THE USE OF SIMULATORS AND ARTIFICIAL INTELLIGENCE IN LEADERSHIP FEEDBACK

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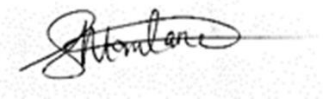
ABSTRACT

Leadership is a key factor in team success. For leadership to succeed, leaders need to possess the requisite competencies that can facilitate their performance. Team skills is identified as a leadership competency that is prioritised and most sought after by leaders. This follows studies that confirm that team skills are vital for leadership and team success. For leadership to develop team skills, feedback must be provided. Feedback is identified as information that is provided by an observer on a particular performance. The role of feedback in leadership development serves the purposes of engagement and self-reflection and evaluation of a leader's performance. In this light, feedback cannot be separated from leadership as it is an essential part of communication in a leadership context. The nature and source of feedback can affect how the feedback is received, as shown by studies that suggest that the effectiveness of feedback goes beyond the content or nature (good/bad feedback) of the feedback. This study looks at two feedback sources: humans and artificial intelligence (AI) using students as the population. Humans have been the traditional source in feedback provision. Thus, in a team setting peers provide feedback on their peers' performances. Unprecedented technological advancements have seen the improvement of AI capabilities to being able to give feedback. This has made AI a feedback source. Following these developments, this research assessed the way in which humans and AI provide feedback and the way in which students react to feedback provided by humans and AI. The research used chatbot AI, a Skills Simulator Assessment, launched by Kotlyar (2018). Students registered for Management One at Rhodes University in 2021 were the population for this research. The research was comprised of two phases where in phase one they were assessed by the Skill Simulator Assessment and in phase two they were assessed by their peers. This research found that students are not averse to feedback from AI, although they prefer peer feedback. It was further found that peer feedback tends to be tainted by lenience, while AI is not affected by lenience. This finding marked a significant development of AI in feedback provision.

DECLARATION

I declare that the thesis entitled “The use of simulators and artificial intelligence in leadership feedback” which I hereby submit for the degree, Master of Commerce at Rhodes University, is my own work. I also declare that this dissertation has not previously been submitted by me for a degree at this or any other tertiary institution and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.



Sixolile Ntombana

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First and foremost, I would like to say, “Praise be to God almighty who has had His hand upon me throughout this journey. The one who continually raised the standard against the tempest.” This thesis is a testament that His word does not return to Him void but accomplishes all that He sent it to. Thank you for your sustenance, Lord.

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CHAPTER 1: Introduction

1.1.Introduction

This chapter provides an overview of this research project which focuses on the use of artificial intelligence (AI) and simulators in leadership feedback. The importance of leadership and the intricacy of feedback provision are discussed. The chapter also presents the problem statement, the purpose of the study, and the research questions, which inform this study. Furthermore, an overview of the methodological approach used in this research will be addressed. The contributions, limitations, and structure of the research project is presented to mark the end of the chapter.

1.2.Background

AI has impacted the world as a ground-breaking phenomenon presenting itself as an imperative; to such an extent that it can be said that the present era is characterised by AI, defined as "the philosophies of machines to think, behave and perform either the same or similar to humans" (Dhamija and Bag, 2020, p.1). It can be further said to be the design, the use of program systems and machines that display human intelligence with its vital activities being knowledge representation, reasoning, and learning (Whitson, 2012). The primary purpose of AI is to replicate the human brain and follow a similar decision-making process as human beings within various contexts (Dhamija and Bag, 2020). According to Bachelor and Petersen (2019), many tasks currently undertaken by humans will, in the future, be partially or wholly undertaken by AI. Advancements in AI will continue to have an enormous effect on society at large; especially in innovation, production, and characteristics of services including the way leadership is assessed and perceived (Cockburn, Henderson and Stern, 2018).

The fourth industrial revolution is a coalescing expansive array of technologies like AI, Internet-of-Things (IoT), and autonomous vehicles (AVs) (Schwab, 2016), which has seen the creation of innovations like simulators; defined as "an imitation of a system which allows for a better understanding of how the system behaves and evolves over time" (Silva, Trigo, and

Pinto, 2010, p.429). In addition to the above advancements, AI and simulators are said to be good contributors to the automation, adoption, and overall development of disciplines that have expediated with the emergence of the fourth industrial revolution (Oren, 1994; Schwab, 2016). This is further evidenced by the fact that simulators are often used for experiments even before the discovery of the real system (Oren, 1994). The simulation environment is created using technologies such as virtual or augmented reality which recreate real life situations in the simulation (Ma, et al., 2017; Kotlyar, Krasma and Fiskenbaum, 2020).

AI has infiltrated many sectors and job industries such that part of its effects is that it has influenced how jobs are done in those sectors (de Laat, Joskimovic and Infenthaler, 2020). While the concept of AI in education and student learning is not entirely new, it is not immune to the many developments as a result of the emergence of the fourth industrial revolution (Olofsson, et al., 2015). AI can play a pivotal role in the learning and development process, given its ability to not only be adaptive to the user but also the way it can process large data (Lamson and Redwitz, 2018). The use of AI will revolutionise how exercises in learning and development are done, this is because of its ability to represent knowledge, learning, and reasoning (Lamson and Redwitz, 2018).

Traditionally, feedback on performance is given by humans in different settings through various forms ranging from oral, written, and multisource feedback programs (Barnard, 2019; Drago-Severson and Blum-DeStefano, 2018; McCarthy and Garavan, 2006). Hattie and Timperley (2007), define feedback as information given by an agent relating to an individual's performance or understanding. It is further said to provide individuals with information that will assist in improving their performance (Geister, Konradt and Hertel, 2016). According to Hattie and Timperley (2007), for feedback to be most effective, it must be based in a learning context. It should form part of a teaching process where the student has followed given instructions and information is provided to the student about their task performance (Hattie and Timperley, 2007).

AI allows for adaptive design assessments that go beyond the traditional question and answer; and produces instantaneous and far more accurate feedback (Barnard, 2019). According to Bronack, et al. (2008), AI is designed to be user-centric with a combination of design and usability considerations which enable it to be used for both input and output. The latter pays attention to participants' behaviour, monitors progress, and produces feedback in real-time

(Bronack, et al., 2008). These types of assistive AI which help human actors are said to be more equipped to make better decisions, diagnoses, and feedback in general (Murphy, 2019).

Leadership is defined as, "the process of influencing others to put effort towards the accomplishment of shared goals; it is a complex process that requires a set of competencies" (Bolden, et al., 2003, p.5). A significant part of leadership involves working in teams which require other soft skills such as collaboration and teamwork, communication skills, problem-solving skills, and people and relationship-building skills (Kotlyar et al., 2020). Team skills are identified as a crucial component of leadership as they address numerous elements that can determine the outcome of leadership in a team setting (Spreitzer et al., 1997). Models that describe a dimensional structure of teamwork skills typically include content areas such as conflict management, influencing, collaborative problem solving, and cooperation with team members (Varela and Mead, 2018). Thus, it is imperative to obtain feedback so as to improve leadership performance.

Avolio (2005) states that feedback is instrumental in the development of leadership and teamwork. In a study done by Steffens, et al. (2018), it was found that feedback on leadership impacts leadership ambition, commitment, performance and affects team dynamics. The study showed that there is a correlation between feedback, be it positive or negative, and leadership development (Steffens, et al., 2018). Thus, the manner in which feedback is compiled and provided are critical to the realisation of growth in leadership.

Humans are identified as the traditional source of feedback (Barnard, 2019). This has been complemented by technological advancements in AI which has given it the capabilities to provide feedback (Pegasystems, 2019). Given the mentioned technological advancements in AI, it is foreseen that there will be a change in how leadership competencies are assessed (Kumar, 2018). The mentioned AI advancements have created a gap that calls for an investigation towards the use of AI in providing leadership feedback (Kumar, 2018). Boyatzis (2008, p.6) defines a competency as "a capability or an ability", or what an individual can do. Boyatzis (1982) asserts that certain abilities of an individual enable them to engage in appropriate, specific actions. It is further argued that competencies are the characteristics of the individual that result in them producing effective performance (Boyatzis, 1982; Winston and Hazlin, 2003). Winston and Hazlin (2003), argue that leadership competencies are used to explain the nature of effective leadership, the leadership qualities, and areas of knowledge

required by those who contribute to team success and to assist in clarifying the types of educational preparation needed by leaders. Research on leadership competencies has been formulated to recognise a set of attributes that successful leaders possess; articulate them in ways that could be transferred across all leaders and create leadership development experiences to ensure that future leaders possess these attributes (Winston and Hazlin, 2003). While Bartram (2005) argues that leadership competencies are sets of behaviours that are instrumental in the delivery of desired results or outcomes in a specific setting. Leadership competencies are captured using leadership competency models that are context-specific to help teams and different collectives train the kind of leader that they require (Winston and Hazlin, 2003).

Leadership development begins with self-awareness which can be facilitated by data-driven tools and AI-powered assistants which may include chatbots, defined as computer programs that interact with users using languages which have the ability to create real-life situations in simulation exercises taken by users (Abu Shawar and Atwell, 2007; Herde and Lievens, 2018). These have the potential to raise self-awareness and provide personalised and real-time feedback on how an individual can become a better leader (Akhtar, 2019). These technologies can also mime individuals' actions and provide instant feedback and practical advice on modifying behaviour. Akhtar (2019) argues that this will bridge the gap between leadership assessment and development as distinct practices.

1.3.Statement of the problem

While there has been research done to assess individuals' general attitudes towards feedback from AI, there is little research done on students' response to team skills feedback provided by simulators and AI (Kotlyar et al., 2020, Pegasystems, 2019). A gap consequently exists in understanding how individuals particularly students respond to leadership feedback provided by AI versus how they respond to leadership feedback from their peers. The development of AI and simulators and its infiltration into multiple disciplines particularly in the field of leadership has become a new phenomenon in leadership feedback provision. This is because traditionally feedback is given by humans (Barnard, 2019). Given this development in simulators and AI, this research seeks to address how students respond to leadership feedback from simulators versus how they respond to leadership feedback from their peers.

1.4.Purpose of the study

The purpose of this research is to assess how students react to feedback generated by the Skills Simulator on their team skills in comparison to how they react to the team skills results they receive from their peers. The purpose of the research is motivated by the context of the unprecedented technological advancements in AI and simulators which have revolutionised the traditional provision of feedback by humans in various contexts, and peoples' reception or non-receptive attitudes towards feedback from AI and simulators. These developments have changed the traditional way of providing feedback by humans.

1.5.Research questions

The research questions of this study are:

1. Using the Skills Simulator Assessment, what are the team skills of students in a tertiary institution?
2. What is the relationship between the Skills Simulator Assessment team skills feedback and the level of acceptance or rejection by students?
3. How do the students' responses to feedback on team skills from AI and peers compare?

1.6.Overview of the methodology

Given the use of AI in leadership development, this research seeks to assess how individuals, particularly students respond to feedback on their team skills from simulators (AI) and their peers. The research goes on to compare the students' responses to feedback from the two sources, simulators, and peers. This research is informed by the following objectives in alignment with the research questions:

1. To assess the team skills of students in a tertiary institution using chatbot AI.
2. To assess the relationship between the team skills assessment and the level of acceptance or rejection of results from the Skills Simulator Assessment.
3. To compare the assessment of chatbot AI feedback, and a student's response to it, to that received from peers.

This research made use of a quantitative methodological approach. This methodology entails a collection of numerical data and the adoption of a deductive approach to the relationship

between theory and research (Bryman, et al., 2014). The research will also use a positivist research paradigm. Bryman, et al. (2014) defines positivism as an epistemological approach that promotes the application of natural science methods to study and understand social reality.

The population of the research comprised of Management One students in 2021 at Rhodes University. All 378 first-year Management One students (who give consent to be part of the study) will be the chosen sample of the study.

The research consisted of two phases as shown in Table 1. Phase one consists of students interacting with the Skills Simulator Assessment (SSA), launched in 2018 by Prof Igor Kotlyar (https://skillsimulator.com/about-us/) and a self-assessment to finish phase one, phase two consists of group work and peer assessment.

The SSA will be used to test the students' leadership skills and provide feedback. The skill simulator recreates team dynamics using chatbot AI and makes use of "a proprietary scoring algorithm to automatically analyse natural language responses" (Skill Simulator Assessments, 2018). The simulation will replicate teamwork situations identified through analysis of common team challenges and "critical incidents", which is a standard approach to developing simulations, (Herde and Lievens, 2018; Mislevy, 2013). In the simulation the student is put in a team of four members; unknown to the student three of the members are virtual characters. Kotlyar et al. (2020) state that, "teammates represented by chatbots were designed to subtly trigger teamwork-relevant behaviours (e.g., via expressions of frustration) in a manner that was seemingly realistic and consistent across human participants. All participants were confronted with standardised stimuli; in order to create a greater illusion of realism and make the conversation flow more naturally, chatbots occasionally displayed minor differences in their responses when replying to individual participants.

Chatting to other group members, it provides a forum for all participants to engage, suggest answers and consider suggestions and in the process, the student is evaluated on the following categories of teamwork skills: Team building, engaging team members, problem-solving, leading, communicating, and dealing with frustration and conflict. The interaction with the simulator will be done as a tutorial as part of the students' Management One coursework which is mandatory towards the completion of the Management One course. Thus, the data collection instruments which include the simulator, questionnaires and a group assignment have been

incorporated into the Management One course to extensively engage and prompt the students to react and exhibit their skills in a team setting. It should be noted that students are asked to consent for their data to be used as part of this research, where consent is not granted the students', work will be marked but their data is excluded from the research for ethical purposes. In the second phase of the research which consists of a group assignment, students will be required to rate their group members' teamwork skills using a peer feedback survey. Ratings will be aggregated per person and each group member receives feedback on how other group members have rated them on the six teamwork skills. Students are asked to report their reaction to the ratings given by group members using the reaction to feedback survey. Participants report their reaction to whether their behaviours and reactions would be different if their teams were different.

A correlation analysis was conducted to test if there is a relationship between teamwork skills results and reactions to or acceptance of the feedback. T-tests will be conducted to test for differences between chatbot and peer-generated leadership feedback.

An ethics application form for HUMAN SUBJECTS was submitted using the Ethical Review Application System (ERAS) to Rhodes University Ethical Standards Committee (RUESC) via the Management Ethics Representative. All the relevant research instruments and consent forms for this research study were submitted. The Rhodes University Registrar granted the researcher permission to use Management One students as the study sample (Appendix C). The ethics application was approved, and the researcher was given permission to conduct the research.

Table 1: Stages of the study showing timing and equivalence of measures

Phase 1: Simulator	**Phase 2: Group Assignment**
Step 1: Participants complete a Google Form in a single step that contains the following: (a) a consent form (b) the demographic items (c) the team orientation questionnaire (Wang et al., 2017) *[Data to be used for international comparison, not local studies]* At end of the Google Form, students will click a link and get instantly directed to the Skills Simulator Assessment (SSA).	Step 5: Students are asked to participate in a group assignment as part of the Management 1 term 3 tutorial.
	Step 6: Students will be required to rate their group members' teamwork skills.
Step 2: Once participants land on the Simulation page, they enter their name and student number (for linking purposes) and begin the simulation. At the end of the simulation, participants will be required to fill out a self-assessment (6 items on teamwork skills). Students will then be directed to their results page Each student will be presented with their individual assessment feedback generated by a computer algorithm of SSA on six teamwork skills.	Step 7: Ratings are aggregated per person and each group member receives feedback on how other group members have rated them on six teamwork skills.
Step 3: Students will be directed to the Reactions Google page. Once on the Reactions Google page, participants will be asked to: (a) enter their names and student number (for linking purposes). (b) to indicate whether they interacted with bots or humans (c) Students will be asked to report their reaction to the rating/assessment given by the SSA by filling out the reaction scales.	Step 8: Students are asked to report their reaction to the ratings given by group members.
Step 4: Students are informed that they were interacting with robots. They are then asked to report their reaction to this. (Reaction to bot evaluation)	Step 9: Students report their reaction to whether their behaviours and reactions would be different if their teams were different.
	Step 10: Students get their individual assignment marks.

1.7.Research contribution

This research will benefit the educational sector, business teams and other entities interested in the provision of leadership feedback and AI in leadership by providing new social-scientific knowledge, using AI in assessments of feedback. In the same light this research will be beneficial to leadership development in that it will help not only provide leadership feedback but be a significant inroad into articulating the importance of teamwork skills as a leadership competence and the extent simulators can be of use in leadership and consequently organisational success.

The SSA provides direct, constructive, and timely feedback that students and employees can engage with in their schools, careers and beyond. The fact that it allows the feedback recipient to reflect on their feedback further benefits them at a personal level so that they can better understand themselves and be mindful of what they need to develop themselves on.

This study further adds to the body of knowledge on the use of simulations as a form of an assessment for teamwork skills and an alternative to human input. It achieves this by highlighting the students' reactions, which can influence their motivation, effort and overall perception of teams and their role in teamwork.

Using Chatbot AI, this research will determine the leadership skills of Management One students at Rhodes University. This research will play a pivotal role in the integration and development of AI and simulators as tools that can determine leadership skills. Students' interaction with the Skills Simulator will show the versatility and adaptability of AI and simulators.

Some of the data will be used as part of an international study, it will holistically contribute data and to the understanding of international teamwork dynamics and AI development in this area.

1.8.Limitations of study

The research data collection for both phases of the study took place towards the end of the Management One course when students were preparing for exams. This resulted in uncompleted evaluations which had to be removed in the data analysis process. This in turn reduced the sample of the study.

As a result of covid-19 and its disruption to the 2021 academic year and given that all teaching was conducted online. This research was limited to using a virtual task for the assessment of peer team skills, which consisted of the group assignment. This in turn limited the interaction of the participants in their engagement, as connectivity problems were a limiting factor in their participation.

1.9.Definitions of terms

Research typically uses key terms which need to be identified and clearly defined. This is because these terms are key towards the coherence and comprehension of the research. The interpretation of these terms will be consistent in this research:

- Artificial Intelligence (AI) – "the philosophies of machines to think, behave and perform either the same or similar to humans" (Dhamija and Bag, 2020, p.1).
- Chatbot - is a software system, which can interact or "chat" with a human user in natural language (Abu Shawar and Atwell, 2007).
- Competencies - the characteristics of the individual that result in him/her producing effective performance (Boyatzis, 1982).
- Feedback - Information given by an agent relating to an individual's performance or understanding (Hattie and Timperley, 2007).
- Fourth Industrial Revolution (4IR) – the coalescing expansive array of technologies like artificial intelligence (AI), Internet-of-Things (IoT), and autonomous vehicles (AVs) (Schwab, 2016).
- Leadership – "the process of influencing others to put effort towards the accomplishment of shared goals, is a complex process that requires a set of competencies" (Bolden, et al., 2003, p.5).

- Simulators - “an imitation of a system which allows for a better understanding of how the system behaves and evolves over time” (Silva, Trigo, and Pinto, 2010, p.429).

1.10. Thesis structure

Chapter 1: Introduction
Chapter 2: Literature Review
Chapter 3: Research Methodology
Chapter 4: Data Analysis and Results
Chapter 5: Discussion
Chapter 6: Conclusion and Contributions

CHAPTER 2: Literature Review

2.1.Introduction

This chapter presents the relevant literature on the use of simulators and AI in the provision of leadership feedback. The chapter starts by addressing the phenomenon of leadership, and leadership competencies particularly highlighting team skills as a leadership competency. This is followed by engaging with how leadership is developed and the development of leadership through feedback. Finally, assessment of feedback from people and AI and the attitudes that people show towards human and AI feedback are discussed in this chapter.

2.2.Leadership

Leadership is defined as "the process of influencing others to put effort towards the accomplishment of shared goals; this entails a complex process that requires a set of competencies" (Bolden, Gosling, Marturano and Dennison, 2003, p.3). Bolden et al. (2003) further state that leadership plays a vital role in the development of individuals and their surroundings. Thus, the development of leadership holistically contributes to well-functioning teams as the success of the team depends on the presence of competent leadership (Sohmen, 2013).

Successful leaders hold true to their values, apply the necessary skills, while adapting and adjusting their style to suit the context in which they are operating (Gibbings, 2020). Englefield et al. (2019) state that the ability and strength of an individual to achieve goals by supervising processes, guiding initiatives, and team members are defined as leadership skills, which are vital for success. In the same light, other valuable contributors to good leadership include making thoughtful decisions, allocation of resources, and the ability to delegate, inspire and communicate effectively; this includes other leadership traits like honesty, confidence, commitment, and creativity. As highlighted above leadership competencies can be used to effectively select, develop, and promote leaders in teams and organisations (Winston and Hazlin, 2003).

Good leadership is determined by the possession and the application of certain skills and competencies in a given context which then leads to that particular leadership being classified as good (Sohmen, 2013). Thus, while a leader can possess the competencies, those have to be applied effectively in the given context. It can then be drawn that leadership competencies are pivotal in leadership and the outcome thereof.

2.3. Leadership competencies

Boyatzis (2008, p.5) states that a competency is "a capability or an ability", or what an individual can do. Certain abilities of an individual enable them to engage in appropriate, specific actions (Boyatzis, 1982; Winston and Hazlin, 2003), and competencies are the characteristics of the individual that result in them producing effective performance (Boyatzis, 1982; Winston and Hazlin, 2003). Duree (2007) defines the term competency as the fundamental knowledge, ability, or expertise in specific areas or skill sets. From the above, it is clear that leadership competencies are characteristics of leaders with behavioural implications associated with the successful performance of their job or task (Garman and Andrew, 2006). Leadership competencies can therefore be said to be prerequisites for leadership.

From the above, it can be deduced that leadership competencies are critical to successful leadership. This is because leadership is not an isolated phenomenon but one that is supplemented by leadership competencies, which represent a specific set of characteristics, skills, and abilities that can constitute effective leadership within a given setting (Garman and Andrew, 2006; Brownell, 2006). Without the requisite competencies, the ability to define and describe leadership is limited, this is because leadership competencies help to define leadership and help in the observation of what comprises successful or good leadership (Mumford, Campion and Morgeson, 2007). As tools for defining and communicating about performance, competencies can be used for performance improvement purposes, as they can clarify a leader's roles, performance expectations, and plans for development (Garman and Andrew, 2006). It is suggested that there is a difference in leadership that is framed around specific leadership competencies versus one where there are no identified competencies to facilitate the successful completion of a leader's objective (Garman and Andrew, 2006).

There is a lot of academic inquiry into leadership competencies as the need for developing leaders with adequate competencies has grown (Jokinen, 2005). Taking this into account, some skillsets have been consistently identified as fundamental requirements in leadership competencies (Jokinen, 2005; Adler and Bartholomew, 1992). However, it should be noted that one challenge in studying leadership competencies has been reconciling the global and the local environments and leadership requirements as institutions grow in the era of globalisation (Harvey and Buckley, 2002). While there are identified leadership competencies this does not take away contextual specificity in identifying leadership competencies for specific situations (Duree, 2007).

A study done by Jokinen (2005) states that a more integrative framework for global leadership competencies, must be looked at as universal qualities that enable individuals to perform their job. Further research suggests that there are a limited number of key competencies, referred to as core global leadership competencies, that enable job completion over and above the contextual ones (Jordan and Cartwright, 1998). These are grouped as: characteristics that affect how one approaches different issues, explicit and tangible knowledge that refers to concrete actions, and producing visible results (Jokinen, 2005; Goleman, 2006). The mentioned main groups include self-awareness, social judgment skills, empathy, and social skills like teamwork skills and networking skills among others (Jokinen, 2005). It is evident that team skills are a cornerstone in the functioning of teams and organisations and consequently, a key competence which employers rank at the top of the required skills in recruitment processes (Betta, 2016).

2.4. Team skills as a leadership competency

Literature reveals that teamwork skills are the skills required to work effectively with others in a team (Kotlyar et al., 2020). It is furthered by Kotlyar et al. (2020) that these skills are necessary for promoting effective teamwork, which is recognised as a vital component in teams and organisations. Models that describe a dimensional structure of teamwork skills typically include content areas such as conflict management, influencing, collaborative problem solving, and cooperation with others (Varela and Mead, 2018). Behaviours such as encouraging others and their contributions, communicating within a group, honesty, providing and receiving feedback are included in discussions surrounding teamwork skills (Cater and Jones, 2014; Salas et al., 2005; Tarricone and Luca, 2002).

Teamwork skills are vital as interpersonal skills that help leaders in bringing out the best in people, increasing their capacity for cooperation and team building, the ability to attract and develop talent, the capacity to motivate and to align people to one vision (Spreitzer et al., 1997). There is a reported gap between employer-required teamwork skills and the skills available in the workplace, hence the need for the development of these skills in educational institutions. In a study done, teamwork was found to be an important learning objective as was confirmed in a survey of educational institutions where 82 percent of respondents reported using team-based assignments in most courses and 93 percent of respondents viewed teamwork as a critical skill for success beyond college (Simione et al., 2017).

According to Pritchard, Stratford, and Bizo (2006) who conducted a team development study in an education organisation setting, training objectives including problem-solving, planning, decision making, setting objectives, time management, agreeing roles, and instruction cooperation are key in the development of team skills as they determine how a leader navigates different scenarios that arise. Prior evaluation of this training has found that it leads to an increase in participants' team skills level (Prichard et al., 2004).

In the same light, team-based assignments have been identified as an effective way of developing teamwork skills (Simione et al., 2017). This has been highlighted as an effective way of encouraging collaboration among students and teams while at the same time encouraging team members to express and expose their team skills in the duration of the assignment (Simione et al., 2017.

2.5.How is leadership developed

Leadership development is an essential strategic priority for teams which seek to improve the calibre of leadership (Reyes, Marlow, Joseph and Salas, 2017). Leader development can be seen as the expansion of a persons' capacity to be effective in leadership roles and processes (van Velsor, McCauley and Rudeman, 2010, p. 2). The focus of leadership development is increasing human capital through the development of individual knowledge, skills, and abilities. In contrast, leadership development is defined by van Velsor et al. (2010) as the expansion of a collective's capacity to produce direction, alignment, and commitment" (van Velsor et al., p. 20). While there is a difference between leader development and leadership development, there seems to be consensus on the fact that although some cognitive abilities

and personality traits are innate and remain stable over time, there are many human capabilities that can be developed and trained to enable individuals to perform their tasks in a better way (van Velsor et al., 2010).

Leadership development takes place through multiple mechanisms: formal instruction, developmental job assignments, 360-degree feedback, executive coaching, and self-directed learning among others. These approaches may occur independently but are more effective in combination (McCauley, 2008; van Veslor et al., 2010). Avolio (2005) submits the full range model of leadership as a way in which one can facilitate the development of their leadership potential, regardless of where they are in their life course.

Amagoh (2009) adopts three components towards the development of leadership in team settings highlighted by Popper and Lipshitz (1993); the first is developing self-efficacy, the extent to which a person believes they can perform well in a given context, in the domain of leadership. The second is developing awareness of modes of motivating team members as leadership is highly dependent on the ability to motivate and influence others. The third component is developing specific leadership skills that are put to use in interactions with team members. Amagoh (2009) found that leadership development should be comprehensive and systematically integrated into the organizational or team culture to produce leaders who can deal adequately with organizational and team challenges. Leadership development takes place through multiple mechanisms which may occur independently but are more effective in combination (McCauley, 2008). Consistent among these approaches is the provision of knowledge, skills, practice, and feedback (Kozlowski, 1998). The feedback component is a necessary part of leadership development that allows leaders to maximize learning opportunities and provides leaders with perceptions of their performance from a full circle of viewpoints (Wiley and Gardner, 2009).

2.6.Developing leadership through feedback

Feedback is defined as information provided by a third-party regarding aspects of one's performance or understanding (Hattie and Timperley, 2007). Feedback is therefore a consequence of performance rendered for the purposes of improvement or assessment. It is important to consider a continuum of feedback and instruction to assist in understanding the

purpose, effects thereof whereby at one end of the continuum is a clear distinction between providing instruction and providing feedback (Hattie and Timperley, 2007).

Steffens, Fonseca, Ryan, Rink, Stoker and Nederveen Pieterse (2018), found that feedback on leadership potential impacts leadership ambition, commitment, and performance. The study showed that there is a correlation between the content of feedback and leadership development (Steffens et al., 2018).

Feedback is essential for goal pursuit such that without it, leaders and individuals alike would not know whether and how much to invest in pursuing their goals and what actions they should take towards advancing their teams (Ashford, Blatt, and van de Walle, 2003). Amagoh (2009) states that critical to the success of any leadership development process is the ability to encourage participants to reflect on learning experiences to promote the transfer of knowledge and skills to work contexts. The author further states that this ability to reflect on feedback consequently empowers team members, encourages collaboration and sharing of information, creates learning opportunities, and promotes leadership development (Amagoh, 2009). This aligns with the argument that feedback has been identified as a critical component of leadership development. Avolio (2005) suggests that there is a need for developmental readiness, as this is critical to how feedback is used and evaluated. It has been found that not all feedback leads to development or improvement. However, feedback cannot be separated from leadership as it is an essential part of communication in a leadership context. Atwater and Waldman (2008) state that feedback is part of open communication which is defined in terms of the difficult information critical in leadership positions, rather than the more positive or mundane information/routine communication.

In a learning and development context, both positive and negative feedback are crucial. Feedback provides a sense of engagement and interactivity and allows learners to take ownership of their learning (Lacerenza, Reyes, Marlow and Joseph, 2017). Effective feedback shows learners their current level of performance and lets them know what they need to do to reach a higher level (Lacerenza et al., 2017).

As established, feedback is vital for development, feedback differs in its nature and effect (Atwater and Waldman, 2008; Antonioni, 1994). Hart (2011) states that feedback can be classified as one of four types: directive, contingency, attribution, and impact. Directive

feedback is future-oriented and specifies a course of action for the receiver to take. Other types of feedback are: Contingency feedback which alludes to feedback that notifies the receiver about consequences and the cause and effect that depend on their actions (Hart, 2011). Attribution feedback which describes the receiver's actions and output in a setting. Impact feedback which informs the receiver about the effect of their actions in their context (Hart, 2011). Directive feedback can be delivered in five different styles: command, advice, advocacy, request, and inquiry (Hart, 2011). The command style gives an order or instruction on what to do, the advice style which requests the receiver to perform a certain way, the request style asks the receiver to act in a particular way and inquiry style which asks the receiver to consider possibilities in which they can perform (Hart, 2011). While there are numerous styles the appropriate style depends on the choice of the feedback giver and the context in which the feedback is being given.

Although there are different styles and forms of feedback as mentioned above, the most identifiable labels of feedback are positive/good and negative/bad feedback concerning the recipient's performance (Antonioni, 1994; Atwater and Waldman, 2008; Hart, 2011). Thus, it can be said that the feedback recipient takes feedback as a reflection of their performance.

While the different types of feedback affect the recipient, DeNisi, Randolph, and Blencoe (1982) submit the argument that feedback sources are a huge factor that should be considered when discussing feedback, its reception, and effectiveness. Although the source is not part of the feedback, it is often difficult to separate the effects of feedback information itself from the effects of the source DeNisi et al. (1982). Greller and Herold (1975) suggest that the psychological closeness of the source to the recipient may be the critical factor in source effects, as evidenced by their finding that workers relied most heavily upon themselves for performance feedback. This research uses humans, Management One course students and chatbot as sources of feedback.

In their study DeNisi et al. (1982) provide some useful insight into the process by which workgroup members respond to feedback. The source of the feedback made a difference with peer feedback being more effective at creating differences in the dependent variables. Individual-level feedback also had a greater impact on behaviour than group-level feedback. The findings in DeNisi et al. (1982), argue the fact that individual feedback is specific to the

party being assessed and are the most effective does not guarantee development if the feedback receiver is not ready to accept the feedback.

Feedback seeking is a way to take initiative to further self and career development and identify ways to improve job performance and development; it further increases the likelihood of accurately recognizing how others view one's work and how one is progressing or regressing in their work (London et al., 1999). In addition, seeking feedback for self-development can be viewed more broadly to encompass improving one's skills and seeking opportunities (Greenhaus et al., 1987). This implies that the underlying motivation of getting feedback is for improvement purposes and development, which then provides high calibre leadership that is constantly improving and efficient (Oldcorn and Forsyth 2013). Good feedback is imperative to the creation of sound leadership. To build professional capital and internal capacity, feedback has emerged as a cornerstone of development (Drago-Severson and Blum-Destefano, 2017).

There is evidence that suggests that the effects of feedback depend, in part, on the type of task the individual is performing, particularly if the task is routine and repetitive versus challenging and novel tasks as not all tasks have developmental potential and attempt to provide developmental feedback (Atwater and Waldman, 2008). Pernick (2001) adds that the ideal task for leadership development must be time bound, measurable and challenging. It is furthered that while leadership contexts can differ these elements push leaders to engage with feedback for further development (Pernick, 2001). In line with the above Hart (2011) reiterates that feedback is an integral part of development especially in leadership where the feedback receiver's actions are being reviewed.

Avolio (2005) states that feedback starts with one's own reflections, and eventually expands to others' observations and their reflections about an incident, one's behaviour, or some interaction; whether feedback comes from others or self, it provides a mechanism for self-regulation in a particular context. Thus, leaders need to have this reflection to have a better comprehension of a situation from which they can determine the course of action. This is because reflection has to be a continuous process in leadership development that ensures that the leader systematically thinks in an analytical way about their context and towards having an appreciation of where and how they could improve (Nesbit, 2012).

Hattie and Timperley (2007: 105) quoting (Sadler, 1989) state that, "feedback needs to provide information specifically relating to the task or process of learning that fills a gap between what is understood and what is aimed to be understood and it can do this in many ways." These may be through affective processes, such as increased effort, motivation, or engagement (Hattie and Timperley, 2007). Alternatively, the gap may be reduced through several different cognitive processes, including restructuring understandings, confirming to the feedback recipient that they are correct or incorrect, indicating that more information is available or needed, pointing to directions that could be pursued, or indicating alternative strategies to understand information (Hattie and Timperley, 2007). Feedback has no effect in a vacuum, for feedback to produce an effect there must be a learning/development context to which feedback is addressed. In the context of development, feedback focuses on at least one of four levels: a certain task, which alludes to whether the work concerned is correct or incorrect (Hattie and Timperley, 2007). This level of feedback may include directions to acquire more, different, or correct information about the task at hand, a process, which alludes to feedback more directly aimed at the processing of information, or learning processes required to complete a task, self-regulation, which alludes to self-evaluation or confidence to engage with a task, and the individual, which alludes to feedback which is not related to the task but is directed at a trait of the feedback receiver (Hattie and Timperley, 2007). These four levels of feedback ensure that there is a holistic learning process directed at the individual and the situation concerned where feedback is provided (Hattie and Timperley, 2007).

2.7.Feedback from people to develop leadership

Feedback is one of the primary ways we can support others' development and grow the internal capacities needed to meet the complex demands of the modern world (de Laat et al., 2017). However, in organisations and the educational sectors there remains a growing sense that teachers and leaders need to do something different in terms of feedback, not just something more; the field seems to be experiencing a proliferation of feedback from supervisors, mentors, coaches, colleagues, parents, students, and performance reports; and via initiatives such as 360-degree feedback, S.M.A.R.T. (specific, measurable, attainable and time based) goals, and learning walks, and nation-wide changes to teacher evaluation systems (Boudett et al., 2005). One of the most popular forms of leadership feedback comes in the form of what is called 360-feedback systems, this system is framed on feedback that comes from everyone around an individual, these can be followers, peers, supervisors, clients, suppliers (Avolio, 2005).

Research in the area of peer ratings, a type of source of feedback presents results that are suggestive of the fact that peer feedback from human sources has been found to have a substantial impact upon the behaviour and attitudes of group members (Kiesler and DeSalvo, 1976). It is furthered that this impact may be greater when the peer feedback is negative as it has been found that negative feedback results in lower interpersonal attraction among team members (Kiesler and DeSalvo, 1976). This predicament has led to lower group cohesiveness and subsequent poor performance (Zojance, 1962 cited in DeNisi et al., 1982, p.176). However, (Gong, Wang, Huang and Cheung, 2017), argue that individuals with a higher level of self-criticism, prefer negative feedback, over positive feedback, about their performance state that negative feedback can be embraced by team members who have a higher level of self-criticism. This is because they seek more negative feedback on their performance from others because they see its value towards improving performance (Gong et al., 2017). In this light negative feedback is well embraced in some cases.

Academic research has found that peer assessment methods have been increasingly adopted as one key component of multisource feedback systems (Hedge, Borman, and Birkeland, 2001), and have become particularly attractive to organisations adopting self-managing workgroups and team-based work processes, research shows that most systems of peer assessment offer a high degree of reliability and validity (Bamberger et al., 2005). This then validates different groups of people like peers, coaches, and managers among others as credible sources of feedback that can be used to develop leadership.

It follows that examination of the social and performance-related consequences of peer assessment appears to lead to mixed results. On one hand, Bamberger et al. (2005) found peer assessment and other multisource feedback components to have a positive, long-term impact on managerial effectiveness. Similarly, Druskat and Wolff (1999, p. 3) concluded that peer appraisals, “can have an immediate positive impact on group member perceptions of open communication, group task focus, group viability, and member relationship.” On the other hand, many other researchers examining the social consequences of peer assessment have concluded that such appraisals generally harm relationships and impair group functioning (Bamberger et al., 2005).

Considering the above, 360-degree feedback for leadership development by gathering feedback on a leader's performance from peers, direct reports, bosses, customers, and others who have seen the individual in action has been hailed as effective for leadership development (van Veslor, et al., 2010). Leaders can build self-awareness by comparing how they see themselves to how they are perceived by others, following which this new understanding can crystallize what it is to be a more effective leader and guide the development of important new leadership competencies (van Veslor, et al., 2010).

Feedback from people provides numerous advantages which differ depending on the feedback giver's experience. Customers, superiors, and team members can all have different views on a leader's performance in their role. In that respect, feedback from people can be inclusive and holistic. This traditional feedback source has gained notoriety as the most reliable source of feedback although research has shown that feedback from people is not always reliable and can be subjective in their outlook (Bamberger et al., 2005). However, human feedback can relate to situations and contexts which gives it a further advantage in its appreciation of situations and being relatable (Bamberger et al., 2005).

One of the major disadvantages of peer feedback is argued by Kok-Yee et al. (2011). These scholars argue that there are two biases that are ubiquitous in performance ratings: (a) lenience, defined as the tendency for raters to assign higher ratings and (b) halo effect, the raters' failure to differentiate among different dimensions of the ratee's behaviours. It is further stated that these raters may not be willing to provide honest feedback because of the risk of potential repercussions from ratees. This suggests that peers and subordinates could be more likely to inflate their ratings (lenience) across multiple behavioural dimensions (halo) such that their feedback has a positive outlook towards performance. Thus, in this study the following is proposed: The feedback from peers is lenient in comparison to feedback from AI.

2.8.Attitudes towards feedback received from people

Feedback is encouraged in teams because it is expected to improve self-awareness and can be used to develop and improve performance (Atwater and Waldman, 2008). Feedback is also useful to motivate and direct the recipient towards reinforcing the desired behaviour. However, because not all feedback is positive, it might not be well-received for various reasons: where feedback recipients might react in ways that can diminish or eliminate its positive effects worse

yet, feedback can also result in reactions having deleterious effects on performance, attitudes, or both (Atwater, Waldman, et al., 2001). As such, feedback, although an example of open communication, is not always effective or desirable (Atwater and Waldman, 2008).

In light of attitude towards feedback given by people, Hawass (2017) states that those personal differences have a significant role to play in the leader's overall receptivity to feedback. Dahling et al. (2012) describe feedback orientation as a quasi-trait that remains stable for a period and can be strongly influenced by situational and environmental factors. This supports the notion of an individual's way of knowing and the filters they use to comprehend information and situations, mentioned above (Drago-Severson and Blum-Destefano, 2017). Dahling et al. (2012) argue that a peer with a high feedback orientation is more capable of handling their emotional reactions to feedback, processing feedback more meaningfully, and effectively using feedback to design job-related objectives and enhance performance. In this light, London and Smither (2002) emphasize that individuals who have a positive attitude toward feedback can use feedback for self-determination. Furthermore, these scholars continue that such individuals are motivated to actively search for reliable feedback sources, learn to develop new capabilities, and maintain constructive relations with peers and supervisors. Moreover, it helps them to accurately understand role expectations, which, in turn, improves their abilities to achieve better performance (Linderbaum and Levy, 2010).

London and Smither (2002) state that although the individual's receptivity to feedback is considered a key to effective performance and development, some studies have considered the environmental conditions which contribute to the development of the people's feedback orientation. This then means that the feedback given, the manner and environment in which it is given can influence the recipient's attitude towards the feedback (Hart, 2011). It has been suggested that effective leadership behaviours can help team members form a positive attitude towards feedback and further make good use of it.

Positive feedback has been found to evoke positive emotions and acceptance from the recipient (Atwater and Waldman, 2008). However, negative emotions like anger are a relatively common reaction individuals have towards negative feedback be it that the source of the feedback are peers or supervisors (Atwater et al., 2001). Atwater and Brett (2005) found that negative feedback from direct reports as part of a 360-degree feedback process was related to emotions such as anger, unhappiness, discouragement, and disappointment. In response to this Hart

(2011) states that the reaction to feedback is dependent on the feedback recipient accepting or rejecting it and therefore determining if that feedback will help towards development or not.

As stated above feedback has been identified as a critical component of leadership development. The attitude evoked by negative feedback from people seems to suggest that there is a need for developmental readiness, as this is critical to how feedback is used and evaluated (Avolio, 2008). Consequently, it can be deduced that feedback, both positive and negative, has the ability to evoke attitude from the recipient, and such attitude can be a determinant of the prospect of the feedback being used to develop or not.

Although the effect of feedback is dependent on the feedback receiver it has been found that feedback perception of the source of the advice influences the evaluation of the advice quality (Feng and MacGeorge, 2010). While the source of the feedback does not make up the feedback, it has a significant effect on how the feedback is received (DeNisi et al., 1982). Thus, in this study, the following is proposed: The students' perception of a feedback source will relate positively to the feedback.

2.9.Feedback from chatbots to develop leadership

Simulators are defined as "an imitation of a system which allows for a better understanding of how the system behaves and evolves over time" (Silva, Trigo, and Pinto, 2010). For any type of problem design, simulators are often used for experiments even before the discovery of the real system (Oren,1994; Kotlyar et al., 2020); this is because simulators have the ability to present an imitation of reality (Kotlyar et al., 2020). The simulation environment is created using technologies such as virtual or augmented reality (Ma, Wijewickrema, Zhou, Zhou, O'Leary and Bailey, 2017). AI, therefore, signifies a process of simulation of the human brain.

Simulation has become a popular instrument used for training and developing team skills in numerous industries and production sectors (Beaubien and Baker, 2004). This is because simulation is a powerful training tool that allows the trainer a lot of control in the system in the form of scheduling of practice, presentation of feedback, and the introduction (or suppression) of distractions and other complexities within a safe, controlled learning environment (Beaubien and Baker, 2004).

Herde and Lievens (2018) found that integrated interpersonal simulations can elicit overt behaviour in a standardized manner across participants, furthermore; a series of simulations can be used to get insight into the behavioural repertoire of a target person. Herde and Lievens (2018) further submit that a well-designed simulation based on situations sampled from a predefined target domain and their intraindividual variability across team situations can be a reliable tool in eliciting behaviours.

To ensure a reliable and valid assessment, the simulation relies on participants to show a sufficient amount of relevant behaviours in the situation given (Kotlyar et al., 2020). In this light, the simulation's content and instructions create multiple independent behavioural incidents that are aimed at participants showing leadership skills, and to ensure that the participants are sufficiently stimulated in a consistent manner the simulator adjusts to situational cues that activate relevant behaviours (Herde and Lievens, 2018).

AI has impacted the world as a ground-breaking phenomenon presenting itself as an imperative; to such an extent that it can be said that the present era is characterised by AI, "the philosophies of machines to think, behave and perform either the same or similar to humans" (Dhamija and Bag, 2020, p.1). It can be further said to be the design, the use of program systems and machines that display human intelligence with its vital activities being knowledge representation, reasoning, and learning (Whitson, 2012). According to Bachelor and Petersen (2019), many tasks currently undertaken by humans will, in the future, be partially or wholly undertaken by AI. Advancements in AI will continue to have an enormous effect on how feedback is given and in the way in which leadership is assessed and perceived (Cockburn, Henderson and Stern, 2018).

In addition to the above advancements, AI and simulators are said to be good contributors to the automation, adoption, and overall development of disciplines (Oren, 1994; Ma et al., 2017). AI has infiltrated many sectors and influenced how learning is conducted in institutions. While the concept of AI in education and student learning is not entirely new, it is not immune to the many developments as a result of the emergence of the fourth industrial revolution (Olofsson et al., 2015). AI can play a pivotal role in the learning and development process, given its ability to not only be adaptive to the user but also the way it can process large data (Lamson and Redwitz, 2018). The use of AI will revolutionise how exercises in learning and development are done, given its ability to represent knowledge, learning, and reasoning. As mentioned

above, traditionally feedback is given by humans (Barnard, 2019). This has been revolutionised by AI which allows for adaptive design assessments that go beyond the traditional question and answer; and produces instantaneous and far more accurate real time feedback (Barnard, 2019).

Technological advancements have led to AI improving to having the capacity to help users make the right decision, over the years, technological solutions and workplace learning analytics systems have been designed to aid this process (Ruiz-Calleja et al., 2019). Recent developments in AI have the potential to further revolutionise the integration of human and artificial learning and will impact human and machine collaboration during teamwork (Seeber et al., 2020).

According to Bronack, Cheney, Reidl and Tashner (2008), AI is designed to be user-centric with a combination of design and usability considerations that enable it to be used for both input and output. The latter pays attention to participants' behaviour, monitors progress, and produces feedback in real-time (Bronack et al., 2008). These types of assistive AI which help individuals are said to be more equipped to make better decisions, diagnoses, and feedback in general (Murphy, 2019).

Campbell (2005) is of the view that the modern-day fast-paced world needs a training and response system that will be effective and produce immediate results; in this regard, AI has the ability to match this need where it is adopted. According to de Laat et al. (2020) automated feedback provision provides numerous benefits, across various team training and educational contexts. According to Marcano et al. (2020), the integration of human and artificial learning will have numerous benefits. In particular, the benefit of real-time feedback includes integrated learning and professional development within teams and less reliance on the availability of an instructor or coach. According to de Laat et al. (2020) this also implies that individuals can receive instant feedback in action without any lag time which then gives teams the ability to immediately respond and strategize accordingly. Automated, data-driven feedback can also motivate team members to learn and reflect more often because they receive relevant and prompt guidance feedback often in manageable quantities. de Laat et al. (2020) further state that recognising this potential is vital because it advocates the impact this development will have in augmenting team learning and professional development.

Although AI has been hailed as a positive development in feedback provision, there is a lot that relies on the development of transparent and trusted systems and clearly demonstrated added value so that feedback recipients will feel at ease and supported when receiving automated feedback which will, in turn, build trust transparency. This is exhibited in the Pegasystems (2019) study where individuals showed mistrust towards AI giving feedback; thus, inroads into customising the technology for users to embrace it will bridge the divide that currently exists.

2.10. Attitudes towards feedback received from chatbots

Traditionally, feedback is given by humans (Barnard, 2019). However, this has changed as AI is now capable of adaptive design assessments that go beyond the traditional question and answer; and produce instantaneous and accurate feedback (Barnard, 2019). Albeit a change from the traditional provision of feedback through humans will meet challenges before full acceptance, de Laat et al. (2020) state that it offers a lot of advantages like instant feedback without having to wait. It is also argued that automated, data-driven feedback can also motivate teams to learn and reflect more often because they receive relevant and prompt guidance often in manageable amounts. The potential of automated and real-time case in point must be the fact that automated feedback systems will have the ability to foster research collaboration and build larger datasets to reduce contextual bias and fragmentation (de Laat, 2020). While the above positive elements hold true, the attitude towards feedback from chatbots and AI is under question.

In a study by Huang et al. (2005) survey where data was collected from 198 long-haul truck drivers to provide quantitative information; the drivers reported that they would like to receive more feedback and that positive feedback was preferred over negative feedback. Feedback from humans, consisting of the truck drivers' supervisors or managers was more preferred and received with a high degree of acceptance than feedback from technology. However, it is important to note that Huang et al. (2005) further found that most drivers were willing to accept feedback by technology if the program was designed properly. The truck drivers expressed a number of objectives towards feedback from technology. These include relatability, transparency of feedback production, trust and reliability, and situation adaptability. Therefore, it is important for a program that uses technology for providing feedback to be adaptable to the users as this can be a crucial attitude determinant.

From the above, the argument is made that a lot of the acceptance and positive outlook of feedback from AI will rest on the ability to develop transparent and trusted systems and clearly demonstrated added value so that individuals and system users will feel at ease and supported when receiving automated feedback (de Laat et al., 2017). It is further tabled that building trust starts with transparency and providing accessible publications about AI-enabled feedback or personal assistants (de Laat et al., 2020; Bull and Kay, 2007). This highlights that there is a degree of acceptance of feedback from AI albeit that it is dismissed in some instances. Nevertheless, the AI source must be configured to the context in which it is being used (de Laat et al., 2020).

Bono and Colbert (2005) submit that there is a bi-dimensional nature towards the attitude and acceptance of feedback. They further argue that acceptance incorporates receptivity on the part of the feedback recipient as well as intentions to change behaviour based on the feedback (Bono and Colbert, 2005). In the same view, Funderburg and Levy (1997) suggest that an individual's receptivity of feedback is affected by both individual differences and contextual variables; the individual-level factors include self-esteem, locus of control, and feedback orientation; while the contextual variables include the feedback-seeking environment, perceptions of procedural justice and organisational citizenship behaviour (McCarthy and Garavan 2007). Thus, while there are legitimate issues to be raised towards AI feedback, some issues that influence attitude towards feedback from AI emanate from the feedback recipient.

Atwater et al. (2000) deem that cynicism, a negative personal attitude, which may include a number of dimensions: a belief that the organisation lacks integrity, a belief that problems exist in teams, and a belief that institutions implementing the initiative for control purposes, as a stumbling block for the acceptance of any feedback given regardless of where it is coming from humans or AI (Dean et al., 1998; Vance et al., 1995). Be that as it may, evidence suggests that individuals who are less cynical about their institutions will be more receptive to the feedback and are highly likely to improve performance and development (Wanous et al., 2000). Thus, in this study the following is proposed: Students are not averse to feedback from AI.

On the other hand, attitudes towards feedback from AI were a mixture of differing sentiments, as shown by the Pegasystems study (2019) where a significant number of people assessed were comfortable with receiving feedback and interacting with AI and another significant segment of individuals stated that they were not comfortable with receiving feedback and interacting

with AI. While the last group of people indicated indecisiveness on how they felt about receiving feedback and interacting with a machine.

It can be said that developmental advancements have given AI the ability to be a legitimate feedback provider. However, the issue as highlighted above are the attitudes towards AI feedback which are mostly cautious and receptive; a predicament that can be attributed to the nature and effect of feedback. DeNisi et al. (1982) are of the view that the process by which people respond to feedback, may be complex. As it not only must consider all the factors studied in the present performance but needs to consider other factors such as the nature of the task and individual team member differences. Taking the reservations raised in the Pegasystems (2019) study and the receptiveness that people have for peer feedback as found in the study by Huang et al. (2005) a proposition is made that: Students are more receptive towards peer feedback than AI feedback.

2.11. Chapter Summary

This chapter presented literature on leadership and addressed the centrality of team skills as a leadership competency. The chapter also linked feedback provision and feedback sources as important elements in leadership development. This was followed by focusing on humans and peers as a feedback source for leadership development and propositions for the study were identified. Finally, the chapter addressed AI as a feedback source for leadership.

CHAPTER 3: Research Methodology

3.1. Introduction

The previous chapter discussed the literature pertaining to the use of humans, AI and simulators in providing leadership feedback. This chapter describes and justifies the research design used in the research and explain the research procedure that was followed. The research instruments and population utilised in this research will be outlined. The data collection methods and data analysis used will be discussed. Furthermore, this chapter will highlight the ethical considerations that were made.

3.2.Research problem

While there has been research done to assess individuals' general attitudes towards feedback from AI, there is little research done on students' response to team skills feedback provided by simulators and AI (Kotlyar et al., 2020). A gap consequently exists in understanding how individuals particularly students respond to leadership feedback provided by AI versus how they respond to leadership feedback from their peers. The development of AI and simulators and its infiltration into multiple disciplines particularly in the field of leadership has become a new phenomenon in leadership feedback provision. This is because traditionally feedback is given by humans (Barnard, 2019). Given this development in simulators and AI, this research seeks to address how students respond to feedback on their team skills from simulators versus how they respond to feedback on their team skills from peers.

3.3.Research purpose

The purpose of this research is to assess how students react to feedback generated by the Skills Simulator on their team skills in comparison to how they react to the team skills results they receive from their peers. The purpose of the research is motivated by the context of the unprecedented technological advancements in AI and simulators which have revolutionised the traditional provision of feedback by humans in various contexts, and peoples' reception or non-

receptive attitudes towards feedback from AI and simulators. These developments have changed the traditional way of providing feedback by humans.

3.4.Research questions

The research questions of this study are:

1. Using the Skills Simulator Assessment, what are the team skills of students in a tertiary institution?
2. What is the relationship between the Skills Simulator Assessment team skills feedback and the level of acceptance or rejection by students?
3. How do the students' responses to feedback on team skills from AI and peers compare?

3.5.Research hypotheses

Hypothesis one to three below were aimed at testing the equivalence of the 2020 and 2021 data sets. Hypothesis four to eleven tested the hypothesised model.

3.5.1. Hypothesis One

$\mathbf{H_{o1}}$: There is no difference between the 2020 team skills ratings (chatbot) data and the 2021 team skills rating (chatbot) data.
$\mathbf{H_{a1}}$: There is a difference between the 2020 team skills rating (chatbot) data and the 2021 team skills rating (chatbot) data.

3.5.2. Hypothesis Two

$\mathbf{H_{o2}}$: There is no difference between the 2020 reaction to ratings (chatbot) scores and the year 2021 reaction to rating (chatbot) scores.
$\mathbf{H_{a2}}$: There is a difference between the 2020 reaction to ratings (chatbot) scores and the year 2021 reaction to ratings (chatbot) scores.

3.5.3. Hypothesis Three

H_{o3}: There is no difference in how 2020 participants reacted to being evaluated by chatbots and how 2021 participants reacted to being evaluated by chatbots.
H_{a3}: There is a difference in how 2020 participants reacted to being evaluated by chatbots and how 2021 participants reacted to being evaluated by chatbots.

3.5.4. Hypothesis Four

H_{o4}: There is no difference between a 4 versus 5-point scale on the team skills rating (people).
H_{a4}: There is a difference between a 4 versus 5-point scale on the team skills rating (people).

3.5.5. Hypothesis Five

H_{o5}: There is no difference between team skills (chatbot) rating scores and team skills (people) rating scores.
H_{a5}: There is a difference between team skills (chatbot) rating scores and team skills (people) rating scores.

3.5.6. Hypothesis Six

H_{o6}: There is no difference between how people react to ratings from the chatbot and ratings from people.
H_{a6}: There is a difference between how people react to ratings from the chatbot and ratings from people.

3.5.7. Hypothesis Seven

H_{o7}: There is no difference between how people react when evaluated by the chatbot and when evaluated by people.
H_{a7}: There is a difference between how people react when evaluated by the chatbot and when evaluated by people.

3.5.8. Hypothesis Eight

H_{o8}: There is no relationship between team skills rating (chatbot) scores and the reaction to ratings (chatbot).
H_{a8}: There is a relationship between team skills rating (chatbot) scores and the reaction to ratings (chatbot).

3.5.9. Hypothesis Nine

H_{o9}: There is no relationship between team skills rating (people) scores and the reaction to the rating (people) scores
H_{a9}: There is a relationship between team skills rating (people) scores and the reaction to the rating (people) scores

3.5.10. Hypothesis Ten

H_{o10}: There is no relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot.
H_{a10}: There is a relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot.

3.5.11. Hypothesis Eleven

H_{o11}: There is no relationship between team skills rating (people) scores and reaction to being evaluated by people.
H_{a11}: There is a relationship between team skills rating (people) scores and reaction to being evaluated by people.

3.6.Research design

This research made use of a quantitative methodological approach. Bryman et al. (2014) describe quantitative methodology as collecting numerical data and adopting a deductive approach to the relationship between theory and research. Creswell (2014) further explains that quantitative research is a methodological approach used for testing objective theories by testing

the relationship between variables. These variables are measured using instruments, and the numerical data is analysed using statistical procedures (Creswell, 2014). In the same light Goertzen (2017, p.12) states that "quantitative research methods are concerned with collecting and analysing data that is structured and can be represented numerically."

This research made use of a positivist research paradigm. Bryman, et al. (2014) defines positivism as an epistemological approach that promotes the application of natural science methods to study and understand social reality. It is further asserted that positivism seeks to gain knowledge through observation and measurement, making the researcher's work include a lot of quantifiable data collection, which leads to statistical analysis and interpretation thereof (Collins, 2010). Crowther and Lancaster (2008) state that positivist studies usually adopt a deductive approach, which is the best-suited approach to best position the researcher to focus on the facts and have minimal interaction with research participants, increasing the extent of objectivity. Consistent with the positivism paradigm applied, this research made use of quantitative statistical data analysis to reject or not reject the null hypotheses (Bless, Higson-Smith and Sithole, 2013).

This research used surveys as means to collect data. Pinsonneault and Kraemer (1993, p.77) defined a survey as a "means for gathering information about the characteristics, actions, or opinions of a large group of people." Surveys can also be used to examine the impact and needs, surrounding a particular phenomenon (Salant and Dillman, 1994).

Surveys are best suited for this research given their capability to obtain information from a large sample of the population like the one used in this research (Bell, 1996). Furthermore, "surveys are inclusive in the types and number of variables that can be studied, require minimal investment to develop and administer, and are relatively easy for making generalisations" (Bell, 1996, p. 68). McIntyre (1999) provides another justification as he states that surveys can also elicit information about attitudes that are otherwise difficult to measure using observational techniques. In this light, surveys were the ideal data collection tool to use in this research.

3.6.1. Data that was collected

Team skills are a cornerstone of a functioning team, as they are regarded as a key competence that leaders should possess (Betta, 2016). To obtain the necessary team skills and competencies

required of an effective leader, leaders must go through leadership development, which seeks to increase individual knowledge, skill and abilities (van Velsor, et al., 2017). While there are many mechanisms and ways to develop leadership (McCauley, 2008), feedback is crucial to this development as it allows leaders to obtain and appreciate perceptions on their performance from different sources (Wiley and Garner, 2009). In this study two feedback sources were used: peers and simulators (i.e., chatbots), to provide feedback for leadership development. The data that was collected focused on the manner in which the students performed in the group assignment with their peers and chatbot during the assessments of their team skills and their reactions towards the feedback given on their team skills.

3.6.2. Population and sample

Bless et al. (2013, p.162) define a population as "the entire set of objects or people that is the focus of a research project and about which the researcher wants to determine some characteristics". The researcher was interested in how students from a tertiary/university setting respond to feedback on their team skills from the Skills Simulator Assessment, versus their peers. The population of this study were all students registered for Management One course at Rhodes University. The sampling procedure consisted of two phases. The first phase was the interaction with Skills Simulator Assessment. Phase two was the group assignment which required students to rate their group members' teamwork skills by completing the feedback survey.

The data of this research was collected in two cohorts. The first was collected in the pilot study conducted in 2020, where 106 of the 435 students registered for Management One course gave consent to participate in the research. The number of participants was low due to the COVID-19 pandemic and connectivity challenges which interrupted the academic year. The data collected in the pilot study in 2020 was kept and combined with the 2021 phase one data. The second cohort took place in 2021, where 256 of the 412 students registered for Management One gave consent to participate in the Skills Simulator Assessment phase (phase one) of the research, and 122 students consented to their data being used from the group assignment phase. Etikan, Musa and Alkassim (2016) define convenient sampling as a non-probability sampling where the targeted population is easily accessible to the researcher, available at a given time and willing to participate in a study. Given that the researcher is a Masters student at the

Management Department at Rhodes University and had access to the Management One students at the University, convenience sampling was used in this research study.

3.6.3. Data collection process and method

The research consisted of two phases. The first phase includes interaction with the Skills Simulator Assessment (SSA). The second phase consists of a group assignment as see in Table 3.1. and Table 3.2 which presents the different questionnaires used at the various stages of this research study.

As part of their second term course, the Management One students were asked to complete the forty-minute Skill Simulator Assessment, as part of their weekly tutorial. This was done either at home, on the premises of Rhodes University, or in any setting where students had internet connection. Before being directed to the Skills Simulator Assessment page, participants were given a link to a Google Form 1 (see Appendix A) and were asked to complete the form in a single sitting. The Google form included a consent form where students were asked their consent for information they had provided to be used as part of a research study. Students were asked demographic questions, responses to these questions would form part of an international research study. The participant's name and surname would not be published in the study. This was followed by the team orientation questionnaire (Wang et al., 2017) which consists of seven questions. After completing the team orientation questionnaire, students were directed to the Skills Simulator Assessment.

The Skill Simulator Assessment launched by Prof Igor Kotlyar was used to assess students' team skills and feedback on these team skills was to be provided to students. The Skill Simulator recreated team dynamics using chatbot AI and makes use of "a proprietary scoring algorithm to automatically analyse natural language responses" (Skill Simulator Assessments, 2018). The simulation replicated teamwork situations identified through analysis of common team challenges and "critical incidents", which is a standard approach to developing simulations, (Herde and Lievens, 2018; Mislevy, 2013). In the simulation, students were put in teams of four members. Unknown to the student, the three were virtual characters. All participants were confronted with standardized stimuli. In order to create a greater illusion of realism and make the conversation flow more naturally, chatbots occasionally displayed minor

differences in their responses when replying to individual participants. The simulator gave the impression that the student is chatting to other group members; it provided a forum for all participants to engage, suggest answers and consider suggestions and in the process. At the end of the Skills Simulator Assessment, the student was evaluated on the following six categories of teamwork skills:

- Team Building – Promotes team cohesion and effective team functioning
- Engaging Team Members – Proactively engages and encourages individual team members to contribute.
- Problem Solving – Actively contributes to the team's problem-solving and other task activities.
- Leading – Facilitates a positive team atmosphere that supports teamwork and boosts energy.
- Communicating – Communicates in a polite, friendly, and respectful manner.
- Dealing with Frustration & Conflict – Maintains composure even when feeling disappointed or provoked by other team members; does not let personal frustrations adversely affect team dynamics.

The first phase is rounded off by an assessment where they were informed that they were interacting with robots in the Skills Simulator Assessment. At this point students were asked to report their reaction (Reaction to chatbot evaluation) to the rating/assessment given by the Skills Simulator Assessment by filling out the reaction scales.

For the second phase of the research: the group assignment, students were required to reflect on their experiences and the functioning of their tutorial groups recommendations for improving the functioning of Management 101 virtual tutorial groups, including the role of tutors in facilitating/leading the virtual tutorials and the role played by students, while also reflecting on the reading "Leadership in Virtual Teams: Oxymoron or Opportunity?" by Ilze Zigurs, which discussed virtual teams (see Appendix B).

Once students had submitted their group assignments and experienced working as a team, they were asked to rate their group members' teamwork skills using a peer feedback survey. Ratings were aggregated per person and each group member received feedback on how other group members had rated them on the six teamwork skills. Students were then asked to report their reaction to the ratings given by group members using the reaction to feedback survey.

Participants reported their reaction to the source of ratings when the source of the feedback was revealed.

Table 3. 1 : Stages of the study showing timing and equivalence of measures

Phase 1: Simulator	**Phase 2: Group Assignment**
Step 1: Participants complete a Google Form in a single step that contains the following: (a) a consent form (b) the demographic items (c) the team orientation questionnaire (Wang et al., 2017) *[Data to be used for international comparison, not local studies].* At end of the Google Form, students will click a link and get instantly directed to the Skills Simulator Assessment (SSA).	Step 5: Students are asked to participate in a group assignment as part of the Management One term two tutorial (Appendix B).
	Step 6: Students will be required to rate their group members' teamwork skills.
Step 2: Once participants land on the Simulation page, they enter their name and student number (for linking purposes) and begin the simulation. At the end of the simulation, participants will be required to fill out a self-assessment (6 items on teamwork skills). Students will then be directed to their results page. Each student will be presented with their individual assessment feedback generated	Step 7: Ratings are aggregated per person and each group member receives feedback on how other group members have rated them on the six teamwork skills.

by a computer algorithm of SSA on six teamwork skills.	
Step 3: Students will be directed to the Reactions Google page. Once on the Reactions Google page, participants will be asked to: (a) enter their names and student number (for linking purposes). (b) to indicate whether they interacted with bots or humans (c) Students will be asked to report their reaction to the rating/assessment given by the SSA by filling out the reaction scales.	Step 8: Students are asked to report their reaction to the ratings given by group members.
Step 4: Students are informed that they were interacting with robots. They are then asked to report their reaction to this. (Reaction to chatbot evaluation).	Step 9: Students report their reaction to whether their behaviours and reactions would be different if their teams were different.
	Step 10: Students get their individual assignment marks.

Table 3. 2: Questionnaire items at each stage of the research study

Phase 1: Simulator	**Phase 2: Group Assignment**
Step 1: A consent form (Sample from Rhodes University will used)	
Step1: Demographic Items Gender Age Student number ● What country do you currently reside in? ● How long have you been residing in this country? (Dropdown: less than 1 yr; 1-3 yrs; 4-6 yrs; 7-10 yrs; more than 10 yrs)	

● In the last 5 years, which country have you lived in the longest? ● Which country's culture do you identify with most?	
Step 1: Team orientation questionnaire (Wang et al., 2017) 1. I prefer to work on team rather than individual tasks. 2. When I have a choice, I try to work in a team instead of by myself. 3. I personally enjoy working with others. 4. Working in a group is better than working alone. 5. Given the choice, I would rather do a job where I can work alone rather than do a job where I have to work with others in the group. 6. I like to interact with others when working on projects. 7. I prefer to do my work and that others do theirs.	Student number of rater. Student number of student being rated.
Step 2: Computer-generated rating of six teamwork skills.	Step 7: Person-generated ratings of six teamwork skills.
1. Team Building – Promotes team cohesion and effective team functioning. 2. Engaging Team Members – Proactively engages and encourages individual team members to contribute. 3. Problem Solving – Actively contributes to team's problem-solving and other task activities. 4. Leading – Facilitates a positive team atmosphere that supports teamwork and boosts energy. 5. Communicating – Communicates in a polite, friendly and respectful manner. 6. Dealing with Frustration & Conflict – Maintains composure even when feeling disappointed or provoked by other team members; does not let personal frustrations adversely affect team dynamics. 7. How would you rate this person's teamwork skills overall?	

8. This person was a highly effective team player (1-Strongly Disagree to 5-Strongly Agree). 9. This person was instrumental to the team's performance (1-Strongly Disagree to 5-Strongly Agree).	
Step 3: Kotlyar et al., 2020 study: Affective and Utility reaction.	
1. I enjoyed the simulation exercise (Affectiveness). 2. The simulation exercise was fun and engaging (Affectiveness). 3. I would recommend this activity to others (Utility). 4. For me, it was worthwhile and interesting to participate in this activity (Utility).	
Step 3:	Step 8:
1. The experience helped me learn about my teamwork skills (Learning). 2. I feel this **online exercise** adequately assessed my teamwork skills. (Utility/Accuracy) 3. I will likely use the assessment feedback provided to further improve my teamwork skills (Utility).	1. The experience helped me learn about my teamwork skills (Learning). 2. I feel the **peer ratings** adequately assessed my teamwork skills. (Utility/Accuracy) 3. I will likely use the assessment feedback provided to further improve my teamwork skills (Utility).
Step 4: (Reaction to chatbot evaluation)	Step 9:
1. Were the members of the team human or chatbots? 2. To what extent, do you think, your behaviours and reactions would have been different if your team members in this activity were humans or chatbots? ● My behaviours and reactions would be not noticeably different; I would have behaved the same regardless of whether my team members were humans or chatbots. ● My behaviours and reactions would be somewhat different; some of my reactions would have been different. ● My behaviours and reactions would be completely different; I would	1. Were the members of the team human or chatbots? 2. To what extent, do you think, your behaviours and reactions would be different if you had a different team? ● My behaviours and reactions would be not noticeably different; I would have behaved the same if I had a different team. ● My behaviours and reactions would be somewhat different; some of my reactions would have been different. ● My behaviours and reactions would be completely different; I would have behaved much differently if I had a different team.

have behaved much differently if I thought my team members were humans or chatbots.	

3.6.4. Data treatment

Once participants completed the surveys on Google Forms (Appendix A) from both phases of the study, their responses were transferred to a Microsoft Excel sheet, where the data was cleaned. The researcher removed all names of participants, as this would not form part of the study, but kept their student numbers so as to be able to identify and trace students' data and answers in the different phases of the research. The researcher removed all participants who had not given consent for their information to be part of the research. Participants who did not complete all the required questions in the survey were also removed during this data cleaning process. The researcher calculated the factor scores, as seen in Table 3.3, before transferring the dataset into Statistica and SPSS for analysis (Fields, 2009). Statistica was mainly used, while SPSS was used for the factor analysis pre-tests (i.e., Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and Bartlett's Test of Sphericity), as they were not available on Statistica.

According to Massey and Miller (2006, p.2) "hypothesis testing uses tests of significance to determine the likelihood that a statement (often related to the mean or variance of a given distribution) is true, and at what likelihood that statement will be accepted as true." T-tests were used in the study to determine whether there was a significant difference between mean groups.

Hypothesis testing adhered to the following procedure: If the p-value is less than the level of significance of 0.05 (5%), the researcher rejected the null hypothesis and concluded that there was a statistical difference in the relationship. If the p-value was not less than the level of significance of 0.05 (5%), the researcher failed to reject the null hypothesis and concluded that there was insufficient evidence to conclude that the relationship is significant (Bless et al., 2013).

The instruments used to collect the scores for the team skills rating (chatbot) and team skills rating (people) consisted of two different scales. The team skills rating (chatbot) made use of

a Likert scale of 1-4. The team skills ratings (people) made use of a Likert scale of 1-5. The challenge that the researcher faced was comparing two different scales: 4-point versus 5-point. A T-test was run where the 4-point was compared to the 5-point scale to test for equivalence. The 5-point scale of the team skills rating (people) instrument was adjusted to a 4-point scale by removing all responses with a 3 "neutral" response. This reduced the sample size from 122 to 98. A T-test for equivalence was run where the 5-point was compared to the 4-point adjusted scale with a smaller sample size. The researcher concluded that there was a statistical difference between the results from a 4-point versus 5-point scale on the team skills rating (people). The researcher continued to use the 5-point scale for the rest of the study.

Pearson's correlation coefficient (r) is defined as a statistical measure of the strength of a linear relationship between paired data. The relationship (or the correlation) between the two variables is denoted by the letter r (Akolgue, 2018). A positive correlation coefficient indicates a positive linear relationship. Negative values indicate a negative linear relationship between the two variables (Akolgue, 2018). The closer the value is to one or negative one, the stronger the linear correlation. The strength of the correlation can be described using the guide that Evans (1996) suggests for the absolute value of r: .00-.19 "very weak" .20-.39 "weak" .40-.59 "moderate" .60-.79 "strong" .80-1.0 "very strong".

Table 3. 3: Factor names and items

Factor Name	Items	Scale	Factor calculation
Team Skills Rating (Chatbots)	1.Team building 2. Engaging 3.Leading 4.Problem solving 5. Communicating 6.Dealing with frustrations and conflict	Likert scale of 1-4 from low to excellent.	Average of the 6 items
Team Skills Rating (People)	1.Team building 2. Engaging 3.Leading 4.Problem solving	Likert scale of 1-5 1 being poor and 5 being excellent	Average of the 6 items

	5. Communicating 6.Dealing with frustrations and conflict	(A 5-point scale was utilised to give people a neutral point)	
Reaction to ratings (Chatbots)	1.The experience helped me learn about my teamwork skills. (Learning) 2. I feel this online exercise adequately assessed my teamwork skills. (Accuracy) 3.I will likely use the assessment feedback provided to further improve my teamwork skills. (Utility)	Likert scale of 1-5. 1 being strongly disagree and 5 being strongly agree.	Average of the 3 items
Reaction to ratings (People)	1.The experience helped me learn about my teamwork skills. (Learning) 2.I feel the peer ratings adequately assessed my teamwork skills. (Accuracy) 3.I will likely use the assessment feedback provided to further improve my teamwork skills. (Utility)	Likert scale of 1-5. 1 being strongly disagree and 5 being strongly agree.	Average of the 3 items
Reaction to evaluation (Chatbot)	1.Were the members of the team human or bots? 2.To what extent, do you think, your behaviours and reactions would be different if you had a different team? •My behaviours and reactions would be not noticeably different; I would have behaved the same if I had a different team. •My behaviours and reactions would be somewhat different; some of	Ranked data	

	my reactions would have been different. •My behaviours and reactions would be completely different; I would have behaved much differently if I had a different team.		
Reaction to evaluation (People)	1.Were the members of the team human or bots? 2.To what extent, do you think, your behaviours and reactions would be different if you had a different team? •My behaviours and reactions would be not noticeably different; I would have behaved the same if I had a different team. •My behaviours and reactions would be somewhat different; some of my reactions would have been different. •My behaviours and reactions would be completely different; I would have behaved much differently if I had a different team.	Ranked data	

The table below lists the hypotheses tested in the research and the tests used in the specific hypotheses. Hypotheses One to Seven made use of T-tests. Hypotheses Eight to Eleven made use of Pearson's correlation coefficient test.

Table 3. 4: The hypotheses tested in the research study and the tests used to tests these hypotheses.

Hypothesis	**Test**
Hypothesis One Is there a difference between the team skills (chatbot) data collected in the year 2020 and the team skills (chatbot) data collected in 2021.	T-test
Hypothesis Two Is there a difference between the 2020 reaction to ratings (chatbot) scores and the year 2021 reaction to rating (chatbot) scores.	T-test
Hypothesis Three Is there a difference in how 2020 participants reacted to being evaluated by chatbots and how 2021 participants reacted to being evaluated by chatbots.	T-test
Hypothesis Four Is there a difference between a 4 versus 5-point scale on the team skills rating (people).	T-test
Hypothesis Five Is there a difference between team skills (chatbot) rating scores and team skills (people) rating scores.	T-test
Hypothesis Six Is there a difference between how people react to ratings from the chatbot and ratings from people.	T-test
Hypothesis Seven Is there a difference between how people react when evaluated by the chatbot and when evaluated by people.	T-test

Hypothesis Eight Is there a relationship between team skills rating (chatbot) scores and the reaction to ratings (chatbot).	Correlation
Hypothesis Nine Is there a relationship between team skills rating (people) scores and the reaction to the ratings (people) scores.	Correlation
Hypothesis Ten Is there a relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot.	Correlation
Hypothesis Eleven Is there a relationship between team skills rating (people) scores and reaction to being evaluated by people.	Correlation

3.7.Ethical clearance

An ethics application form for HUMAN SUBJECTS was submitted using the Ethical Review Application System (ERAS) to RUESC via the Management Ethics Representative. All relevant research instruments and consent forms for this research study were submitted. The Rhodes University Registrar granted the researcher permission to use Management One students as the study population (Appendix C). The ethics application, reference number: 2020-1468-4731, was accepted, and the researcher was permitted to conduct the research.

Management One students were asked to give consent, as seen in Google Form one (Appendix A), for their data to be used in this research. Where consent was not granted, the data was not used. The names of all participants were not used in this research to ensure the anonymity of the participants. All the data was protected and not made available to anyone other than the researcher. The researcher's ethics application was approved (Appendix C). Following that the researcher was required to apply for a Gate Keeper's permission for the research. The Gate Keeper's application was submitted to the Registrar of Rhodes University as the researcher

wanted to use Management One students as the research participants. The Gate Keeper's permission was approved by the Registrar as seen in Appendix C.

3.8.Chapter summary

This chapter presented the methodology of the research and the process of data collection and analysis. The research design that was used to undertake this study and the rationale justifying this design and the data that was collected for analysis. The chapter addressed the sources of the data and the sample size. Finally, the ethical considerations that were considered in the research and data gathering process were also outlined.

CHAPTER 4: Results

4.1.Introduction

The previous chapter described the methodology of this research, detailing the research process and the analysis of the findings to produce the results outlined in this chapter. The preceding chapters reviewed the literature on leadership and the use of simulators and AI in providing leadership feedback and identified team skills as a central leadership competence. This chapter presents the identified hypotheses on leadership feedback provided by humans and AI, using the data collected from the students registered for Management One students as outlined in the preceding chapter. The presentation of the statistical results is outlined in this chapter.

4.2.Research respondents

The population of the study consists of students studying Management One, an undergraduate introductory course in business management, at Rhodes University in the 2020 and 2021 academic years. The sampling procedure takes into account the two phases of the study. The first phase was the interaction with the Skills Simulator Assessment (SSA). The second phase was a group assignment which included a requirement for students to rate their group members' teamwork skills using the peer feedback survey.

In the pilot study conducted in 2020, the population consisted of all 435 Management One students. Due to COVID-19 disruptions and technical challenges like connectivity, 106 students gave consent for their data to be used as part of the research. The 2020 data was kept and combined with the 2021 data. In 2021, the population consisted of all 412 students studying Management One at Rhodes University. The 2021 data consisted of the data collected from the two phases of the research, the SSA, and the group assignment. 256 students gave consent to participate in the SSA phase of the research, and 122 students consented to their data being used from the group assignment phase. This sample size is sufficiently representative of the Management One class.

4.3.Comparison of 2020 to 2021 data

Hypothesis one to three below were aimed at testing the equivalence of the 2020 and 2021 data sets. Hypothesis four to eleven tested the hypothesised model.

Given that the researcher had 2020 and 2021 data; testing the equivalence of the data sets was needed, to determine if the data could be combined, prior to testing the hypothesised model.

4.3.1. Hypothesis One

$\mathbf{H_{o1}}$: There is no difference between the 2020 team skills ratings (chatbot) data and the 2021 team skills rating (chatbot) data

$\mathbf{H_{a1}}$: There is a difference between the 2020 team skills rating (chatbot) data and the 2021 team skills rating (chatbot) data

Table 4.1 shows the results for the tested mean difference between the year 2020 team skills rating (chatbot) data and the year 2021 team skills rating (chatbot) data. Results show that the p-value is 0.014809 and is significant at a 5% level. Therefore, the researcher rejects the null hypothesis and concludes that there is sufficient evidence, at the 5% level of significance, that there is a statistical difference between the 2020 team skills rating (chatbot) data and the 2021 team skills rating (chatbot) data. The mean score for the 2020 team skills rating (chatbot) data (M=2.567610) is higher than the 2021 team skills rating (chatbot) data mean score (M=2.425781), which indicates that the average values for 2020 team skills rating (chatbot) data scores were higher.

Table 4. 1: T-test result for 2020 versus 2021 total team skills scores (chatbot)

Variable	T-tests; Grouping: Year (Dataset for Tests2) Group 1: 2020 Group 2: 2021										
	Mean 2020	**Mean 2021**	**t-value**	**df**	**p**	**Valid N 2020**	**Valid N 2021**	**Std Dev. 2020**	**Std Dev. 2021**	**F-ratio Variances**	**p Variances**
BotSkillsScore	2 567610	2.425181	2.448823	360	0.014809	106	256	0.486744	0.507378	1.086583	0.631329

4.3.2. Hypothesis Two

$\mathbf{H_{o2}}$: There is no difference between the 2020 reaction to ratings (chatbot) scores and the year 2021 reaction to rating (chatbot) scores

H_{a2}: There is a difference between the 2020 reaction to ratings (chatbot) scores and the year 2021 reaction to ratings (chatbot) scores

Table 4.2 shows the results for the tested mean difference between the reaction to rating (chatbot) scores for the year 2020 and the year 2021 in a paired t-test. The results show that the p-value is 0.006117 and is significant at a 5% level. The t-statistic is also significant since it is greater than two (rule of thumb) t=-2.75776. Therefore, the researcher rejects the null hypothesis and concludes that there is sufficient evidence, at the 5% level of significance, that there is a statistical difference between the reaction to rating (chatbot) scores for the year 2020 and the reaction to rating (chatbot) scores for the year 2021. The mean score for the 2021 reaction to rating (chatbot) score (M=4.296875) is higher than the 2020 reaction to rating (chatbot) score (M=4.056604), which indicates that the average values for the 2021 chatbot reaction score were higher. The 2021 reaction to rating (chatbot) data had a higher average which is consistent with the preceding hypotheses' findings where data from the two years is compared.

Table 4.2: T-tests results for 2020 versus 2021 total reaction to rating (chatbot) scores

Variable	T-tests; Grouping: Year (Dataset for Tests2) Group 1. 2020 Group 2: 2021										
	Mean 2020	**Mean 2021**	**t-value**	**df**	**p**	**Valid N 2020**	**Valid N 2021**	**Std. Dev. 2020**	**Std.Dev. 2021**	**F-ratio Variances**	**P Variances**
BotReactionScore	4.056604	4.296875	-2.75776	360	0.006117	109	256	0.741847	0.75941 8	1.047932	0.793827

4.3.3. Hypothesis Three

H_{o3}: There is no difference in how 2020 participants reacted to being evaluated by chatbots and how 2021 participants reacted to being evaluated by chatbots

H_{a3}: There is a difference in how 2020 participants reacted to being evaluated by chatbots and how 2021 participants reacted to being evaluated by chatbots

Table 4.3 presents the results for the tested mean difference between the 2020 and 2021 reaction to evaluation (chatbots) scores, using a paired t-test. The results indicate that the p-value is 0.000000 and is significant at a 5% level. Therefore, the researcher rejects the null hypothesis and concludes that there is sufficient evidence, at the 5% level of significance, that there is a statistical difference between the 2020 and 2021 reaction to evaluation (chatbots) scores. The mean score for the 2020 reaction to evaluation (chatbot) score (M=2.669811) is higher than the

2021 reaction to evaluation (chatbot) score (M=1.945313), which indicates that the average values for 2020 reaction to evaluation (chatbot) scores were higher. Therefore, this indicates that there is a difference in how 2020 participants reacted to being evaluated by chatbots compared to the 2021 participants.

Table 4.3: T-test results for 2020 versus 2021 reaction to evaluation (chatbot) scores

Variable	T-tests; Grouping: Year (Dataset for Tests2) Group 1. 2020 Group 2: 2021										
	Mean	**Mean 2021**	**t-value**	**df**	**p**	**Valid N 2020**	**Valid N 2021**	**Std. Dev. 2020**	**Std.Dev. 2021**	**F-ratio Variances**	**P Variances**
BotReacToEvalu	2.669811	1.946313	10.18026	360	0.000000	106	256	0.697163	0.62332 2	1.091280	0.612996

There are significant differences in the results from the simulation exercise conducted in 2020 versus the one conducted in 2021. These differences were noted in all three ratings: team skills, reaction to rating (chatbot) scores and in how participants reacted to being evaluated by chatbots. Given these differences, the data sets were not combined for further hypothesis testing. Only the 2021 data will be used.

4.4.Factors and Variables

Using the SSA, this research seeks to assess how participants react to their team skills results generated by the Skills Simulator in comparison to how they react to the team skills results they receive from their peers. To assess this, team skills rating derived from the chatbot, and team skills ratings derived from people are used as factors, each consisting of six items. Reaction to ratings by chatbots and reaction to ratings from people are also factors consisting of three items each.

This research made use of the following instruments, namely the SSA, the Reaction to Ratings (chatbot) survey (Appendix A), the Team Skills (people) survey, and the Reaction to Ratings (people) survey (Appendix A). The reliability of these instruments is assessed below. The SSA ratings were examined first. If they are to be revised, then the equivalent measures from peer data will be adjusted accordingly, to ensure equivalence of measures.

4.4.1. Skills Simulator Assessment ratings

As indicated above, the reliability of the SSA measures, namely the total team skills rating (chatbot), and the reaction to ratings (chatbot) are examined first**.**

4.4.2. Instrument reliability Skills Simulator Assessment ratings

4.4.2.1.Cronbach's alpha calculations

Cronbach's alpha reliability coefficient for the team skills rating (chatbot) scores for the year 2021 was calculated to estimate the reliability of the team skills rating (chatbot) scores. Table 4.4 below shows that Cronbach's alpha reliability coefficient for the team skills rating (chatbot) scores is .402093265, which is poor. Table 4.5, the correlation matrix also indicates that some of the items included are not converging.

Table 4.6 shows that the Cronbach alpha reliability coefficient for reaction to rating (chatbot) scores is .811169960, which is good.

Table 4. 4: Cronbach alpha reliability coefficient for team skills rating (chatbot) scores

Reliability Results: Data for cronbach2
Number of items in scale: **6** Number of valid cases: **256** Number of cases with missing data:**0** Missing data were deleted: **casewise** **SUMMARY STATISTICS FOR SCALE** Mean: **14.554687500** Standard Deviation: **3.04427977** Skewness: **-.007601442** Minimum: **6.000000000** Cronbach alpha: **.402093265** Sum: **3726** Variance: **9.26** Kurtosis: **-.00** Stadardized alpha: **.47** Average Inter-Item Correlation: **.13**

Table 4. 5: Correlation matrix for team skills ratings (chatbot) scores

	Correlations (Data for cronbach2) Marked correlations are significant at p < _06000 N=256 (Casewise deletion of missing data)								
Variable	**Mean**	Std.Dev.	BotTeamBuild	BotEngaging	BotLeading	BotProblemSolv	BotComm	BotDealing w.F&C	BotSkillsScore
BotTeamBuild	2.296875	0.964949	1.000000	0.271925	0.392013	0.121129	0.375638	-0.147729	0.613878
BotEngaging	2.631250	1.130244	0.271925	1.000000	0.378977	0.079744	0.302781	-0127436	0.626359
BotLeading	2.382813	0.942430	0.392013	0.378977	1.000000	0.218218	0.433424	-0.208812	0.666542
BotProblemSolv	2.164063	0.856599	0.121129	0.079744	0.218218	1.000000	0.132036	-0.044830	0.434161
BotComm	2.238281	0.831877	0.375638	0.302781	0.433424	0.132036	1.000000	-0.196685	0.593338
BotDealing w.F&C	2.941406	1.280504	-0.147729	-0127436	-0.208812	-0.044830	-0.196685	1.000000	0.195485
BotSkillsScore	2.425781	0.507378	0.613878	0.626356	0.666542	0.434161	0.593338	0.195485	1.000000

Table 4. 6: Cronbach alpha reliability coefficient for reaction to rating (chatbot) scores

```
Number of items in scale: 3

Number of valid cases: 256

Number of cases with missing data:0

Missing data were deleted: casewise

              SUMMARY STATISTICS FOR SCALE
Mean: 12.968750000
Standard Deviation: 2.271520179
Skewness: -1.276265171
Minimum: 4.000000000
Maximum: 15.00
Cronbach alpha: .811169960
Sum: 3320
Variance: 5.15
Kurtosis: 1.25
Stadardized alpha: .81
Average Inter-Item Correlation: .60
```

The team skills rating (chatbot) scores are not reliable and therefore a factor analysis needs to be conducted. The reaction to rating (chatbot) scores are reliable and will not require any changes.

4.4.2.2. Pre-tests

Table 4.7 presents the value of the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) which is .762, this is above the recommended value of .6 (Kaiser, 1974 cited in Fields, 2009:647). Table 4.7 also indicates that the significance level is less than 0.05, p=.001. From this analysis, the researcher concludes that a factor analysis can be conducted.

Table 4. 7: Kaiser-Mayer-Olkin measure of sampling adequacy and Bartlett's Test of Sphericity for team skills rating (chatbot) scores

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.762
Bartlett's Test of Sphericity	Approx.Chi-Square	188.420
	df	15
	Sig.	<.001

4.4.2.3. Factor analysis of team skills rating (chatbot)

Six variables relating to team skills rating (chatbot) scores were factor analysed using factor analysis unrotated factor rotation, on Statistica. Table 4.8 indicates that the analysis yielded one factor reporting a total of 37.4602% of the variance for the set of variables. The results of a factor analysis are presented in Table 4.8, which indicates that Problem Solving should not be included, as it is below .4. The factor analysis also indicates that Dealing with Frustration and Conflict is included. However, it is negatively loaded. Therefore, a new team skill (chatbot) total consisting only of 5 items was constructed and with the Dealing with Frustration and Conflict scores reversed.

Table 4. 8: Factor analysis of team skills rating (chatbot) scores

	Factor Loadings (Unrotated) (Data for Cronbach2) Extraction: Principal components (Marked loadings are >.700000)
Variable	Factor 1
BotTeamBuild	-0.677876
BotEngaging	-0.622081
BotLeading	-0.778616
BotProblemSolv	-0.332751
BotComm	-0.723869
BotDealing w.F&C	0.400199
Expl. Var	2.247613
Prp.Totl	0.374602

4.4.2.4. Cronbach's alpha calculation of revised total team skills rating (chatbot) scores

A new total team skills rating (chatbot) score was constructed, which had five items as Problem Solving was omitted and Dealing with Frustration and Conflict score was reversed. A revised Cronbach's alpha was then calculated as shown in table 4.9. The revised Cronbach's alpha reliability coefficient for the team skills rating (chatbot) scores is 0.635971661, which is acceptable.

Table 4. 9: **Cronbach alpha reliability coefficient of revised total skills rating (chatbot) scores**

```
Number of items in scale: 5
Number of valid cases: 256
Number of cases with missing data:0
Missing data were deleted: casewise
              SUMMARY STATISTICS FOR SCALE
Mean: 12.507812500
Standard Deviation: 3.324292273
Skewness: .265040849
Minimum: 6.000000000
Maximum: 15.00
Cronbach alpha: .635971661
Sum: 3202
Variance: 11.05
Kurtosis: -.54
Stadardized alpha: .66
Average Inter-Item Correlation: .28
```

4.4.3. Instrument reliability peer assessment ratings

To ensure consistency, the researcher created an equivalent total score for team skills rating (people) scores by omitting Problem Solving as an item and reversing the scores for Dealing with Conflict and Frustration. The revised Cronbach's alpha reliability coefficient for the team skills rating (people) scores as seen in table 4.10 is .665556311, which is acceptable.

Table 4.11 shows that the Cronbach alpha reliability coefficient for reaction to rating (people) scores is .717645850, which is good.

Table 4. 10: Cronbach alpha reliability coefficient of revised total skills rating (people) scores

Number of items in scale: **5**

Number of valid cases: **122**

Number of cases with missing data:**0**

Missing data were deleted: **casewise**

SUMMARY STATISTICS FOR SCALE

Mean: **18.913934426**
Standard Deviation: **2.693412159**
Skewness: **-1.849637575**
Minimum: **7.500000000**
Maximum: **23.00**
Cronbach alpha: **.665556311**
Sum: **2307**
Variance: **7.25**
Kurtosis: **4.34**
Stadardized alpha: **.60**
Average Inter-Item Correlation: .**35**

Table 4. 11: Cronbach alpha reliability coefficient for reaction to rating (people) scores

Number of items in scale: **3**

Number of valid cases: **122**

Number of cases with missing data:**0**

Missing data were deleted: **casewise**

SUMMARY STATISTICS FOR SCALE

Mean: **13.245901639**
Standard Deviation: **2.148655068**
Skewness: **-1.692270036**
Minimum: **3.000000000**
Maximum: **15.00**
Cronbach alpha: .**717645850**
Sum: **1616**
Variance: **4.61**
Kurtosis: **3.81**
Stadardized alpha: **.72**
Average Inter-Item Correlation: .47

4.4.4. Hypothesis Four: Scale equivalence

$\mathbf{H}_{o4}$: There is no difference between a 4 versus 5-point scale on the team skills rating (people)

$\mathbf{H}_{a4}$: There is a difference between a 4 versus 5-point scale on the team skills rating (people)

The instruments used to collect the scores for the team skills rating (chatbot) and team skills rating (people) consisted of two different scales. The team skills rating (chatbot) made use of a Likert scale of 1-4. The team skills ratings (people) made use of a Likert scale of 1-5. The challenge that the researcher faced was comparing two different scales: 4-point versus 5-point. A T-test was run where the 4-point was compared to the 5-point scale to test for equivalence. The 5-point scale of the team skills rating (people) instrument was adjusted to a 4-point scale by removing all responses with a 3 "neutral" response. This reduced the sample size from 122 to 98. A T-test was run where the 5-point was compared to the 4-point adjusted scale with a smaller sample size. Table 4.12 below presents the results.

The results show that the p-value is significant (p= 0.01) at the 5% level. The t-statistic is also significant as it is greater than two (rule of thumb) t=2.490128. Therefore, the null hypothesis is rejected, and it is concluded that there is a statistical difference between the results from a 4-point versus 5-point likert scale on the team skills rating (people). The researcher will continue to use the 5-point scale for the remainder of the study but recognises this as a research limitation.

Table 4. 12: T-Test for the 4 versus 5-point scale on the team skills rating (people) scores

	T-test for Independent Samples (Data for Cronbach-Reversed score) Note: Variables were treated as independent samples									
Group 1 vs. Group 2	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2	Std.Dev. Group 1	Std.Dev. Group 2	F-ratio Variances
People Total Converted score (4-point scale) vs. People Rating Totals (5-point scale)	19.78061	19.03142	2.490128	218	0.013517	98	122	1.575486	2.621657	2.76899

4.4.4.1.Descriptive Statistics

The sample sizes, mean standard deviation, skewness, and kurtosis of each of the above-mentioned factors are listed in Table 4.13. The correlation of these factors is listed in Table 4.15. Team skills rating (people) has the highest mean of M=22.20492 (SD=3.68), whereas the team skills (chatbot) have an average of M= 12.50781 (SD=3.32). From these results, it can be

concluded that people/peers were more lenient in their scores in comparison to the chatbot, and with scores showing a lower variance.

The reaction to rating (chatbot) scores (M=12.96875, SD=2.27) and reaction to rating (people) scores (M=13.24590, SD=3.00), are close to each other, with the people rating slightly higher on average and a higher standard deviation. Similarly, the reaction to evaluation (chatbot) scores (M=1.92578, SD=0.637365) and the reaction to evaluation (people) scores (M=1.35246, SD=0.588065) are also close to one another, but this time the chatbot ratings are higher and with a higher variance in scores. In the next section, it will be determined if these differences in ratings are significant or not.

Table 4. 13: Descriptive statistics for chatbot and people factors

Variable	Descriptive Statistics (Dataset for Tests2)						
	Valid N	Mean	Minimum	Maximum	Std.Dev.	Skewness	Kurtosis
ChatBotTotal	256	12.50781	6.00000	21.00000	3.324292	0.26504	-0.541269
BotReactTotal	256	12.96875	4.00000	15.00000	2.271520	-1.27627	1.259756
BotReacToEvalu	256	1.92578	1.00000	3.00000	0.637365	0.06365	-0.534441
PeerRatingTotal	122	22.20492	15.00000	31.00000	3.681400	0.21721	-0.678321
PeopleReactTotal	122	13.24590	3.00000	15.00000	2.148655	-1.69227	3.813504
PeopleReactToEvalu	122	1.35246	1.00000	3.00000	0.588065	1.46312	1.136165

Table 4. 14: Correlation for chatbot and people factors

Variable	Correlations (Dataset for Tests2) Marked correlations are significant at p < .05000 N=122 (Casewise deletion of missing data)							
	Mean	Std.Dev.	ChatBotTotal	BotReacToEvalu	BotReactTotal	PeerRatingTotal	PeopleReactTotal	PeopleReacTo Evalu
ChatBotTotal	11.910803	3.429551	1.000000	-0.018513	0.088139	0.941976	0.072293	-0.059318
BotReacToEvalu	1.94262	0.855697	-0.018513	1.000000	-0.18570	-0.025095	0.007737	-0.254028
BotReactTotal	12.90984	2.408676	0.088139	-0.018570	1.000000	0.263997	-0.056362	-0.034290
PeerRatingTotal	22.20492	3.681400	0.941976	-0.025095	0.263997	1.000000	0.070893	-0.060360
PeopleReactTotal	13.24590	2.148655	0.072293	0.007737	-0.056362	0.070893	1.000000	-0.179386
PeopleReacToEvalu	1.35246	0.588065	-0.059318	0.254028	0.034290	-0.060360	0.179386	1.000000

4.4.5. Hypothesis Testing: Hypothesis Five to Eleven

Hypothesis testing adhered to the following procedure: If the p-value is less than the level of significance of 0.05 (5%), the researcher rejected the null hypothesis and concluded that there is statistical difference in the relationship. If the p-value is not less than the level of significance of 0.05 (5%), the researcher failed to reject the null hypothesis and concluded that there is insufficient evidence to conclude that the relationship is significant.

4.4.5.1.Hypothesis Five

H_{o5}: There is no difference between team skills (chatbot) rating scores and team skills (people) rating scores

H_{a5}: There is a difference between team skills (chatbot) rating scores and team skills (people) rating scores

Table 4.15 shows the results for the tested mean difference between the team skills (chatbot) rating scores and the team skills (people) rating scores, and a paired t-test was used. Results show that the p-value is 0.00 and is therefore significant at a 5% level. Therefore, the researcher rejects the null hypothesis and concludes that there is sufficient evidence, at the 5% level of significance, that there is a statistical difference between the team skills (chatbot) rating scores and team skills (people) rating scores. The mean for the team skills (people) rating scores is (M=22.20492) and is higher than the team skills (chatbot) rating scores mean (M= 12.50781), this may suggest that people/peers are more lenient in their ratings than the chatbot.

Table 4. 15: T-test results for team skills rating (chatbot) scores and team skills rating (people) scores

	T-test for Independent Samples (Dataset for Tests2) Note: Variables were treated as independent samples										
Group 1 vs. Group 2	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2	Std.Dev. Group 1	Std.Dev. Group 2	F-ratio Variances	P Variances
ChatBotTotal vs PeerRatingTotal	12.50781	22.20492	-25.5992	376	0.00	256	122	3.324292	3.681400	1.226387	0.180611

4.4.5.2.Hypothesis Six

H_{o6}: There is no difference between how people react to ratings from the chatbot and ratings from people

H_{a6}: There is a difference between how people react to ratings from the chatbot and ratings from people

Table 4.16 shows the results for the tested mean difference between the chatbot reaction score and the people reaction score using a paired t-test. The results show that the p-value is 0.259899. Therefore, the researcher fails to reject the null hypothesis and concludes that, at the

5% level of significance, there is no statistical difference between how people react to ratings from the chatbot and how they react to ratings from people.

Table 4. 16: T-test results for reaction to rating (chatbot)scores and reaction to rating (people)

Group 1 vs. Group 2	T-test for Independent Samples (Dataset for Tests2) Note: Variables were treated as independent samples										
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2	Std.Dev. Group 1	Std.Dev. Group 2	F-ratio Variances	P Variances
BotReactTotal vs. PeopleReactTotal	12.96875	13.24590	-1.12833	376	0.259899	256	122	2.271520	2.148655	1.117634	0.491456

4.4.5.3.Hypothesis Seven

$\mathbf{H_{o7}}$: There is no difference between how people react when evaluated by the chatbot and when evaluated by people

$\mathbf{H_{a7}}$: There is a difference between how people react when evaluated by the chatbot and when evaluated by people

Table 4.17 shows the results of a paired t-test for the tested mean difference between how people react when they discover they were evaluated by the chatbot, compared to when they were evaluated by people. The results show that the p-value is 0.405779. Therefore, the researcher fails to reject the null hypothesis and concludes that, at the 5% level of significance, there is no statistical difference between how people react when evaluated by the chatbot and how they react evaluated by people.

Table 4. 17:T-test results for reaction to evaluation (chatbot) and reaction to evaluation (people)

Group 1 vs. Group 2	T-test for Independent Samples (Dataset for Tests2) Note: Variables were treated as independent samples										
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2	Std.Dev. Group 1	Std.Dev. Group 2	F-ratio Variances	P Variances
BotReacToEvalu vs PeopleReacToEvalu	1.925781	1.860656	0.832281	376	0.405779	256	122	0.637365	0.846144	1.762429	0.000180

4.4.5.4.Hypothesis Eight

$\mathbf{H_{o8}}$: There is no relationship between team skills rating (chatbot) scores and the reaction to ratings (chatbot)

$\mathbf{H_{a8}}$: There is a relationship between team skills rating (chatbot) scores and the reaction to ratings (chatbot)

A Pearson correlation coefficient was computed to assess the relationship between team skills ratings (chatbot) and the reaction to these ratings (chatbot). Table 4.18 shows that there is a weak positive linear relationship between the team skills ratings (chatbot) and the reaction to ratings (chatbot) r=0.059755, p=0.00. Therefore, the null hypothesis is rejected, and it is concluded that there is sufficient evidence, at the 5% level of significance, that there is a significant relationship between team skills rating (chatbot) scores and the reaction to ratings (chatbot).

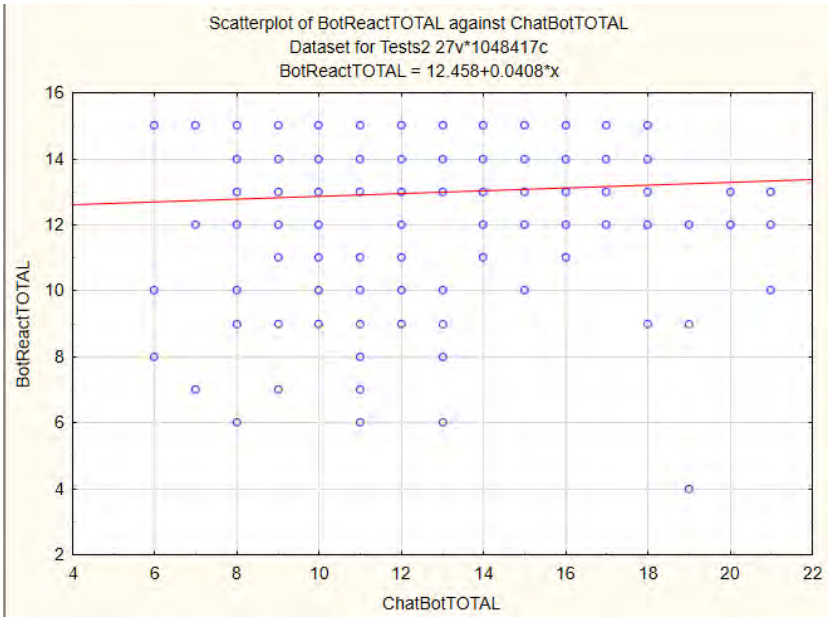
Table 4. 18: Correlation results for team skills rating (chatbot) and reaction to rating (chatbot)

Variable	Correlations (Dataset for Tests2) Marked correlations are significant at p<.05000 N=256 (Casewise deletion of missing data)
	BotReactTotal
ChatBotTotal	0.059755

Table 4. 19: T-test results for team skills rating (chatbot) and reaction to rating (chatbot)

Group 1 vs. Group 2	T-test for Independent Samples (Dataset for Tests2) Note: Variables were treated as independent samples										
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2	Std.Dev. Group 1	Std.Dev. Group 2	F-ratio Variances	P Variances
ChatBotTotal vs BotReactScore	12.50781	4.322917	38.41059	510	0.00	256	256	3.324292	3.324292	19.27559	0.00

Figure 4. 1: Scatterplot of reaction to ratings by chatbots against team skills rating (chatbot)scores



4.4.5.5.Hypothesis Nine

H_{o9}: There is no relationship between team skills rating (people) scores and the reaction to the rating (people) scores

H_{a9}: There is a relationship between team skills rating (people) scores and the reaction to the rating (people) scores

A Pearson correlation coefficient was computed to assess the relationship between team skills ratings (people) and the reaction to the ratings (people). Table 4.20 indicates a moderate positive linear relationship between team skills rating (people) scores and the reaction ratings (people) r=0.590486, p=0.00. Therefore, we reject the null hypothesis as there is sufficient evidence to conclude that there is a significant relationship between team skills rating (people) scores and the reaction to the ratings (people).

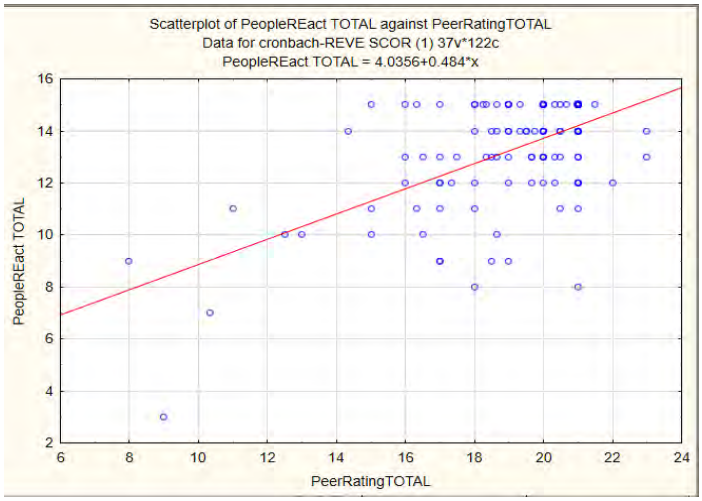
Table 4. 20: Correlation results for team skills rating (people) score and reaction to rating (people) scores

Variable	Correlations (Data for Cronbach-reverse score (1)) Marked correlations are significant at p< .05000 N=122 (Casewise deletion of missing data) **PeopleReactTotal**
PeerRatingTotal	0.590486

Table 4. 21: T-test results for team skills rating (people) score and reaction to rating (people) scores

Group 1 vs. Group 2	T-test for Independent Samples (Data for cronbach- reverse score (1))) Note: Variables were treated as independent samples										
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2	Std.Dev. Group 1	Std.Dev. Group 2	F-ratio Variances	P Variances
PeerRatingTotal vs PeopleReactTotal	19.03142	13.24590	18.85237	242	0.00	122	122	2.621657	2.148655	1.488738	0.029483

Figure 4. 2: Scatterplot of reaction to ratings (people) scores against team skills ratings (people) scores



4.4.5.6.Hypothesis Ten

$\mathbf{H_{o10}}$: There is no relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot

$\mathbf{H_{a10}}$: There is a relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot

A Pearson correlation coefficient was computed to assess the relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot. Table 4.22 indicates that there is a weak positive linear relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot, r= 0.003051, p=0.00. Therefore, the null hypothesis is rejected as there is sufficient evidence to conclude that there is a significant relationship between team skills ratings (chatbot) and the reaction to being evaluated by a chatbot.

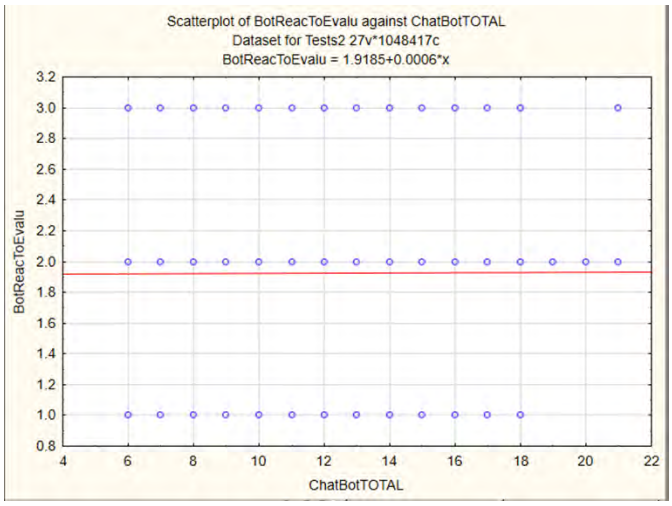
Table 4. 22: Correlation results for team skills ratings (chatbot) and reaction to evaluation (chatbot)

	Correlations (Dataset for Tests2) Marked correlations are significant at p<.05000 N=256 (Casewise deletion of missing data)
Variable	**BotReacToEvalu**
ChatBotTotal	0.003051

Table 4. 23: T-test results for team skills rating (chatbot) and reaction to evaluation (chatbot)

	T-test for Independent Samples (Dataset for Tests2) Note: Variables were treated as independent samples										
Group 1 vs. Group 2	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2	Std.Dev. Group 1	Std.Dev. Group 2	F-ratio Variances	P Variances
ChatBotTotal vs. BotReacToEvalu	12.50781	1.925781	50.02080	510	0.00	256	256	3.324292	0.637365	27.20329	0.00

Figure 4. 3: Scatterplot of reaction to being evaluated by a chatbot against team skills ratings (chatbot) scores



4.4.5.7.Hypothesis Eleven

H_{o11}: There is no relationship between team skills rating (people) scores and reaction to being evaluated by people

H_{a11}: There is a relationship between team skills rating (people) scores and reaction to being evaluated by people

A Pearson correlation coefficient was computed to assess the relationship between team skills rating (people) scores and reaction to being evaluated by people. Table 4.24 indicates a weak negative linear relationship between team skills rating (people) scores and reaction to being evaluated by people, r= -0.060360, p=0.00. Therefore, we reject the null hypothesis as there is sufficient evidence to conclude that there is a significant negative relationship between team skills rating (people) scores and the reaction to being evaluated by people.

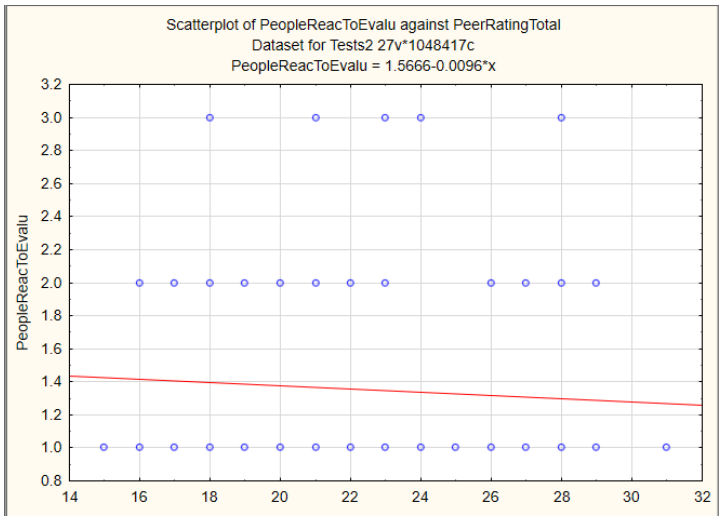
Table 4. 24: Correlation results for team skills rating (people) and reaction to evaluation (people)

	Correlations (Dataset for Tests2) Marked correlations are significant at p<.05000 N=122 (Casewise deletion of missing data)
Variable	**PeopleReactToEvalu**
ChatBotTotal	-0.060360

Table 4. 25: T-test results for team skills rating (people) and reaction to evaluation (people)

Group 1 vs. Group 2	T-test for Independent Samples (Dataset for Tests2) Note: Variables were treated as independent samples										
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2	Std.Dev. Group 1	Std.Dev. Group 2	F-ratio Variances	P Variances
PeerRatingTotal vs. PeopleReacToEvalu	22.20492	1.352459	61.78071	242	0.00	122	122	3.681400	0.588065	39.19001	0.00

Figure 4. 4: Scatterplot of team skills ratings by people against reaction in terms of team evaluation by people



4.4.6. Chapter summary

This chapter presented the identified hypotheses on the use of simulators and AI in leadership feedback. The hypotheses and conclusions reached in this chapter are summarised in table 4.26 below:

Table 4. 26: Chapter Summary

Hypothesis	Conclusion
Hypothesis One Is there a difference between the team skills (chatbot) data collected in the year 2020 and the team skills (chatbot) data collected in 2021.	There is a statistical difference between the 2020 team skills rating (chatbot) data and the 2021 team skills rating (chatbot) data.
Hypothesis Two Is there a difference between the 2020 reaction to ratings (chatbot) scores and the year 2021 reaction to rating (chatbot) scores.	There is a statistical difference between the reaction to rating (chatbot) scores for the year 2020 and the reaction to rating (chatbot) scores for the year 2021
Hypothesis Three Is there a difference in how 2020 participants reacted to being evaluated by chatbots and how 2021 participants reacted to being evaluated by chatbots.	There is a difference in how 2020 participants reacted to being evaluated by chatbots compared to the 2021 participants.
Hypothesis Four Is there a difference between a 4 versus 5-point scale on the team skills rating (people).	There is a statistical difference between the results from a 4 versus a 5-point likert scale on the team skills rating (people).
Hypothesis Five Is there a difference between team skills (chatbot) rating scores and team skills (people) rating scores.	There is a statistical difference between the team skills (chatbot) rating scores and team skills (people) rating scores.
Hypothesis Six Is there a difference between how people react to ratings from the chatbot and ratings from people.	There is no statistical difference between how people react to ratings from the chatbot and how they react to ratings from people.
Hypothesis Seven Is there a difference between how people react when evaluated by the chatbot and when evaluated by people.	There is no statistical difference between how people react when evaluated by the chatbot and when evaluated by people.

Hypothesis Eight Is there a relationship between team skills rating (chatbot) scores and the reaction to ratings (chatbot).	There is a significant relationship between team skills rating (chatbot) scores and the reaction to ratings (chatbot).
Hypothesis Nine Is there a relationship between team skills rating (people) scores and the reaction to the ratings (people) scores.	There is a significant relationship between team skills rating (people) scores and the reaction to the ratings (people.
Hypothesis Ten Is there a relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot.	There is a significant relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot.
Hypothesis Eleven Is there a relationship between team skills rating (people) scores and reaction to being evaluated by people.	There is a significant negative relationship between team skills rating (people) scores and reaction to being evaluated by people.

CHAPTER 5: Discussion

5.1.Introduction

After presenting the results of the research in Chapter Four, the implications of these results are now discussed in this chapter, in the light of the literature reviewed in Chapter Two. This chapter will also outline the reliability and validity of the instruments used to test the hypotheses used in this research.

5.2.Measurement of the instruments

In Chapter Four the researcher conducted a set of statistical tests, including Cronbach's alpha, and factor analysis to confirm the instrument reliability of the instruments used in the study. Where the instrument was found unreliable, corrections were made by developing measurements that are better constructed and using these for further analysis in the research.

Using the SSA, this research sought to assess how participants react to their team skills results generated by the SSA in comparison to how they react to the team skills results they receive from their peers. The original measurement construction of the SSA by Kotlyar et al. (2020), consisted of six dimensions of team skills. The factor analysis conducted in Chapter Four showed that the Cronbach's alpha reliability coefficient for the team skills rating (chatbot) scores was found to be poor. The correlation matrix also indicated that some of the items included were not converging. This suggested that a new measure of team skills needed to be constructed. The equivalent measures from peer data were adjusted accordingly, to ensure equivalence of measures.

This research found that the Cronbach's alpha reliability coefficient for the team skills rating (chatbot) scores is .402093265, which is poor. The researcher concluded that the team skills rating (chatbot) scores are not reliable and therefore factor analysis had to be conducted. A new total team skills rating (chatbot) score was constructed, which consisted of five items as Problem Solving was omitted and Dealing with Frustration and Conflict score was reversed.

The revised Cronbach's alpha reliability coefficient for the team skills rating (chatbot) scores was 0.635971661, which is acceptable. The research found that the revised Cronbach's alpha reliability coefficient for the team skills rating (people) scores was .665556311, which is acceptable.

On the other hand, the Cronbach alpha for the reaction to rating (chatbot) scores was .81169960, which is good. The Cronbach alpha for reaction to rating (people) scores was .717645850, which is good and acceptable.

From the various tests conducted, the researcher concluded that the revised measure consisting of five items and a revised score is the appropriate composite measure for team skills for this research.

5.3.Team skill scores – chatbot versus people team skills ratings

Hypothesis five investigated whether there was a difference between team skills (chatbot) rating scores and team skills (people) rating scores. The results in the t-test indicated that the p-value is 0.00 and is therefore significant at a 5% level and there is a statistical difference between the team skills (chatbot) rating scores and team skills (people) rating scores. The results also indicated that the mean for team skills (people) rating scores was (M=22.20492, SD=3.68) is higher than the team skills (chatbot) rating scores mean (M= 12.50781, SD= 3.32), suggesting that people/peers are more lenient in their ratings than the chatbot.

Based on the literature reviewed both peers and chatbots are recognised as legitimate feedback sources (Bamberger et al., 2005; Kotlyar et al., 2020). However, there is concern raised that feedback is biased. Taking the results found in this research there is a difference in the feedback from peers and that from AI. The feedback from peers was found to be more lenient than that from chatbots which is suggested in the t-test above. In that light Kok-Yee et al. (2011) argue that two biases are ubiquitous in performance ratings: (a) lenience, defined as the tendency for raters to assign higher ratings, and (b) halo effect, the rater's failure to differentiate among different dimensions of the ratees behaviours. Kok-Yee et al. (2011) drawing from a study by Lance (1994) state that instead of measuring ratees' performance, ratings in peer feedback tend to have a stronger reflection of raters' overall biases. Feedback is one of the primary ways to support individuals' development and grow the internal capacities needed to meet the complex

demands of the modern world (de Laat et al., 2017). Where the feedback is distorted by lenience and bias the reliability of such feedback is questioned in the achievement of leadership development. Thus, this may suggest that chatbot feedback is more reliable in providing feedback, as AI allows for adaptive design assessments that go beyond the traditional question and answer; and produces instantaneous and possibly more accurate real-time feedback (Barnard, 2019).

5.4.Reaction to ratings

Hypothesis six investigated whether there is a difference between how people react to ratings from the chatbot compared to ratings from people. The results of this t-test show that the p-value is 0.259899. The researcher fails to reject the null hypothesis and concludes that there is no statistical difference between how people react to ratings from the chatbot and how they react to ratings from people.

Based on the literature reviewed it is argued by DeNisi et al. (1982) that feedback sources are an important factor that should be considered when discussing feedback, its reception, and effectiveness. Although the source is not part of the feedback, it is often difficult to separate the effects of feedback information itself from the effects of the source (Greller and Herold, 1975). These findings in hypothesis six suggest that feedback is received the same way at face value before the recipient knows the source. However, the results from hypotheses eight and nine confirm that knowledge of the source of the feedback affects the way in which feedback is received as argued by DeNisi et al. (1982).

Hypothesis seven investigated whether there is a difference between how people react when evaluated by the chatbot and when evaluated by people. The results of this t-test show that the p-value is 0.405779. Therefore, the researcher fails to reject the null hypothesis and concludes that, at the 5% level of significance, that there is no statistical difference between how people react when evaluated by the chatbot and when evaluated by people.

This highlights the submission by Huang et al. (2005) which states that at face value there are no differences in how people react, although there are underlying issues and factors like relatability, transparency of feedback production, trust and reliability, and situation adaptability that cause concern on chatbot feedback.

Hypothesis eight investigated the relationship between team skills rating (chatbot) scores and the reaction to ratings. The results of the correlation analysis indicate that there is a weak positive linear relationship between the team skills ratings (chatbot) and the reaction to ratings (chatbot) r=0.059755, p=0.00. The researcher, therefore, rejects the null hypothesis and concludes that there is a significant relationship between team skills rating (chatbot) scores and the reaction to ratings (chatbot).

From the correlation analysis in hypothesis eight, there is a significant but weak relationship between team skills rating(chatbot) and the reaction to ratings (chatbot). This is in line with the literature reviewed where it was found that there was a mixture of differing sentiments, as shown by the Pegasystems study (2019) where a significant number of people assessed by AI were comfortable with receiving feedback and interacting with AI and while some individuals stated that they were not comfortable with receiving feedback and interacting with AI. This is suggestive of significant developmental milestones that have been achieved in the provision of leadership development feedback by AI. While on the other hand, it is suggestive of the need for further development to build a positive outlook towards feedback from AI through transparent and trusted systems that will help users be at ease and feel supported when receiving automated feedback (Bull & Klay, 2007; de Laat et al., 2017).

Hypothesis nine investigated the relationship between team skills rating (people) scores and the reaction to the ratings (people) scores. The results of the correlation analysis indicate a moderate positive linear relationship between team skills rating (people) scores and the reaction ratings (people) r=0.590486, p=0.00. The researcher, therefore, rejects the null hypothesis and concludes that there is a significant relationship between team skills rating (people) scores and the reaction to the ratings (people).

From the correlation analysis in hypothesis nine, there is a stronger reaction to scores from people than chatbots. The test results are in line with the literature reviewed which showed a high preference and positive reaction of peer feedback especially where the feedback is positive (Atwater and Waldman, 2008). This is suggestive of the fact that peer feedback is preferable among people than feedback from AI (Avolio, 2008; Hart 2011). In a study done by Pegasystems (2019) people showed a high preference for peer feedback citing reasons like

relatability and a need to customise and further develop technology so that it can be fully embraced.

5.5.Reaction to chatbots versus people

Hypothesis ten investigated the relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot. The results of the correlation analysis indicate a weak positive linear relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot, r=0.003051, p=0.00. The null hypothesis is rejected as there is sufficient evidence to conclude that there is a significant relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot.

Considering the correlation analysis in hypothesis ten, people are not dismissive of feedback; even when they know that the rating was by a chatbot. This shows that people are not averse to chatbot feedback, relative to that from people as people are receptive to both, although there is more preference for peer feedback. Furthermore, this holds promise for using chatbots for developmental feedback as confirmed in the studies done by Pegasystems (2019) and Huang et al. (2005) where feedback from AI was accepted although there were concerns for further development towards making it more transparent and relatable (Bull & Klay, 2007; de Laat et al., 2017).

Hypothesis eleven investigated the relationship between team skills rating (people) scores and reaction to being evaluated by people. The results of the correlation analysis indicate a weak negative linear relationship between team skills rating (people) scores and reaction to being evaluated by people, r=-0.060360, p=0.00. The null hypothesis is rejected and concludes that there is a significant negative relationship between team skills rating (people) scores and reaction to being evaluated by people.

Given the correlation analysis in hypothesis eleven, the analysis seeks to address whether there is a relationship between team skills rating (people) scores and reaction to being evaluated by people. The results of the correlation analysis indicate that there is a significant negative relationship between team skills rating (people) scores and reaction to being evaluated by people. This suggests that if an individual is critical of their performance, they are more likely to prefer negative feedback about their performance (Gong, Wang, Huang and Cheung, 2017).

Gong et al. (2017) argue that individuals who focus on criticising their shortcomings seek more negative information from others because of the value of negative feedback in improving performance.

5.6.Chapter summary

This chapter discussed the measurement of the research instruments that were used in this research and the reliability of these measurements when assessing how students respond to feedback on their leadership competency from a simulator and AI, versus receiving feedback from their peers. Based on the research propositions into account, it is found that students are receptive to AI feedback although they have a higher preference for peer feedback. It was discovered that there has been significant improvement that has been achieved in the provision of leadership development feedback by AI in the manner that students engaged and reacted to AI. Furthermore, this study revealed that students who are critical of themselves tend to react negatively to positive peer feedback because of the value of negative feedback in improving their performance (Wang et al., 2017).

CHAPTER 6: Conclusion

6.1.Introduction

This chapter aims to provide the conclusions that can be drawn from the research study and its objectives. This will be addressed in four parts. Firstly, the chapter will look at the research findings/implications and outline the relevant findings. Secondly, the chapter will state the research recommendations based on the findings. Thirdly, the research limitations will be outlined. Finally, the research contributions and areas for further research will be presented.

6.2.Research findings

The purpose of this study was to assess how students react to their team skills results generated by the Skills Simulator Assessment in comparison to how they react to the team skills results they receive from their peers. This research was informed by the following objectives:
1. To assess the team skills of students in a tertiary institution through the use of chatbot AI.
2. To assess the relationship between the team skills assessment and the level of acceptance or rejection of results from the Skills Simulator Assessment.
3. To compare the assessment of chatbot AI feedback, and a student's response to it, to feedback received from peers.

The findings of the research study suggest that there is no difference in the reaction to the feedback ratings of chatbots versus people when respondents did not know the source of the ratings. However, knowledge of the source of the feedback affects the way in which feedback is received. There were no significant differences in reaction to the source of feedback from AI and peers (i.e., Hypothesis 7). However, there is a significant and positive relationship between team skills ratings (chatbot) and reaction to being evaluated by a chatbot (i.e., Hypothesis 10); and a significant negative relationship between team skills rating (people) scores and reaction to being evaluated by people (i.e., Hypothesis 11). This suggests that respondents reacted positively to high team skills ratings by the simulator, but negatively to high team skills ratings from peers. In contrast low scores from the simulator received a negative reaction, while low peer scores were viewed more positively. This is suggestive of the notion that the higher the

level of self-criticism is, the more people prefer negative feedback about their performance (Gong, Wang, Huang and Cheung, 2017). Gong et al. (2017) further argue that individuals who focus on criticising their shortcomings seek more negative information from others because of the value of negative feedback in improving performance.

The study found that students prefer peer feedback, but they are not averse to chatbot feedback as found in hypothesis six which concluded that there was no statistical difference between how people react to ratings from the chatbot and how they react to ratings from people. This is a significant development in AI as a feedback provision tool.

The research findings make a recommendation for management practice on leadership development. The peer feedback was found to be lenient, this could suggest that simulators and AI, which were found to be stricter, as this study found that the mean for team skills rating by people was higher in comparison to that of chatbot. This presents AI and simulators as potential efficient tools for the provision of feedback and leadership development.

6.3.Research Limitations and Recommendations for Future Research

The instruments used to collect the scores for the team skills rating (chatbot) and team skills rating (people) consisted of two different scales. The team skills rating (chatbot) used a Likert scale of 1-4. The team skills ratings (people) used a Likert scale of 1-5. The challenge that the researcher faced was comparing two different scales: 4-point versus 5-point. The 5-point scale of the team skills rating (people) instrument was adjusted to a 4-point scale by removing all responses with a 3 "neutral" response. A T-test was run where the 5-point was compared to the 4-point adjusted scale. This resulted in a reduced sample size.

The researcher therefore recommends that further studies should use equivalent scales for team skills rating (chatbot) and team skills rating (people) to avoid any discrepancies of rating scales. This research faced the challenge of having to compare two different scales: 4-point versus 5-point scale. The researcher had to adjust the 5-point scale by removing all responses with a 3 "neutral" response and run a T-test to compare the 5-point scale to the 4-point adjusted scale.

The research data collection took place towards the end of the course when students were preparing for exams. This resulted in uncompleted evaluations which had to be removed in the

data analysis process. This in turn reduced the sample of the study. The researcher therefore recommends that further research makes use of a larger sample size, as this research was limited by a reduced sample size. Although phase one, the SSA had a large sample size, this number had decreased in the second phase, the group assignment, of the study. Having a large sample size can be achieved by finding various ways of encouraging participants to complete the evaluations. Some ways of doing this could include collecting the data at the beginning of the academic year or at the start of the course when the students' schedule is not restricted by exams. The researcher recommends that the timing of the data collection could lead to a bigger sample size and consequently better results.

As a result of covid-19 pandemic and its disruption to the academic year, this research was limited to using a virtual task for the assessment of peer team skills, which consisted of the group assignment. This in turn limited the interaction of the participants in their engagement.

6.4.Research contributions

This research has shown that feedback provided by AI is accepted by the research participants, as they exhibited a small difference in reaction between feedback from AI and peers. The research has contributed towards the use of simulators in the provision of leadership feedback. Furthermore, it can be said that when it comes to providing feedback, simulators can be an equally reliable developmental tool that can provide feedback without being affected by lenience as opposed to peer and human feedback, which was found to be affected by lenience as showed in Hypothesis Ten. In this light, this could lead to simulators being the preferred tool for feedback provision in the future.

Other researchers can conduct a similar study looking at the use of simulators in the provision of leadership feedback using a larger sample to provide corroborating empirical evidence on the findings of this research. Furthermore, there could be avenues for further research in investigating how simulators and AI handle bias, halo effect, and lenience that has been found to affect peer and human feedback.

Further research could be done using a different type of task to assess peer team skills as the researcher found that the virtual group assignment did not allow a face-to-face interaction among peers. In other words, other researchers can conduct a similar study where the second

phase of the study, the group assignment, is conducted face to face as opposed to a virtual teamwork setting as was the case in this research. This could allow for better interaction between students and avoid difficulties like connectivity which might have contributed to participant attrition in the second phase of the study.

6.5.Research Conclusion

AI and peer feedback are both legitimate feedback sources that can be used for developing leadership. However, this study found that AI has made a significant developmental leap as a source of feedback to the extent that participants are receptive to AI feedback. AI has also made acritical contribution in showing a significant difference between the reactions of the participants towards peer feedback and AI feedback. As AI develops further it could be used as the primary source of feedback.

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APPENDICES

Appendix A: Google Forms

Google Form 1

Welcome to the Research Project: Leadership and Teamwork Skills

Thank you for taking part in this research project! We greatly appreciate your contribution to this study!

This exercise will take approximately 40 minutes. Please ensure that you complete it in one sitting.

* Required

1. Your First and Last Name *

_____

2. Your Student Number *

_____

Your Informed Consent Declaration

3. Sixolile Ntombana from the Department of Management, Rhodes University has requested my permission to participate in the above-mentioned research project. The nature and the purpose of the research project and of this informed consent declaration have been explained to me in a language that I understand. I am aware that:1. The purpose of the research project is to assess how students at a tertiary institution respond to teamwork skills. 2. Rhodes University has given ethical clearance to this research project and I have seen/ may request to see the clearance certificate.3. By participating in this research project I will be contributing towards understanding how people, particularly students respond to feedback on their teamwork skills. The teamwork feedback I receive will help me in my academic learning.4. I will participate in the project by completing the 40 minutes Skill Simulator Assessment, as part of the Management 102 tutorial for week 13. 5. My participation is entirely voluntary and should I at any stage wish to withdraw from participating further, I may do so without any negative consequences.6. I will not be compensated for participating in the research.7. There may be risks associated with my participation in the project. I am aware that, (a) I might not be happy with the feedback I receive.

(b) The following steps have been taken to prevent the risk: This exercise has no right or wrong answer which could in any way effect my confidence or insult my intelligence. 8. The researcher intends publishing the research results in the form of full thesis and a journal article. However, confidentiality and anonymity of records will be maintained and that my name and identity will not be revealed to anyone who has not been involved in the conduct of the research.9. I will receive feedback from the skill simulator assessment regarding the results obtained during the study. The skills simulator makes use of a proprietary scoring algorithm to automatically analyse natural language responses. The final thesis will also be available on the Rhodes University library website. 10. Any further questions that I might have concerning the research or my participation will be answered by the researcher, Sixolile Ntombana (sixolilentombana@yahoo.com) ,the main supervisor Mr Trevor Amos (t.amos@ru.ac.za) and one of the co-supervisor Mr Mattheus Louw (m.louw@ru.ac.za). 11. By signing this informed consent declaration I am not waiving any legal claims, rights or remedies. 12. A copy of this informed consent declaration will be given to me, and the original will be kept on record. *

Check all that apply.

- [ ] Yes, I consent
- [ ] No, I do not consent

A Little About You

4. What country do you currently reside in?

_____

5. How long have you been residing in this country?

Mark only one oval.

- ◯ less than 1 year
- ◯ 1-3 years
- ◯ 4-6 years 7-10
- ◯ years more than
- ◯ 10 years

6. In the last 10 years, which country have you lived in the longest?

_____

7. Which country's culture do you identify with most?

_____

Please let us know to what extent you disagree or agree with the following statements

8. I prefer to work on team rather than individual tasks

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

9. When I have a choice, I try to work in a team instead of by myself

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

10. I personally enjoy working with others

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

11. Working in a group is better than working alone

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

12. Given the choice, I would rather do a job where I can work alone rather than do a job where I have to work with others in the group *Mark only one oval.*

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

13. I like to interact with others when working on projects

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

14. I prefer to do my work and that others do theirs

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

GREAT JOB!

Note: After you click Submit, you will be given the link to begin the Skills Simulator Assessment. Enjoy!

Google Form 2

Peer feedback related to Management 101 assignment

You recently completed a group assignment for Management 101, working mainly online.

The purpose of this survey is to provide feedback to your group members on the team skills that they displayed during your completion of the assignment. Please answer all of the following questions for each of your group members, one at a time. This will require you to complete the survey three times if you had three other people in your group to rate.

You will need to provide your personal details - first and last name and student number and each of their personal details. This is required so that the ratings can be collated for each person, and to check that there are no duplicate ratings. Please note that the feedback sent to each person will be given in an aggregated format, combining the results from all the other group members.

* Required

1. Please note, that in addition to this being a task for the Management 101 course that forms part of your learning about your team skills and leadership, we would also like to use the results for research purposes. Your responses will be handled anonymously, and analysed in an aggregated manner, not individually. Please confirm that the data can be used for research purposes. * *Mark only one oval.*

   ◯ I give my consent for my rating of my peers to be used for research purposes.

   ◯ I do not want my ratings of my peers to be used for research purposes.

2. Your first name *

   _____

3. Your last name *

   _____

4. Your Rhodes student number *

   _____

5. Your email address *

6. The first name of your group member *

7. The last name of your group member *

8. Your group member's Rhodes University Student number *

9. Team Building – Promotes team cohesion and effective team functioning *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

10. Engaging Team Members – Proactively engages and encourages individual team members to contribute * *Mark only one oval.*

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

11. Problem Solving – Actively contributes to team's problem-solving and other task activities. *

Mark only one oval.

1 2 3 4 5

Strongly disagree						Strongly agree

12. Leading – Facilitates a positive team atmosphere that supports teamwork and boosts energy *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree						Strongly agree

13. Communicating – Communicates in a polite, friendly and respectful manner. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree						Strongly agree

14. Dealing with Frustration and Conflict – Maintains composure even when feeling disappointed or provoked by other team members; does not let personal frustrations adversely affect team dynamics. * *Mark only one oval.*

	1	2	3	4	5	
Strongly disagree						Strongly agree

15. How would you rate this person's teamwork skills overall? *

Mark only one oval.

	1	2	3	4	5	
Poor						Excellent

16. This person was a highly effective team player *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

17. This person was instrumental to the team's performance *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

Google Form 3

Reaction to feedback from group members

You recently received ratings from your group members on your team skills. The purpose of this survey is to report your reaction to the ratings given by your group members.

You will need to provide your personal details; first and last name and student number.

Please rate the statements below using a 5-point scale, where 1=strongly disagree and 5=strongly agree.

* Required

1. Please note, that in addition to this being a task for the Management 101 course that forms part of your learning about your team skills and leadership, we would also like to use the results for research purposes. Your responses will be handled anonymously, and analysed in an aggregated manner, not individually. Please confirm that the data can be used for research purposes. * *Mark only one oval.*

   - ◯ I give my consent for my reaction to my ratings to be used for research purposes.
   - ◯ I do not want my reaction to my ratings to be used for research purposes.

2. Your first name *

   _____

3. Your last name *

   _____

4. Your Rhodes University student number *

5. The experience helped me learn about my teamwork skills *

   Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

6. I feel the peer ratings adequately assessed my teamwork skills *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

7. I will likely use the assessment feedback provided to further improve my teamwork skills * *Mark only one oval.*

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

8. Were the members of the team human or robots? *

Mark only one oval.

- ◯ Human
- ◯ Robot

9. To what extent, do you think, your behaviours and reactions would be different if you had a different team * *Mark only one oval.*

- ◯ My behaviours and reactions would be not noticeably different; I would have behaved the same if I had a different team
- ◯ My behaviours and reactions would be somewhat different; some of my reactions would have been different
- ◯ My behaviours and reactions would be completely different; I would have behaved much differently if I had a different team

Appendix B: Tutorial Preparation and Management One Assignment

Tutorial Preparation-Term 2: Week 9

Introduction

In the Management 1 course, you have spent your time learning business principles, strategies and skills for success in your career and life. This was done mainly in an online and virtual environment. You now have another opportunity to experience the virtual world and receive feedback on your teamwork skills.

For this tutorial, follow the steps as set out below.

Step 1

Complete the **QUESTIONNAIRE ON TEAM ORIENTATION** and the **SKILLS SIMULATOR ASSESSMENT** by clicking on the link below. You must complete the questionnaire on TEAM ORIENTATION and SKILLS SIMULATOR ASSESSMENT in one sitting, which should not take longer than 40 minutes. At the end of the questionnaire on TEAM ORIENTATION there will be a direct link that will give you access to the SKILLS SIMULATOR ASSESSMENT.

The Skills Simulator Assessment will require you to enter your email address. First enter using your Rhodes student email address which consists of your Rhodes student number @campus.ru.ac.za , for example G11X1111@campus.ru.ac.za. If you face any difficulties using your Rhodes Student email address, re-enter the Skills Simulator Assessment using your personal email address.

LINK: https://forms.gle/sC4vdKGhw1rFDDhaA

Step 2

Once you have completed the questionnaire on TEAM ORIENTATION and the SKILLS SIMULATOR ASSESSMENT, you will be directed to the self-assessment questionnaire on TEAMWORK SKILLS. On completion of this questionnaire, you will receive the results of your teamwork skills.

Step 3

Once you have completed the SKILLS SIMULATOR ASSESSMENT and have received your results on the teamwork skills, please click the link below which will direct you to the REACTION TO FEEDBACK SURVEY. LINK: https://forms.gle/qujP8dTCL2Gs1KxC8

Step 4

If you are happy for your participation to be included in the research project on team skills being undertaken by Sixolile Ntombana, a Masters student in the Management Department, please click "Yes" in the consent box in the link: https://forms.gle/qujP8dTCL2Gs1KxC8.

Instructions for tutorial

After you have completed steps 1, 2, 3 and 4 answer the tutorial question below. Submit your answers for the tutorial, by typing your answers, using 12-point Arial font and with 1.5 line spacing and submitting it via RUconnected. Please submit this tutorial on RUconnected before 09:00 on Wednesday, 19th May 2021.

Question

Identify and discuss the three most critical teamwork skills that would be required of managers to be successful in a virtual world.

Total Marks 15

Writing assignment-Term 2: Week 11

Introduction

Up until now, in the Management 1 course, you have been working in your designated tutorial groups. These tutorial groups have met online via weekly zoom sessions. For this writing assignment, you have been allocated to a new group, with three other students representing three other tutorial groups. You will receive an email indicating the group that you have been allocated for this writing assignment. You will also be allocated a specific colour, namely: blue, green, orange or red. In this assignment group, you are to reflect on the four tutorial groups' functioning.

For this writing assignment, follow the steps as set out below.

Step 1

Please read the article, Leadership in Virtual Teams: Oxymoron or Opportunity? by Ilze Zigurs, which discusses virtual teams. The article will be available on RuConnected. Referring to the above-mentioned article and at least one other article dealing with virtual teams, discuss your experiences in your tutorial group.

Step 2

In your designated group for this writing assignment discuss the Zigurs article in relation to what you experienced as a virtual group. In your designated group make recommendations for improving the functioning of Management 101 virtual tutorial groups, including the role of tutors in facilitating/leading the virtual tutorials and the role played by students. Your discussions and recommendations need to written up as an assignment comprising 800 – 1500 words. Please note that each of you has been allocated a colour when assigned to this writing assignment group of four students. When you write up the group assignment, your individual contribution is to be written in the colour allocated to you. Any other texts that are integrative or written collaboratively by the group are to be written in the default black font.

Step 3

The marking criteria for this assignment will focus on

- The balance of font colour from the four participants
- The group contribution reflected in black font

- Recommendations clearly articulated
- Intext references done correctly
- Compilation of a reference list
- Evidence of an introduction and summary

Step 4

The deadline for uploading the group assignment onto RUconnected is 23:55 on Friday 11 June 2021. A link is provided for you to upload the Word Document (NO Pdf or other formats) onto RUconnected. The document needs to be neatly typed using 12-point Arial font and with 1.5 line spacing.

Step 5

Once you have uploaded the group assignment, all participants will be required to rate their group members' teamwork skills on or before 16:00 on 14 June 2021. Please note that a bonus mark of 5% will be allocated to the writing assignment if all members rate each other. **Remember you need to rate ALL your group members**. You are therefore required to complete the survey three times, corresponding with the number of members in your group. Click the link below, which will direct you to the GROUP MEMBERS' TEAMWORK SKILLS questionnaire.

LINK:https://docs.google.com/forms/d/e/1FAIpQLSfMSy0SLq1AbPVmji9Cgl_3xJeF0-IGViBKHQY6yfiaP2_NHw/viewform?usp=sf_link

Step 6

Each of the four group members will receive feedback on how other group members have rated them on the six teamwork skills via email. Once you have received feedback, please complete the REACTION TO FEEDBACK FROM GROUP MEMBERS questionnaire on or before 16:30 on 21 June 2021. A bonus mark of 5% will be allocated to the writing assignment if all group members complete the questionnaire. Click the link below, which will direct you to the Reaction to Feedback from Group Members questionnaire. If you want to continue to participate in the research project on team skills being undertaken by Sixolile Ntombana, a Masters student in the Department of Management, please also click "Yes" in the consent box in the link.

LINK: https://docs.google.com/forms/d/1HMIYcX0FVk7-dHMii8AHfbPpe-BZhcPUJL4VzxKdse8/edit

Thank you for participating in my research

Appendix C: Ethics and Gatekeeper's Permission

Human Ethics subcommittee
Rhodes University Ethical Standards Committee
PO Box 94, Grahamstown, 6140, South Africa
t: +27 (0) 46 603 8055
f: +27 (0) 46 603 8822
e: ethics-committee@ru.ac.za

www.ru.ac.za/research/research/ethics
NHREC Registration no. REC-241114-045

05/11/2020

Sixolile NTOMBANA

Email: g16n2390@campus.ru.ac.za

Review Reference: 2020-1468-4731

Dear Mr. Trevor Amos

Title: The use of simulators and artificial intelligence in leadership feedback.

Principal Investigator: Mr. Trevor Amos

Collaborators: Miss Sixolile Ntombana, Professor Noel Pearse, Mr. Mattheus Louw

This letter confirms that the above research proposal has been reviewed and **APPROVED** by the Rhodes University Human Ethics Committee (RU-HEC). Your Approval number is: 2020-1468-4731

Approval has been granted for 1 year. An annual progress report will be required in order to renew approval for an additional period. You will receive an email notifying when the annual report is due.

Please ensure that the ethical standards committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the ethics committee on the completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the ethical standards committee should be aware of. If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloging number allocated.

Sincerely,

Prof Arthur Webb

Chair: Rhodes University Human Ethics Committee, RU-HEC

cc: Mr. Siyanda Manqele - Ethics Coordinator

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Ms Sixolile Ntombana
G16N2390
Department of Management

29 October 2020

Dear Ms Ntombana

REQUEST FOR GATEKEEPERS PERMISSION TO CONDUCT RESEARCH WITH RHODES UNIVERSITY STAFF AND OR STUDENTS

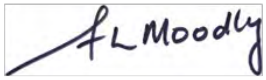
Name of research proposal: An exploration of the experiences of Rhodes institutional culture: The use of simulators an artificial intelligence in leadership feedback.

This serves to confirm that you have been granted permission to conduct your proposed research at Rhodes University as requested.

The University is not obliged to make any arrangements in terms of this research. The onus is on the researcher. It is also your responsibility to protect the integrity of the University at all times.

This letter is valid from 29 October 2020 to 28 October 2022.

Yours sincerely



Dr Adéle Moodly
REGISTRAR