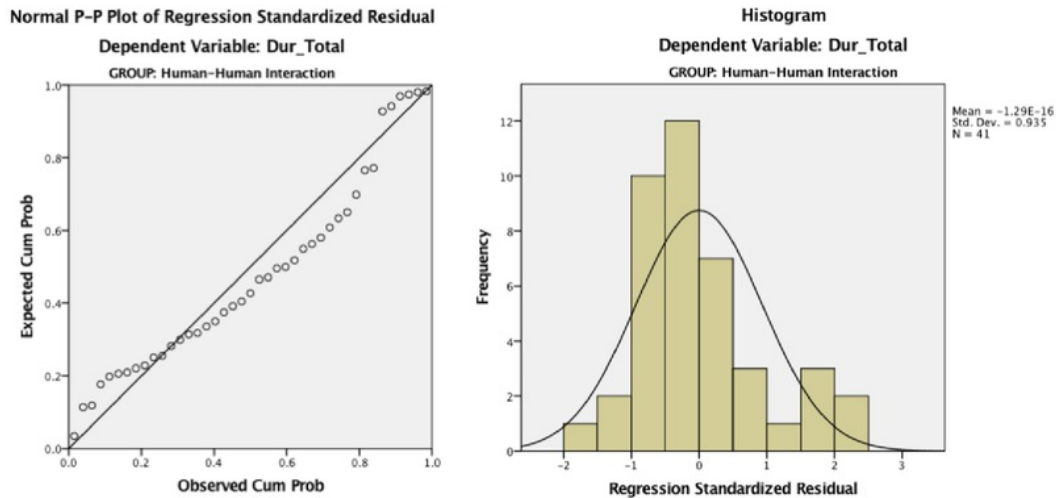
Histogram represents that the variables of Dur_total are normally distributed. The P-P Plot depicts the normality of residual.

## 9. LINGUISTIC VARIABLES ANALYSED

This research study investigated three variables that are total number of messages sent (sent_total) per conversation, total duration of chat time per conversation (dur_total) and total number of words exchanged per conversation (words_total) on the basis of the written conversation on the Slack platform.

Figure 4.9 Bar graph for total messages/ sentences exchanged and total words exchanged.
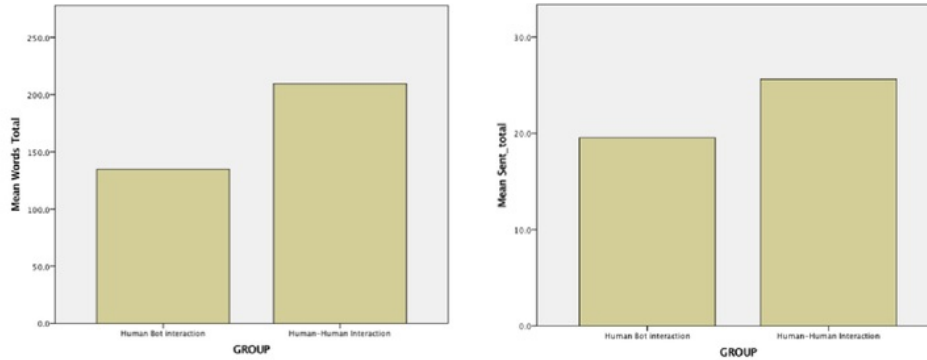
The bar chart represents the comparison between experimental group (human-bot inter-action) and the control group (human-human interaction) in terms of number of messages sent per conversation, number of words sent per conversation

Figure 4.10 This figure represents bar graph which compares for total messages/ sentences exchanged and total words exchanged in both the groups.
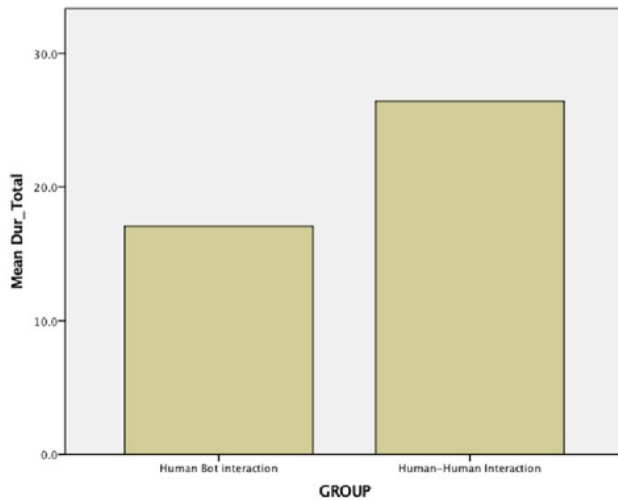
The bar chart represents the comparison between experimental group (human-bot inter-action) and control group (human-human interaction), in terms of number of messages sent per conversation, number of words sent per conversation and total chat duration time per conversation respectively.

10.   CONCLUSION

The conclusions drawn from the research study are stated as below :

i. The credibility and correlation are positively correlated to each other wherein correlation between coordination and credibility is stronger in H-B interaction (r = 0.564) at significance level of 0.01 as compared to being medium in H-H interaction (r = 0.335).

ii. There is no statistically significant relationship between personality and correlation and also between personality and coordination at significance level of 0.01 and 0.05 respectively. So, personality is invariant of the coordination and credibility of tasks of collaborative experiences.

iii. There exist a moderately negative correlation between neuroticism trait and total chat duration time per conversation. So, a neurotic person tends to take lesser time duration and communicate for a shorter duration during collaborative experiences in H-H interaction.

iv. Conscientiousness that is C_Mean is statistically significantly different with mean difference of 60.3088 (equal variances not assumed) and there is significant difference in words_total mean between experimental and control groups (t $_{68.724}$ = 2.413), p < 0.05.

v. Conscientiousness mean of control group (Mean $_{control}$ = 3.430) is greater than the conscientiousness mean of experimental group (Mean $_{experimental}$ = 3.121). So, the number of participants with conscientiousness trait is more in the control group as compared to the experimental group.

vi. Words_total is statistically significantly different with mean difference of 68.10 (equal variances not assumed) and there is significant difference in words_total mean between experimental and control groups (t $_{70.099}$ = 2.413), p < 0.05.

vii. The most prevalent personality trait in both the groups is Agreeableness as it has the highest mean value of 3.606 for H-H interaction and 3.650 for H-B interaction respectively. Also, the least prevalent personality trait in both the groups is Openness as it has the lowest mean value of 2.817 for H-H interaction and 2.737 for H-B interaction respectively.

viii. The mean of coordination in the experimental group is Co_Mean= 3.870 and is slightly higher in the experimental group as compared to Cr s_Mean= 3.675 of the control group.

ix. The mean of credibility in the experimental group is Cr_Mean= 3.545 and is slightly higher in the experimental group as compared to Cr s_Mean= 3.410 of the control group.

12.   LIMITATIONS OF THE STUDY

The limitations of the study are as stated below :

i. The sample size for the research study, which is N = 80 , is comparatively small as both the groups (control group and experimental group) consists of 20 pairs each.

ii. The discretion of the participants whether they believe in the existence of bot on the other end or not.

iii. The participant's prior experience of interaction with the bot also acted as a limitation of this study.

13.   RECOMMENDATIONS FOR THE FUTURE WORK

The recommendation for the future work that is in order to extend this research work are :

i.   The sample size should be large so that the results are more accurate.

ii. The next phase should be conducted by using an actual bot and differences in both the interactions that is H-H interaction and H-B interaction should be studied.

iii.   The prior experience of user interaction with the bots should also be taken into account.

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