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Marlene Meyer

A System for Strategy Training in Digital Negotiations

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Marlene Meyer

A System for Strategy Training in Digital Negotiations



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Foreword

Digital negotiations are nowadays the preferred form of business negotiations. Negotiation skills as well as digital skills are vital for conducting effective, efficient, and successful negotiations. These skills have to be acquired and, therefore, dedicated digital negotiation training is required.

The current approaches to negotiation training are mainly performed by human coaches. Furthermore, training is done with human negotiation partners. Such approaches allow basic negotiation concepts and processes to be taught. However, learning about negotiation behaviour is challenging because human negotiators as training partners and/or as coaches will always exhibit limited behaviours based on their individual personality traits. To practice choosing appropriate negotiation tactics implementing specific negotiation styles for particular negotiation strategies to achieve set goals calls for dedicated training to be developed that offers a variety of behaviours.

Negotiation agents can offer such range and can thus act as digital partners in digital negotiation training. Up to now, the focus of negotiation agents was on autonomous negotiations rather than on human-agent negotiations. To design and implement agents for training purposes concerning various styles, strategies, and tactics is a new research area.

The present dissertation of Marlene Meyer takes up this challenge and develops an innovative solution that is highly relevant for both negotiation researchers and negotiation practitioners. Extensive evaluations show the merits of the novel approach. The research was presented at various conferences and published in journals and books. It has always attracted much interest and attention.

I am convinced that the book will, therefore, reach a large audience and will contribute to better digital negotiations in the future. It is a fitting inaugural volume of the series.

Prof. Mareike Schoop
Oxford
May 2026

Preface

This doctoral thesis was completed during my tenure as a research assistant at the Intelligent Information Systems Department at the University of Hohenheim. The research focused on developing an advanced training system designed to help learners master the strategic application of negotiation styles, strategies, and tactics. By combining theoretical frameworks with practical learning scenarios, this system aims to enhance negotiators' ability to recognise situational cues and adapt their approach accordingly, moving beyond mere knowledge of negotiation techniques to achieving true strategic competence.

A PhD journey is never undertaken alone, and the completion of this thesis would not have been possible without the invaluable support, guidance, and encouragement of many individuals. I extend my deepest gratitude to everyone who accompanied me on this academic journey and contributed to making this research a reality.

A special thank goes to my supervisor Prof. Mareike Schoop, PhD who supported me with valuable discussions and recommendations during the whole PhD process. She gave me the opportunity to conduct my research in this topic area, supported me in developing my research profile and gave me the opportunity to present and discuss my research at international conferences.

My sincere thanks go to Prof. Dr. Henner Gimpel and Prof. Dr. Rudolf Vetschera for their co-supervision, insightful discussions, and valuable recommendations. I also wish to thank Prof. Dr. Bernd Ebersberger for serving as chair of the examination committee.

Furthermore, I want to express gratitude to my colleagues at the Intelligent Information Systems department Dr. Josepha Witt, Dr. Muhammed-Fatih Kaya, Dr. Philipp Melzer, Dr. Andreas Schmid, Dr. Bernd Schneider and Stefan Ullmann for the regular discussions and talks, and their support in all these years. My appreciation extends to the Negoisst development team, which I had the privilege of managing

and leading for an extended period, for their collaborative efforts in implementing the training features within the Negoisst system. I also wish to acknowledge Dr. Per van der Wijst from Tilburg University for the productive collaboration across multiple negotiation simulations.

Finally, I wish to express my profound gratitude to my family and friends for their unwavering encouragement and support throughout this PhD project. Thank you all for your faith in me.

Marlene Meyer
Ludwigsburg
May 2026

Competing Interests The author has no competing interests to declare that are relevant to the content of this manuscript.

Abbreviations

AI Artificial Intelligence

AL Aspiration Level

ANAC Automated Negotiating Agents Competition

API Application Programming Interface

DSR Design Science Research

DSS Decision Support System

E-learning Electronic/Digital Learning

EPL Event Processing Language

ICT Information and Communication Technology

IMI Intrinsic Motivation Inventory

IT Information Technology

LLM Large Language Model

MLE Maximum Likelihood Estimators

NAA Negotiation Agents-Assistant

NLP Natural Language Processing

NSA Negotiation Software Agent

NSS Negotiation Support System

RL Reservation Level

RQ Research Question

SD Standard Deviation

SDT Self-Determination Theory

TKI Thomas-Kilmann Conflict Mode Instrument

TNT Tactical Negotiation Trainer

ZOPA Zone of Possible Agreements

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1. Introduction

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Negotiations are omnipresent, whether in private life, in business or in politics. Digitalisation is present in almost all areas of life, including the field of negotiations, which results to an increase in digital negotiations. Digital negotiations are characterised by decision-making and communication processes between at least two parties who are unable to solve their conflict unilaterally and therefore exchange information through (counter-) offers and use digital media to support at least one of their decision-making or communication processes with the aim of reaching an agreement (Bichler et al., 2003; Ströbel and Weinhardt, 2003).

Conflicts in negotiations are not necessarily characterised by an actual dispute or disagreement; rather, they emerge from a lack of information regarding the partner's preferences and perceptions of events, which results in a conflict (Miller, 2014). Individuals possess a personal conflict style with which they approach conflictual situations. One model that can be utilised to identify an individual's personal conflict style is the Thomas-Kilmann Conflict Mode Instrument (TKI). This personal conflict style is a combination of different expressions from five styles (competing, compromising, collaborating, accommodating, avoiding) (Thomas and Kilmann, 1976, 2008). As

demonstrated by previous studies (Brown, 2012; Fujita, 2018; Koley and Rao, 2018; Shell, 2001; Yu and Kersten, 2018), this model can be applied to negotiations and as negotiation styles of the negotiators since negotiations only occur in the event of conflict. As the TKI model is based on the Dual-Concern model (Miller, 2014), the approached negotiation style in the TKI model is also characterised by these two dimensions: 1) the importance of the individual outcome, and 2) the importance of the relationship with the partner (Lewicki, Barry, Saunders, 2010; Thomas and Kilmann, 1976, 2008). Thus, negotiation styles are characterised by orientations, indicating how an individual negotiates in relation to the importance of their own outcome and the relationship with their partner (Loewenstein and Thompson, 2014). Depending on the negotiation scenario, the importance of one's own outcome and the relationship with the partner may vary. Thus, an individual may use different negotiation styles depending on the negotiation scenario (Thomas and Kilmann, 2008).

As negotiation styles are interconnected with negotiation strategies and tactics, multiple strategies can be applied for one style and multiple tactics can be applied for one strategy. For negotiation strategies and tactics there is no uniform term in use, as different terms of identical strategies/tactics or different allocations to strategies/tactics for the identical descriptions are used (Meyer and Schoop, 2023). Hence, negotiation strategies are considered to comprise an overall plan for the selection and evaluation of negotiation priorities. Negotiation tactics are defined as techniques for the implementation of applied negotiation strategies for a given issue (Goldman, 2003; Lewicki, Barry, Saunders, 2010).

A variety of reasons may cause negotiators to achieve suboptimal outcomes, as negotiators often fail to recognise compatible interests with their partner during the negotiation process (Thompson, 1990) or novices often fail to intentionally apply an appropriate negotiation style (Meyer, 2022; Thompson, 2022). Furthermore, negotiators tend to persist with a negotiation style with which they have experience, rather than changing their style to achieve a better outcome (Thompson,

1990). Thus, in order to achieve a better outcome, negotiators need to be trained regarding the application of negotiation styles in concrete scenarios.

1.1 The Importance of Skill Training

In order to learn to negotiate, trainees need to negotiate (Loewenstein and Thompson, 2000). Negotiation training is predominantly implemented as a cyclic process, adapted from Kolb (1976). Thus, besides conducting negotiations, the process encompasses theories in the form of concepts and generalisations, personal goal setting, and debriefing of the conducted negotiations (Lewicki, 1997).

As individuals have different learning types, this needs to be addressed in negotiation training in order to support as many trainees as possible (Fleming and Mills, 1992; Martin et al., 2014). These learning types can be graphical representations of information (visual), information printed in words (read/write), information presented in tutorials (aural), and simulations (kinaesthetic) (Fleming and Mills, 1992). In order to address various learning types, it is necessary to combine training methods in order to meet the needs of the trainees. Such methods are among others case studies, games-based trainings, mentoring, lectures, programmed instructions, role play, and simulations (Martin et al., 2014). In negotiation training, methods that allow reflection, coaching, and repeated experimentation have to be used (Roloff et al., 2003), which is addressed by the training methods case studies, game-based training, programmed instruction, mentoring, lectures, and simulations (Martin et al., 2014; Thompson, 2022)

Through negotiation training, various skills and abilities are acquired in order to achieve goals in negotiations (Lewicki, Saunders, Barry, 2010; Roloff et al., 2003), as is also the case in this thesis. Skills are defined as the ability to apply knowledge and utilise expertise to complete tasks as well as solve problems (Sicilia et al., 2018). The main skills, intelligences, and abilities that negotiators need to consciously apply and recognise negotiation styles are explained below.

Negotiators require a cognitive ability (intelligence) to comprehend complex ideas, reason, plan, solve problems, learn from experiences, and make rational decisions (Lewicki, Barry, Saunders, 2010; Lewicki, Saunders, Barry, 2010). In addition to these cognitive abilities, effective negotiators have to possess emotional intelligence, which can be categorised into self-awareness, self-regulation, self-motivation, patience, and empathy. Self-awareness enables negotiators to be able to know their own thoughts, impulses, moods, and behaviour, as well as how they affect the negotiation parties, including themselves. Negotiators who are self-regulatory can manage their emotions by channelling them into behaviour that is appropriate to the situation. The capacity of self-motivation enables negotiators to pursue their goals even when the situation is difficult. Patience is a prerequisite for maintaining self-motivation. Empathetic negotiators understand the feelings of their negotiation partners and are able to make offers that take into account the partners' perspectives (Billikopf, 2014; Lewicki, Barry, Saunders, 2010; Lewicki, Saunders, Barry, 2010; Roloff et al., 2003; Zartman and Berman, 1982). With interpersonal intelligence (social intelligence), negotiators are able to understand the motives of their negotiation partners and know how to work cooperatively with their negotiation partners (Lewicki, Saunders, Barry, 2010).

In addition to the three types of intelligence, further abilities and skills are required for effective negotiation. These include perspective-taking, pragmatism, creativity, vision, strategy, awareness of negotiation power and awareness of the cultural aspects (Lewicki, Barry, Saunders, 2010; Lewicki, Saunders, Barry, 2010). Negotiators need to understand the partner's offers in order to respond appropriately during a negotiation. This ability entails the capacity to comprehend the partner's perspective, thereby enabling the anticipation of the partner's styles, which is called perspective-taking (Damen et al., 2020; Galinsky et al., 2008; Lewicki, Barry, Saunders, 2010; Neale and Bazerman, 1983). Negotiators who have the ability to be pragmatic set high but realistic goals and focus on practical considerations rather than on abstract ideological principles (Lewicki, Saunders, Barry, 2010). Being

creative enables negotiators to think outside of the box by trying new ideas, modifying an offer, and combining unrelated issues into one set (Lewicki, Saunders, Barry, 2010). Visionary negotiators, while willing to take risks, maintain realistic expectations in order to propose something better than the status quo (Lewicki, Saunders, Barry, 2010). Negotiators who are strategic are able to plan effectively and set their negotiation styles (including strategies and tactics) and goals in a way that is appropriate to the case (Lewicki, Saunders, Barry, 2010). There are several sources of power a negotiator and their negotiation partner can have, such as information-related, personality-related, contextual-related, position-based, or relationship-based. The application of power has to be adapted and considered by negotiators according to the particular circumstances of the negotiation. Thus, negotiators need to be aware of their own and their partners' negotiation power (Lewicki, Barry, Saunders, 2010). Culture, as a very broad sphere of influence, also has to be considered in negotiation, especially in negotiations involving negotiation partners from different cultural backgrounds. Negotiators need to be aware of cultural dimensions, such as individualism vs. collectivism, hierarchy vs. egalitarianism, and high- vs. low-context cultures (Brett, 2000; Hofstede, 2011; Lewicki, Barry, Saunders, 2010; Lewicki, Saunders, Barry, 2010).

In addition to the necessity of negotiation skills in digital negotiations, digital skills are needed to effectively use the negotiation system in which digital negotiations take place (Mitrovic, 2010; van Laar et al., 2017). Thus, in order to use the system in a specific context and as part of a task, multifaceted skills are needed (Mitrovic, 2010; Roloff et al., 2003; van Laar et al., 2017).

Digital skills can be categorised as medium-related skills and content-related skills (van Deursen and van Dijk, 2011). Medium-related skills, such as the ability to operate an internet browser and internet-based forms or to navigate on the internet (van Deursen and van Dijk, 2011), are expected to be present for negotiators in digital negotiations, as they are a prerequisite in today's working environment. The utilisation of context-specific tools to support

(digital) skills in negotiations can be conducted through information systems, such as Negotiation Support Systems (NSSs). NSSs can be defined as software that supports at least two parties in their negotiation activities by providing models and procedures as well as communication and coordination capabilities, while the users remain independent in making their own decisions and representing their own interests (Kersten and Lai, 2007; Kersten and Lai, 2010; Lim and Benbasat, 1992). The support features mainly include assisting users with their own preferences, identifying the problem, searching for a solution, assessing the partner (identifying preferences, predicting next steps), and advising on concessions (Kersten and Lai, 2010). An example of an NSS is Negoisst (Schoop, 2021), which already includes some support in teaching digital skills for the NSS, such as providing onboarding tours and explanations in glossaries and FAQs, as well as negotiation skills through communication and decision support. However, skill training regarding negotiation styles is currently lacking. Further, as an advantage of an individualised training, participants are able to learn at their own pace (Chen and Wang, 2021).

Thus, the present thesis aims to conceptualise an individualised skill training by designing and implementing a digital training of different negotiation styles by conducting negotiations and to evaluate this training through experiments after implementing the training in Negoisst.

1.2 The Need of Agents as Negotiation Partner

As mentioned in the previous chapter, negotiation skills need to be acquired through negotiation training, which involves conducting negotiations and evaluating them through debriefing. Since at least one negotiation partner is required to conduct negotiations (Bichler et al., 2003; Lewicki, Barry, Saunders, 2010), a negotiation partner has to be selected for the training. The negotiation partner can be either a human or a software. Human negotiators have different levels of expertise, moods, and emotions that can change over time (Forgas, 1998;

Kopelman et al., 2006; Lewicki, Barry, Saunders, 2010). While these factors of the human negotiation partner may cause some difficulties during the negotiation training, software is not affected by them, and furthermore, different approaches can be tried by repeating negotiations with the software at any time, and thus software as a negotiation partner can be more beneficial for novice negotiators than humans (Gratch et al., 2016). Such software can be a negotiation software agent (latter called agent) that actively participates in a negotiation and makes decisions for its principal (Kersten and Lai, 2007). However, agents need to be appropriate for the training context, and thus realistic for this purpose, as they need to respond to human behaviour by applying different strategies and tactics throughout the negotiation (Cao and Peng, 2016). Agents can be designed to be domain-independent or domain specific (Baarslag et al., 2016). As the aim of this thesis describes, negotiations are conducted in the training. In order to train through negotiating, agents as negotiation partners need to be designed for the specific training context (specific domain) whilst also being able to be used in different negotiation scenarios.

Various negotiation agents already exist. Melzer et al. (2012) created an agent that simulates a human negotiator by applying a tit-for-tat strategy (so called tactical negotiation trainer) with the aim of helping humans learn to negotiate, but without focusing on training of negotiation styles rather than on general negotiation learning. Some studies focus on automated agents that aim to negotiate for humans, such as providing a competitive agent with incomplete information and a time-dependent strategy for competitive agent-to-agent negotiation (Fatima et al., 2002), or agents that apply models adapted from fuzzy theory, argumentation-based reasoning and/or analytical hierarchy process (Huang et al., 2010; Kowalczyk, 2002; Parsons et al., 1998), as well as provided architectures that focus on approaches for finding (counter-) offers, evaluating received offers, and finding acceptance conditions (Baarslag et al., 2014; Faratin et al., 1998; Jonker et al., 2007). Since 2010, the Automated Negotiating Agents Competition (ANAC) has been held annually, where agents autonomously negotiate

against each other with the goal of outperforming the other agents (Baarslag et al., 2012; Interactive Intelligence Group, 2019; NEC-AIST AI Cooperative Research Laboratory, 2025). Although few truly autonomous negotiators have been developed for real-world scenarios, further research is needed (Baarslag et al., 2017), in particular in training different negotiation styles (including strategies and tactics) that is individualised for humans.

Other studies focus on the use of artificial intelligence (AI) in agents. For example, Nego-Bot as a robot for human interaction and with deep learning algorithms to maximise the utility (Rincon et al., 2021) or NegoChat as an agent with natural language processing capabilities (Rosenfeld et al., 2016). Stevens et al. (2016) used theory-of-mind to infer human negotiation style. Mollick and Mollick (2024) generated a prompt to use GPT-4 as a negotiation partner and described a debriefing exercise for participants. The style used by the agent, the debriefing provided, or the feedback provided on the assumed style of the human are described in these studies only as rough orientations (e.g., dimensions of the TKI/ dual-concern model) and are thus on a meta-level that is insufficient for in-depth training of negotiation styles (including strategies and tactics).

1.3 Overall Research Objective and Research Questions

The overall research goal of this thesis is to design and implement a framework to support novices in identifying the partner's negotiation style, to support the use of the intended negotiation style, and to support self-reflection on the negotiation style used in digital negotiations. To achieve this research objective, we answer four research questions (RQs).

As using appropriate negotiation styles in negotiations is a fundamental aspect of achieving one's goals, negotiators need to have knowledge about the different types of negotiation styles. However, even for experienced negotiators, training has been shown to improve

negotiation outcomes (Loewenstein and Thompson, 2006) and practising is essential to improve negotiation skills. Thus, this thesis aims to examine whether knowledge of different types of negotiation styles is sufficient to apply them in a targeted manner and to recognise the partner's negotiation style which leads to the first research question.

RQ1 **To what extent can novice negotiators recognise their own and their partner's negotiation styles?**

To do so, a negotiation experiment was conducted as study 1 (cf. Chap. 2) with 112 participants. The experiment includes several negotiations as well as surveys in which the participants were asked to indicate their own negotiation style and the negotiation style, they thought their partner used. As a result, study 1 shows that even when participants confirmed that they had knowledge of negotiation styles, they were mostly unable to identify their own or their partner's style correctly. Hence, a more individualised digital training is needed to support the identification of negotiation styles.

Based on the need for more individualised training, the question arises as to how this training can be implemented. As negotiation styles, strategies, and tactics are used inconsistently in the literature, there is a need to create a classification of these terms. This leads to the second research question of this thesis:

RQ2 **How can negotiation behaviour be classified by including negotiation styles, strategies, and tactics?**

RQ2 is addressed by study 2 (cf. Chap. 3), in which a taxonomy is implemented. To this end, a systematic literature review was conducted in which 876 articles were considered. As a result, study 2 provides a review of 139 relevant articles, which led to combinations of negotiation styles, strategies, and tactics in digital negotiations and identified patterns in the literature.

As previously mentioned, human negotiation partner may cause some difficulties during the negotiation training. Thus, negotiation partners are needed to be uniform. In such cases, the classification can serve as a basis for the design of the negotiation partners, but the actual design needs to be addressed in the third research question:

RQ3 **How can agents be used as negotiation partners to support negotiation styles training?**

RQ3 is addressed by study 3 (cf. Chap. 4), which employs the taxonomy of the study 2 to design and implement a framework for training negotiation styles, strategies, and tactics in digital negotiations. As a result, we designed different negotiation agents with different styles, strategies, and tactics (as well as levels of difficulty) as negotiation partners for training, and asked users to identify the negotiation styles, strategies, and tactics of their partner in the training. Since the negotiation partners were agents, we were able to provide immediate feedback on whether the identification of the partner was correct.

Besides this brief feedback on whether the partners' styles, strategies, and tactics have been correctly identified, there is a need to provide feedback on one's own behaviour during the training, i.e., whether one is using one's intended negotiation styles. Negotiators who receive immediate feedback tend to adjust their styles and perform better in subsequent negotiations (Thompson, 2022). As immediate feedback can be given in negotiations focusing on negotiation styles during the negotiation process as well as immediately after the negotiation is completed, when and what feedback is given needs to be examined. These aspects lead us to the last research question:

RQ4 **How can feedback be provided to support novices in training their negotiation styles?**

In order to address RQ4, study 4 (cf. Chap. 5) and study 5 (cf. Chap. 6) were conducted. While the primary focus of study 4 is on feedback during the negotiation process, study 5 concentrates on feedback subsequent to the negotiation. Study 4 employed a mixed-method approach to evaluate the designed feedback elements. Nine feedback elements were adapted from the literature and implemented in the NSSs Negoisst. As a result, seven feedback elements were identified as useful in supporting negotiators to apply their intended negotiation style and achieve their set goals. In study 5, a designed science research approach was adopted, utilising a mixed-method approach and Bloom's Taxonomy to evaluate the feedback elements after the conclusion of the negotiation. Seven feedback elements were designed and evaluated in several experiments. Four of these feedback elements were found to be useful in supporting participants to engage in self-reflection regarding their negotiation styles after the negotiation concluded. In both studies, we focused solely on negotiation styles to ensure that novice negotiators were not overwhelmed by the large number of different strategies and tactics, rather than first learning the differences between negotiation styles.

1.4 Design Science Research Approach

This thesis follows a designed science research (DSR) approach. First, this chapter discusses DSR in information systems in general, then the applied approach of this thesis.

1.4.1 Design Science Research in Information Systems

Information system (IS) research is characterised by the two paradigms behavioural science and design science (Hevner et al., 2004). Behaviour science applies natural science research methods to develop and justify theories to explain the behaviour of humans or organisations. Design science research utilises engineering to create new artefacts (ideas, practices, technical capabilities, products) while relying on existing theories (Hevner et al., 2004).

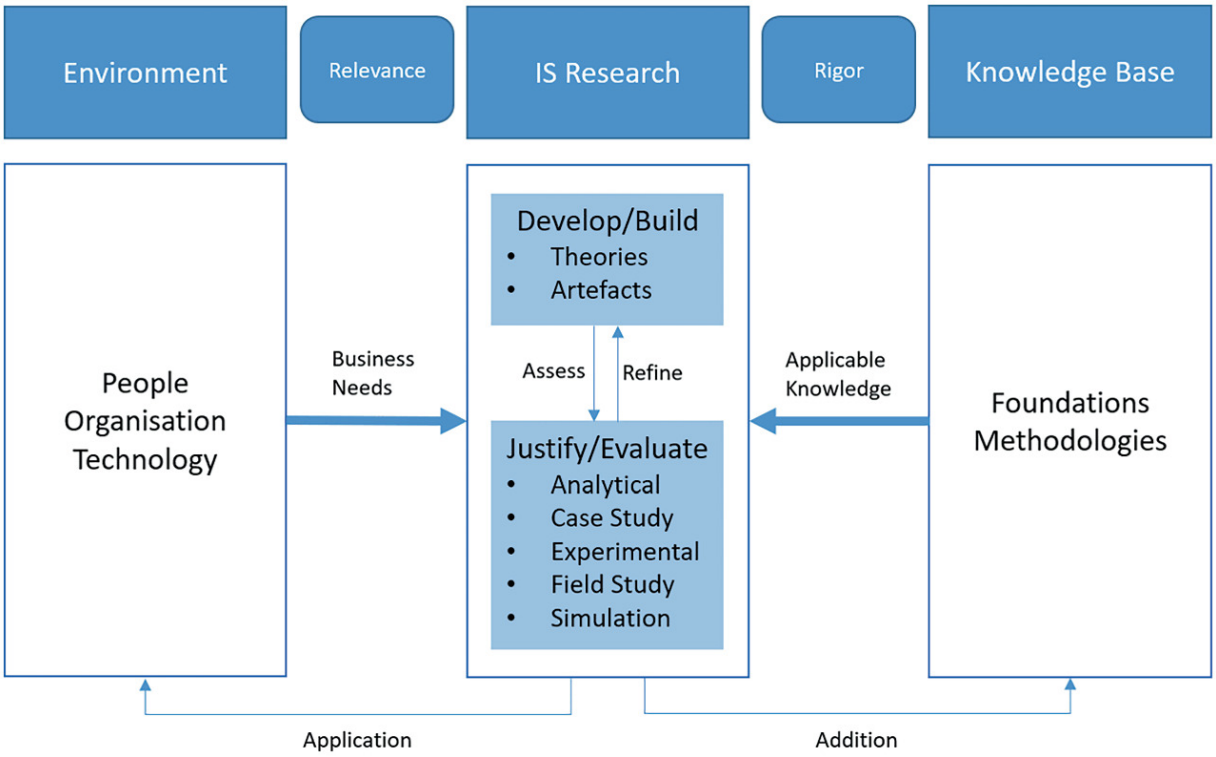

Fig. 1.1 Design Science Approach by Hevner et al. (2004)

Hevner et al. (2004) designed a framework that combines these two paradigms (cf. Fig. 1.1). As IS are influenced by people, (business) organisation, and technology, they build the environment and thus define the problem space. It includes goals, problems, opportunities or tasks from which business needs can be derived (Relevance of the research). Based on the business needs, IS research can be conducted by behaviour science or by design science. In behaviour science, research is developed and justified with theories that explain the phenomena identified in the business need (goal is truth). In design science, research is built and evaluated through artefacts that are designed to meet the business need (goal is utility). In order to develop theories or build artefacts knowledge is needed. The knowledge base includes foundations (theories, frameworks, constructs, models, methods) and methodologies (data analysis, techniques, measures, and validation criteria). Foundations consist of prior research from IS and reference disciplines and are applied in the develop/build phase. Methodologies consist of guidelines applied in the justify/evaluate

phase. The appropriate usage of existing foundations and methodologies achieves rigor.

DSR applies an iterative process in which new findings increase the knowledge base and the insights of the environment, and then are used for finding a new/ adapted business need with new/ adapted applicable knowledge (Hevner et al., 2004; Peffers et al., 2007). The model of Peffers et al. (2007) highlights the iterative process of design science by design/develop and evaluate an artefact while applying six activities (cf. Fig. 1.2). Although the process is designed to be sequential from activity 1 to activity 6, it is not necessary to always go through all activities sequentially, but rather to adapt them to the corresponding research. If the research idea resulted from observing a problem (problem-orientated approach), the researcher starts with the first activity. If a research need can be addressed by developing an artefact (objective-oriented solution), the researcher might start with the second activity. If an artefact already exists, but "has not yet been formally thought through as a solution for the explicit problem domain in which it will be used" (Peffers et al., 2007, p. 56) (design- and development-orientated approach), the researcher starts with the third activity. When working retroactively by adapting a by-product of an experience (observing a solution), researchers start with the fourth activity (Peffers et al., 2007).

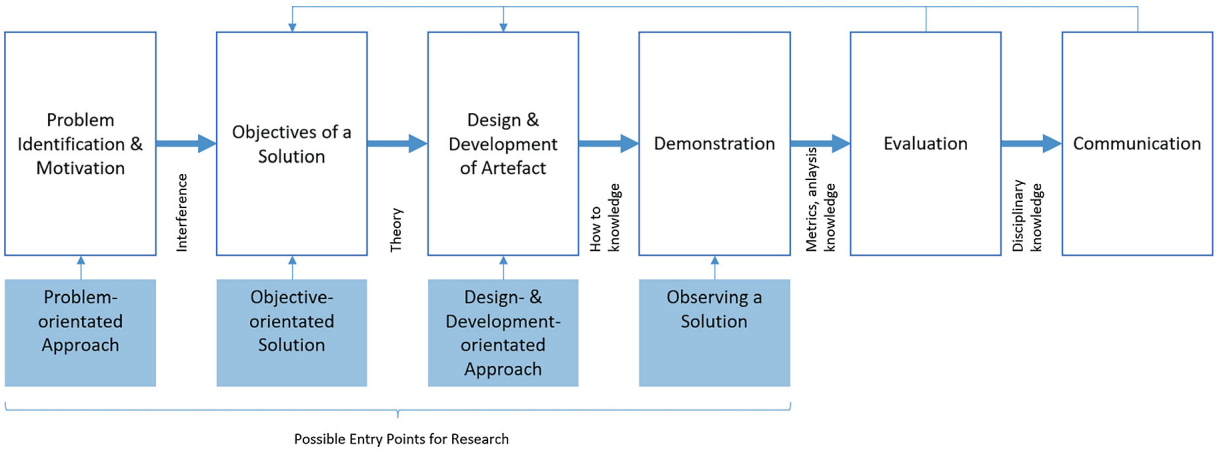

Fig. 1.2 Design Science Approach by Peffers et al. (2007)

There is little difference in the content of the approaches of Hevner et al. (2004) and Peffers et al. (2007), apart from the focus of the two approaches. The activities in the approach of Peffers et al. (2007) are transferable to the process in Fig. 1.1 as well as "artefact" is used in a broader context, i.e., consists models, methods or instantiations. Activity 1 can be seen as identifying the business needs. In activity 2, the business need is known, but the objectives have to be defined based on the known business need. Based on business needs and theory, activity 3 *designing and developing the artefact* is applied (analogously Design/Build). Afterwards a suitable context is identified (activity 4) to evaluate the designed artefact (activity 5) which is analogously to Justify/Evaluate. In the final activity (activity 6), the findings are published (Hevner et al., 2004; Peffers et al., 2007).

1.4.2 Applied Approach

The applied methodology of this thesis is based on the DSR approach of Peffers et al. (2007) (cf. Fig. 1.3). Even if DSR was not always explicitly applied in each study (cf. Chap. 2–6), their approaches can be transferred in the overall approach of the following DSR approach. This approach is characterised by multiple iterations, with each study comprising at least one iteration of the DSR approach. Since the studies build on each other, they either have different entry points or are iterations in the DSR approach. The problem-orientated approach constitutes the entry point of study 1 (cf. Chap. 2). The entry points of the remaining studies (cf. Chap. 3–6) are the objective-orientated solution.

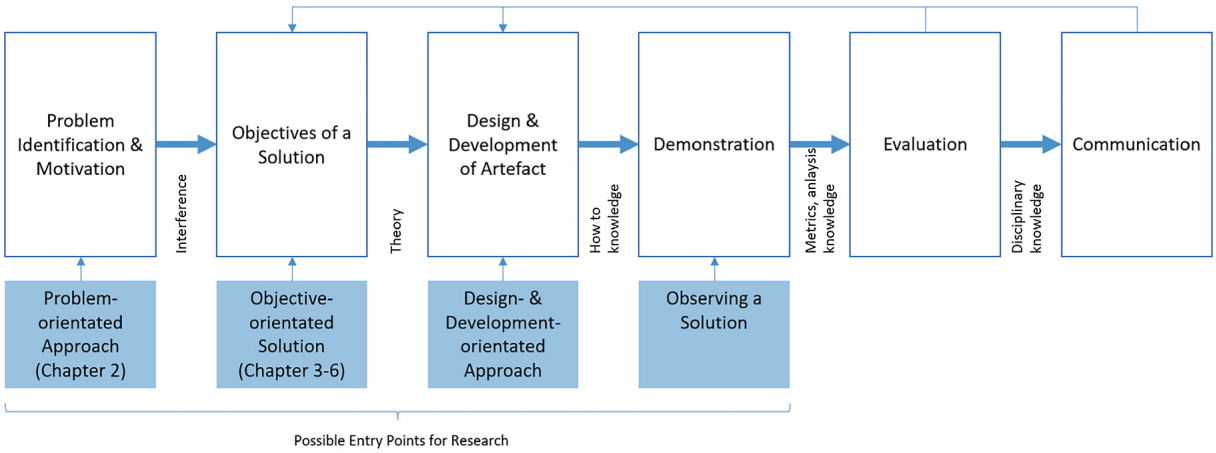

Fig. 1.3 Design Science Research Approach of the Thesis

The approach begins with the identification of the problem and with stating the motivation. Negotiations fail now and then which can cause mistrust and frustration towards the negotiation partners. There are various reasons for failed negotiations, e.g. insufficient preparation, unforeseen changes during the negotiation, insufficient skills, non-awareness of power, misinterpretation of the interests or of the own and/or the partner's negotiation styles as well as strongly contrasting negotiation styles of the negotiation partners (Lewicki, Barry, Saunders, 2010; Meyer, 2022; Miller, 2014; Thompson, 2022). In the first study (cf. Chap. 2), the problem was observed that novices have difficulties to identify negotiation styles of their own and their partners correctly. Wrong judgement for the own approached negotiation styles can be caused by insufficient knowledge of how to apply the intended negotiation style or by trying to apply a negotiation style that is contrary the own conflict style and resulting digression during the negotiation. Wrong judgment of the partners' negotiation style can be due to misinterpretation. In particular, strong competitive styles of one or both negotiators tend to fail the negotiation (Meyer, 2022).

The overall objective of this thesis is to implement a training system to support negotiators in applying and reflecting on their negotiation behaviour. From the second activity onwards, the activities of the DSR approach were repeated for each study (cf. Chap. 3–6).

The second study (cf. Chap. 3) examined negotiation behaviour, styles, including strategies and tactics. As unified definitions and usage for negotiation behaviour, styles, strategies and tactics are not existent, a taxonomy was created as an artefact (activity 3) to ensure uniform understanding of terms as well as to conduct a template for negotiators. The taxonomy was demonstrated (activity 4) and evaluated (activity 5) through negotiation behaviour patterns identified in the literature. In the final activity, the study was published.

In order to create a safe training environment with the possibility to repeat negotiations with identical but realistic negotiation partner (uniform partner), agents are used. The agents are individualised for different negotiation scenarios to enable training different behaviours. Thus, in the third study (cf. Chap. 4), these agents are designed and developed (activity 3) with the basis of the created taxonomy of the second study. To demonstrate the agents (activity 4), they are implemented in the NSSs Negoisst and afterwards evaluated (activity 5). The results are published (activity 6).

As the application of negotiation styles, strategies, and tactics takes place during the actual negotiation, reflection on the style applied can take place during and in particular after the negotiation is completed. Thus, two studies were conducted to 1) support negotiators to apply their intended negotiation styles (cf. Chap. 5), and 2) support negotiators to reflect on their applied styles when the negotiation concluded (cf. Chap. 6) in order to enable reflection on deviations between their intended and applied styles. To do so, artefacts are designed (activity 3). The support features during the negotiation were implemented for demonstration (activity 4) into the NSSs Negoisst. The self-reflection features for completed negotiations were demonstrated in a task in which the participants had to empathise with a negotiation situation. The support functions were evaluated (activity 5) and published afterwards (activity 6).

In order to classify this research contribution into DSR contributions, the maturity matrix from Gregor and Hevner (2013) can be used. The matrix consists of two dimensions—solution maturity, and

application maturity –. The application maturity represents the problem context, i.e., whether the problem is known (high maturity) or new (low maturity). The solution maturity dimension consists of whether potential artefacts exist for the solution of the research, i.e., either known solutions (high maturity) or new solutions (low maturity). Resulting on the two dimensions three research opportunities and knowledge contributions are derived. An exaptation extends known solutions (solution maturity high) with new problems (application domain maturity low). An invention arises when new solutions for new problems are derived. An improvement arises when new solutions for known problems are developed. While routine design applies know solutions to known problems and thus has no major knowledge contribution.

Since there is already a large number of publications dealing with various negotiation strategies and the need to train negotiators the application domain maturity can be considered to be high. The individualised training of negotiation behaviours in digital negotiations including styles, strategies, and tactics is rather new, i.e., the solution maturity is characterised low. Thus, this dissertation aims to contribute to an improvement of individualised negotiation training of styles, strategies, and tactics (new solution) to the known problem (need to train negotiators to recognise and apply negotiation styles) (cf. Fig. 1.4).

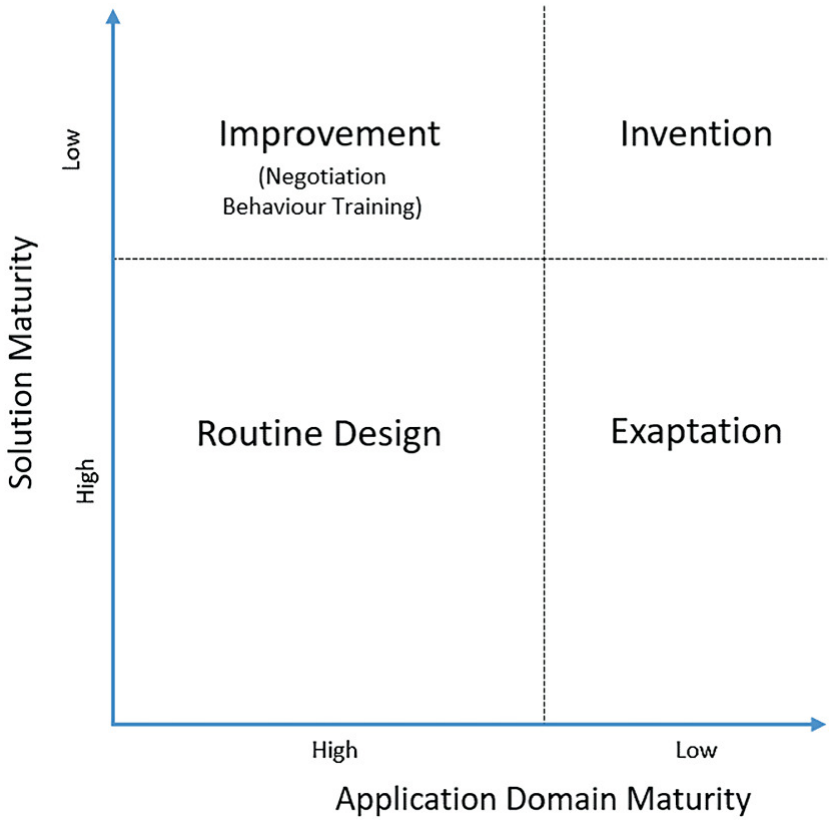

Fig. 1.4 Knowledge Contribution Framework of DSR. (Adapted from Gregor and Hevner (2013))

1.5 Structure of the Thesis

The structure of this thesis is outlined in Fig. 1.5. Chapter 1 introduces the topic and describes the selected research methodology following a design science approach. Chapter 2 presents a study that examined whether negotiators could recognise their own approached negotiation style and that of their partner in a previous negotiation. Chapter 3–6 build on the findings. Chapter 3 provides the foundation by creating a taxonomy of negotiation styles, strategies, and tactics to ensure consistent terminology and to enable the creation of patterns for different negotiation behaviour. Chapter 4 builds on this taxonomy by deriving negotiation partners from it to train novices in identifying negotiation styles, strategies, and tactics of their partners. Providing feedback to support negotiators in applying their negotiation styles and reflecting on whether they have applied their negotiation styles,

frameworks are designed and evaluated in Chap. 5 and Chap. 6. The conclusion of this thesis is presented in Chap. 7, which summarises the present studies and discussing the findings, as well as implications for future research.

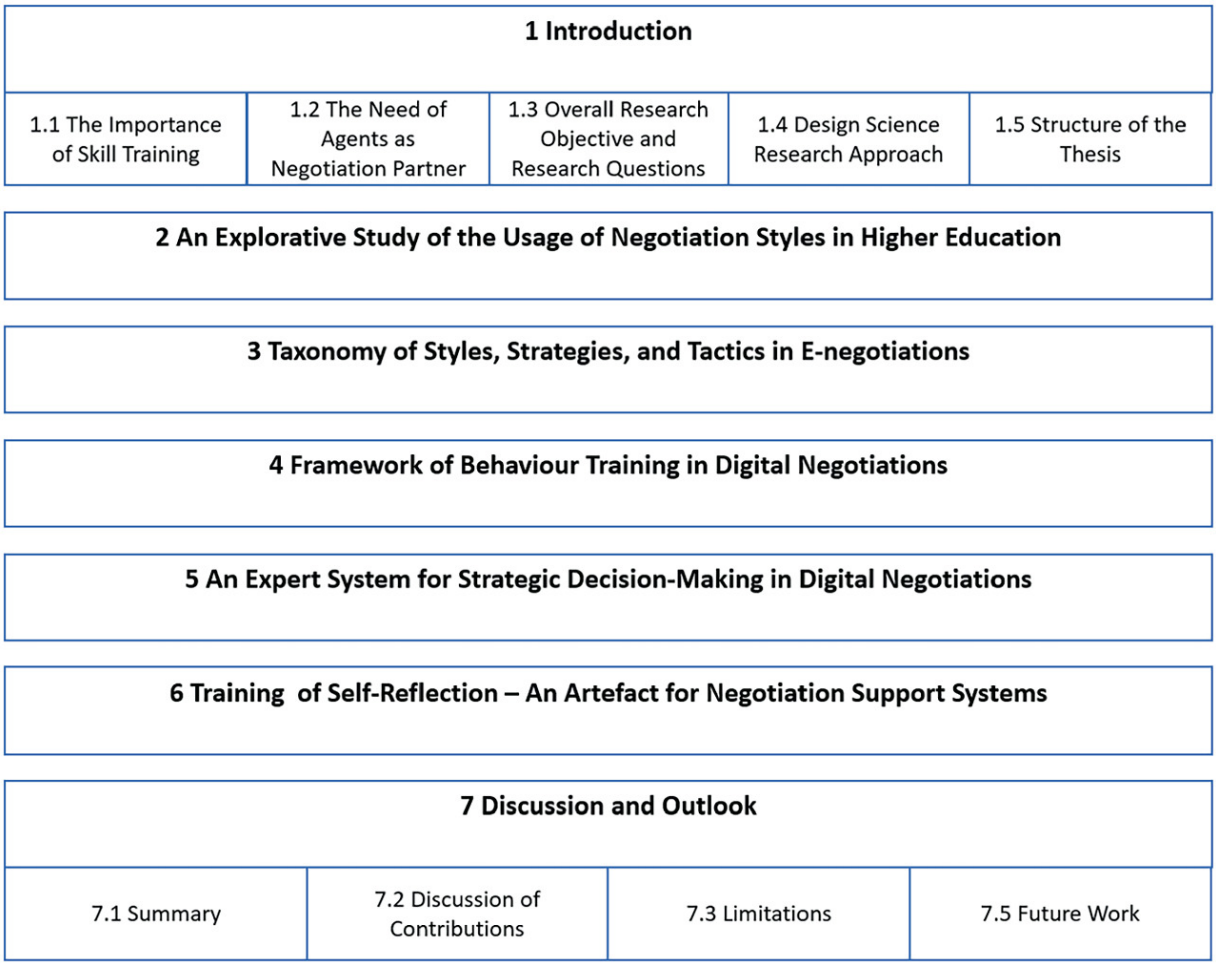

Fig. 1.5 Structure of the Thesis

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2. An Explorative Study of the Usage of Negotiation Styles in Higher Education

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Abstract
In everyday life, we usually negotiate intuitively with each other. However, especially through important negotiations, e.g., business negotiations, an optimal outcome is desirable. By preparing the negotiation and training how to negotiate in various conflicts, the negotiation knowledge can be improved and thus negotiators can be more successful in negotiations. 112 Students in higher education were supported in a course and an electronic negotiation training. To examine how students learned negotiation styles, a study was conducted to determine the bias between what they learned and how they applied in electronic negotiations. As a result, the students confirmed that they learned negotiation styles, however, most of them could not identify their own and their counterpart's styles. Thus, a more individualised training in the course and in the electronic training according to the negotiation styles and negotiation strategies has to be adapted.

Co-Author
This chapter has been written in sole authorship.

Status

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2.1 Introduction

Individuals face multiple problems or conflicts on a daily basis that need to be solved interactively (Cantor and Harlow, 1994; Reb, 2010), e.g. through negotiation (Kelman, 1996; Reb, 2010). For negotiations a preparation and a training are essential to improve the negotiation outcome (Lewicki, Saunders, Barry, 2010; Raiffa et al., 2002). Even for advanced negotiators, training can help to increase their negotiation efficiency (Loewenstein and Thompson, 2014). ElShenawy (2010) investigated that even a short training programme increases the performance of the participants. Moreover, an extensive training programme leads to a high training effect.

A study of Thompson (1990) revealed that a large number of negotiators failed to recognise compatible interests with the counterpart and thus achieved a suboptimal outcome. Moreover, negotiators with experience in a negotiation style from previous negotiation tend to maintain this style, regardless of whether a change in negotiation style would lead to a more successful outcome (Thompson, 1990). Raising awareness of the existence of different negotiation styles and various negotiation strategies, as well as providing knowledge about the counterpart's style and strategies, could have a positive effect on negotiation outcomes (Lewicki, Barry, Saunders, 2010; Miller, 2014; Peleckis, 2014; Thompson, 2022).

Thus, a study was conducted to investigate whether, and if so, how individuals can apply knowledge about negotiation styles from negotiation preparation and negotiation training in a human-to-human-

negotiation. The negotiations of the study were applied electronically in the Negotiation Support System (NSS) Negoisst (Schoop, 2010, 2021). In electronic negotiations, communication and information systems are applied to support negotiations, such as NSSs, with the aim to reduce transaction costs and to improve the quality of negotiation outcomes (Bichler et al., 2003; Kersten and Lai, 2007; Schoop et al., 2003).

For this purpose, participants of the conducted study are students attending a course on negotiation. During this course and before conducting the study, students already learned basics about negotiation, such as negotiation process, negotiation styles, personal traits, and their effects on negotiation styles. As part of the course, students attended several face-to-face exercises to negotiate with each other in diverse situations.

For an optimal negotiation outcome trust and understanding the counterpart are essential. Empathising with the counterpart's situation with comprehensive understanding of the counterpart's points of view and believes enables them to actively influence their counterpart (Fisher et al., 2011).

Based on their personality, individuals possess personal conflict styles to handle conflictual situations (Thomas and Kilmann, 1976), such as negotiations. One model to identify those conflict styles is the Thomas-Kilmann Conflict Mode Instrument (TKI), which were considered in this study. TKI can be applied to teach students to use personal conflict styles and to interpret their counterpart's intention in a negotiation (Shell, 2001).

The main purpose of this study was to investigate the behaviour of individuals with negotiation knowledge in negotiations. More specifically, the goals were to:

1) Study the correlation between students' conflict style and their used negotiation styles in a human-to-human-negotiation,
2) Investigate whether students can recognise their counterpart's negotiation style, and

3) Examine how students apply negotiation styles learned in a course in a negotiation.

2.2 Theoretical Background

The following section presents theoretical foundations of negotiations and TKI.

2.2.1 Negotiations

Negotiations are communication and decision-making processes between at least two parties. By exchanging arguments (such as offers and requests), the parties want to achieve a consensus while solving a conflict (Kelman, 1996; Kersten and Lai, 2007; Schoop, 2010). This study focusses on the decision-making processes of negotiations.

Negotiations can be categorised into three phases—the pre-negotiation phase, the phase of the actual negotiation, and the post-negotiation phase (Fig. 2.1). The phases are interconnected to each other and are not distinct (Gulliver, 1988).

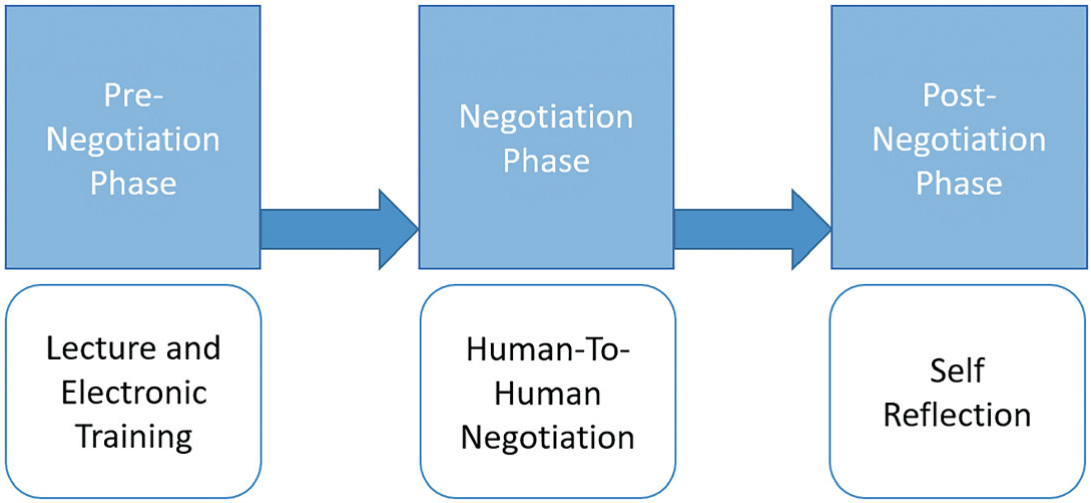

Fig. 2.1 Negotiation Phases (Gulliver, 1988)

The pre-negotiation phase considers information about past negotiations, such as the relationship and conflicts with the counterpart, and known information about the counterpart, such as

expectations and dislikes (Gulliver, 1988). In addition, this phase includes the preparation for the negotiation, as learning negotiation techniques, defining the negotiation frame, such as reservation and aspiration level, and considering the negotiation style, strategies and tactics that will be used during the negotiation. The selection of the negotiation style and strategies depends on the counterpart's position, and on past and future negotiations with the counterpart (Lewicki, Saunders, Barry, 2010). Thus, the conducted course and the electronic training can be categorised in the pre-negotiation phase.

The negotiation phase comprises the actual negotiation between the involved parties, with all information and offer exchanges as well as the end of the negotiation (Gulliver, 1988), which in this investigation comprises a human-to-human negotiation.

The post-negotiation phase, as the last phase of the negotiation, considers the outcome and the social consequences of the negotiation; thus the evaluation and documentation of results and lessons-learned (Gulliver, 1988). The post-negotiation phase was conducted by the students themselves and not guided by the study.

By assisting negotiators during the three negotiation phases, NSSs can be utilised (Kersten and Lai, 2007). Such a System is the NSS Negoisst (Schoop et al., 2003; Schoop, 2021) which includes among others a training component with a tactical negotiation trainer (TNT). A TNT is a trainer with whom an individual can learn to negotiate (Melzer et al., 2012).

2.2.2 Negotiation Styles

During the pre-negotiation phase, the context, negotiation styles and strategies for the upcoming negotiation have to be defined (Lewicki, Saunders, Barry, 2010). There are two orientations in a negotiation—integrative and distributive—to reach an agreement and resolve a conflict. Thus, negotiation styles, strategies and tactics are affected by these orientations (Vetschera et al., 2011).

Integrative bargaining focus on similarities, such as increasing the joint outcome by addressing needs and interests, exchange information

and ideas and commit to achieve an agreement that meets all parties' needs (Goldman, 2003; Lewicki, Barry, Saunders, 2010).

Whereas distributive bargaining focuses on the discovery and the influence of the counterpart's resistance point to maximise the own profit (Goldman, 2003; Lewicki, Barry, Saunders, 2010).

Negotiation styles vary according to the type of relationship and the importance of the outcome (Ganesan, 1993) and can be combined during a negotiation (Lewicki, Saunders, Barry, 2010). Lewicki, Saunders, Barry (2010) defined accommodating, collaborative, compromise, avoiding and competitive as five negotiation styles that differ based on the importance of the relationship and the importance of the outcome for a negotiator. The relationship between the dimensions and the corresponding style is illustrated in Fig. 2.2.

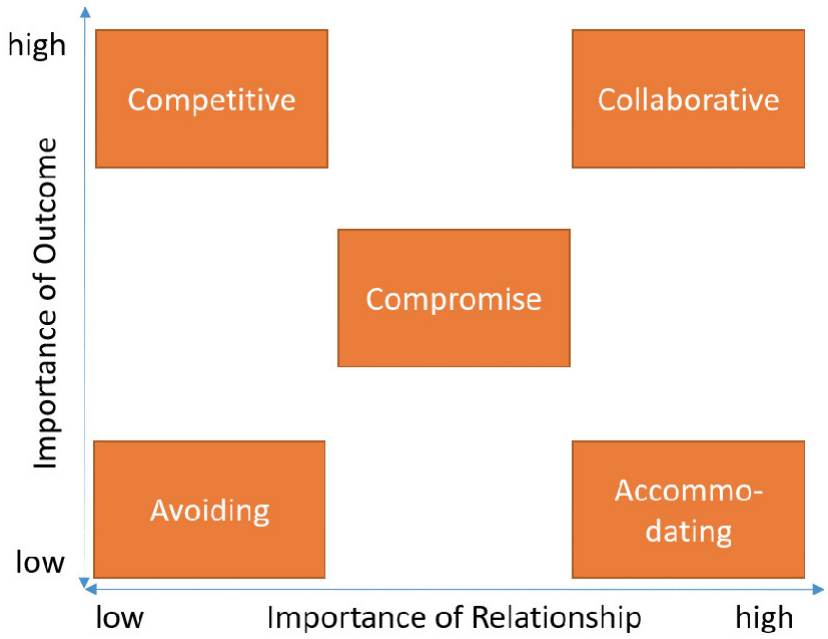

Fig. 2.2 Negotiation Styles (Lewicki, Saunders, Barry, 2010)

Negotiation strategies and negotiation tactics are often used as similarities; indeed, they vary according to their abstraction level. Strategies consider the plan of the negotiation according to the selection and re-evaluation of the priorities and the used negotiation styles. Whereas negotiation tactics are the techniques to apply the

selected negotiation strategy (Goldman, 2003; Lewicki, Barry, Saunders, 2010).

Since this study focuses on conflict styles and negotiation styles, strategies and tactics will not be discussed further.

2.2.3 TKI

TKI is a model to rate and evaluate how an individual conduct oneself in conflict situations between parties with diverse concerns. The model describes two dimensions—assertiveness and cooperativeness—how an individual can behave in such situations. Assertiveness describes to which extent an individual concerns its own behaviour. Cooperativeness considers to which extent an individual wants to satisfy the counterpart's concern (Thomas and Kilmann, 1976, 2008).

Figure 2.3 depicts the five conflict styles of TKI and their relation to assertiveness and cooperativeness (Thomas and Kilmann, 1976, 2008).

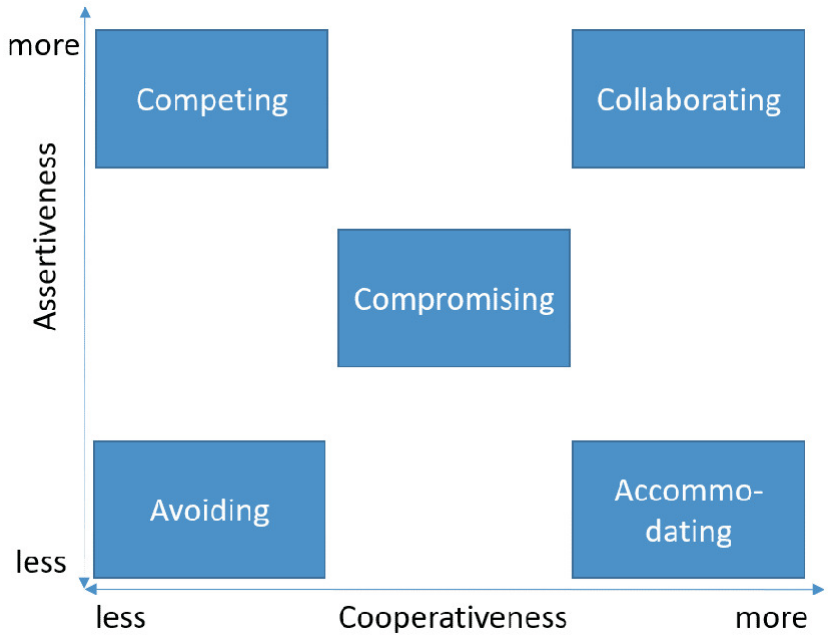

Fig. 2.3 TKI Conflict Types (Thomas und Kilmann 1976, 2008)

A negotiator with a *competing* conflict style only wants to achieve its own concern by using power to win its position no matter what and how it could affect the relationship to the counterpart (Thomas and Kilmann, 1976, 2008). The conflict style *accommodating* is contrary to

competing. The concern of the counterpart and the relationship to the counterpart have a high priority for the negotiator, i.e. the negotiator is yielding to the counterpart's view (Thomas and Kilmann, 1976, 2008). A negotiator who does neither concern its interests nor the interests of the counterpart behaves as *avoiding* by diplomatically sidestepping the negotiation or postponing an issue (Thomas and Kilmann, 1976, 2008). A negotiator is *compromising* if the negotiation outcome satisfies both parties partially by splitting the difference or exchanging concessions (Thomas and Kilmann, 1976, 2008). *Collaborating* as a conflict style can be defined as an extension of compromising, i.e. both parties are working together to find a fully satisfying solution for both by identifying the others interests and concerns (Thomas and Kilmann, 1976, 2008).

2.2.4 TKI in Negotiations

Ganesan (1993) states that the TKI conflict mode were referred as negotiation styles in the research of conflict resolution. Thus, the previous defined negotiation styles were mapped with the TKI's conflict styles. Table 2.1 depicts an overview of the negotiation styles, the corresponding TKI conflict style, the outcome type, and the identified synonyms used by participants in the surveys. A negotiator who withdraws from an active negotiation is avoiding. The outcome of the negotiator itself and its counterpart remain behind the achievable outcome (lose-lose). If a negotiator is only interested in its own concern and not at all in the relationship with the counterpart, the negotiator behaves in a competitive manner by aiming to achieve a high own outcome, whilst the counterpart will achieve a poor outcome (win-lose). Contrary to competitive, a negotiator who sacrifices own outcome to build a relationship is characterised as accommodating (lose-win). Collaborative and compromising are related orientations. Negotiators are collaborative if they achieve a solution that suits both needs fully (win-win). While negotiators are compromising, if the achieved solution suits both sides partially, i.e., both parties give up some points to achieve a settlement (split the difference).

Table 2.1 Overview of Mapped TKI Conflict Styles and Negotiation Styles (Lewicki, Saunders, Barry, 2010; Thomas and Kilmann, 1976, 2008)

2.3 Conducting the study

The study is based on the methodology of Kelley et al. (2003). Several surveys and negotiations were conducted to determine the participant's level of knowledge about negotiation styles and the skills to apply these styles.

Before the study was conducted, the participants already learned negotiation basics during a term-long course, such as their personal conflict style, negotiation styles and conflicts in negotiations. The aim of the course was to build fundamental knowledge in negotiations and already train the participants with small exercises to negotiate in various situations. Figure 2.4 depicts the chronological sequence of the study as part of the course. The study was conducted electronically between November 11th to December 8th, 2021, and included:

Three surveys: Survey 1, Survey 2, Survey 3,

An electronic negotiation training with several bilateral human-to-machine negotiations

A bilateral human-to-human negotiation, so called simulation.

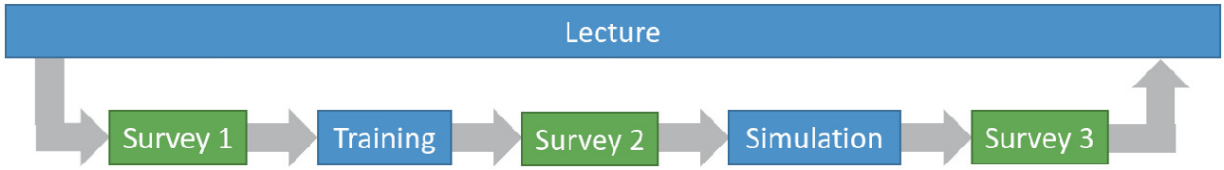

Fig. 2.4 Chronological Sequence of the Study

The surveys were conducted with a covering letter containing all necessary information and a uniform questionnaire layout for all surveys. The survey questions were closed in all those cases that contained a given range for possible responses. The answers to the closed questions were given on a seven-point Likert scale. In the

remaining cases, especially for the questions on the used negotiation styles, open questions were asked to encourage participants to provide unbiased statements.

Survey 1 collected general information about the participants, such as their personal conflict style and their level of knowledge in negotiation and negotiation styles.

The electronic negotiation training followed survey 1. Both, the electronic training and the simulation, were conducted in the NSS Negoisst (Schoop, 2010, 2021). During the training, participants had to conclude at least three negotiations with the TNT within eight days. Further, the participants had the possibility to repeat every negotiation multiple times.

After the participants concluded their electronic training on an individual period during these eight days, Survey 2 was conducted. Among others, the participants were asked to name the used negotiation styles in the training—by defining their own negotiation style and the TNT's negotiation style—and their intended negotiation style in the simulation.

The simulation was scheduled on five days in which the participants had to conclude their negotiation—either with a reject or an accept of the negotiated offer. The topic of negotiation was an integrative case study.

After the conclusion of the simulation, the participants were asked in survey 3 to state the used negotiation style in the simulation by defining their own style and the counterpart's style.

To achieve meaningful survey results, only those participants were considered, who and their counterpart completed all surveys, the electronic training, and the simulation. In total 112 students (58 male, 54 female) attended the study successfully with an average age of 24.47 years. The participants were enrolled in information systems, business communication and management.

2.4 Results

This section represents the results of the study by including the surveys and the outcome of the negotiations.

Participants were asked to state their negotiation skills and how the electronic training had influenced their skills. The replies were given on a seven-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). The aim of this measurement was to control whether the participants were already familiar with negotiation (Question 1–3 in Table 2.2) and whether the electronic training had increased their knowledge level (Question 4–9 in Table 2.2).

In accordance with the negotiation basics learned in the course, most of the participants are familiar with various negotiation styles (Mean 4.97; SD 0.925). However, they tend to be insecure about the intended usage of negotiation styles (Mean 4.97; SD 1.346).

The participants stated that the training helped them to improve their skills and be more prepared how to use negotiation styles.

Table 2.2 Participant's Knowledge Level of Negotiation Styles

2.4.1 Used Negotiation Styles

Thomas and Kilmann (1976, 2008) defined five different conflict styles. However, an individual can have more than one of these conflict styles combined as their personal conflict style. According to Table 2.3 the participants in the simulation applied eleven different negotiation styles with varying frequency of use. The most used negotiation styles were *compromising* (31 participants), *collaborative* (29 participants), and *compromising & competitive* (23 participants). These styles were followed by the negotiation styles *competitive* (10 participants) and *accommodating* (9 participants). The remaining negotiation styles were applied by three or less participants.

Overall, five negotiations (10 participants of 112 participants) were concluded with a reject statement. Except one participant, who negotiate with a *collaborative & then compromising* style, the remaining participants with a rejected negotiation applied a *competitive* negotiation style.

Table 2.3 Used Negotiation Styles and Conclusion Statement of the Negotiation

Overall, 66 participants utilised *compromising* as part of their negotiation style; followed by 38 participants with *competitive* and 34 participants with *collaborative* as part of their negotiation style. Eleven participants utilised *accommodating* and four participants applied *avoiding* as part of their negotiation style.

In the third survey, the participants were asked to state their used negotiation styles during the simulation. Overall, nine participants did not state any negotiation style, i.e., either they could not determine their negotiation style, or they did not apply a negotiation style intentionally. The negotiation style of those nine participants were identified as *accommodating & avoiding* (1 participant), *avoiding & competitive* (1 participant), *compromising* (2 participants), *compromising & collaborative* (1 participant), *compromising & competitive* (3 participants), and *competitive* (1 participant).

Fifteen of 112 participants correctly identified the negotiation style. Five of 66 participants with *compromising* as part of their negotiation style state their style correctly. While two of ten participants who negotiated exclusively with the *competitive* negotiation style stated their style correctly. Eight of 29 participants who negotiated exclusively with this style correctly identified the negotiation style *collaborative*. Whereas no participant with *accommodating* or *avoiding* as part of their negotiation style identified their style correctly.

Considering the negotiation styles of all participants, 61 participants identified at least one negotiation style correctly. Nine of them stated three different negotiation styles, 49 participants stated one negotiation style, and the remaining participants mentioned two different negotiation styles as their negotiation style.

2.4.2 Correlation between Negotiation Style and Conflict Style

To examine whether the participants negotiated according to their individual conflict styles, the correlation between the participant's

conflict style and their used negotiation style will be described in the following.

All participants were classified into their individual conflict style using the TKI MODE instrument, which includes 30 statement pairs to be answered. The score of an individual's style results from the number of times the selected statements represent this particular style and are ranged between 0 (minimum value) and 12 (maximum value) (Womack, 1988).

The conflict styles were additionally analysed according to their ranking. The ranking is based on a descending order of the number of statements assigned to the conflict styles. Comparing the negotiation styles used in the simulation with the participant's TKI conflict styles the following results were conducted.

TKI Avoiding

As Table 2.4 depicts four participants applied the negotiation styles *avoiding* in the simulation. One participant utilised the negotiation style *accommodating & avoiding* with the expression of the conflict styles *avoiding* as above the average of all participants. Nonetheless, this participant achieved an agreement in the negotiation. Whereas the remaining three participants concluded their negotiations with a rejection. However, their conflict style *avoiding* is characterised as among the average of all participants. The conflict style *avoiding* was ranked three times in first place (one accommodating & avoiding, two avoiding & competitive) and once in last place.

Table 2.4 Identified Negotiation Style in Simulation—Avoiding

TKI Compromising

More than a half of the participants (66 of 112 participants) applied *compromising* as part of their negotiation style that is in mean also part of their conflict styles. As Table 2.5 depicts, all participants possess in mean a tendency to be *compromising*. The conflict style *compromising* was ranked six times in first, twice in second, and once in fourth place

in the negotiation style *accommodating & compromising*. In the negotiation style *collaborative & then compromising*, *compromising* was ranked in first place. The negotiation style *compromising* was ranked nineteen times in first, nine times in second, twice in third and once in fifth place. In the negotiation style c*ompromising & collaborative* compromising was ranked once in first and once in second place. While collaborative was ranked thirteen times in first, six times in second, three times in third and once in fifth place in the negotiation style *compromising & competitive*.

Table 2.5 Identified Negotiation Style in Simulation—Compromising

TKI Collaborating

The conflict style *collaborating* of participants who negotiated with a *collaborative* negotiation style cannot be considered as very pronounced (cf. Table 2.6); however, their conflict style *compromising* does. All participants with *collaborating* as negotiation style concluded the negotiation with an agreement. *Collaborating* as conflict style and negotiation style was ranked three times in first, eight times in second, nine times in third, seven times in fourth and twice in fifth place. While in the negotiation style c*ollaborative & then compromising* the conflict style *collaborative* was ranked once in third place; in *competitive & collaborative* once in second and once in fifth place; and in *compromising & collaborative* once in third and once in fourth place.

Table 2.6 Identified Negotiation Style in Simulation—Collaborating

TKI Competing

Competing as a conflict style and part of the negotiation style contains the highest standard deviation in this study based on all other conflict styles and identified negotiation styles (cf. Table 2.7). The negotiation styles *avoiding & competitive* and *competitive* tend to contain *competing* as a medium to strong conflict styles. Especially those participants with

the negotiation styles including *collaborative* or *compromising* tend to negotiate *competitive* at the beginning and then change their style over time to *compromising* or *collaborative*. All participants with the negotiation style *avoiding & competitive* and six participants with the negotiation style *competitive* concluded the negotiation with a rejection. *Avoiding & competitive* was ranked once in second, once in third, and once in fifth place. *Competing* as a conflict style and negotiation style was ranked twice in first, once in second, twice in third, twice in fourth and three times in fifth place. While *competing* in the negotiation style *competitive & collaborative* was ranked once in first and once in fourth place; and in the negotiation style *compromising & competitive* three times in first, seven times in second, twice in third, five times in fourth and six times in fifth place.

Table 2.7 Identified Negotiation Style in Simulation—Competing

TKI Accommodating

The conflict style *accommodating* has a medium expression on average in this study (cf. Table 2.8). Further, those participants who utilised *accommodating* as part of their negotiation style were not characterised with the highest distinct value of the *accommodating* conflict style. All participants with *accommodating* as negotiation style concluded the simulation with an agreement. In the negotiation style *accommodating* the corresponding conflict style was ranked once in fourth place; in the negotiation style *accommodating & avoiding* once in third place and in *accommodating & compromising* four times in second, three times in third, once in fourth and once in fifth place.

Table 2.8 Identified Negotiation Style in Simulation—Accommodating

According to the use of multiple conflict styles in a negotiation style, the ranking shows that 50 participants applied their first ranked conflict style, 35 participants their second ranked conflict style, 30

participants their third ranked conflict style, 20 participants their fourth ranked conflict style and eighteen their fifth ranked conflict style as part of their negotiation style.

2.4.3 Identification of Counterpart's Negotiation Style

A further indication of whether the participants are familiar with negotiation styles is that they had to specify the negotiation styles of their counterpart. This indication was examined in the results of the negotiation training and the negotiation simulation and will be presented in the following.

Negotiation Training

In the training, the participants negotiated with a TNT that applied the Tit-For-Tat-Strategy, i.e. imitate the strategy of the participant (Baarslag et al., 2013). The comparison between the participant's negotiation styles and the assumed style for the TNT are shown in Table 2.9. No participant identified the Tit-For-Tat-Strategy. However, 28 of 112 participants identified the identical negotiation style for themselves and for the TNT. More concrete, the negotiation styles *compromising* (5 participants), *competitive* (7 Participants), *collaborative* (7 Participants), *competitive & collaborative* (5 Participants), *compromising & competitive* (2 Participants), *compromising & collaborative* (1 Participant) and *accommodating & compromising & competitive* (1 Participant), were characterised.

In total, 35 participants did not consider any negotiation style for the TNT Two participants, who characterised their own style as *competitive*, claimed that the TNT has no strategy at all. *Accommodating* was claimed nine times as part of the TNT's negotiation style. Whereas eight of those participants characterised their own negotiation style partly *compromising*. *Avoiding* as part of the TNT's negotiation style was maintained twice. Whereas the participants considered their own style as partially *compromising*. Thirteen participants claimed the TNT's negotiation style as *compromising*; however, five participants characterised *competitive* and other five participants *compromising* as

their negotiation style. In total 20 participants assumed that the TNT's negotiation style was *competitive,* while they claimed their own negotiation styles seven times as *competitive* and eight times as *collaborative*. *Competitive & collaborative* as the TNT's negotiation styles were maintained by thirteen participants; while five of those participants stated the same negotiation style for themselves and four participants characterised their own style as *collaborative*. Eleven participants assumed *collaborative* as the TNT's negotiation style and seven of them as their own style.

Negotiation Simulation

During the third survey, which was conducted after the negotiation simulation, the participants were asked to assume the used negotiation style of their counterpart. As the participants negotiated in the simulation with each other, the negotiation style was not predefined and thus identified by the researcher. Overall, fifteen participants could not identify any negotiation style of the counterpart. Eighteen of 112 participants determined the correct identification of the counterpart's negotiation style: one as *accommodating & compromising*, nine as *collaborative*, four as *competitive*, two as *compromising* and two as *compromising & competitive*. Counterparts with a *compromising* or *compromising & collaborative* negotiation style were characterised as *competitive* by sixteen participants and as *collaborative* by six participants. Further details of the negotiation styles are shown in Table 2.10.

Table 2.9 Comparison of Negotiation Styles in Training

Table 2.10 Comparison of Negotiation Styles in Simulation

2.5 Discussion

By addressing the defined goals, the evaluation of the results of the present study will be represented and limitations will be outlined.

2.5.1 Conflict Styles in Negotiation

The first goal was to examine the correlation between conflict style of a student and their used negotiation styles in human-to-human-negotiations. According to the different conflict styles some participants negotiated according to and others against their styles.

The conflict style *compromising* was identified with a mean value of 8.3125 (SD 2.0530) over all participants. The mean value of the conflict style *compromising* utilised, as part of their negotiation style is higher than the overall mean value of *compromising*. Thus, these participants negotiated according to their conflict style.

For the remaining four conflict styles the participants possess a medium expression of the considered conflict style according to their mean value—*avoiding* with 5.7857 (SD 2.3430); *collaborating* with 4.9286 (SD 1.8503); *competing* with 5.4821 (SD 3.6253); and *accommodating* with 5.4821 (SD 2.3867).

The high standard deviations of the conflict styles can be explained by applying the pairwise comparison of TKI Mode Instrument and the comparison of all participants at once. Thus, only considering the standard deviations of the same used conflict styles, the SDs are mostly smaller than the SD overall participants (cf. Table 2.4–Table 2.8).

The conflict style *competing* scores the highest SD (3.6253) by far. The expression of the *competitive* conflict style of participants applied *competitive* as negotiation style is above the average expression of all participants and thus confirms that *competitive* participants only concern about their own outcome.

The conflict style *avoiding* receives a mean value of 5.7857 (SD 2.3430) and thus is considered as the second highest expression in this study. However, only four participants applied this style in the negotiation—one participant with a high expression, the remaining three with medium to low expression. Thus, all other participants who had a high expression of avoiding as their conflict style, applied different styles in the negotiation. Since avoiding is usually implemented by withdrawing from the negotiation and thus the

negotiation goals are not achieved (Lewicki, Saunders, Barry, 2010), the participants learned to use other styles.

The third highest expression (mean 5.4821; SD 3.6253) scores the conflict style *competing* with the highest SD in total. The participants with the negotiation style *avoiding & competitive* received the highest mean value 9.3333 (SD 3.9012) and concluded with a reject statement. Further six of ten participants, who applied *competitive* as their negotiation style with a mean value of 6.1 (SD 3.2078), concluded with a rejected negotiation. Thus, a strong expression of the conflict style *competing* tends to fail the negotiation outcome in this conducted study.

The conflict style *accommodating* (mean 5.4821; SD 2.3867) represents the fourth highest expression. Only eleven participants used *accommodating* as part of their negotiation style. None of the conflict styles of those participants were characterised as accommodating, rather they contain a medium degree of expression. Contrary to those participants with a strong expression of accommodating who did not applied accommodating as their negotiation style and thus learned to change their negotiation style to achieve a higher outcome for themselves in the case study.

The least expression scores the conflict style *collaborating* (mean 4.9286; SD 1.8503) with a low to medium range of expression. Those participants applied *collaborative* as part of their negotiation style scores in average a slit higher expression as the overall participants. Further, only three of 34 participants applied *collaborative* as their number one conflict style. Thus, participants with a medium expression are able to apply a negotiation style contrary to their conflict style to possibly achieve a win-win outcome.

Since the participants possess a subjective perception how they want to handle situations, i.e., some participants characterise themselves differently to the result of the TKI conflict styles and thus negotiated contrary to what was expected. Further, the subjective perception of the participants and the objective evidence can vary in some cases.

2.5.2 Identification of Counterpart's Behaviour

The second goal was to investigate whether students can recognise the negotiation style of their counterpart. If negotiators are able to understand the counterpart's behaviour, they could influence their counterpart (Fisher et al., 2011) and thus reach their goals during the negotiation.

The participants were asked twice to state the counterpart's negotiation style—first in the training and second in the simulation.

In the training, none of the participants identified the accurate negotiation strategy of the TNT—the Tit-for-Tat strategy. However, as Tit-for-Tat means to imitate the counterpart (Baarslag et al., 2013), 28 of 112 participants identified the same negotiation style for themselves and the TNT and thus, identified the negotiation style of their counterpart.

44 of 112 participants perceive part of the TNT's negotiation style as *competitive*; only a half of them characterised themselves as part *competitive*. The remaining 22 participants considered their negotiation style as part of *collaborative*, *compromising* or *accommodating*, potentially with the intention to negotiate accordingly. However, they misled their own negotiation styles, or they misinterpreted the counterpart's style.

The same appears on the remaining negotiation style:

> 30 participants perceive the TNT's style and 23 of them their own style as *collaborative*.
>
> 28 participants stated the TNT's style as *compromising*, whereas sixteen characterised themselves as compromising.
>
> *Accommodating* was stated nine times as the TNT's style and three of those stated themselves as accommodating.
>
> Two participants perceive the TNT's style as *avoiding*, whereas none of them reported themselves as avoiding.

In total 32 participants reported themselves as *collaborative*, which is fractional more than they stated the TNT (30 participants). In the

remaining negotiation styles, more participants attributed the negotiation styles to the TNT than to themselves.

Since only 28 of 112 participants could identify the TNT's negotiation style, the participants have to be trained in a more dedicated way. Identifying the counterpart's negotiation style and to be able to estimate how the own styles is perceived by the counterpart can help to respond appropriately on the counterpart's style (Salacuse, 1999).

Additionally, the results of the simulation underline the necessity to improve the training on how to identify the negotiation styles of the counterpart. The participants who characterised the negotiation style in the simulation correctly is less than in the training (18 of 112 participants).

2.5.3 Intentional Usage of Negotiation Styles

The third goal was to examine how students apply learned negotiation styles from the course in the negotiation simulation and will be stated in the following.

More than a half of the participant applied *compromising* as part of their negotiation style (66 of 112 participants), thus, they tried to split the difference to achieve an agreement. Except one of those participants, with a competitive counterpart, the remaining participants concluded the negotiation with an agreement.

Those participants who could not achieve a collaborative negotiation, tried to resolve differences through compromising. The aim is to teach negotiators to develop a collaborative style whenever possible, even under time pressure.

Only eleven of 112 participants utilised *accommodating* as part of their negotiation style. In contrast to the content of the case study, which enhances a long-term relationship, the participants in the study negotiated once with their negotiation partner without the intention for repetition. As Ganesan (1993) already claimed that in a short-term relationship the negotiators mostly concern about the outcome of the current negotiation, our study underlined this result. Only up to 10 %

of the participants consider the relationship as most important in their negotiation.

Even fewer participants applied avoiding as part of their style. Both styles—*accommodating* and *avoiding*—have a higher expression as conflict style than their actual usage in the negotiation indicated. Those participants applied different styles to achieve a better outcome for themselves.

In line with previous findings integrative styles are more efficient than competitive styles (Butler, 1994), at least one of the negotiators in every failed negotiation in this study applied a *competitive* style. These participants also tend to have a strong expression on the conflict style competitive. It is therefore indicated that a strong expression of the conflict style competitive tend to fail the negotiation. The impact on explicit training on responding to a competitive negotiation style of the counterpart should be investigated in further research to increase accepted negotiation outcome.

Chapter 2.4 demonstrates that the students learned various negotiation styles and are familiar with them. However, the actual usage of these styles seems to be quite more difficult. Only a small group of participants are secure about the usage of negotiation styles during negotiations and even less participants are using negotiation styles with an intention (cf. Table 2.2).

Further training must therefore close the gap between the knowledge about negotiation styles and the application of specific styles depending on the concrete situation.

The analysed negotiation style in this study included five general orientations. In order to negotiate according to these orientations, participants need to use more specific negotiation strategies, which should be explained in more detail in the course and training.

The course is conducted the same way for years and various students have already learned how to negotiate. However, the course needs to be adapted to teach more specific negotiation strategies in addition to negotiation styles, and how to theoretically apply them during a negotiation.

The electronic training should enable participants to try out various styles in diverse situations without flaws of reasoning. NSSs can support targeted training by using, among others, TNTs with individual negotiation styles and guided tours to support training. A neutral instance, such as a TNT, is immune against distraction and flaws of reasoning (Greenwald et al., 2003).

In this study the TNT only negotiated with one strategy—Tit-for-Tat. For a more specific training of negotiation strategies, the TNT's strategies have to be adapted.

2.5.4 Limitations

Since the study contains some limitations, they will be explained in the following.

First, in the surveys the participants were asked to state their negotiation styles in a free text field without predefined negotiation styles. However, some participants only describe how the proceeded the negotiation which had to be transmitted to the five negotiation styles. In addition, some participants did not mention any negotiation style, which could indicate that they are either unfamiliar with negotiation styles or did not apply a negotiation style intentionally.

Second, if a participant considered more than one negotiation style and did not specifically mention an order, the styles were sorted alphabetically. Further, the ratio of usage of the named styles were not further differentiated. According to Preuss and van der Wijst (2017) negotiation styles can vary between the negotiation phases. Further studies need to examine how negotiation styles change over time.

Due to limited time of the negotiation which has to be concluded within five days some participants could have felt under time pressure and thus have been more inclined to compromise than to try to reach a collaborative outcome.

Finally, the students were externally motivated by receiving extra points for their participation.

2.6 Conclusion

Before conducting the study, students learned negotiation knowledge in a term-long course and applied it during the study in an electronic training. Although students felt well prepared by applying the course and training, the study revealed that only a small group of students can intentionally use negotiation styles in a negotiation and even less can identify the used negotiation styles of their counterpart. Thus, a dedicated training is required to increase knowledge on negotiation styles and, in the next step, on negotiation strategies to improve outcomes and reduce rejected negotiations.

The training should be adapted in two ways—in the course and in the electronic training. The course should include a mapping between negotiation styles and concrete negotiation strategies and how to react to negotiation strategies to achieve own negotiation goals. The electronic training should include the negotiator's individual conflict styles to increase an individual training according to the strength and weaknesses.

Further to support training that is independent of the knowledge level of the counterpart, a TNT should be adapted with various negotiation strategies and a flexible use of the negotiation strategies as a counterpart. The TNT should be able to adapt the negotiation style and strategy individually to the knowledge level of the negotiator and thus, increase the training success of the students.

As future research, it has to be investigated to what extent individual training influences the use of learned negotiation styles and the correct identification of the negotiation partner's styles in a negotiation in order to increase an optimal negotiation outcome.

Footnotes

1 The content of the published article is identical to the content presented here; the only changes applied are the alignment of references, text formatting, and numbering of figures and tables to be consistent throughout this thesis.

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3. Taxonomy of Styles, Strategies, and Tactics in E-negotiations

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Abstract
Negotiations are essential in every day's life, increasingly via electronic media. Due to a huge amount of negotiation styles, strategies, and tactics presented in the literature, it is unclear which combinations of strategies and tactics for a concrete style can be applied in (electronic) negotiations. Therefore, we conducted a systematic literature review identifying combinations of negotiation styles, strategies, and tactics in electronic negotiations. The findings were consolidated into a taxonomy and patterns of the combinations were generated.

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3.1 Introduction and Background

Negotiation in general are communication and decision-making processes between at least to parties who exchange arguments with the aim to solve conflictual situation (Kelman, 1996; Kersten and Lai, 2007; Schoop, 2010). “Conflict is at the center of negotiations. Conflict in terms of negotiation does not necessarily have to be an actual dispute or disagreement. It suffices that there is insufficient information about the other’s wishes or about the other’s perception of the events in order to create a conflict.” (Miller, 2014)

The Thomas-Kilmann-Conflict Mode Instrument (TKI) identifies a personal conflict style of individuals that can be applied to handle conflictual situations (Thomas and Kilmann, 1976), such as negotiation (Ganesan, 1993). TKI considers two dimensions how an individual can behave in conflict situations: (1) assertiveness, i.e. the extent to which an individual is concerned with their own interests; (2) cooperativeness, i.e. the extent to which an individual is concerned with the partner’s interests (Thomas and Kilmann, 1976, 2008). Further, TKI can be applied to identify the partner’s style in negotiations (Fujita, 2014; Wachowicz and Wu, 2010). Based on the two dimensions, TKI defines the five styles competing, accommodating, avoiding, collaborating, and compromising. A *competing* negotiator is only concerned with their own interests no matter how it affects the relationship to the partners. An *accommodating* negotiator is concerned with the relationship to the partner, i.e., the negotiator is yielding to the partner’s view. An *avoiding* negotiator is neither concerned with their own interests nor with those of the partner, i.e. the negotiator postpones an issue or eludes the negotiation. A *compromising* negotiator is concerned with both their own interests and with those of the partner and tries to find a conclusion that partially satisfy all parties, e.g., by splitting the difference or exchanging

concessions. A *collaborating* negotiator is concerned with their own interests and those of the partner and tries to find a solution that satisfies all parties (Thomas and Kilmann, 1976, 2008). In our research, the TKI styles provide a basis for different types of negotiation partners and are defined as negotiation styles.

For allocating findings in the literature to negotiation styles, strategies, and tactics, they have to be defined. Negotiation styles are orientations how someone can negotiate and are dependent on the importance of the outcome and the relationship (Loewenstein and Thompson, 2006). Negotiation strategies consider an overall plan of the negotiation according to selection and re-evaluation of priorities and used negotiation styles (Goldman, 2003; Lewicki, Barry, Saunders, 2010); thus some negotiation strategies are more applicable to a particular style than other strategies. Negotiation tactics are techniques to apply specific negotiation styles and strategies (Goldman, 2003; Lewicki, Barry, Saunders, 2010) and thus vary during the negotiation process.

To choose the appropriate strategies, and tactics seems to be a difficult task especially for novice negotiators (Meyer, 2022). The definitions of strategies and tactics vary in the literature. Some findings have different terms for identical strategies or tactics, e.g. large concession vs. being soft (Baytalskaya, 2017; Vahidov et al., 2014; Vahidov, Saade, Yu, 2017). In other findings, identically described strategies or tactics are allocated in some cases to strategies and in other cases to tactics, e.g. Tit-for-Tat (Vahidov et al., 2014; Yinping and Singhal, 2009). Thus, the aim of this research contribution is to classify styles, strategies, and tactics, and group similar strategies/ tactics with consistent naming and consistent allocation to a strategy or tactic. Whether they are allocated to strategies or tactics depends on prior definitions. The following research question is formulated:

RQ1 **To what extent negotiation styles, strategies, and tactics in e-negotiation can be classified?**

Electronic negotiations (e-negotiations) comprise electronic argument exchange from simple offers to complex communication and thus can be used to apply different negotiation models, such as negotiation agents (as negotiation partner) and negotiation support (supporting human negotiators in complex negotiations) (Bichler et al., 2003; Schoop et al., 2003).

Negotiation support systems (NSSs) are communication and information systems, which support the negotiations process by gathering information, structuring, and generating alternatives (Bichler et al., 2003; Schoop et al., 2003).

Once negotiation styles, strategies, and tactics are classified, we will investigate whether specific negotiation styles, strategies, and tactics are mentioned together in the literature and can be linked together as a pattern. Each pattern contains one style of the TKI, and the matching strategies and tactics found in the literature. The aim of the patterns is to possess different combinations of strategies and tactics for a concrete style to apply in e-negotiations. Our investigation will focus on decision support in bilateral semi-structured human-machine negotiations. To the best of our knowledge, an extensive model of the mentioned aim is missing and thus the following research question is formulated:

RQ2 **Which patterns can be identified between the classified negotiation styles, strategies, and tactics?**

3.2 Methodological Approach

This chapter describes how the research was conducted. First, negotiation styles, strategies, and tactics were identified through a systematic literature review. Second, based on the findings of the literature review a taxonomy was created to determine a classification of the identified negotiation styles, strategies, and tactics (RQ1) and finally patterns of the classified styles, strategies, and tactics in e-negotiations were generated (RQ2).

3.2.1 Systematic Literature Review

The systematic literature review (Vom Brocke et al., 2009; Vom Brocke et al., 2015) is shown in Table 3.1. Google scholar was chosen as search engine due to its broad coverage of major databases and publishers. The aim of this literature review was to identify styles, strategies, and tactics in e-negotiation in general and in the application of a software agent. Culture is not explicit considered in this research.

Table 3.1 Steps of Systematic Literature Review

In total 876 findings were identified within three search algorithms. However, these findings comprise various duplicates, missing access on full paper, and non-English publications, which had to be excluded. In Exclusion 2, the relevance was examined according to the title and abstract of the publications. After the third exclusion, which examined the relevance of full text, 139 findings were identified as relevant.

3.2.2 Taxonomy Development

A taxonomy according to Nickerson (Nickerson et al., 2013) was created to classify negotiation styles, strategies, and tactics.

Firstly, a meta-characteristic as "the most comprehensive characteristic that will serve as the basis for the choice of characteristics in the taxonomy" (Nickerson et al., 2013) was defined, i.e., negotiation styles, strategies, and tactics in semi-structured bilateral e-negotiation with decision-making focus. Whether negotiation styles, strategies, and tactics were mentioned together in the findings was insignificant for the creation of the categories in the taxonomy.

Afterwards for defining the termination, the subjective and objective ending conditions were characterised. The objective ending conditions were concise, robust, extensible, and explanatory (Nickerson et al., 2013).

Finally, the approach of the iterations to create the taxonomy had to be chosen out of inductive (empirical-to-conceptual) or deductive

(conceptual-to-empirical) approaches (Nickerson et al., 2013). In the first iteration, we applied an inductive approach based on an unstructured literature search in the field of negotiation styles, strategies, and tactics by analysing 50 publications. Based on our defined meta-characteristic, we identified two dimensions with 19 subdimensions (Faratin et al., 1998; Faratin et al., 2002; Lewicki, Barry, Saunders, 2010; Thompson, 2022; Walton and MacKersie, 1991). The second iteration applied an inductive approach based on a systematic literature review. Due to exponentially increasing categories in the dimensions, we had to restructure the taxonomy into three dimensions with nine subdimensions. Now, the subjective ending conditions were met. Due to the restructuring process and remaining literature from the literature review, a third iteration was conducted by applying an inductive approach. After performing the third iteration all objective ending conditions were met (Nickerson et al., 2013), especially since all objects were examined.

3.3 Taxonomy

The taxonomy (see Fig. 3.1) is characterised by three dimensions—styles, meta-strategies, and meta-tactics. The style dimension includes the categories avoiding, accommodating, competitive, collaborative, and compromising which are based on TKI (Thomas and Kilmann, 1976, 2008) and thus verified by the literature. Meta-strategies and meta-tactics contain further subdimensions.

Meta-strategies. The category meta-strategies provides strategies and contains the subdimensions central concern, concession-making approach, concession-making degree, information exchange, strategy composition, and other approaches; which are evaluated in the following according to the findings in the literature review.

Central concern as a subdimension contains the basic orientation of how negotiators are concern with their own interests and/or their partner's interests. The TKI model describes assertiveness as being concerned with one' own behaviour and cooperativeness as being

concerned with the partner's interest. Being only focused on own interests, an individual is denoted as competing. Negotiators who are only interested in their own concern, only behave according to their goals, do not consider knowledge about the partner or employ a "take-it-or-leave-it" strategy (Baarslag, 2016; Baarslag et al., 2016; Baytalskaya, 2017; Cairo et al., 2003; Yinping and Singhal, 2009). Negotiators who are only interest in the partner's concern, try to achieve an outcome that suits the partner's needs, e.g., by employing the strategy to ask the partner to make an offer (Cairo et al., 2003). Negotiators who are neither interested in their own concern nor in their partner's concern, e.g. postpone or cancel the negotiation (Thomas and Kilmann, 1976, 2008). Negotiators who are interested in their own and partner's concern, can be collaborating or compromising negotiators; compromising negotiators split the difference and thus find a partially satisfied conclusion for all parties; collaborative negotiators expand the pie of the negotiation by finding a solution that satisfies all parties (Thomas and Kilmann, 1976, 2008).

Dimension	Categories				
Styles	Avoiding	Accommodating	Competitive	Collaborative	Compromising

Meta-strategies	Central concern	Partner's concern		Own concern	
	Concession-making degree	Large concession	Gradual concession	No concession	
	Concession-making approach	Random	Trade-offs	Fixed concession strategy	Repetitive strategy
	Information exchange	Share information		Withholding information	
	Strategy composition	Pure strategy		Mixed strategy	
	Other approaches	Coordination strategy	Relation-based negotiation strategy	MESOArgN	...

Meta-tactics	Time-dependent	Delayed concession		Immediate concession		
	Behaviour-dependent	Concession reciprocity		Estimating partner		
	All	Heuristic models	Mathematical models	Game theory algorithm	Degree of concession	...

Fig. 3.1 Taxonomy

Solving conflictual situations to achieve an agreement, concessions have to be made by the negotiators (Ross and Stillinger, 1991). Based on this assumption the subdimensions concession-making degree and concession-making approach were generated.

Concession-making degree defines to what extent a concession is made, namely no, gradual, or large concession. The category in which negotiators do not make any concession (Rahwan et al., 2003; Yinping and Singhal, 2009) or do not want to participate in the negotiation is defined as no concession. Examples of concrete strategies are avoiding discussions (Rahwan et al., 2003; Rahwan et al., 2007; Yinping and Singhal, 2009) or leaving the negotiation (Cairo et al., 2003). Gradual concession describes more/ fewer concessions being made depending on the concrete strategies. For example, an optimistic opening offer is provided, followed by small concessions (Lopes et al., 2005). More precisely, the negotiator is willing to make further large concessions if the partner will also make large concessions, or the negotiator tries to split the difference (Cairo et al., 2003). Making large concessions could have multiple reasons. Some negotiators might want to conclude the negotiation as quickly as possible (Chen, 2003; Yinping and Singhal, 2009); for others achieving an agreement at all is more relevant than no agreement at the end of a negotiation (Etukudor et al., 2020; Kersten et al., 2013; Patel and Gupta, 2006; Vahidov, Kersten, Yu, 2017). With these three categories, all findings of the literature review are included.

The **concession-making approach** comprises how an individual wants to proceed during making concession, e.g., willingness to trade off (Kersten et al., 2013; Zulkernine, 2011), trial-and-error or random (Hernandez-Leal et al., 2017; Lopes et al., 2005), and thus is relevant to determine the own strategy in a negotiation. This subdimension contains the categories random, trade-offs, fixed-concession strategy, and repetitive strategies.

A random approach possesses a set of feasible issue combinations and picks random a combination of issues as an offer, which leads to unpredictable offers during the negotiation (Baarslag, 2016; Baarslag et al., 2016; Etukudor et al., 2020; Hindriks et al., 2009). In trade-offs,

issues of low importance are traded for issues of high importance for oneself, i.e., an individual make high concessions on issues with low importance and low concessions on issues with high importance (Baarslag, 2016; Cheng and Ch, 2012; Hindriks et al., 2009; Kersten et al., 2013; Lai et al., 2010). In fixed concession strategies, the concession making depends on the urgency when the negotiation should end or on the necessity, an outcome is needed. A greater urgency causes greater concessions (Lai et al., 2010). The category "Repetitive strategies" includes routine-based strategies, such as case-based reasoning (Masvoula et al., 2010).

Knowing, e.g., the intention of the partner enables a negotiator to influence the partner's behaviour to its own benefits (Kelman, 1996). Thus, **exchanging information** with the partner is a part of negotiation as well as of the taxonomy. Dependent on negotiator's goal the extent of information exchanged, and the extent of trustworthiness information vary, i.e., one wants to hide information or share them with the partner.

In "share information", negotiators are willing to exchange information about themselves and their preferences to the partner (Chen, 2003). The shared information can be truthful, wrong, or irrelevant (Vahidov, Kersten, Yu, 2017), e.g. claiming an issue to be important whilst it is really not important for the negotiator. Further information can be shared with an intentional use (Baytalskaya, 2017), i.e., the negotiator only shares information by influencing the beliefs and intentions of the partner (Rahwan et al., 2003). By withholding information, the negotiator intends to obfuscate its truth intentions and beliefs, e.g. contradictory offers. Mostly this strategy is applied in distributive negotiations (Baytalskaya, 2017; Vahidov, Kersten, Yu, 2017).

The approach to achieve goals in the negotiation (**strategy composition**) might change through receiving new information about the negotiation setting or the partner, and thus the applied strategies might have to be changed too. If one strategy is applied for all issues or over time, it is called pure strategy (Zulkernine and Martin, 2011). If

multiple strategies are applied for different issues or over time, it is called mixed strategy. Based on our literature review, especially agents are applying negotiation strategies, which are changing over time and thus apply a mixture of strategies (Awasthi et al., 2016; Cao et al., 2015; Kiruthika et al., 2020; Vij et al., 2019; Zulkernine and Martin, 2011).

The subdimension **other approaches** consolidates further findings of the literature review (Cheng and Ch, 2012; Etukudor et al., 2020; Paliwal et al., 2003; Shi and Sim, 2008; Sim, 2009), which are only mentioned once or twice and are concrete applications. Thus, these findings are unclassifiable to the already defined subdimensions, such as coordination strategy, relation-based negotiation strategy or MESOArgN. As there are no limitations of future findings of concrete applications one category is defined as "…" to consolidate further findings for strategies, which cannot be classified in the remaining categories of the taxonomy.

Meta-tactics. Time-dependent, resource-dependent, and behaviour-dependent are common terms for negotiation tactics in negotiation literature (Al-Agtash and Al-Fahoum, 2005; Carbonneau and Vahidov, 2014; Carbonneau and Vahidov, 2016; Patel and Gupta, 2006; Vahidov, Saade, Yu, 2017). Due time-dependent, resource-dependent, and behaviour-dependent describe orientations of tactics, they were considered as subdimensions in the dimension meta-tactics. Behaviour-dependent tactics are based on the negotiation partner's attitude, e.g., tit-for-tat. In time-dependent tactics the negotiator's attitude changes over time, e.g., near deadline a negotiator changed their tactics from tough to conceding. Resource-dependent tactics contain changes in resources, i.e., similar to time-dependent, but the concession pattern can differ (Faratin et al., 1998). Tactics belonging to a combination of meta-tactics can be categorised to combined meta-tactics. After applying the literature on our taxonomy, the subdimensions time-dependent, behaviour-dependent and all (time-dependent, resource-dependent, and behaviour dependent) were identified.

Tactics affecting different time points in a negotiation (Zulkernine, 2011) are categories of the subdimension **time-dependent**, e.g. when concessions are made. The two defined categories are delayed concession and immediate concession.

In delayed concessions, first concessions are made in later periods, i.e., starting tough and change to making (large) concession while approaching the end of the deadline, e.g., Boulware tactic (Awasthi et al., 2016; Cao and Peng, 2016; Mirzayi et al., 2022; Sim, 2006; Vahidov, Kersten, Yu, 2017). Immediate concessions are characterised by making concession at the beginning of a negotiation, i.e., in the first offer. Concessions can remain monotonic or become smaller to no concessions over time, e.g., conceder tactic (Awasthi et al., 2016; Chen, 2003; Sim, 2006; Vahidov, Kersten, Yu, 2017; Yinping and Singhal, 2009).

Behaviour-dependent tactics contain tactics how a negotiator behaves, e.g., the extent of willingness to make concessions if receiving concessions (Concession reciprocity) or assessing the partner to gain knowledge (Estimating partner).

Concession reciprocity describes the tendency of a negotiator to reciprocate concession, e.g., tit-for-tat (Baarslag et al., 2016; Hernandez-Leal et al., 2017; Lai and Lin, 2004; Lopes et al., 2005; Vetschera et al., 2014). Estimating the partner's preferences can enable a sufficient negotiation outcome for oneself. For example, the reservation value or the probability that the partner will accept a certain offer can be estimated (Baarslag et al., 2016). Further behaviour-dependent tactics (e.g., power) affect multiple categories and are dependent on the partner and thus are consolidated in an overall behaviour.

The subdimension "**all**" comprises time-dependent, resource-dependent, and behaviour dependent. However, it does not imply that all three meta-tactics perform together, rather than the categories can be time, behaviour, and resource related. It mainly contains models, functions, and algorithms, i.e., concrete applications of tactics, which can be applied as a negotiation partner in e-negotiations, and includes

the categories heuristic models, mathematical models, game theoretic models, degree of concession, and "…". The category "…" contains further findings of the literature review, which are concrete application and unclassifiable into the previous defined categories, e.g., BOA, KDE, Zeuthen strategy, and QO-Agent (Mirzayi et al., 2022; Rahwan et al., 2003; Vetschera et al., 2014). This category enables the taxonomy to be extendable for further investigations or new findings.

Heuristic models search the scope of the negotiation incompletely, i.e., the negotiation outcome can be suboptimal (Jia-hai et al., 2005), but more realistic (Cao et al., 2021; Faratin et al., 1998; Rahwan et al., 2007), i.e., these models should be investigated further as negotiation partner in electronic human-machine negotiations. Heuristic models comprise several models, such as, artificial neural networks, rule-based algorithms, argumentation-based algorithm (Chen, 2003; El-Fangary et al., 2008; Jia-hai et al., 2005; Park et al., 2019; Rahwan et al., 2007), genetic algorithms, Q-Learning (Kiruthika et al., 2020; Masvoula et al., 2010), fuzzy algorithms (Lai and Lin, 2004; Luo et al., 2003), reinforcement learning (Brzostowski, 2007; Hernandez-Leal et al., 2017), and regression (Brzostowski, 2007). Mathematical models comprise especially mathematical functions (e.g., linear, exponential, or logarithmic) (Choi et al., 2005; Kamath and D'Souza, 2017; Kiruthika et al., 2020; Ludwig, 2008; Vahidov, Kersten, Yu, 2017) and algorithms modelling tactics (Baarslag et al., 2015; Lai et al., 2010; Lai and Lin, 2004; Sim, 2006, 2010) and thus outline how concessions are changed over altered behaviour, remaining time, or remaining resource. These models can be applied as support or negotiation partner in electronic human-machine-negotiations. Game theoretic models include models based on game theory approach, such as Rubinstein, Markov chains, and Bayesian learning (Baarslag et al., 2016; Zulkernine, 2011). Agents using game theoretic models are defined as completely rational (Jia-hai et al., 2005). Due to rationality of such models, they tend to be not applicable as negotiation partner in e-negotiations. Whereas applying game theoretic models, e.g. identifying strategy changes by using Markov chains or Bayesian learning (Baarslag et al., 2016), can support

the negotiators in a human negotiation. “Degree of concession” depicts on a precise level to what extent a concession is made within single issues of an offer (no, small, moderate, large, complete) (Baarslag et al., 2015; Haberland et al., 2012; Sim and Wang, 2003; Vahidov et al., 2014; Vahidov et al., 2016). The selections cover all relevant degrees of concession in our taxonomy. The selection of a model relies on the framing of a concrete negotiation and has to be re-examined for each negotiation.

The described taxonomy enables to show the behaviour of a negotiator without being influenced by the negotiation partner or the setting of the negotiation. There are further categories, which are influenced by the partner or the setting, such as power, anchoring, issue consideration with multi-issues offers and single issue offers. These categories are classified as an overall behaviour in this research contribution. Power categorises the equality of relationship between the negotiation partners. If the power between the parties is equal, the behaviour of the negotiation is relationship oriented, e.g., accommodating or collaborative. If the power between the parties is unequal, the negotiator’s behaviour can be self-centric, e.g., competitive or aggressive, in the negotiation (Baytalskaya, 2017; Patel and Gupta, 2006; Westbrook, 1996). The first offer serves as a landmark for the negotiation parties in the remaining negotiation and is called anchoring (Agrawal and Chari, 2009). Issue consideration determines the number of issues considered in a single offer, i.e., either single-issue offers, or multi-issues offers. If multiple issues are discussed in the negotiation, single issue offers can be discussed at the beginning of the negotiation, however during the negotiation process the negotiation parties have to switch to multi-issues offers to conclude the negotiation (Baarslag et al., 2016; Vetschera et al., 2014).

3.4 Patterns of Styles

Based on the conceptualised taxonomy and the findings in the literature review, combinations between negotiation styles and

strategies and tactics were identified and consolidated into patterns. In this research contribution, patterns are defined as occurrences of the categories in the taxonomy identified in the literature review. A pattern contains all categories mentioned in the literature together with the examined style; regardless how often the categories were mentioned together with the examined style in the literature review. Some patterns have only a few categories which were explicitly mentioned in the literature review, e.g., with the styles accommodating and avoiding. These styles are in general not suitable for a successful negotiation outcome and thus are only mentioned a few times in the findings of the literature review.

Each pattern contains one of the five styles and their identified strategies and tactics (see Fig. 3.2). Whether negotiation styles, strategies, and tactics were mentioned together is only considered in the patterns and not in the creation of the taxonomy. Thus, some categories in the taxonomy could not be explicitly identified in the patterns. Due to the generality of the taxonomy, i.e., the taxonomy could also be applied to choose tactics for concrete strategies without considering the negotiation style; it is valid, that some categories are not comprised in our considered patterns.

Style based patterns		Avoiding	Accommodating	Competitive	Collaborative	Compromising
Meta-strategies	Central concern	-	Partner's concern*	Own concern	Partner's concern, Own concern	Partner's concern, Own concern*
	Concession-making degree	Large concession, No concession	Large concession	No concession	Large concession, Gradual concession, No concession*	Gradual concession
	Concession-making approach	Random, Trade-offs, Fixed concession strategy, Repetitive strategy*	Random, Trade-offs, Fixed concession strategy, Repetitive strategy*	Trade-offs	Trade-offs	Random, Trade-offs, Fixed concession strategy, Repetitive strategy*
	Information exchange	Share information, Withholding information*	Share information, Withholding information*	Share information, Withholding information	Share information	Share information
	Strategy composition	Pure strategy, Mixed strategy*	Pure strategy, Mixed strategy*	Mixed strategy	Mixed strategy	Pure strategy, Mixed strategy*
	Other approaches	Coordination strategy, Relation-based negotiation strategy, MESOArgN, ...*	Coordination strategy, Relation-based negotiation strategy, MESOArgN, ...*	Coordination strategy, Relation-based negotiation strategy, MESOArgN, ...*	Relation-based negotiation strategy, MESOArgN	Coordination strategy, Relation-based negotiation strategy, MESOArgN, ...*
Meta-tactics	Time-dependent	Delayed concession, Immediate concession*	Immediate concession	Delayed concession, Immediate concession	Delayed concession, Immediate concession	Delayed concession, Immediate concession
	Behaviour-dependent	Concession reciprocity, Estimating partner*	Concession reciprocity, Estimating partner*	Concession reciprocity, Estimating partner*	Concession reciprocity	Concession reciprocity, Estimating partner*
	All	Heuristic models, Mathematical models, Game theory algorithm, Degree of concession, ...*	Mathematical models	Heuristic models, Mathematical models, Degree of concession	Heuristic models, Mathematical models, Degree of concession, ...	Mathematical models

Fig. 3.2 Identified Patterns

Due to some opposite approaches of strategies or tactics, not all (but some) categories identified in a pattern cannot be applied together. In fact, applying concrete strategies and tactics in a negotiation, reasonable strategy-tactic-combinations have to be utilised, which are explained in the following.

In the pattern **avoiding**, negotiators neither concern about their own interest nor about their partner's interest (subdimension central concern) (Al-Jaljouli et al., 2018; Yinping and Singhal, 2009) and either make large concession (Rahwan et al., 2007) or no concession (Rahwan et al., 2003; Rahwan et al., 2007; Yinping and Singhal, 2009) (subdimension concession-making degree). Within the style avoiding, large concessions tend to be made when the negotiator wants to end the negotiation as fast as possible. No concessions tend to be made when the negotiator does not want to participate at all and try to postpone the negotiation. Both characteristics are accompanied by the definition of avoiding.

The pattern **accommodating** contains large concession (subdimension concession-making degree) (Chen, 2003; Yinping and Singhal, 2009), immediate concession (subdimension time-dependent) (Chen, 2003; Yinping and Singhal, 2009), and linear function in the mathematical models (subdimension all) (Ludwig, 2008). Align to the style definition, the accommodating pattern is characterised by quick, large concession (Chen, 2003; Patrikar et al., 2015), and immediate concession (Chen, 2003; Patrikar et al., 2015) as identified categories. Linear function (category mathematical models) (Ludwig, 2008) as implementation of the concession matches the category immediate concession.

The **competitive** pattern comprises the following seven categories in five subdimensions of meta-strategies: own concern (Baarslag, 2016; Baytalskaya, 2017; Yinping and Singhal, 2009) and partner's concern (Zulkernine, 2011) (subdimension central concern); no concession (subdimension concession-making degree) (Yinping and Singhal, 2009); trade-offs (subdimension concession-making approach) (Yinping and Singhal, 2009); share information (no implication of truthful information) (Baytalskaya, 2017) and withholding information (Baytalskaya, 2017; Vahidov, Kersten, Yu, 2017) in the subdimension information exchange; and mixed strategy (subdimension strategy composition) (Awasthi et al., 2016; Cao and Peng, 2016; Mirzayi et al., 2022; Sim, 2006; Vahidov, Kersten, Yu, 2017).

In "central concern", concerning about the own interests was mentioned several times in the literature review, which suits the definition of competitive style. The subdimension information exchange in the competitive patterns includes the categories share information (Baytalskaya, 2017) and withholding information (Baytalskaya, 2017; Vahidov, Kersten, Yu, 2017). Sharing information in this context refers to considered information exchange, which suits the competitive negotiation style. The following five categories were identified in meta-tactics: delayed (Awasthi et al., 2016; Cao and Peng, 2016; Mirzayi et al., 2022; Sim, 2006, 2010; Vahidov, Kersten, Yu, 2017; Vahidov, Saade, Yu, 2017) and immediate (Awasthi et al., 2016; Cao and Peng, 2016;

Mirzayi et al., 2022; Sim, 2006, 2010; Vahidov et al., 2016; Vahidov, Kersten, Yu, 2017) concession in the time-dependent subdimension; heuristic models (Zulkernine, 2011), mathematical models (Lai et al., 2010; Ludwig, 2008; Mirzayi et al., 2022; Sim, 2006, 2010), and degree of concessions (Baarslag et al., 2015; Baytalskaya, 2017; Chen, 2003; Vahidov et al., 2016; Vahidov, Kersten, Yu, 2017) in the "all" subdimension. In our findings, immediate concession in the time-dependent subdimension appears always together with delayed concession and the category mixed concession whereas delayed concession (Vahidov, Kersten, Yu, 2017; Vahidov, Saade, Yu, 2017) was also mentioned standalone. Thus, immediate concession only has a small impact on the style, which is supported by the style definition. However, it can influence the negotiator to be less tough over time. Trying to make no concession (subdimension concession-making degree) and trading less important issues for important issues for themselves (trade-offs in concession-making approach subdimension) represent the competitive style as only concerning about the own interests.

The **collaborative** pattern comprises five subdimension and six categories in the meta-strategies, namely own concern (Al-Jaljouli et al., 2018) and partner's concern (Cheng and Ch, 2012; Yinping and Singhal, 2009) (central concern subdimension), trade-offs (Cheng and Ch, 2012; Lai and Lin, 2004; Lopes et al., 2005; Vetschera et al., 2014; Yinping and Singhal, 2009) (subdimension concession-making approach), share information (Chen, 2003; Vahidov, Kersten, Yu, 2017) (information exchange subdimension), mixed strategy (Lopes et al., 2005) in subdimension strategy composition, and Relation-based negotiation strategy and MESOArgN (Cheng and Ch, 2012; Park et al., 2019) in the subdimension other approaches.

Only considering the own concern was mentioned once without the extent of assertiveness; concerning about the own and partner's interests was mentioned several times in the literature review, which suits the definition of the collaborative style. Sharing information in the collaborative pattern comprises truthful exchange of information.

Truthful information exchange enables the negotiator to recognise interests and preferences of the partner and thus enables to exchange highly important issues with low important issues for themselves and their partner (trade-offs). In meta-tactics seven categories in three subdimensions were identified, namely delayed (Lai et al., 2010), and immediate (Lopes et al., 2005; Sim, 2010; Yinping and Singhal, 2009) concession (time-dependent subdimension), concession reciprocity (Baytalskaya, 2017; Cheng and Ch, 2012; Lopes et al., 2005; Vetschera et al., 2014) (behaviour-dependent subdimension), and heuristic models (Kowalczyk and van Bui, 2000), mathematical models (Lai et al., 2010; Lai and Lin, 2004; Sim, 2010), degree of concession (Baarslag et al., 2015; Baytalskaya, 2017; Cheng and Ch, 2012; Lopes et al., 2005; Vetschera et al., 2014), and"…" (Mirzayi et al., 2022) in the "all" subdimension. In the collaborative pattern delayed concession were mentioned once together with the immediate concession, i.e., depending on the concession reciprocity of the partner a mixed strategy can be applied to counteract on a partner with a less collaborative behaviour.

The pattern **compromising** contains two subdimensions in meta-strategies and two subdimensions in meta-tactics. The following categories were identified in meta-strategies: gradual concession (Chen, 2003) in the concession making degree, and wrong/ irrelevant information are shared in the information exchange (Vahidov, Kersten, Yu, 2017) subdimension. In meta-tactics immediate concession (Vahidov et al., 2016; Vahidov, Kersten, Yu, 2017) in the time-dependent subdimension, and mathematical models (Ludwig, 2008; Vahidov, Kersten, Yu, 2017) in the "all" subdimension were identified.

A compromising negotiator is defined as someone with an overall medium interest in their own concerns and in their partner's concerns which can be characterised by self-centric strategies/ tactics (e.g. exchange irrelevant information (Al-Jaljouli et al., 2018; Vahidov, Kersten, Yu, 2017) and delayed concession (Chen, 2003)) in some aspects and partner-focused strategies/tactics (e.g. immediate concession (Al-Jaljouli et al., 2018; Vahidov, Kersten, Yu, 2017)) in other

aspects. The pattern describes negotiators focusing on their own concern and simultaneously making concessions towards the partner to achieve the set goals.

Besides the mentioned patterns, two combinations of styles—competitive-compromising and collaborative-competitive—were identified in the literature.

The style dimension **competitive-compromising** comprises mixed strategy (Vahidov et al., 2016; Vahidov, Kersten, Yu, 2017) (subdimension strategy composition). In meta-tactics immediate (Vahidov et al., 2016), and delayed (Ludwig, 2008) concessions in time-dependent subdimension, and degree of concession (Vahidov et al., 2016) in "all" subdimension were identified. Comparing the competitive-compromising pattern with the pattern competitive and the pattern compromising shows that this pattern accompanies the competitive pattern completely and the compromising pattern partially.

The style dimension **collaborative-competitive** contains mixed strategy (Awasthi et al., 2016; Cao and Peng, 2016) (subdimension strategy composition). In meta-tactics immediate (Awasthi et al., 2016; Cao and Peng, 2016), and delayed (Awasthi et al., 2016; Cao and Peng, 2016) concessions in the time-dependent subdimension, and mathematical models (Awasthi et al., 2016) in the "all" subdimension were identified. Comparing the collaborative-competitive pattern with the pattern competitive and the pattern collaborative shows that this pattern can be found completely in the competitive pattern and in the collaborative pattern. Both style combinations—competitive-compromising and collaborative-competitive—underline the usefulness of the taxonomy as similar patterns are accompanied by the same category selection.

Further meta-strategies and meta-tactics without specifying a concrete style were mentioned together in the literature review. Due to the focus on patterns related to the negotiation styles, these relations were not discussed further.

3.5 Outlook

In this research contribution, a literature review was conducted to 1) generate a taxonomy including relations between negotiation styles, strategies, and tactics, and 2) identify patterns of applied negotiation strategies and tactics for a concrete negotiation style. The generated taxonomy includes three dimensions—styles, meta-strategies, and meta-tactics—with nine subdimensions. Five patterns align to the TKI styles and two combinations of styles—compromising-competitive and collaborative-competitive—were identified in the literature review. Individual conflict styles consist of different combinations of TKI styles. Thus, additional investigations could identify further patterns by investigating several combinations of conflict styles. In order to evaluate the taxonomy and the patterns data can be utilised from past negotiation experiments to identify behaviour of negotiators and decode into our taxonomy and identified patterns.

As every research contribution, this research has limitations. The results are limited by the applied search criteria and date of search. However, the generated taxonomy is editable and thus, can be adjusted by further findings. Further, the taxonomy focuses only on strategies and tactics from the decision support context. We are aware that in e-negotiations with humans not only the outcome but also message exchange during offers is relevant and should be investigated in further research. For building patterns, we focused on findings, which were mentioned together with the examined styles, i.e., combinations of meta-strategies and meta-tactics without concrete styles were not considered. Future research could investigate these combinations and examine whether they are related to the already identified patterns. Already presented agents or algorithms from other researcher were further identified in this literature review and summarised in the taxonomy into the categories specific applications, heuristic models, mathematical models, game theory algorithms, and other approaches. As next step, the applicability of the identified agents and algorithms

has to be investigated, and own algorithms might have to be designed to fully match the identified patterns.

Due to this taxonomy strategic behaviours of negotiators are classified which enables comparison of various behaviours or a self-reflection for a negotiator as well as the possibility to integrate the strategic behaviour into a computational system.

Improving negotiation outcome, a training can be applied (Lewicki, Saunders, Barry, 2010; Raiffa et al., 2002) in NSSs, e.g. Inspire (Köszegi and Kersten, 2003; Vetschera et al., 2006) or Negoisst (Melzer and Schoop, 2016). Negotiation training should emphasise which negotiation strategies, and tactics are available and offer training on all components. Some researchers indicate that automated agents as negotiation partners can increase training output for novices better than human partners (Gratch et al., 2016; Lin et al., 2009); agents can provide human negotiators with the opportunity to try out negotiation situations with various negotiation styles, strategies and tactics whilst not being distracted from reasoning (Greenwald et al., 2003).

For agents to react to human non-deterministic behaviour in human-machine negotiation, agents have to combine various strategies and tactics dynamically during the negotiation process (Cao and Peng, 2016). Furthermore, agents have to possess a pool of negotiation strategies and tactics to initiate a learning process for different types of human negotiators (Meyer, 2022). The identified patterns in this research contribution can generate a foundation for a negotiation agent negotiating dynamically with various conflict styles to train individuals.

Footnotes

1 The content of the published article is identical to the content presented here; the only changes applied are the alignment of references, text formatting, and numbering of figures and tables to be consistent throughout this thesis.

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4. Framework of Behaviour Training in Digital Negotiations

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Abstract
In order to act and to react effectively in (digital) negotiations, it is essential that negotiators recognise and apply diverse negotiation behaviour. However, there is a lack of research regarding IT-based training tools that support negotiators in implementing such behaviour. Consequently, training becomes essential for acquiring the skills to recognise and apply various negotiation approaches. Our objective is to enhance the accessibility of IT-based training for novice negotiators.

The training employs software agents capable of exhibiting different negotiation behaviour, thereby enabling negotiators to identify these patterns and respond appropriately during business negotiations. The training encompasses business negotiations with a variety of negotiation partners representing businesses. An artefact was designed and implemented in accordance with the principles and methodologies of design science research. The artefact underwent empirical evaluation through surveys, wherein negotiators identified specific displayed behaviour and reflect-ed upon their individual learning outcomes. Despite the inherent complexity of negotiation behaviour training, novice negotiators were able to successfully recognise

behaviour whilst maintaining a consistently high level of intrinsic motivation. Furthermore, the study demonstrated positive effects on learning outcomes.

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4.1 Introduction

Digital negotiations are defined as communication and decision-making processes between at least two parties with divergent preferences, which create a conflict situation that cannot be resolved unilaterally. These parties exchange arguments (e.g. offers, counteroffers, questions, and clarifications) to resolve such conflicts (Bichler et al., 2003). Negotiation support systems (NSSs) have been shown to facilitate communication and/or decision-making tasks for negotiators by providing relevant information about the negotiation. However, these systems do not conduct negotiations autonomously on behalf of the negotiator (Bichler et al., 2003; Kersten and Lai, 2007; Schoop et al., 2003).

The process of negotiating through NSSs requires a range of skills. Digital skills have been proven to be essential for the effective utilisation of information and communication technology (ICT) (Mitrovic, 2010; van Laar et al., 2017). For instance, the use of ICT has been demonstrated to facilitate the exchange of information and the decision-making purposes (van Laar et al., 2017), whilst enabling conflict resolution through argument exchange (Bichler et al., 2003). Digital skills are imperative for the effective utilisation of NSSs to enhance negotiation processes through communication and decision-

making. The appropriate utilisation of digital systems whilst possessing the requisite technological understanding of such systems demands multidisciplinary knowledge (Mitrovic, 2010). Thus, effective negotiation requires a range of (multifaceted) skills (Roloff et al., 2003), including perspective-taking. The skill of perspective-taking enables negotiators to consider negotiations from their partner's viewpoint, enhancing efficiency whilst facilitating the achievement of more valuable agreements (Damen et al., 2020; Galinsky et al., 2008; Neale and Bazerman, 1983). Since negotiators (sub)consciously apply and are exposed to a variety of negotiation behaviour, including strategies and tactics for specific contexts, and are required to respond to their partner's negotiation manoeuvres (e.g. in offers, counteroffers, questions, and clarifications), they must recognise the negotiation behaviour their partner employs. Novice negotiators may find this requirement particularly challenging (Meyer 2022); thus, training in negotiation skills, such as perspective-taking, is needed, as skills can be improved through negotiation simulations (Thompson, 2022). Digital negotiation training (digital training) is defined as training conducted within a system that utilises digital media and is distinguished by its accessibility, independent of time and place (Greenwald et al., 2003; Kersten and Lai, 2007; Lim et al., 2007). This training has been developed to facilitate self-directed learning for negotiators, allowing them to engage in the programme at their own schedule. Nevertheless, the issue of digital training facilitating novices' acquisition of diverse negotiation behaviour remains unaddressed, as NSSs focus on supporting general decision-making and communication. Our study addresses this gap by conceptualising, implementing, and evaluating digital training. The training has been designed to train novices in the recognition of various negotiation behaviour by supporting the application of different negotiation strategies and tactics (particularly the skill perspective-taking).

Since negotiation involves at least two parties (Lewicki, Saunders, Barry, 2010), negotiation training requires negotiation partners. Employing human negotiation partners during the training process can

result in several challenges. This is attributable to the fact that the competence, expertise, moods, emotions, and cultural background of a human negotiation partner may vary over time, thereby having an influence on negotiation dynamics (Adair and Brett, 2004; Forgas, 1998; Kopelman et al., 2006; Lewicki, Barry, Saunders, 2010). Thus, negotiating with agents can be more advantageous for novices than engaging with humans (Gratch et al., 2016), as such digital partners afford opportunities to practise comprehensive negotiation traits within various negotiation styles. Novices require training across several negotiation behaviour, including diverse negotiation strategies and tactics. The concept of agents engaging in more realistic negotiations through, e.g., adaptive behaviour, taking the partner's preferences into account, anticipating future conduct when formulating offers, and providing guidance to novices, is not a novel concept (Baarslag et al., 2012; Baarslag et al., 2016; Bosse and Jonker, 2005; Gratch et al., 2015).

The following research questions have been formulated in order to investigate the effects of such training:

RQ 1 **In what way does the designed digital training support novices in identifying negotiation behaviour?**

RQ 2 **Does the designed digital training motivate the trainees during training?**

RQ 3 **What is the effect of the designed digital training on the learning outcome of the novices?**

RQ 4 **Does additional training of the negotiation behaviour increase the correct identification of the agents' behaviour during the designed digital training?**

4.2 Theoretical Background

This section establishes the theoretical foundation of negotiation phases, the framework of self-determination theory, the skill of

perspective-taking, and negotiation behaviour, including styles, strategies, and tactics.

Negotiations can be divided into three phases: pre-negotiation, conduct of negotiation, and post-settlement (Kersten, G. E. and Noronha, S. J., 1999). The pre-negotiation phase encompasses preparation for the negotiation (Kersten, G. E. and Noronha, S. J., 1999), which includes planning, agenda setting and exploring the field (Braun et al., 2006), as well as negotiation training. The conduct of negotiation is characterised by the exchange of offers and the subsequent conclusion of the negotiation (Braun et al., 2006), which can result in either a successful or a failed outcome. The post-settlement phase is characterised by a process of evaluation and reflection upon the outcome, alongside consideration of potential improvements (Braun et al., 2006). As the present study is concerned with the training of negotiation behaviour, the pre-negotiation phase will be the primary focus.

4.2.1 Self-Determination Theory

In the process of designing training, pedagogical aspects must be considered, including the motivation of the trainees (Östlund, 2017). Self-determination theory (SDT) offers a theoretical framework for the examination of human motivation and the investigation of how social contexts influence attitudes, values, motivation and behaviour (Deci and Ryan, 2012). According to SDT, humans possess needs for competence, autonomy, and relatedness "that are essential for optimal development and functioning." (Deci and Ryan, 2012, p. 417). The SDT comprises several sub-theories, which explain various motivational phenomena. One of these sub-theories is the cognitive evaluation theory, which examines the effects of external factors in social contexts on intrinsic motivation (Center for Self-Determination Theory; Deci and Ryan, 2012).

The Intrinsic Motivation Inventory (IMI) was developed based on the cognitive evaluation theory and is introduced by Ryan and colleagues (Deci and Ryan, 1985; Plant and Ryan, 1985; Ryan, 1982;

Ryan et al., 1983; Tsigilis and Theodosiou, 2003). IMI has been extensively utilised as a measure of intrinsic motivation in exercises, and was thus developed for the purpose of assessing humans and their experiences in laboratory experiments. The model comprises seven categories, namely interest-enjoyment, perceived competence, effort/importance, pressure/tension, perceived freedom of choice, value/usefulness, and relatedness. Interest-enjoyment is the only category that addresses intrinsic motivation. Perceived competence and perceived freedom of choice measure positive behavioural and self-report indicators of intrinsic motivation, whilst pressure/tension measures a negative indicator of intrinsic motivation.
Effort/importance measures self-report indicators of the effort humans put into the activity. Values/usefulness measures self-report indicators of how humans evaluate the activity as being useful within a specific context, and relatedness examines interpersonal interactions by measuring the relationship between the interacting humans (Center for Self-Determination Theory; Deci and Ryan, 1985). In our work, we use IMI to assess whether the designed digital training motivates the trainees.

4.2.2 The Role of Perspective-Taking in Negotiations

As perspective-taking is defined as the capacity of an individual to view situations from the others' viewpoints and anticipate their behaviour to enhance interpersonal relationships (Davis, 1983), this is particularly important in negotiations (Damen et al., 2020; Neale and Bazerman, 1983). The ability to understand the partner's perspective increases the likelihood of making convincing offers and reaching mutually satisfactory agreements (Lewicki, Barry, Saunders, 2010). In order to gain a deeper insight into their partner's perspective, negotiators have to be able to recognise and interpret their partner's behaviour. Those who employ perspective taking have been shown to experience several advantages, such as diminished egocentric perceptions regarding fairness and reduced anchoring effects from the partner's offer (Galinsky et al., 2008). Given that perspective-taking can be learned

(Damen et al., 2020; Galinsky et al., 2008; Neale and Bazerman, 1983), it warrants inclusion in negotiation training for negotiation behaviour.

4.2.3 Negotiation Styles, Strategies, and Tactics

Negotiators aim to achieve their goals during the negotiation. In the pre-negotiation phase, they prepare how they want to behave during the negotiation by employing various strategies and tactics (Lewicki, Saunders, Barry, 2010). The current section delineates the relationship between negotiation styles, strategies, and tactics.

Negotiation styles are defined as orientations that specify how an individual can negotiate, and are characterised by the extent to which the outcome and the relationship with the partner are prioritised (Loewenstein and Thompson, 2006). Negotiation strategies are defined as plans of action that delineate the manner in which negotiators intend to engage during the ongoing negotiation. The primary focus of this process is the selection and continuous reassessment of preferences. Negotiation tactics represent techniques for implementing selected negotiation strategies regarding specific arguments or issues (Goldman, 2003; Lewicki, Barry, Saunders, 2010). Tactics vary throughout the negotiation process. Based on these definitions and the taxonomy of negotiation styles, strategies, and tactics by Meyer and Schoop (2023), negotiation styles, strategies, and tactics are interconnected (cf. Fig. 4.1). These interconnections are not distinct. Each style encompasses multiple strategies that can be applied; certain strategies are applicable to a variety of styles. For one strategy, multiple tactics can be employed; particular tactics can be applied across multiple strategies. These relations are illustrated in Fig. 4.1. Whilst a tactic constitutes a specific course of action within an applied strategy (more fine-grained), a style represents a general approach to negotiation that establishes the desired outcome and relationship. During the pre-negotiation phase, negotiators typically initiate the process by considering the desired outcome and relationship with their partner. Such preliminary consideration establishes the negotiator's style as an orientation, thereby providing the foundation for

subsequently defining a concrete plan. As part of the plan, the preferred application of strategies is then outlined. Negotiation styles, strategies, and tactics can be applied to negotiation. We define negotiation behaviour as an approach adopted by a negotiator to implement negotiation strategies and tactics for a specific style. This approach is influenced by several factors in the negotiation, including the negotiator's own interest in the negotiation, their reciprocity to make concessions, the issues considered in the negotiation, and the power dynamics in the negotiation.

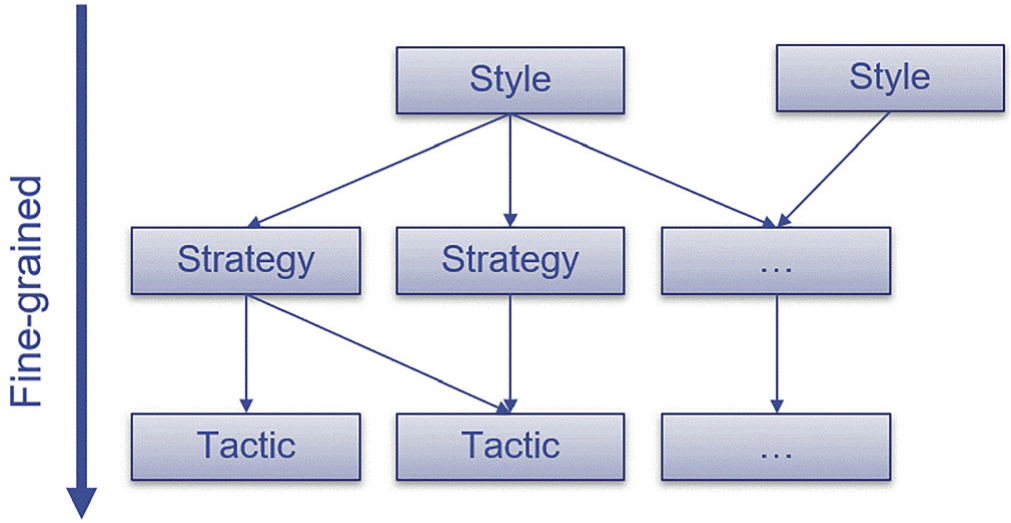

Fig. 4.1 Structure of Negotiation Behaviour

4.3 Methodological Approach

The methodological approach employed in our research follows the design science research (DSR) methodology established by Peffers et al. (2007) compromising six activities (cf. Fig. 4.2).

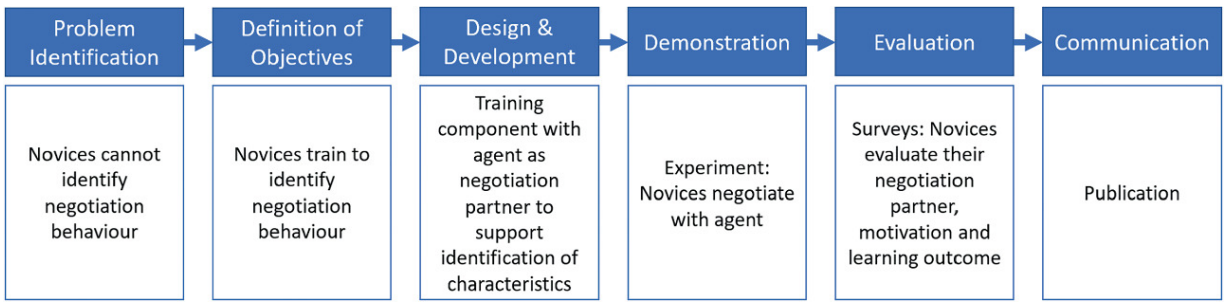

Fig. 4.2 Design Science Research Approach

The initial activity involves *identifying the problem* and establishing the motivation through the explicit articulation of the proposed artefact's significance. Previous research demonstrates that novices (later termed trainees) are unable to adequately identify the negotiation behaviour employed by their negotiation partner, particularly in a comprehensive manner (Meyer, 2022). Previous research has developed various training systems, including tutoring systems with chat functionalities to personalise user experiences (Kerlyl et al., 2007), gamified feedback throughout all phases (Meyer et al., 2020), feedback concerning value creation and value claiming (Johnson, 2021), negotiation outcomes (Dannenmann et al., 2022), negotiation performance (Core et al., 2006), learning experiences (Votintseva and Johnson, 2024), empathy skill training (Sato et al., 2024), and feedback for self-reflection during post-negotiation phases (Meyer and Schoop, 2024). What they fail to address is what we focus on in the current research, namely behaviour training for digital negotiations.

The second activity *defines the objectives*, i.e., how the proposed artefact will solve the identified problem. These objectives can encompass new solutions for an already existing artefact or a new artefact addressing the defined problem (Peffers et al., 2007). Effective negotiation requires proper training (Thompson, 2022). Since literature does not reveal a dedicated approach for electronic negotiation behaviour training (including strategies, and tactics), our objectives involve designing a new artefact for trainees to learn to identify their partners' negotiation behaviour (including styles, strategies, and tactics). The negotiation partners are agents. Whilst there is previous research on negotiation agents, they predominantly focus on opponent modelling with the aim to outperform that opponent (Chen et al., 2022; Keskin et al., 2023; Khosravimehr and Nassiri-Mofakham, 2017; Nazari et al., 2015; van Krimpen et al., 2013; Yu et al., 2013; Zafaria et al., 2014). The aim of outperforming trainees would not be aligned with the primary objectives of the training. Other agents

solely mirror the behaviour of the trainee (Baarslag et al., 2013; Melzer et al., 2012), focus on integrative approaches such as the application of Social Exchange Theory (Chiou et al., 2019), or employ physical robots as negotiation partners (Mell et al., 2017). Thus, agents designed specifically for behaviour training remain scarce. Our research will contribute to closing that gap.

The third activity encompasses the actual *design and development* of the artefact. Artefacts can manifest as constructs, models, methods, instantiations, or technical features (Peffers et al., 2007). In our research, agents are designed and implemented to serve as negotiation partners (model). The agents employ various negotiation behaviour to enhance the trainees' awareness of such behavioural differences. The negotiation agents are designed to be domain-independent, enabling their application across multiple settings (Baarslag et al., 2016).

The fourth activity, namely *demonstration*, involves the testing of the implemented artefact. The aim of the demonstration is to establish the artefact to address one or more instances of the defined problem. This can be achieved through a variety of methods, including experiments, simulations, case studies, or formal proof (Peffers et al., 2007). In our study, trainees participated in negotiations with the implemented agents in international experiments and completed various surveys.

To validate whether trainees can identify negotiation behaviour, the artefact undergoes *evaluation* in the fifth activity. This evaluation examines "how well the artefact supports a solution to the problem" (Peffers et al., 2007, p. 56). Initially, a survey was completed by the trainees after each completed negotiation, with a set of structured response options, to ensure that trainees addressed questions for the appropriate agent. A subsequent survey employed the Intrinsic Motivation Inventory (IMI) to measure intrinsic motivation before and after training. Finally, a third survey determined the learning outcomes achieved through the training.

The sixth activity encompasses *communication*, i.e., publishing, the designed and evaluated artefact.

According to the maturity matrix developed by Gregor and Hevner (2013), each artefact can be classified according to the solution maturity and the application domain maturity. The solution maturity dimension characterises whether there are known solutions (high) or new solutions (low). The application maturity dimension characterises whether the problem is known (high) or new (low). Our artefact thus contributes to improvement (cf. Fig. 4.3), as the problem is known (the necessity to train different negotiation styles, strategies, and tactics) and the solution is new (the artefact for behaviour training).

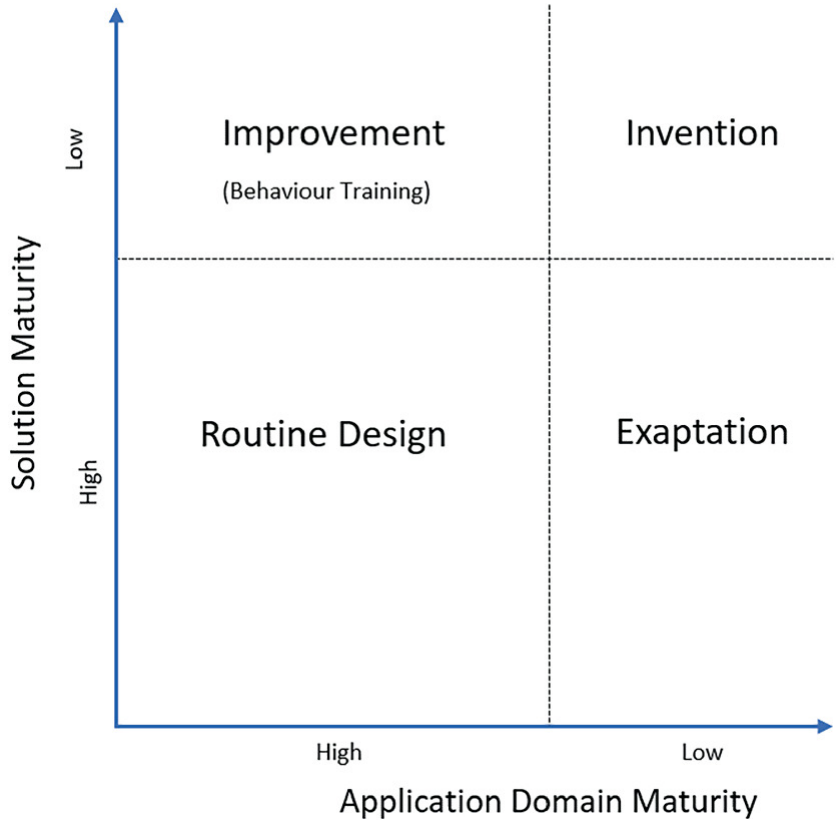

Fig. 4.3 Knowledge Contribution Framework of DSR. (Adapted from Gregor and Hevner (2013))

4.4 Electronic Behaviour Training—Design and Implementation

Following the outlined requirements, we designed agents with negotiation behaviour and implemented the artefact as part of the well-

known NSS Negoisst (Schoop et al., 2003; Schoop, 2021), whilst providing digital training.

4.4.1 Designed Agent

To assess how negotiation styles, strategies, and tactics in digital negotiations can be categorised, a taxonomy by Meyer and Schoop (2023) was used to derive negotiation behaviour. The Thomas-Kilmann-Conflict Mode Instrument (TKI) has been widely used to identify individual conflict styles (Thomas and Kilmann, 1976, 2008); it can also provide insight into various negotiation styles (Meyer and Schoop, 2023). The categories of strategy and tactic, as introduced in the taxonomy, serve as parameters for the design of agents in the present paper (cf. Table 4.1). The expression "none" represents a parameter that remains unspecified.

Table 4.1 Expressions of Behaviour Parameter

Information exchange determines whether information is withheld or shared with the partner when sending an offer.

Strategy composition established how many different strategies and tactics the agent will employ. Pure strategy indicates that a single algorithm is utilised, whilst mixture of strategies encompasses multiple strategies and tactics being implemented.

To specify temporal changes in strategy or tactics (*time-dependency*), the progress of negotiations has to be established, e.g., through the number of offers sent. In our study, immediate concessions occur upon sending the initial message, whilst delayed concessions commence with the second (or subsequent) message.

Behaviour-dependency establishes whether the negotiator is willing to make concessions. When concession reciprocity is selected, the negotiator typically demonstrates their willingness to make concessions, particularly when their partner also makes concessions.

The *central concern* parameter determines the extent to which negotiators prioritise their own interests over those of their partner,

categorised by target utility thresholds. The following target utility values were derived from empirical data obtained through comprehensive review of prior experiments and case studies with known negotiation styles of the participants. Those case studies exhibit integrative and distributive characteristics. When negotiators focus exclusively on their partner's outcomes, target utility ranges between 35% and 45%. When negotiators focus solely on their own interests, the target utility exceeds 70%. When negotiators balance both their partner's interests and their own interests, target utility falls between 45% and 70%. When negotiators are concerned with neither their own nor their partner's interests (as in the case of an avoiding style), no target utility is established.

The *concession-making degree* parameter is quantified through mathematical functions, gradients or delta utility values. Since the end of a negotiation is unpredictable, yet essential for the modelling of the applied algorithm (e.g., the number of messages sent or the utility achieved at the end of the negotiation), the mean number of messages sent from previous negotiations is used to predict the end of a negotiation. This is achieved by defining target utility as the point at which the mean number of messages has been exchanged. This does not imply that negotiations end upon reaching the message threshold; rather, concessions stagnate at this point. The subsequent values were derived from an empirical analysis which entailed the analysis of 1090 bilateral negotiations across a total of 17 experiments with Negoisst between 2016 and 2023. These experiments encompassed a diverse array of case studies, ranging from highly cooperative to more competitive cases, and from more to less complex cases with three to eight issues. No concessions signifies zero concession degree or where target utility equals current utility value of the negotiator. Gradual concession involves approx. 5% concession per offer or achieving target utility after ten offers. Large concessions entail approx. 10% concession degree per offer or reaching target utility after five offers. Whether predetermined concessions or the number of messages sent

determines the decision-making degree depends upon the algorithm used for a certain behaviour.

As the *concession-making approach* characterises the expressions of the applied algorithms, algorithms matching specific traits are employed, e.g., a randomised algorithm is used for a random approach.

Various negotiation behaviour emerge through different combinations of selected expressions. Since some combinations of expression prove contradictory, the selection of feasible parameters and feasible negotiation behaviour is limited. We examined all feasible combinations of selected expressions and identified 53 potential negotiation behaviour types, which we subsequently termed combinations. These combinations were mapped onto five meta-behaviour: *stalemate, tough, moderate, compromise*, and *soft*, as adapted from Vahidov et al. (2014). Expressions were allocated across meta-behaviour for agents functioning as negotiators: stalemate (3 combinations), tough (10 combinations), moderate (11 combinations), compromise (21 combinations), and soft (8 combinations). Figure 4.4 presents a comprehensive overview of all the specified negotiation behaviour expressions. The expression "n.s." indicates categories for which no further specification is required for a particular behaviour. Some of these expressions can be selected for one meta-behaviour to define specific agents for implementation. These five meta-behaviour establish the basis for the different types of agents, which can be selected or randomly assigned for specific negotiations.

Behaviour category	Stalemate	Tough	Moderate	Compromise	Soft
Information exchange	Withhold Information	Withhold Inf-ormation/ n.s.	Share Inform-ation/ n.s.	Share Inform-ation/ n.s.	Share Inform-ation/ n.s.
Strategy composition	Pure/ mixed	Mixed	Mixed	Mixed	Pure/ mixed
Time dependency	-	Delayed	Delayed	Delayed/ immediate	Immediate
Behaviour dependency	-	Concession reciprocity/ n.s.	Concession reciprocity/ n.s.	Concession reciprocity/ n.s.	Concession reciprocity/ n.s.
Central concern	Own	Own	Partner & own	Partner & own	Partner/ n.s.
Concession-making degree	No/ n.s.	Gradual/ n.s.	Gradual/ n.s.	Large/ gradual/ n.s.	Large
Concession-making approach	-	Random/ trade-offs/ n.s.	Random/ trade-offs/ fixed/ n.s.	Random/ trade-offs/ fixed/ n.s.	Random/ trade-offs/ fixed/ n.s.

Fig. 4.4 Agents' Orientations

The derived behaviour for each meta-behaviour (stalemate, tough, moderate, compromise, and soft) illustrated in Fig. 4.4 facilitates a preselection of negotiators and enables allocation to particular negotiations. Furthermore, the selection of appropriate expressions (*Selected Expression*) is fundamental for the development of specific agents (*Agent's Behaviour*) as negotiation partners (cf. Fig. 4.5). In order to establish a definition of the manner in which an agent will behave during a negotiation; it is necessary to select a particular expression of the agent's orientations which represents the agent's behaviour. The *agent's behaviour* is generally described by expressions of the parameters in Fig. 4.4, which determine how the agent behaves in negotiations. In order to behave in the described way, it is necessary

to specify the applied algorithm and the target utility in order to make decisions in negotiations. Additionally, the communication of such intentions to the partner should be accompanied by specific sentences. These specifications enable the agents to make and to communicate decisions. In order to conceptualise the decision-making process of agents, one has to specify the applied algorithm for modelling concessions and the target utility (as the reservation level). Based on the results of these 1090 negotiations (mean = 10.1454; median = 10 per bilateral negotiation), the number of messages to be sent by the agents is set to five for the purpose of this training (representing half the total message count). In order to exchange arguments, communication with the trainees is needed. The *information exchange* parameter defines how the agents behave when exchanging information through communication. Sentences which reflect agent behaviour require formulation. For example, a tough agent making delayed concessions begins with tough sentences, such as "We are currently unable to make any concessions…".

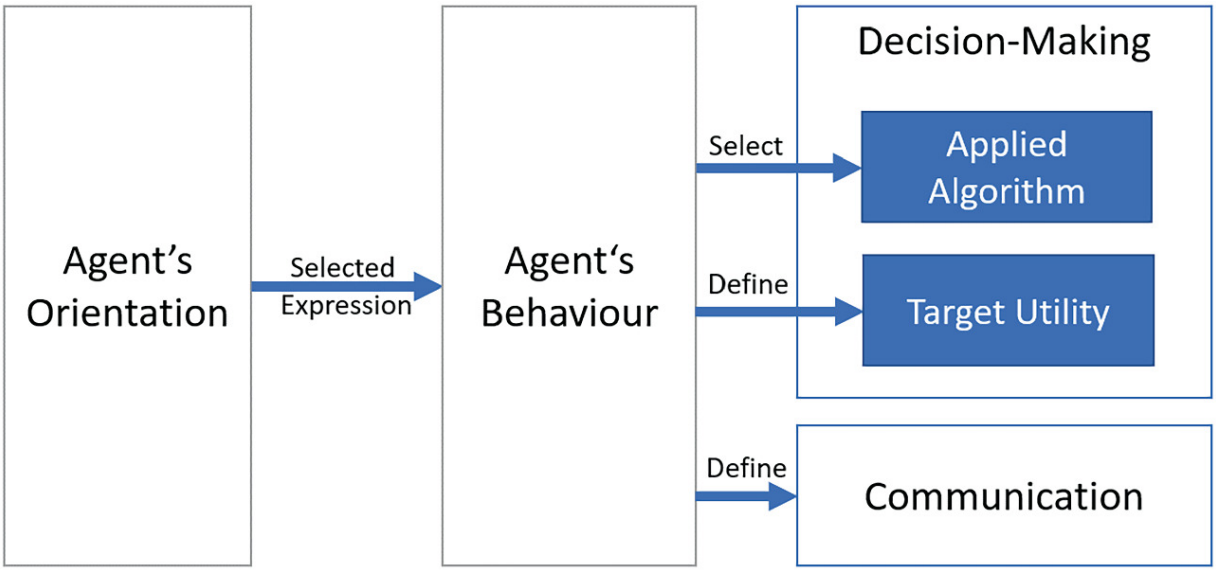

Fig. 4.5 Framework of Agent

4.4.2 Digital Training of Negotiation Behaviour

We designed a framework for behaviour training including the implementation of the designed agents. Figure 4.6 depicts the training,

which comprises an introduction to the system alongside explicit behavioural training in three negotiations. Agents exhibit various behaviour as negotiation partners, requiring trainees to characterise each agent's behaviour.

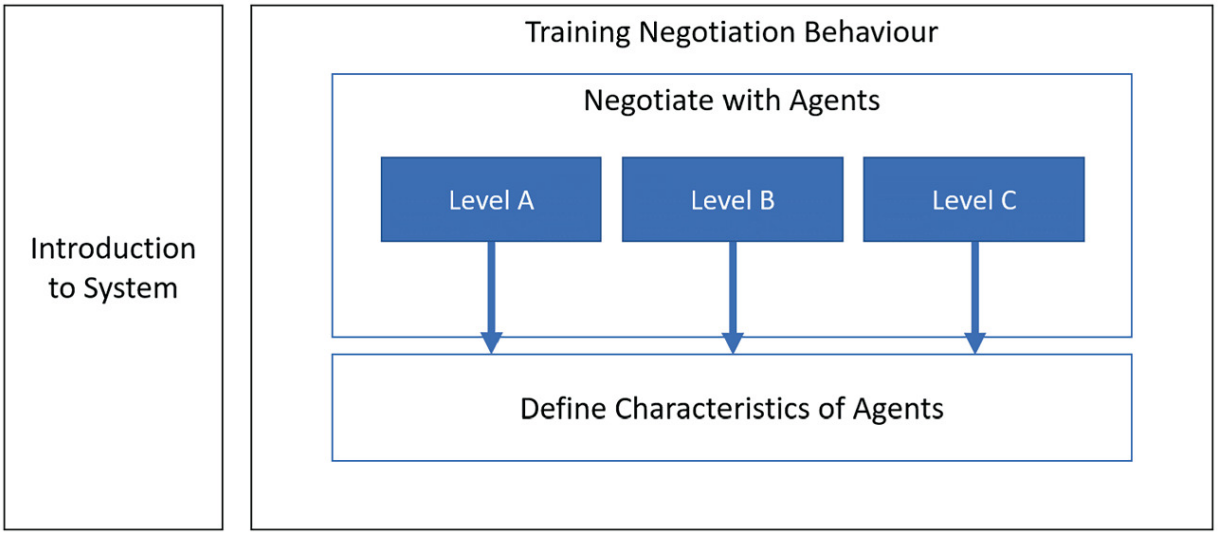

Fig. 4.6 Framework Training Negotiation Behaviour

The following section provides a comprehensive overview of this training framework. Prior to the start of behaviour training, trainees receive an introduction to the NSS (shown as Introduction to System in Fig. 4.6). Subsequently, three levels (i.e., Level A: compromise; Level B: moderate; Level C: tough) with different behaviour are undertaken. Each level comprises a bilateral negotiation with varying negotiation partners, case studies, and complexity levels, which has to be successfully completed to advance to the next level. To ensure that trainees encounter diverse types of behaviour, they negotiate with agents designed according to Fig. 4.5. Following each level, trainees characterise the agents by describing the agent's behaviour (e.g., competitive with hidden information).

Considering the behaviour mentioned in Fig. 4.4, compromise (level A), moderate (level B), and tough (level C) behaviour were selected for training purposes. Negotiating with partners exhibiting stalemate (very distributive) or soft (very accommodating) behaviour is challenging for

achieving precise argumentative exchange; such behaviour was, therefore, excluded from the training. Each behaviour comprises several combinations of human behaviour. These combinations demonstrate subtle variations in the expression of the behaviour. The most prevalent expression of each behaviour was selected and implemented as a uniform training partner (subsequently termed uniform opponent). The uniform opponent serves as a standardised negotiation partner for each level, thereby ensuring comparability and repeatability across all negotiations conducted at that level.

In accordance with the training framework, the behaviour of the agents must be specified. Table 4.2 presents the particular expressions of level A, level B, and level C. All three levels are characterised by a mixture of strategies.

As level A is defined as *compromise*, level A agents make immediate concessions. The agents are willing to make concessions whilst considering both parties' interests. These agents reveal information about themselves and their preferences to signal openness and interest in the relationship with their partner (*shared information*). Whilst the degree of concession-making remains unspecified, the approach employs fixed concessions through a conceder algorithm, with initially large concessions, tapering to smaller ones as the negotiation progresses (with *gradual concessions* on average). Consistent with the principle of immediate concessions, the opening offer includes compromises. The target utility is established at 60%, a reflection of the collaborative nature of the case study.

Level B (moderate) agents exhibit delayed concessions, withholding any compromises during the initial two messages before adopting a linear concession strategy from the third message onwards. These agents demonstrate reciprocal behaviour, making concessions when receiving concessions and balancing both parties' interests. As from the third message onwards, these agents share information regarding themselves and, subsequently, their preferences. This characteristic is indicative of a more sceptical agent, who considers the interests of their partner during the course of the negotiation. The concession-making

degree of these agents is gradual with a fixed approach. The target utility remains at 100% for the initial two messages, subsequently declining to 65%.

Level C (tough) agents similarly employ delayed concessions whilst prioritising self-interest exclusively. Nevertheless, they offer modest concessions in exchange for receiving concessions. The degree of concession-making is gradual, and the approach is random. The applied algorithms are the no concessions algorithm and the random algorithm. The absence of disclosure by these agents can be attributed to the contradictory and non-personal nature of the information provided (*withheld information*), which serves to indicate an absence of interest in the relationship. The target utility maintains 100% for the initial two offers and fluctuates randomly between 100% and 75% for the subsequent offers.

Table 4.2 Specification of Level A, B, C

This study employs the IBM ILOG CPLEX Optimizer to execute offer calculations for designated expression characteristics of the agents. The IBM ILOG CPLEX Optimizer is a tool designed for the resolution of linear multi-objective problems (IBM). It determines optimal utility values within multi-attributive negotiations whilst accommodating constraints from established negotiation behaviour.

Regarding the communication aspects, sentences reflecting agents' behaviour are formulated and implemented through the Drools engine (Drools). Drools enables rule definition for specific negotiation behaviour and generates outputs as particular text phrases to justify offers provided and selected by the algorithms.

4.4.3 Applied System—Negoisst

The designed artefact has been implemented in the web-based NSS Negoisst (Schoop et al., 2003; Schoop, 2021). Negoisst facilitates sophisticated digital negotiations, offering decision support, communication management, and comprehensive contract

management. Throughout the past two decades, thousands of digital negotiations have been conducted via Negoisst globally. New features have been continuously integrated, encompassing various means of eliciting preferences, composing messages, rating offers, digital contracting, and digital conflict management (Schoop, 2021).

Beyond bilateral human-to-human negotiations, Negoisst accommodates gamified training for bilateral human-to-machine negotiations. This training incorporates levels and leader boards to demonstrate progress in learning, whilst motivating and supporting participants (Schmid and Schoop, 2022). Participants familiarise themselves with the system and develop negotiation skills through Negoisst by engaging with a tactical-negotiation-trainer (TNT). During the training, the TNT employs solely one behaviour, mirroring the participant's actions (namely tit-for-tat) (Melzer et al., 2012). Consequently, the TNT proves inadequate for training awareness to recognise the negotiation behaviour of the partner.

In addition to the human-agent negotiations that constitute the core of our negotiation training, participants can engage in human-human negotiations once they have completed negotiations with the agents. This enables them to adapt the content they have already learned to negotiations with human partners. Hence, our negotiation training incorporates a hybrid training approach.

4.5 Evaluation

Our negotiation training comprises three levels (A-C) that trainees have to complete. The purpose of the artefact is to enhance awareness of identifying negotiation behaviour in partners. This research contribution prioritises accurate behaviour identification, the Intrinsic Motivation Inventory (IMI) factor of the SDT, and the learning outcome for the trainees rather than negotiation success or failure.

4.5.1 Identification of Negotiation Behaviour

This section presents and analyses the findings regarding the identified behaviour. Two groups participated in the evaluation: group 1 (N = 125; 60 females; 65 males; average age of 24.36 years) negotiating with a Tit-for-Tat agent, and group 2 (N = 95; 52 females; 43 males; average age of 24.14 years) negotiating with the new agents, as shown in Table 4.2. Both groups participated in negotiations across the three levels and subsequently stated their partner's behaviour upon completion of each level. The participants engaged in negotiations involving various business cases, alternating between the roles of buyer and seller, with varying degrees of complexity and addressing three to eight issues.

The negotiations for group 1 were conducted during the training in 2023. The first conducted level for group 1 was concluded 131 times. Concession-making was recognised as a trade-off approach twice within the 131 negotiations conducted at level A. Level B was concluded 135 times. Tit-for-Tat was described twice amongst the 135 negotiations conducted at level B, though not explicitly stated. Trade-off as a concession-making approach and concession reciprocity were each identified once as the agents' behaviour. The Tit-for-Tat behaviour was not explicitly stated in either level A or level B. Level C was completed 125 times. Among the 125 negotiations, only one participant was able to correctly label the agents' behaviour as Tit-for-Tat. The agents' behaviour was partially described as Tit-for-Tat eight times, with the concession-making approach being described as trade-off six times and as concession reciprocity twice.

Few trainees correctly identified Tit-for-Tat, while the majority reported divergent behaviour on the part of themselves and the agents. The agents were characterised as competitive in most cases, whereas the trainees' own behaviour was described as compromising, collaborating or even accommodating. These findings indicate that Tit-for-Tat agents do not facilitate behavioural training, as mirroring behaviour requires the capacity to accurately identify one's own behaviour and recognise its potential influence upon one's partner's behaviour.

For group 2, the agents deployed in our artefact varied by level; each level was examined separately (cf. Table 4.3). Furthermore, trainees were able to repeat levels; consequently resulting in a variation of the number of completed negotiations per level. The difficulty increased with each level. The trainees possessed subjective perceptions of what they deemed to be challenging, which led to the following consideration. The selection of *behaviour category* could be deemed correct in two ways: 1) trainees correctly identified the agents' defined characteristic, and 2) if the trainees identified the agents' behaviour category incorrectly, but they still correctly identified that the agents have become tougher in the course of the training.

As trainees were permitted to repeat levels at will, the number of behaviour identified varied for each level.

In total, 95 trainees identified behaviour 117 times in level A, with the central concern being correctly identified 76 times (64.96%). The strategy composition was correctly identified 77 times (65.81%). The concession-making degree was correctly identified 89 times (76.07%). The behaviour category was correctly identified in 1) 36 times (30.77%) and in 2) an additional 17 times (14.53%). Information exchange was correctly identified 96 times (82.05%). All behaviour expressions were correctly identified in 1) 15 times, in 2) an additional 19 times, totalling 34 times (29.06%).

For level B, 95 trainees identified the behaviour 119 times. The central concern was correctly identified 36 times (30.25%). The strategy composition was correctly identified 72 times (60.50%). The concession-making degree was correctly identified 81 times (68.07%). The behaviour category was correctly identified in 1) 19 times (15.97%) and in 2) an additional 17 times (14.29%). Information exchange was correctly identified 83 times (69.75%). All behaviour expressions were correctly identified in 1) six times, in 2) additional two times, totalling eight times (6.72%).

For level C, 95 trainees identified the behaviour 127 times. The central concern was correctly identified 104 times (81.89%). The strategy composition was correctly identified 72 times (56.69%). The

concession-making degree was correctly identified 69 times (54.33%). The behaviour category was correctly identified in 1) 69 times (54.33%) and in 2) an additional 17 times (13.39%). Information exchange was correctly identified 81 times (63.78%). All behaviour expressions were correctly identified in 1) 13 times, in 2) additional three times, totalling 16 times (12.6%).

Table 4.3 Correctly Identified Behaviour Expressions of the Agents

The findings demonstrate that the agents assist trainees in identifying their partners' behaviour more precisely, particularly at level A, though this extends to other levels despite the varying complexity. The majority of trainees correctly identified strategy composition, concession-making degree, and information exchange across all levels. In level B, trainees misidentified the central concern, resulting in accurate behaviour recognition occurring on merely eight times across all behavioural expressions. Whilst the agents' communication lacked openness and clarity, it remained attentive to both parties, suggesting scope for enhancing training by making trainees more aware of such behaviour. The randomised concession-making approach at level C resulted in variations in strategy composition and concession-making degree, which led trainees towards divergent behavioural interpretations. Thus, behaviour was accurately identified across all expressions in a mere 16 negotiations.

The artefact, therefore, facilitates more nuanced identification of agents' negotiation behaviour than would otherwise be achievable. Having examined the training's impact on identifying agents' behaviour, attention must now turn to its effect on trainees' motivation.

4.5.2 Intrinsic Motivation

We adapted the IMI survey from the Center for Self-Determination Theory's website for digital negotiation training and administered it to the trainees of group 2 before and after completing the digital training. As this study does not examine internalisation studies or interpersonal

interactions such as friendships, only the remaining five categories were assessed. Table 4.4 presents the findings, evaluated using a 7-point Likert scale (1 = totally disagree; 7 = totally agree). Given the modest sample size (N = 95), Huber's (1967) maximum likelihood estimators (MLE) were employed to reduce outliers and derive mean values. Before commencing the training, intrinsic motivation (MLE = 4.51) and effort (MLE = 5.73) could be measured. Subsequently, the remaining IMI factors were examined only after training completion. These results indicate that after the training, trainees were on mean intrinsically motivated (MLE = 4.482), invested a considerable amount of effort into the training (MLE = 5.453), perceived competence through the training (MLE = 5.010), and perceived a sense of freedom of choice (MLE = 5.153). Additionally, the participants reported a neutral to slightly disagreement regarding feelings of pressure during training (MLE = 3.578).

In order to compare the trainees' intrinsic motivation and effort before and after the training, ANOVA was conducted using independent sample t-tests. Levene's test for equal variance demonstrated that there were no significant differences in terms of effort, $F(1, 95) = 0.876$, $p = 0.377$, but it revealed a significant difference in terms of interest-enjoyment, $F(1, 95) = 12.242$, $p = 0.008$. However, the two-sided significance tests for interest-enjoyment showed no significant difference ($p = 0.921$).

Table 4.4 Results IMI

Thus, despite participating in sophisticated training involving multiple agents, the participants' interest (intrinsic motivation) and effort remained stable throughout the training. Given that the digital training was mandatory and constituted a prerequisite for subsequent negotiations that were subject to grading, the digital training can be considered extrinsically motivated. The grading shifted the locus of causality from internal to external, thereby diminishing intrinsic motivation (Deci and Ryan, 1985). This phenomenon is reflected in the

minor changes to intrinsic motivation shown in Table 4.4. Moreover, trainees exhibited enhanced competence whilst reporting an absence of pressure on average. The increase in competence can be observed in two ways: 1) the identification of statistically significant variations in negotiation behaviour, as detailed in the previous section; and 2) trainees' self-perceived competence gains. Furthermore, the following chapter provides a comprehensive analysis of the participants' learning outcomes, thereby ensuring a thorough examination of the enhanced competence.

4.5.3 Learning Outcome

Following the completion of digital training by the trainees (N = 95), participants of group 2 were asked to rank statements concerning their learning outcome using a 7-point Likert scale (1 = totally disagree; 7 = totally agree). The results of the study are presented in Table 4.5. Consistent with previous analyses, we employed Huber's (1967) MLE to reduce the influence of outliers, and these were then utilised as mean values. Twenty-one questions were posed in order to validate outcomes, encompassing skill improvement, training satisfaction, and system knowledge categories. The skill improvement category is comprised of three distinct areas: general skill improvements, skill improvements in identifying partners' behaviour, and skill improvements to train the usage of one's own behaviour. The findings indicate that trainees have acquired system knowledge after participating in the training (MLE = 5.442); and expressed satisfaction with the training relative to its intended purposes (MLE = 4.953). Furthermore, the trainees exhibited general skill enhancement (MLE = 5.197), including increased preparedness and adaptivity. Participants demonstrated enhanced negotiation skills through improved partner behaviour identification and management (MLE = 4.431), while acquiring knowledge of diverse negotiation behaviour and their application in negotiations (MLE = 4.702). In accordance with the challenges associated with intentionally employing behaviour and subsequently identifying the behaviour of the partner, mean values fell

between slightly agreeable and neutral positions. Nevertheless, the findings indicate that the implemented training positively influences learning and identification of negotiation behaviour.

Table 4.5 Results Learning Outcome

4.5.4 Additional Training Information

In order to ascertain whether the component was sufficient, a subsequent investigation was conducted by dividing trainees of group 2 into two subgroups. Group 2.1 was provided with additional material on the various types of negotiation behaviour, strategies, and tactics (N = 42), whilst group 2.2 received no supplementary information (N = 53). Both subgroups were enrolled in a negotiation course and possessed fundamental negotiation knowledge.

The responses provided in chapter 4.5.1 underwent further analysis by categorising the results of each level according to the subgroups. Since trainees had the opportunity to repeat levels and behaviour identification exercises, the number of identified behaviour varied per level. The trainees identified central concern, strategy composition, concession-making degree, behaviour category, and information exchange through predetermined responses, each accompanied by brief explanations. For the purpose of subsequent testing, responses were coded numerically as follows: correct answers received a value of 1, incorrect answers received a value of 0. An independent sample t-test was conducted using ANOVA in order to compare the subgroups.

The results of level A are shown in Table 4.6. The Levene's test revealed no significant differences for strategy composition $F(1, 53) = 0.457$, $p = 0.5$, concession-making degree $F(1, 53) = 0.074$, $p = 0.786$, and behaviour category $F(1, 53) = 3.509$, $p = 0.064$. Two-sided significance tests for information exchange revealed no significant difference ($p = 0.102$). However, two-sided significance tests for central concern showed a significant difference ($p = 0.001$). The analysis of the mean value indicated that trainees without additional information

performed better at identifying agents' central concern (group 2.1 mean = 0.49; group 2.2 mean = 0.78).

Table 4.6 Results Level A

Table 4.7 presents the results for level B. The Levene test indicated no significant differences for central concern, $F(1, 56) = 2.603$, $p = 0.109$, behaviour composition, $F(1, 56) = 0.008$, $p = 0.930$, concession-making degree, $F(1, 56) = 0.008$, $p = 0.927$, behaviour category $F(1, 56) = 0.887$, $p = 0.348$, and for information exchange $F(1, 56) = 0.002$, $p = 0.963$.

Table 4.7 Results Level B

Table 4.8 presents the results for level C. The Levene test indicated no significant differences for central concern $F(1, 63) = 2.145$, $p = 0.146$, strategy composition $F(1, 63) = 2.107$, $p = 0.149$, concession-making degree $F(1, 63) = 0.026$, $p = 0.873$, behaviour category $F(1, 63) = 0.026$, $p = 0.873$, and for information exchange $F(1, 63) = 1.738$, $p = 0.190$.

Table 4.8 Results Level C

Apart from a significant discrepancy in the central concern of level A between group 2.1 and group 2.2, no further significant differences emerged across other behaviour expressions. The level A result may be attributable to trainees who presumed they had a comprehensive understanding of the meaning of the defined behavioural expressions' *own* concern (cf. Table 4.1) whilst adopting their own perspective rather than the agents' perspective, as specified in the survey. The assumption was incorrectly made that concerning *themselves* was defined as the agent's concerns regarding the partner rather than the agent's interests. Consequently, additional explanation is deemed unnecessary. The utilisation of pre-selected responses, accompanied by

concise descriptions of agents' behaviour, has been demonstrated to be sufficient and may potentially reduce misinterpretation risks.

Across both levels A and B, the characteristic of behaviour category was predominantly misidentified by both groups. This phenomenon can be attributed to the utilisation of a largely subjective characteristic, namely the identification of agents as, e.g., compromise, moderate, or tough. An attempt was made to counteract this through providing explanations of behavioural expressions. However, trainees retained subjective perceptions of what they deemed challenging, with level difficulties being interdependent. Nevertheless, a learning effect between levels can be observed, as half of the trainees correctly identified the behavioural category in level C.

The modest proportion of trainees who accurately recognised the central concern in level B (group 2.1 mean = 0.34; group 2.2 mean = 0.27) stems from the agents' behaviour, which conveyed contradictory signals. Initially, these agents postponed the negotiation by discussing personal matters and justifying their reluctance to compromise. Subsequently, the approach shifted towards greater compromising and consideration of both interests. It appears that trainees retained their initial perception of the agents as predominantly self-interested. In order to ensure that trainees could observe the agents' strategic change, we verified each dataset's message count and exclusively included those demonstrating strategic change.

4.6 Concluding Discussion

Our designed artefact comprises two principal components: firstly, agents employing distinct negotiation behaviour whilst negotiating with trainees, and secondly, trainees evaluating these behaviour after the conclusion of negotiations. The agents serve as uniform opponents, thereby ensuring that external influences from training partners, such as fluctuating competence, mood, or time constraints, are minimised and do not affect the trainees. Moreover, the training framework enables trainees to determine autonomously when to complete

particular levels, which aligns with IMI findings where trainees endorsed the perceived freedom of choice category (MLE = 5.153; SD = 1.199).

The enhanced competence demonstrated through improved identification of behavioural expressions, coupled with IMI results and learning outcomes, indicates that our designed artefact effectively supports negotiation behaviour training. Consequently, the artefact has proven successful in facilitating awareness regarding the adoption of negotiation behaviour, thereby fostering perspective-taking.

In the experiment, trainees exhibited superior accuracy in identifying behavioural expressions in comparison to their tit-for-tat training partners.

Upon completion of the survey on behavioural identification, the trainees received concise feedback on their responses. This feedback indicated whether the answers were correct or incorrect but did not specify what the solution was. This approach was selected for experimental evaluation purposes, as it enabled measurement of training effects amongst those who repeated levels. Nevertheless, in order to optimise learning outcomes, supplementary training incorporating more comprehensive feedback on the correctness or identified behavioural expressions is recommended.

Given the experimental nature of this study, which involved trainees from international universities pursuing programmes in Information Systems, Management, and Business Communication and Digital Media, the findings might reasonably be applicable for business negotiations in general.

This research contribution possesses certain limitations. Only three distinct behaviour were designed and implemented. In order to accommodate varying expertise levels amongst trainees, additional scenarios might be incorporated into subsequent levels. The trainees' individual TKI types, alongside the personal conflict types, were not considered, as the aim was to evaluate the designed digital training and the concept of different behaviour, as well as the mechanism for identifying these behaviour, rather than determining whether different

TKI types influence behavioural identification accuracy. Nevertheless, this matter warrants further research. The trainees were extrinsically motivated to participate, as attendance was mandatory for the subsequent graded negotiation exercise. However, training performance itself was not formally assessed, since the mere act of participation was sufficient to ensure eligibility for the subsequent negotiation exercise. The learning outcomes remain subjective, as they are self-reported by participants. Given the relatively modest sample size of the experiment, further experiments could yield more comprehensive evaluations of the digital training.

As subsequent steps, the digital training could become more individualised by incorporating additional variables, such as TKI type, cultural background, and expertise level of the trainee, or by expanding the component's functionalities (e.g., including additional behaviour or permitting trainees to determine which behaviour required training). In order to achieve this, the implementation of all meta-behaviour (including stalemate, soft, tough, moderate, and compromise) is recommended. Upon successful completion of level C, trainees should be permitted to select their partner by choosing one of the five meta-behaviour. The selection of an explicit expression of the meta-behaviour could then be made at random in order to vary the agents' negotiation behaviour. This would ensure greater variability in training scenarios.

Furthermore, to ensure more refined selection possibilities for administrators and advanced trainees, they could select behaviour expressions autonomously by generating their own negotiation partner, e.g., to prepare for a specific forthcoming business negotiation with particular negotiation partners. This capability would provide practitioners with tailored preparation opportunities that closely mirror real-world negotiation contexts.

The present study focused on the decision-making process of our agents. To this end, text modules were employed to visualise the behaviour expressions. In future research, it has to be investigated whether generative AI can be utilised in communication to construct messages in accordance with specific behavioural expressions and

utility values. Such an approach has the potential to enhance the realism of the training environment by facilitating the generation of more contextually appropriate negotiation communications.

Our designed training can be employed to train novices to recognise different negotiation behaviour and to learn to identify those conducted by their negotiation partners in any type of business negotiation.

Footnotes

1 The content of the published article is identical to the content presented here; the only changes applied are the alignment of references, text formatting, and numbering of figures and tables to be consistent throughout this thesis.

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5. An Expert System for Strategic Decision-Making in Digital Negotiations

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Abstract
The process of decision-making is an integral aspect of daily living. These decisions range in complexity, from simple to complex, often involve multiple parties, and the necessity to resolve disputes. Negotiations are one of the main means to resolve conflicts; however, they can also be the source of conflicts. Therefore, decision-making in negotiations is not only an almost daily activity of humans but is often challenging and thus requires support. As negotiations are characterised by a variety of communication and decision-making processes, the present research examines the potential for providing advice to facilitate decision-making in such negotiations. To do so, requirements are derived from the relevant literature and evaluated using quantitative research methods, after which they are further refined. Based on the requirements, nine advice features are conceptualised and integrated into a negotiation support system to enhance decision-making processes. The implementation of features is evaluated through a mixed-method approach. The findings indicate that the advice features support negotiators in the decision-making processes.

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5.1 Introduction

When making decisions, particularly multi-criteria decisions, it can be challenging for a decision-maker to identify the most optimal solution (Aruldoss et al., 2013). A further challenge is to select the optimal decision-making method from a range of options (Triantaphyllou, 2000). Digital tools such as spreadsheet programs (such as MS Excel (Goepel, 2013)) can be used to support decision-makers. Information systems that provide users with individualised dedicated decision support are called decision support systems (DSSs) (Bonczek et al., 2014). DSSs help users to understand their objectives and problems, as well as to find solutions by including analyses (Kersten and Lai, 2007). The overall aim of the present research paper is to identify the requirements for an information system to support complex decision-making processes in negotiations. In negotiations, negotiators have to decide, e.g., on their goals, their intended offer, and whether they want to conclude the negotiation with an agreement. Given that the parties involved in a negotiation cannot achieve their goals unilaterally (Bichler et al., 2003), they have to explore alternative solutions to reach a negotiation agreement (Kersten and Lai, 2007). This can be supported with information systems, such as Negotiation support systems (NSSs) as they support decision-making and communication processes in negotiations, e.g. by collecting and structuring information and generating alternatives (Kersten and Lai, 2010; Schoop, 2010).

Negotiators frequently do not engage in intuitive, purely rational strategies (Raiffa, 1982) in decision making; therefore, advice on negotiation styles and strategies is needed. The negotiation style of an individual is defined on the basis of importance attributed to the outcome of the negotiation and their relationship with the other party (Loewenstein and Thompson, 2006).

Providing advice or tutoring negotiators during negotiations is not new. A number of studies have previously been conducted on the utilisation of gamification elements (Meyer et al., 2020), virtual reality (Ding et al., 2020), and advice for value claiming/ creating (Johnson, 2021), negotiation outcome (Dannenmann et al., 2022), and negotiation performance (Core et al., 2006). Other approaches have been employed, encompassing negotiation partners or tutors utilising natural language or (AI-) chatbots during negotiations (Dannenmann et al., 2022; Kerlyl et al., 2007; Mollick and Mollick, 2024; Schlimbach et al., 2022; Traum et al., 2003; Zahn and Schöbel, 2024). Additionally, features have been developed to support self-reflection on one's own style after the negotiation has ended (Meyer and Schoop, 2024). However, research focusing on the development of support features to advise negotiators in applying their intended negotiation styles during negotiations is lacking. The present research will address this identified research gap by developing advice features to facilitate novice negotiators in making complex decisions during digital negotiations, in particular by providing decision support for a negotiator's intended negotiation style. The following research questions will be addressed:

RQ1 **What kind of advice can be used to support humans in digital negotiations to achieve their goals?**

RQ2 **To what extent is the designed advice perceived as useful?**

In order to address the first research question, potential advice features will be extracted from requirements, which are derived from the literature and surveys. The second research question will be addressed through 1) the actual usage of the advice and 2) by identifying the usefulness and potential improvements of the advice provided.

5.2 Theoretical Background

This chapter outlines the theoretical basis for negotiations and types of advice.

5.2.1 Negotiation Phases and Styles

Negotiations compromise a number of decision-making processes that occur throughout the entire negotiation process (Bichler et al., 2003; Gulliver, 1988). The negotiation process is comprised of three interconnected phases (cf. Fig. 5.1). These three phases are the pre-negotiation phase, the actual negotiation phase, and the post-negotiation phase (Gulliver, 1988).



Fig. 5.1 Negotiation Phases (Gulliver, 1988)

In the contexts of negotiation, where success is dependent on adequate preparation (Thompson, 2022), gathering and structuring as much information as possible is crucial. This information comprises the relationships, expectations, and interests of the parties involved, gathered from previous negotiations and the current dispute (Gulliver, 1988). In addition to the process of information gathering, negotiators have to define their negotiation goals and their intended negotiation style for the upcoming negotiation (Lewicki, Barry, Saunders, 2010). Negotiation goals encompass the aspiration level (AL) (which determines the preferred outcome of the negotiation) and the reservation level (RL) (which characterises the least acceptable outcome of a negotiation (Goldman and Rojot, 2003; Thompson, 2022)).

In order to negotiate effectively, it is necessary for negotiators to understand their personal negotiation style before starting the

negotiation, i.e. how they communicate in conflict situations, given that every negotiation starts with a conflict (Miller, 2014; Mitrovic, 2010). The Thomas-Kilmann Conflict Mode Instrument (TKI) is a means to determine different conflict styles. Using this model, one can identify one's own conflict style, i.e. one's preferred approach to handle conflicts (Thomas and Kilmann, 1976, 2008). TKI comprises two dimensions, namely assertiveness and cooperativeness, which are utilised to specify an individual's behaviour in conflict situations. Assertiveness is defined as the extent to which an individual attempts to satisfy their own interests. Cooperativeness is defined as the extent to which an individual attempts to satisfy the interests of their partner, thereby indicating the importance of the relationship (Thomas and Kilmann, 1976, 2008). Depending on the levels of concern in these two dimensions, five different conflict styles can be identified (cf. Fig. 5.2).

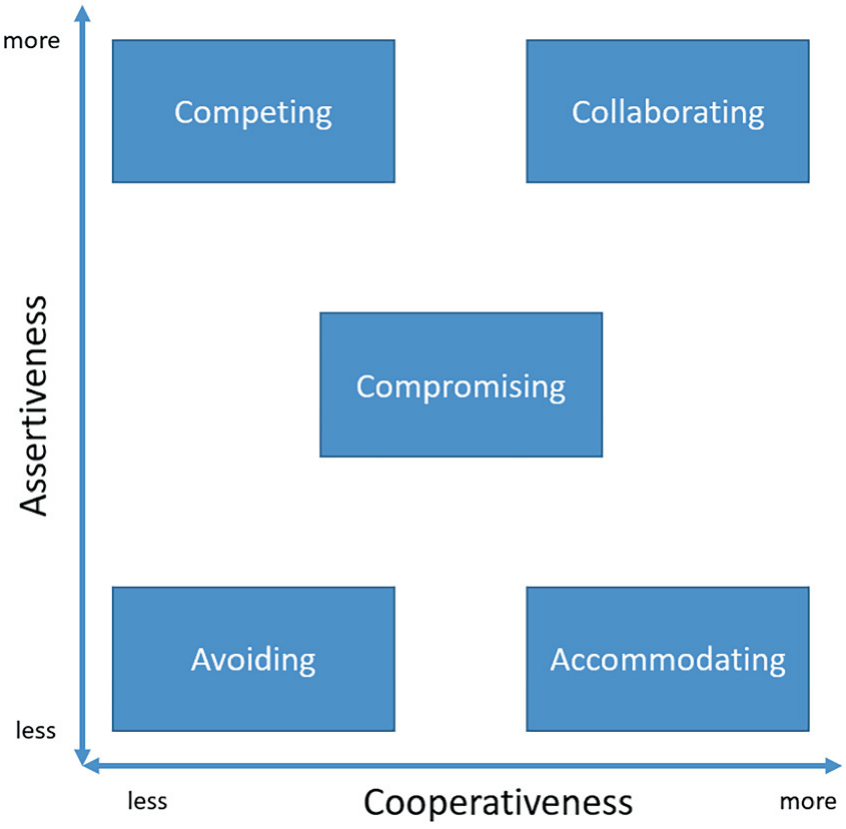

Fig. 5.2 TKI conflict styles (Thomas and Kilmann, 1976, 2008)

A negotiator who employs an avoiding style attempts to satisfy neither their own needs nor those of their partner. This can be expressed by leaving or postponing (parts of) the negotiation and not making any decisions. A negotiator with a competing style is concerned solely with satisfying their own needs, regardless of the impact on the relationship with their partner. By contrast, a negotiator with an accommodating style prioritises the relationship with their partner, seeking to satisfy their partner's interests. A compromising negotiator attempts to satisfy all parties partially, for example, by splitting the difference. A collaborating style involves negotiation parties working together to develop a solution that fully satisfies all parties involved, which can be achieved by identifying the interests and concerns of all parties involved. A collaborating style can thus be regarded as an extension of the compromising style, as it involves the parties attempting to identify a mutually beneficial solution.

Following the preparation, the negotiation phase begins and offers and arguments are exchanged until the negotiation is concluded (Gulliver, 1988). Once the negotiation is concluded, the post-negotiation phase begins, during which the outcome and the social consequences of the negotiation are analysed, evaluated and documented for future negotiations (Gulliver, 1988).

As NSSs support the decision-making and communication processes in negotiations, e.g. by gathering and structuring information and generating alternatives (Kersten and Lai, 2010; Schoop, 2010), they can support all three negotiation phases.

5.2.2 Types of Advice

People take more advice from experts than from novices, probably in the expectation that expert advice will improve their performance and be of higher quality (Bailey et al., 2023; Harvey and Fischer, 1997; Meshi et al., 2012; Sniezek et al., 2004). If the advice is given shortly after the participants have performed a task, e.g. make a decision, the advice is more likely to be accepted (Meshi et al., 2012).

Four types of advice are proposed in Dalal and Bonaccio (2010). “Recommendation for” an alternative shows which one to choose; “recommendation against” shows which one to avoid; “provide information” issues more details of one alternative without explicit favouring it; “decision support” helps decision makers how to decide, i.e., it focuses on the structure rather than prescribing what to do. Since most decision makers prefer receiving information about alternatives and recommendations for alternative from experts (Dalal and Bonaccio, 2010), these two types of advice are considered together with decision support in our system.

5.3 Methodology

The methodology of our research is based on an adapted design science research approach from Gregor and Hevner (2013) with a mixed method approach. The detailed approach is shown in Fig. 5.3.

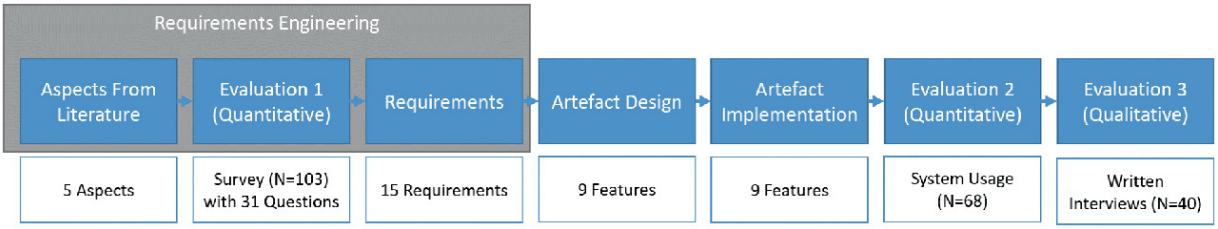

Fig. 5.3 Methodological Approach

Firstly, requirements engineering was conducted through a review of the literature and a survey. Based on the absence of support for behaviour according to the intended style, and thus for decision-making according to this style during the negotiation, requirements (five aspects) were identified in the literature. Building on these aspects, the participants were asked 31 questions to validate requirements derived from the literature (evaluation 1—quantitative). The participants were students from European universities (N = 103; 57 females, 46 males; with a mean age of 23.67) and the experiment was conducted in 2023. Fifteen requirements to design functions to advise decision-making processes in negotiations were derived from

the results of evaluation 1. Nine features were subsequently derived from all the requirements as certain requirements represent different states of the features. The features together form a framework which was implemented in the NSS Negoisst (Schoop, 2010, 2021), as NSSs consist of a DSS with communication support (Lim and Benbasat, 1992), and the present paper focuses on features to support decision-making in negotiations.

To validate the advice features a convergent mixed method approach (Creswell and Plano Clark, 2018) is applied via evaluation 2 (quantitative—examine the actual usage of features in the system based on negotiations conducted by the participants) and evaluation 3 (qualitative—participants discuss usefulness of the features).

The participants of evaluation 2 (N = 68) were students (37 females, 31 males; with a mean age of 24.32) from European universities. The evaluation of the actual usage is divided into two parts: 1) flags inserted into the system to track the actual usage, and 2) a validation mechanism to identify whether participants like the system's advice and follow it. To check whether the participants would take the advice, a judge-advisor system approach is applied. In this paradigm, the role of the "judge" is assumed by each participant, while the role of the "advisor" is assumed by the system. Initially, the judge makes an initial decision on how to proceed with e.g., the next offer. Subsequently, the advisor makes a recommendation on how they would proceed, e.g., with the next offer, which is provided to the judge. The judge's final decision is based on the consideration of both approaches, and the subsequent action is then taken, either in accordance with the judge's original decision or the recommendation of the system. (Bonaccio and Dalal, 2006).

In Evaluation 3, the participants had discussed the usefulness of the implemented features in detail and also made suggestions if they had any. The evaluation was conducted through written interviews, i.e., open answers in a survey, with a focus group (N = 40; 21 females, 19 males; with a mean age of 24.83). The focus group consists of a

subgroup from the participants of the second experiment, hereafter referred to as P1–P40.

5.4 Requirements Engineering

This chapter comprises the process of the entire requirements engineering and the derived requirements for the advisor features.

5.4.1 Literature-Based Requirements

As the entire negotiation process is comprised of a series of decision-making steps (Bichler et al., 2003; Gulliver, 1988), a system that provides support in all negotiation phases (Kersten and Lai, 2007) has been designed. The requirements (five aspects) for which are derived from existing literature in order to support decision-making at each negotiation phase.

In the preparation phase, the negotiators have to gather information about the negotiation partner and the negotiation, as well as set goals and define their intended negotiation styles. A negotiation style has to be selected by the negotiators who prepare their own goals.

The process of individual goal setting can be challenging for novice negotiators, as it involves the identification of their ideal outcome, which requires a comprehensive understanding of their true goals (Thompson, 2022). To mitigate the potential difficulties, it is recommended to incorporate a support feature for participants to set realistic goals prior to the start of negotiations.

Learning a style for a particular negotiation situation can be ineffective (Shell, 2006). It is thus important to get to know the negotiation partner and negotiate with existing skills rather than negotiating with a style that is not suited to the individual (Miller, 2014). Thus, the intended negotiation style for a concrete negotiation should be based on the individual negotiation style according to TKI. As Miller (2014) observes, such awareness constitutes the most fundamental step, enabling the negotiator to learn, develop, and successfully navigate negotiation processes. Novice negotiators,

however, face challenges in consciously applying and stating negotiation styles (Meyer, 2022). To address this, TKI is used in order to identify each participant's unique style. This unique style should then be used in a feature with the set goals and the negotiation scenario to identify the intended negotiation style for the participant in the upcoming negotiation. Our system excludes advice for the avoiding TKI style which is a non-negotiation style. Given that individual TKI styles can encompass diverse negotiation approaches, a comprehensive focus is placed on each participant's unique style.

During the negotiation, various decisions need to be made, including the formulation of an offer or the identification of necessary adjustments based on the emergence of new information. In addition, negotiators should continuously verify whether they remain on-track to achieve their set goals and whether their behaviour is in accordance with the intended negotiation style. Goals are established by the participants with the aim of being achieved upon the conclusion of the negotiation. The concept of "on-track" indicates the degree to which the negotiators are on the right way to achieve their goals. It is essential to provide support in the form of recommendations to negotiators who are not on-track to achieve their goals. This support may take the form of suggestions for adjusting subsequent offers, such as withdrawing concessions or modifying behaviour in alignment with the intended negotiation style.

If possible, negotiations should contain multiple issues to reduce win-lose outcomes and thus increase the zone of possible agreements (Lewicki, Barry, Saunders, 2010). While negotiating, offers are made, either as multi-issue offers or single-issue offers. As multi-issue offers are usually a better approach to reach win-win outcome (Thompson, 2022), thus, these are applicable for integrative styles. Single-issue offers are generally unsuitable for achieving a win-win outcome (Thompson, 2022), and are thus more likely to be applied with compromising or competitive styles. Either way, the negotiators have to decide which issues to consider in the subsequent offer (later called packages). The identification of particular packages to be offered can be

challenging during the negotiation process and should therefore be supported.

It is possible to simulate the progress of an ongoing negotiation in order to provide support by verifying whether the goals can still be achieved (on-track) by considering the negotiation style and the goals in the preparation.

Once the negotiation has been concluded, it is recommended that the negotiators reflect on the process and the outcome (Gulliver, 1988). This involves evaluating whether the outcome is considered satisfactory. To encourage self-reflection among the participants, the system should provide a review of the entire negotiation process and an overview of whether the goals were achieved.

5.4.2 Relevance of the Requirements

As the requirements identified in the literature are on a meta-level, possible application scenarios were derived and evaluated by means of a survey. While the requirements have been derived from experts (literature), users of the advice features need to be asked about their potential benefits when using the features by validating the requirements. To do so, 103 participants (57 females, 46 males; mean age 24.6) who had completed multiple negotiations in an NSS were asked whether they needed the requirements listed in Table 5.1 to support their decision-making. A 7-point Likert scale (1 = totally disagree; 7 = totally agree) was utilised for this purpose, and the results of this evaluation are categorised in statements for the scope of providing advice, setting goals, whether the participant is on-track or not, and evaluation when the negotiation ended. The statements are shortened in the table and statements with * were originally negated statements which were reversed for the evaluation.

Table 5.1 Results of the Usefulness of the Derived Features

5.4.3 Determined Requirements for the Advisor

The results discussed in the previous section demonstrate the necessity of the functionalities identified by the negotiators. On the basis of these functionalities, they were consolidated, and specific requirements were derived for the advisor framework (cf. Table 5.2). The requirements are categorised in the negotiation phases and different scenarios, such as setting goals, being (or not being) on-track to achieve the defined goals with the intended style, and general requirements of the advisor.

Table 5.2 Requirements for Advising Decision-Making Processes in Negotiations

As goals need to be established in the pre-negotiation phase, this can be supported by providing information to justify realistic goals in terms of the desired negotiation style and setting of negotiation. However, the self-determined behaviour remains with the participant, as they have to set their goals independently.

Whether goals can be identified as being realistic (requirement 1) depends on the case in question with the related preference models of all parties. The system possesses complete information from all parties. The number of packages that achieve the goals is provided to the user. The system does not explicitly provide a classification of whether goals are realistic; however, it does provide a utility value for the number of packages that fulfil the set goals. This value is style-independent. For example, if a participant sets their reservation level at 60%, then all issue selections with a utility value greater or equal to 60% would fulfil the goal. Consequently, the system calculates a percentage of these packages in relation to all packages in the case. The user can thus consider this percentage as an indicator to examine whether the goals are realistic.

The negotiation style consists of the TKI conflict style. The TKI conflict style comprises one or more dominant negotiation styles, one of which is selected as the intended style based on the goals set by the participant. The intended style dictates the manner in which the negotiation is conducted. For example, a participant with a competing-compromising TKI conflict style and high goals for themselves would be

recommended a competing negotiation style by the system. However, it may happen that none of the participant's TKI conflict styles fully match the goals set by the participants. In such cases, the most pronounced conflict style is applied, which is likely to contradict the goals set. The participant is then provided with information regarding the contradiction (requirement 2).

The specific goal (resulting from aspiration level and reservation level) that is applied for the on-track curve depends on the chosen negotiation style. It is important to note that the highest utility value does not necessarily represent the best alignment with the negotiation style. For example, in the case of an accommodating style, the goal with the lower utility value would be aimed for, as the relationship with the partner is considered most important.

During the negotiation (negotiation phase), it is essential to define the general requirements for advice, as different advice is required depending on the current state of the negotiation. In general, the scope of provided advice should be predetermined by the system; however, for more advanced negotiators a possibility to deactivate the advice function (requirement 3) should be added. Furthermore, the goal employed to define the on-track function and to measure whether the participant is on-track should be based on the negotiation style of the participant (requirement 4). There are several scenarios in which participants require support, based on whether they are moving towards their goals. Consequently, advice should be provided for any offer where a participant is not on-track to achieve their goals, i.e., as long as an offer is not on the on-track function (requirement 5). Graphic support should be provided to visualise the current state of the negotiation independent of whether the offer is on-track or not (requirement 6).

The on-track status is visualised by a function that simulates the optimal negotiation progress based on the average number of offers exchanged, the participant's negotiation style and the defined goals. Thus, the curves vary and are calculated after the first offer has been sent. Due to the preference model of the participants, the aim utility

(identified from the goals set) may not be reached with a package, thus, a tolerance factor is introduced.

The utility curves have been adapted from Carbonneau and Vahidov (2014) for all four negotiation styles. In the case of competing, a section of a convex curve is used. The goals should be high as one is only concerned about the own outcome; in the case of compromising, a linear curve is employed and the goals should be medium as the focus is on splitting the differences; in the case of accommodating, a section of a concave curve is used; in the case of collaborating, a section of a less pronounced concave curve than for accommodating is applied and the goal should be higher than with accommodating since one wants to achieve a win-win outcome with a collaborating style.

The actual termination of the negotiation is not possible to predict; therefore, a review of prior negotiations was conducted to ascertain the average offer exchange rate prior to the negotiation conclusion. A total of 1090 negotiations were analysed across 17 experiments conducted between 2016 and 2023. The mean number of offers exchanges was 10.15 (with a median of 10). This indicates that, on average, after ten offers exchanged, the target utility value will be reached by the utility curve. Should the participants write more than ten offers, the curve stagnates. The end point of the on-track function is specified as either AL or RL of the defined goals.

In the event that the utility value indicated in the participant's offer falls within the tolerance factor from the curve, the participant is considered to be on-track. Advice is provided in accordance with the specific requirements and the negotiation style of the participant and is offered for any offer that does not align with the established parameters (requirements 7–13). Furthermore, an offer can be above, within tolerance, or below the on-track function. Similarly, an offer may be above, within tolerance, or below the defined goals; in the latter case the participant is not fully aware of their goals and deviates from them. The conditions under which advice regarding the on-track function is triggered are explained below:

If the offer made exceeds the on-track function, it is not necessary to provide advice regarding a competing style, as this style is characterised by a high level of assertiveness and low interest in the relationship with the partner. However, advice should be provided if the negotiation style has a high or medium level of cooperativeness. In such cases, the relationship with the partner is deemed relevant, and an offer above the on-track function may result in an offer that is too tough. If the offer made aligns with the on-track function, providing an indication to the participant to maintain their current behaviour is advised.

If the offer made is close to the on-track function and thus not optimal, the following measures should be taken: 1) advice should be given to make the participant aware of the sub-optimal offer to avoid possible large deviations in subsequent offers, and 2) even if the advice is contrary to the participant's style, it should be provided as achieving goals is more important than adjusting the participant's negotiation style.

If the offer made does not align with the on-track function, it is recommended that advice be provided to return on-track, e.g., by reducing the concession degree of the subsequent offer.

If a participant makes an improper offer that is not aligned with the on-track function and falls below the established goals, three requirements are derived: 1) if necessary, advice should be given with the intention of reversing any concessions that have been made; 2) no advice should be given with the intention of rejecting the negotiation; 3) advice should generally be given as to how the goals can be achieved during the negotiation and how the next offer can be made to achieve the next step.

In the post-negotiation phase (requirements 14–15), advice should be provided to trigger self-reflection on the previous negotiation. The advice has to indicate whether each of the goals in the final offer (accepted offer or last offer before rejection) will be achieved.

5.5 Designed Framework of the Advisor

In accordance with the requirements, a set of nine features was devised with the objective of providing advice to the participants. These features were subsequently implemented.

5.5.1 Features Supporting the Pre-Negotiation Phase

Participants are required to specify their TKI style and goals in order to start the first negotiation. The system provides the TKI questionnaire for this purpose, and the results are calculated based on the literature used by the system to identify the style employed in a particular negotiation. The results are then provided to the participant (cf. Fig. 5.4) and remain visible to them throughout the usage of the system. "Percentage significance" shows the percentile scores of the participants in terms of the degree to which the style is pronounced.

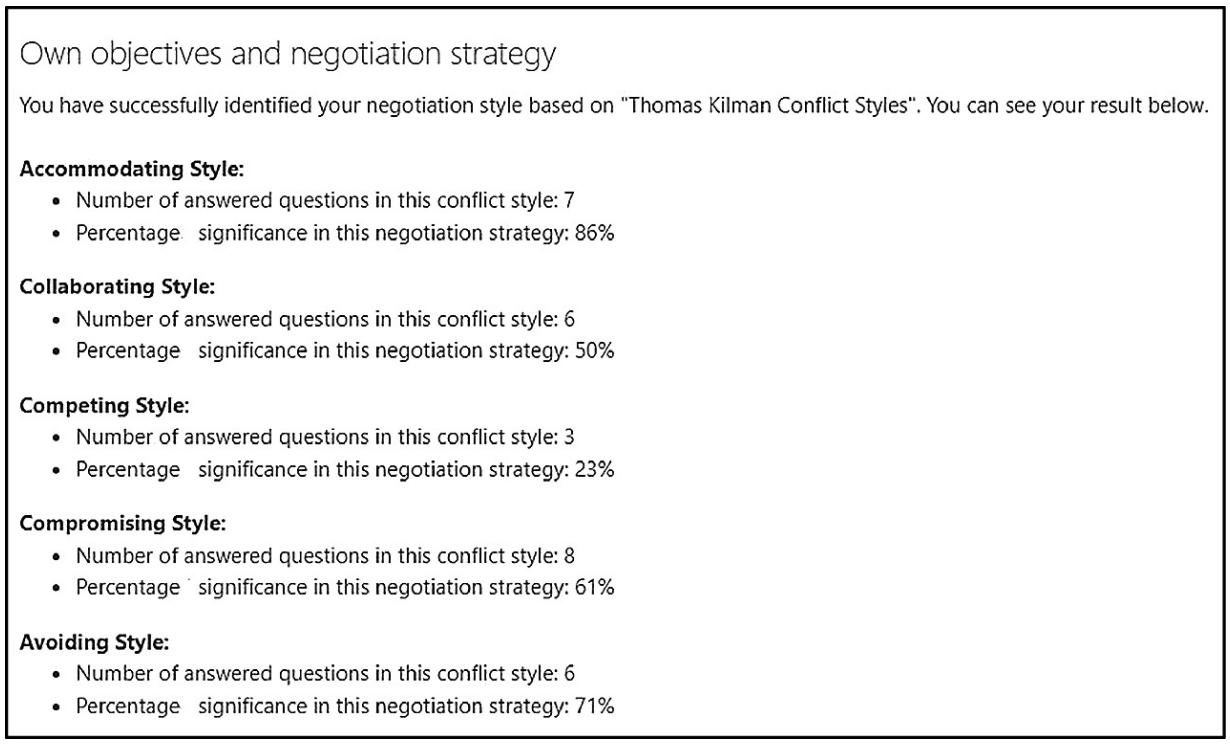

Fig. 5.4 Feature 1—TKI Style

In the process of goal setting, participants are required to specify their aspiration level and reservation level. Once the values have been

defined, the system calculates the achievability of the goals by determining the percentage of issue combinations whose utility value is equal to or greater than the value of the specified goal (cf. 2. in Fig. 5.5). As it can be difficult to determine a utility value of multi-attributes, a utility calculator has been implemented (cf. Fig. 5.6), which can be opened using a button (cf. 3. in Fig. 5.5). This utility calculator reduces complexity by allowing participants to try out all valid issue-selections while the system calculates the actual utility value for each selection as needed. If participants do not select all issues, a range of the utility value is displayed.

Based on the results of the TKI questionnaire and the goals set, the system selects the intended negotiation style for the upcoming negotiation. The system then validates whether the selected goals correspond to the chosen negotiation style (cf. 1. in Fig. 5.5). For each of the four negotiation styles and for each case study, the system proposes ranges to the system administrators, who determine the utility value. The ranges are based on previous negotiations in which the results of the negotiation and conflict styles of the negotiators were consolidated. Contradicting goals can occur when a participant has a strongly developed style and tries to set goals that are contrary to this style, e.g., accommodating as a strongly developed style and high goals.

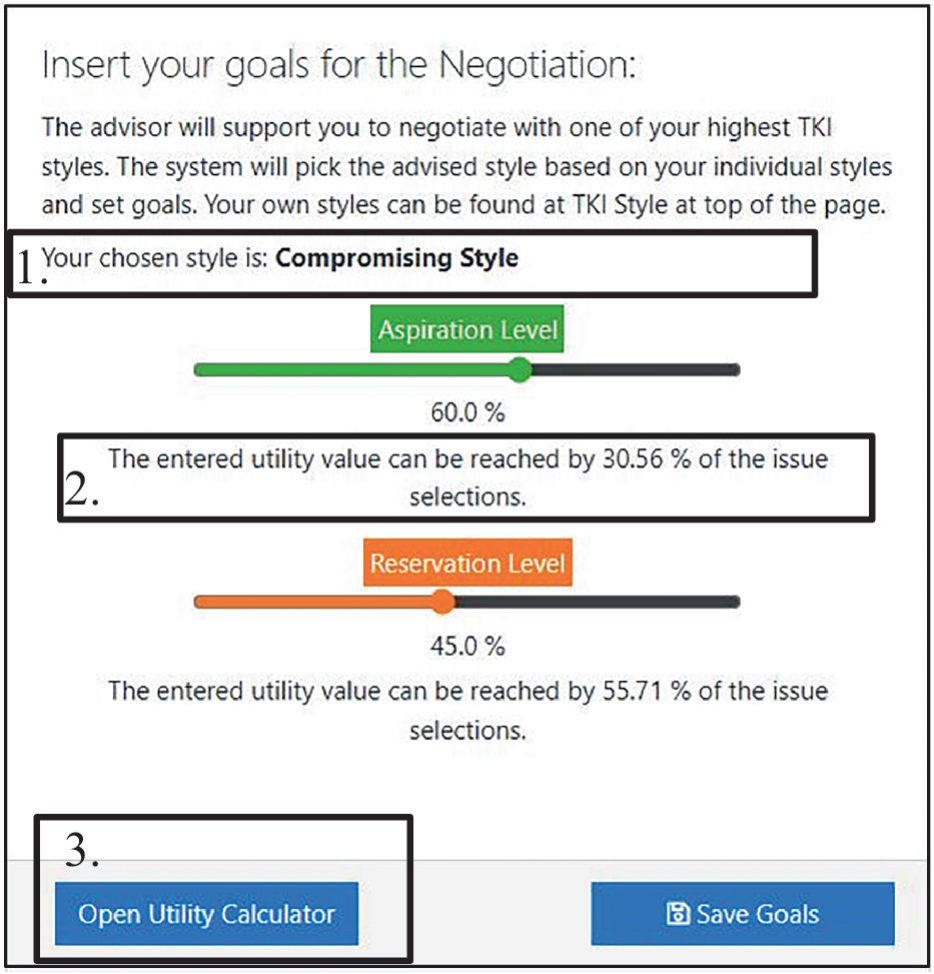

Fig. 5.5 Feature 2—Setting Goals

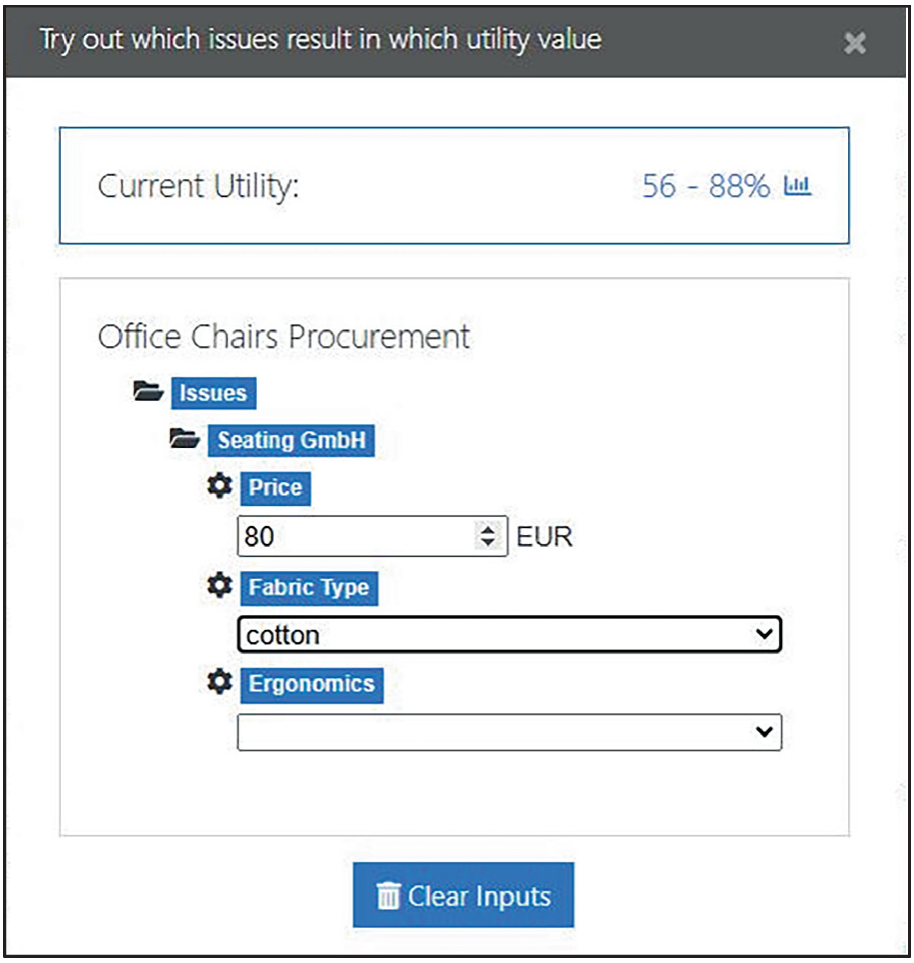

Fig. 5.6 Feature 3—Utility Calculator

5.5.2 Features Supporting the Negotiation Phase

Once the participants have defined their goals, they can start the negotiation. The initial offer is defined as the anchoring point for the features, i.e., the utility values are used as starting values. All features are visible to the participants once they have received their first message from their partner.

The feature recommended utility (cf. Fig. 5.7) provides participants with information facilitating the composition of a new offer, with the recommended utility value being calculated on an individual basis. This is based on the progress of the negotiation, the goals set, and the intended negotiation style. In case of any contradictions between negotiation style and goals, the system provides information regarding the contradiction. If the participant nevertheless chooses to continue

the negotiations with their goals and the intended negotiation style, the system provides advice accordingly, thereby enabling the participants to experiment with a contradictory style and goals and thus acquire knowledge from this experience.

As these utility values can also be abstract, further support is provided upon clicking on the recommended utility (cf. Fig. 5.7). The system provides three packages as examples for the recommended utility (cf. Fig. 5.8) and thus provides further information on the recommended utility feature. A tolerance factor is used to ensure that three different packages are provided in each case.

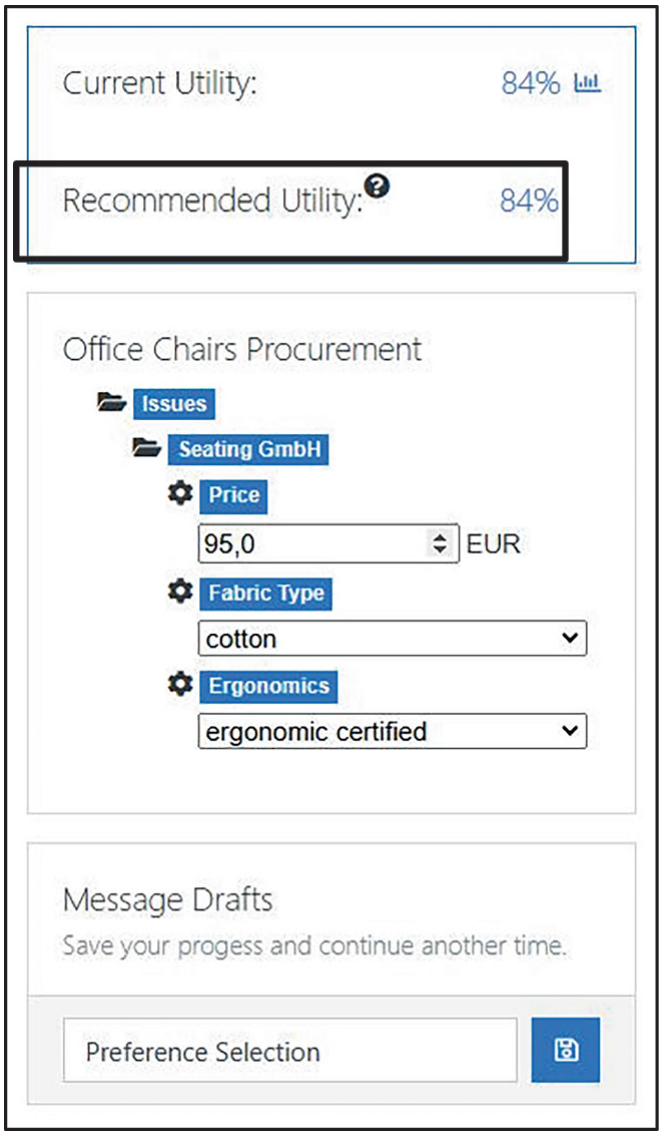

Fig. 5.7 Feature 4—Recommended Utility

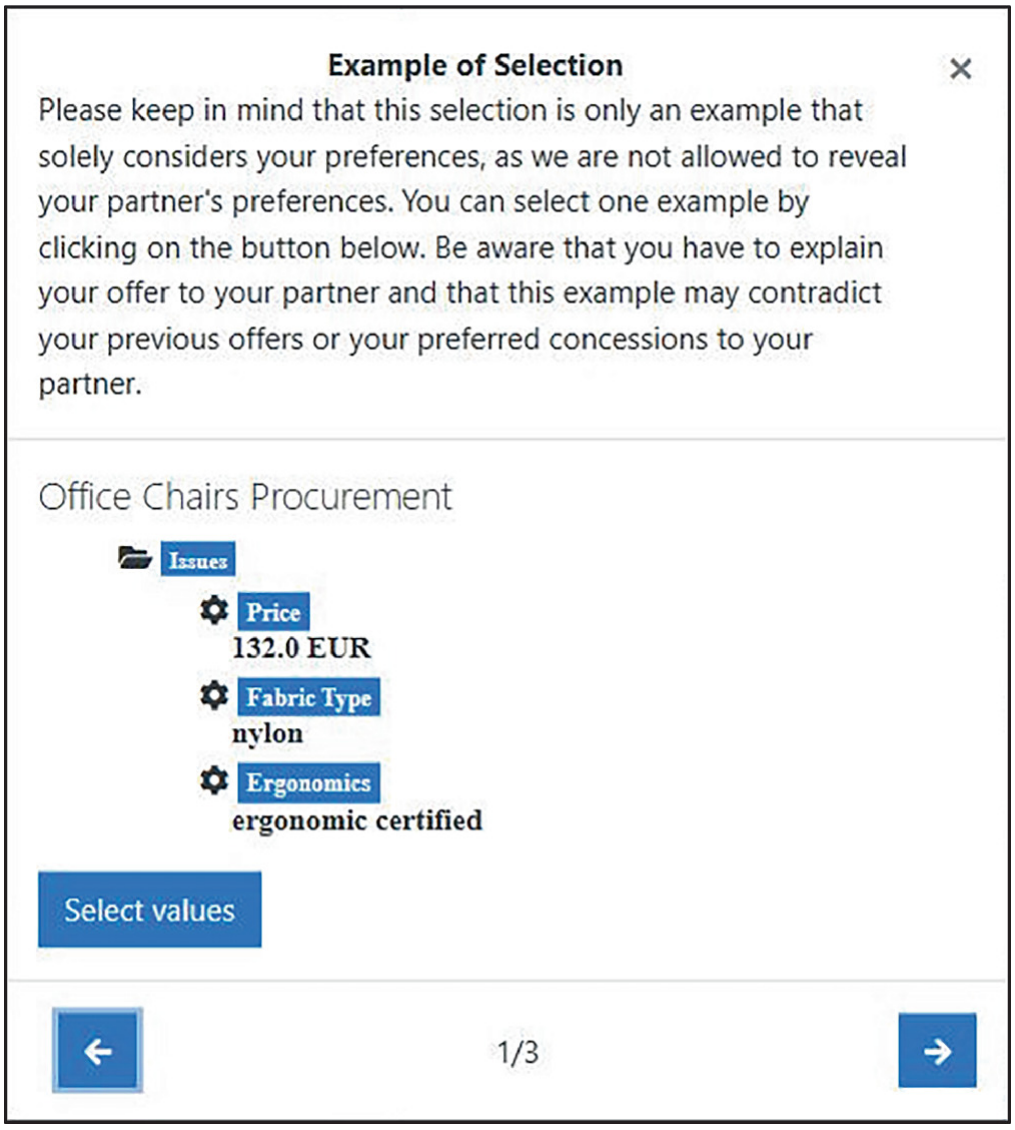

Fig. 5.8 Feature 5—Example Packages

An advice graph employs a function to illustrate whether one is on-track to achieve the set goals. The systems provides an explanation with suggestions for the subsequent offer (cf. Fig 5.9). In addition to the advice graph, the system provides a textual explanation and advice on what to do in the subsequent offer (cf. Fig. 5.9).

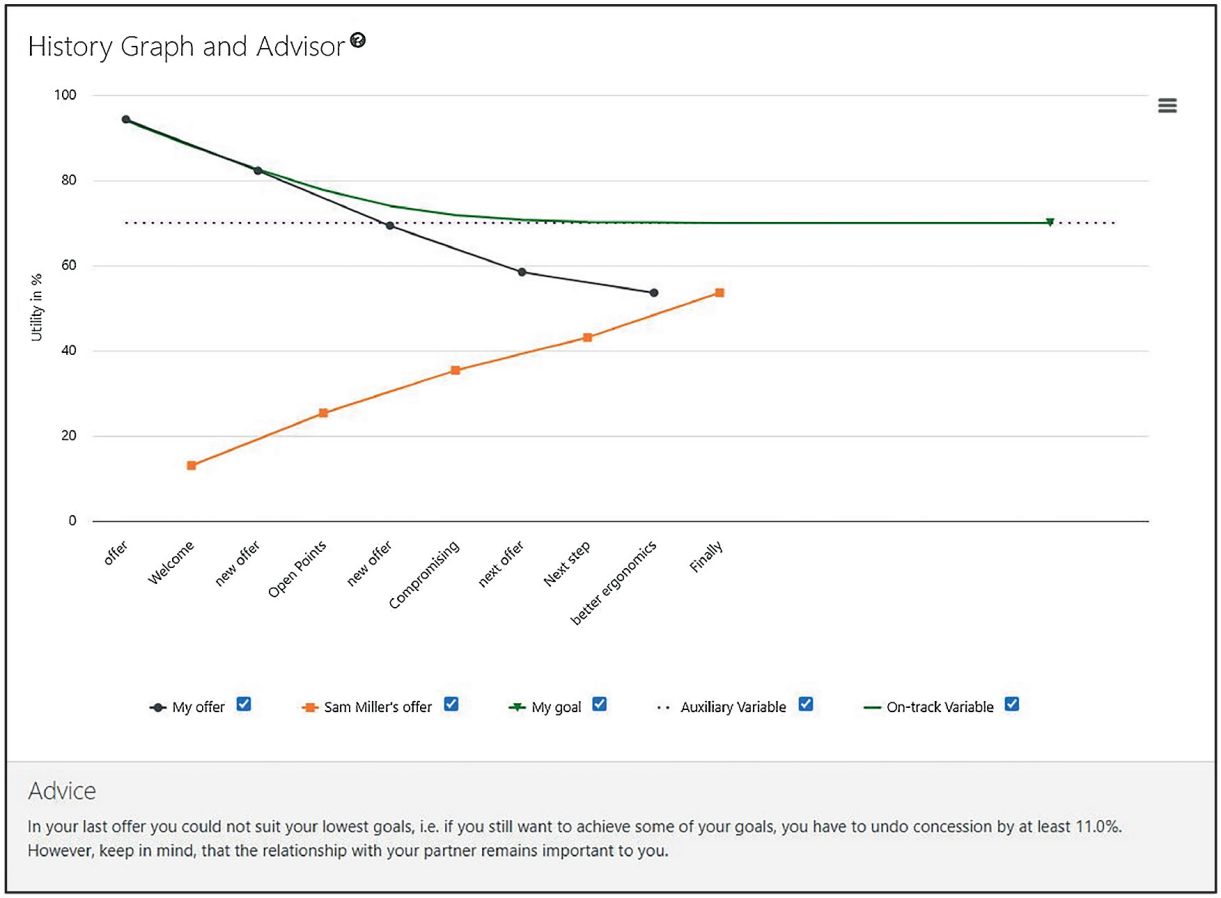

Fig. 5.9 Feature 6—Advice Graph and Feature 7—Advice Text

If the participant is not on-track with the previous offer, the system initiates a process of self-reflection (cf. Fig. 5.10) comprising three steps. Firstly, the participant is required to reflect on their previous behaviour and indicate their intended approach to the subsequent offer (cf. Fig. 5.10). Secondly, following the articulation of their intended approach, they receive advice. This advice constitutes recommendations for the subsequent offer, including potential concessions and an explanation of the suggestions. Thirdly, the participant is then required to determine whether they will adopt their own approach or the system's advice for the subsequent offer (cf. Fig. 5.11). For the purpose of evaluating the usage of the advice, the selected approach is saved by the system.

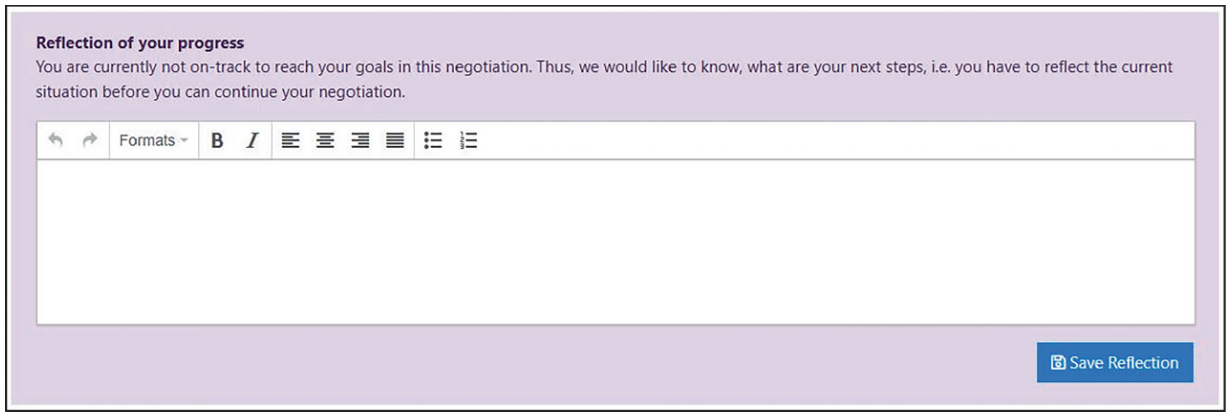

Fig. 5.10 Feature 8—Self-Reflection

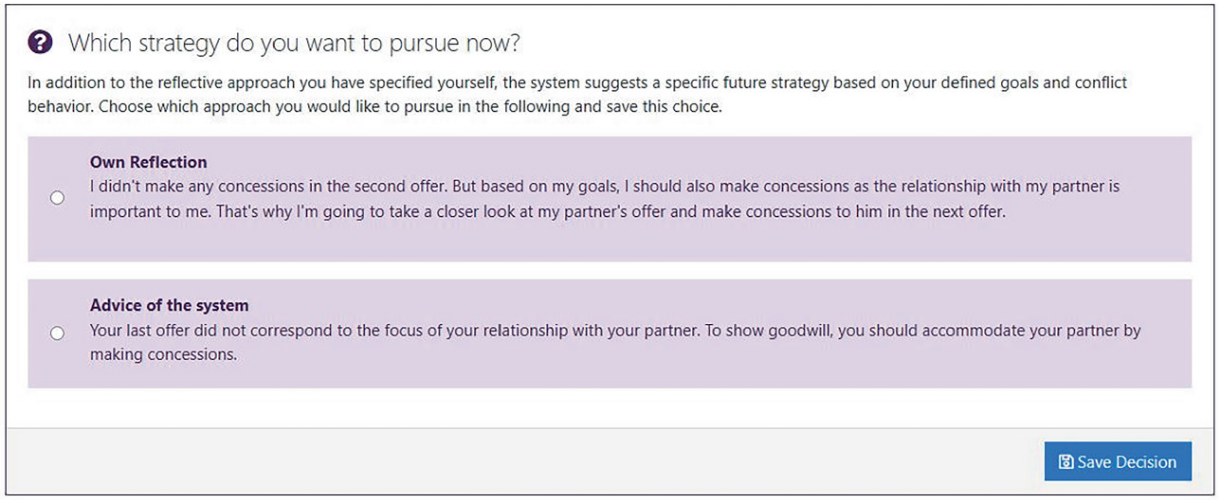

Fig. 5.11 Feature 8—Self-Reflection

5.5.3 Features Supporting the Post-Negotiation Phase

Following the end of the negotiation, the overview of the set goals, the advice graph and the latest advice text, concise feedback are provided, indicating whether the goals (Aspiration Level, and Reservation Level) have been accomplished (cf. Fig. 5.12).

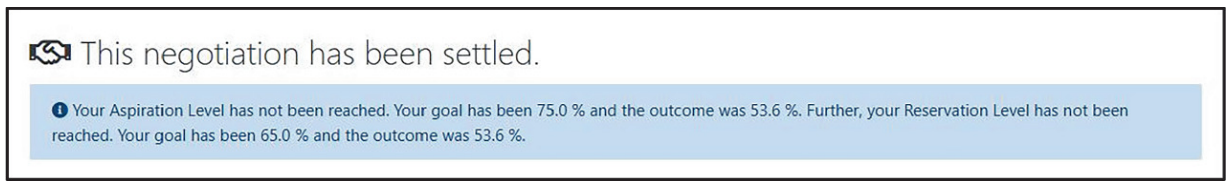

Fig. 5.12 Feature 9—Goal Achieved

5.6 Evaluation

This section presents the findings from the actual usage of the feature example packages (cf. Fig. 5.8), whether the participants followed the advice, as well as qualitative research by analysing statements from written interviews conducted with a focus group.

The requirement to disable the advice features as a participant (cf. Table 5.2, requirement 3) was implemented. However, in order to ensure sufficient data collection through the actual use of the advice features, this function was disabled in the reported experiment.

In order to validate the advice features, two groups were formed: one with the advisor features described in the previous chapter (Group A) and one as a control group without the advisor features (Group B). Both groups negotiated at least twice in order to validate the advice features. The participants in both groups negotiated with agents with identical negotiation strategies and preference models in each negotiation, but with different cases. Background information and the negotiation scenario were provided in a detailed description to the participants. However, Group B was provided with randomised general information on negotiation theory, which they had already acquired during their negotiation course, the history graph, and only the input fields for defining aspiration level and reservation level. It should be noted that this history graph only included the utility values of the offers from both sides, i.e., *My offer* and *Sam Miller's offer* of Fig. 5.9. Thus, Group B was unable to utilise or know about the implemented advice features, as these could not be accessed.

5.6.1 Actual Usage of Example Packages

Group A (N = 68; 37 females, 32 males) was able to utilise this advice feature following the initial message. The feature presented three distinct packages as recommendations for the subsequent offer to the participant, who were required to conclude two negotiations (Negotiation 1, Negotiation 2). Participants were only permitted to conduct Negotiation 2 once they had completed Negotiation 1.

Participants were permitted to repeat the negotiations as often as they wished, with a maximum of three attempts. A comprehensive summary of the general information, including the number of negotiations conducted and messages sent, as well as the utilisation of the agenda advice, is provided in Table 5.3.

In Negotiation 1, all participants of Group A concluded the negotiation, exchanging a total of 474 messages throughout the negotiation. Participants used the provided advice 232 times (48.95%), 109 times with the actual suggested package. In 123 instances, they adapted the packages with loading one of the suggested packages and customising it according to their purpose.

In Negotiation 2, fewer participants of Group A concluded the negotiation (N = 50; 30 females, 20 males) with 315 sent messages. The suggested packages were used 164 times (52.06%), 68 times with the identical agenda selection and 96 times with an adapted agenda selection.

Table 5.3 Results Usage of Feature Example Packages

5.6.2 Judge Advisor System

In this section, the self-reflection feature is evaluated through the utilisation of a judge-advisor system. If the participants were not on-track during their negotiations (Negotiation 1, Negotiation 2), the system triggered a self-reflection process. Participants were asked to reflect their own behaviour by 1) describing how they would proceed with the next offer and 2) deciding whether to proceed according to their own approach or to the system's advice (cf. Fig. 5.11). The validation process established whether the participants followed their own step or the advice of the system. As only the group with advice functions was asked to reflect on their own behaviour if they were not on-track, only these are considered in Table 5.4.

The self-reflection advice only occurred when the participants were not on-track to achieve their goals. In Negotiation 1, the participants were not on-track 380 times. Following the participants' indication of

their intended approach, the system provided a suggested approach, and the participants had to decide which approach they would like to take. They subsequently intended to employ their own approach a mere 13 times (3.42%), while opting for the system's approach in 367 instances (96.58%). In Negotiation 2, the participants were not on-track 257 times and then intended to apply their own approach only twice (0.78%); while they applied the system's advice 255 times (99.22%).

Table 5.4 Results Judge Advisor System

5.6.3 Reflection of the Focus Group

In order to assess the features, a focus group (N = 40; 21 females, 19 males; mean age of 24.83 years) was asked to state three advice features in written interviews. The participants were divided into two groups: a group with access to the implemented advice (Group 1; N = 23; 10 females, 13 males) and a group without advice (Group 2; N = 17; 11 females, 6 males). None of the actual implemented advice features were mentioned to Group 2. Both groups had negotiated in several negotiations and were asked to state three advice features; either features they had actually seen/used in their negotiations or features they could come up with and considered supportive in negotiations. However, some participants were unable to state three features, which is why the results of features mentioned vary (cf. Table 5.5). In order to allocate the stated features and statements regarding usability and improvements to the participants of the focus group, they are hereafter referred to as P1-P40.

Table 5.5 Results Number of Stated Features

As illustrated in Table 5.6, the features are categorised into three groups: "advice features", "conceived features", and "already existing features". The latter category includes features that were specified as

advice features but are already existing support features in the system. N indicates the frequency with which each feature was mentioned by the participants.

Table 5.6 Results Stated Features by the Focus Group

The participants of Group 1 predominantly stated actual advice features, except on two occasions where an already existing feature was described. 22 out of 23 participants stated that the advice graph was an advice feature, followed by 17 participants who named the recommended utility as an advice feature; nine participants who named the advice text, seven participants who named the self-reflection with the advice text, six participants who named the utility calculator, and five participants who named the setting goals feature.

In Group 2, existing support (but not advice features) was mentioned 14 times as advice features, while conceived advice features were mentioned on three occasions, namely in the form of an *optimal solution advice*, an *agreement progress indicator*, and a *recommending utility*. The *optimal solution advice* could provide an overview of the ideal negotiation path with optimal offers to achieve the maximum utility for all parties (P23). The *agreement progress indicator* displays a percentage that quantifies the degree of alignment of the current offer for the negotiating parties (P23). The conceived feature *recommending utility* actually corresponds to the advice feature *recommended utility* which was only displayed for Group 1. No indication of this feature was made in the remaining mentioned advice features in Group 2. Ten participants stated the randomised general information of negotiation theory as an advice feature. Thirteen participants mentioned the history graph as an advice feature, and eight participants stated the input fields of setting aspiration level and reservation level as an advice feature.

All participants in Group 1 indicated that at least one feature was useful. However, some participants specified different features for the two tasks. In total, these participants mentioned useful features 62

times: advice graph (20 times), recommended utility and example packages (16 times), advice text (9 times), utility calculator (6 times), self-reflection (6 times), setting goals (5 times).

In general, the advice features are described as being very useful for assessing whether a negotiation approach is suited to one's own style and goals (P8, P33) and for supporting a better understanding of one's own negotiation style (P9). Even those who did not always follow the advice feature to try out their own approaches described the features as valuable (P40).

The **advice graph** is perceived as extremely useful and enjoyable to use due to its user-friendly interface (P12, P21). The visible information in the graph supports a better understanding of the negotiation progress (P9) and helps to be realistic and effective in achieving one's own goals (P12). In particular, the visual feedback provided quick feedback to keep track of the goals (P15). Furthermore, the on-track function provides a suggestion for the subsequent offer, indicating the potential concessions that could be made and thereby preventing overly generous concessions (P15, P14, P20).

The **utility calculator** was described as a highly beneficial feature that facilitates the calculation of utility, thereby assisting in setting goals (P14). Further, the preparation is significantly supported by the calculator, as it enables the exploration of various options (P10). Some participants have utilised the calculator to prepare their offers (P16, P21, P30), as it provides a clear and structured method for evaluating offers. In addition to its functionality, the design is described as being enjoyable and fun to use (P21).

Setting goals is considered as highly beneficial, as it provides clear boundaries and goals for the negotiation (P20).

The **recommended utility** feature simplifies the process of decision-making by offering suggestions for the subsequent offer that suits with the user's goals and preferences (P15, P19). It provides precise utility values and example combinations which are valuable for making informed adjustments to the offers and for avoiding overly generous concessions too early (P15, P10). Consequently, it facilitates

proposing reasonable offers (P20, P30). The feature provides an overview of the negotiation, similar to the graph, but focusing on the subsequent offer (P19).

The **example of selections** is stated to support the participants' recognition of different but similar options for the subsequent offer, as they are not limited to just one option (P10), and thus can adapt their offer to an example they had not previously thought of (P30).

The provided **advice text** is considered beneficial as it functions as an effective reminder and ensures that the user acts according to their aspiration and respiration level (P12). Moreover, this feature facilitates exploring alternatives (P8). One participant emphasised the usefulness of the advice, noting that the advice given is plausible and based on previous interactions in the current negotiation (P30).

The **self-reflection** feature is described as being of significant importance in maintaining a strategic mind-set, particularly when deviating off-track (P15). It supports to step back in a heated situation (P16), enables individuals to organise their thoughts and intentions by documenting the next steps, and encourages the re-evaluation of the efficacy of the intended strategy in the situation (P19, P21). Furthermore, the feature is considered impressive, as it evaluates whether the negotiation approach is suited to one's personal style (P33). One participant highlighted the mandatory reflection as beneficial (P33), while another suggested that the system could be further developed by offering follow-up guidance or alternative strategies after self-reflection, thereby promoting understanding of the impact of one's own approach and providing options to change it (P40).

Group 1 proposed a total of 20 suggestions; with 16 participants contributing to this effort. 15 of these suggestions focused on enhancing the advice text, particularly by offering more detailed insights (P8) and providing a longer-term recommendation for the negotiation (P27). Three participants suggested improvements to the advice graph: 1) by simulating predictions about the negotiation progress with different offers (P6), e.g., by suggesting optimal or realistic combinations and providing insights into the partner's utility

value (P8); and 2) by offering a line similar to the on-track function for the negotiation partner, which is calculated on the basis of the partner's given offers (P30), i.e., the system should identify the negotiation style of the partner, based on the received offers. The suggestions of a tutorial for setting aspiration level and reservation level were also made (P20). As an improvement to the utility calculator, the possibility to save the selections of the corresponding utility to view (P30) and reflect on the progress (P30) was proposed.

In Group 2, a total of 17 suggestions for improvements were proposed by 13 participants, of which eight addressed the randomised and general information of negotiation theory (generic **advice texts**). The participants suggested that more concrete and context-specific recommendations should be provided (P5), with consideration given to the unique elements of the negotiation, such as the preferences, priorities, and past interactions of both parties (P3). These recommendations should include specific suggestions for concessions or opportunities that have been overlooked (P3), as well as conflicts with the goals (P23). Furthermore, it is recommended that the advice texts are adapted after each interaction with the negotiation partner (P3), which should also include suggestions on the partner's negotiation style (P5). Receiving more detailed information about the partner's negotiation style could help negotiators to stay calm and be less confused and frustrated during negotiations (P22). The advice could benefit from using real-time information to provide contextual advice based on historical data from the ongoing negotiation (P5).

The **advice graph** was already considered to be excellent for tracking the negotiation's progress (P2) and no improvements were suggested by Group 1. The control group suggested improvements which have already been implemented in the extended history graph, such as displaying the aspiration level or reservation level as a horizontal line in the graph (P2) and clear instructions on how to behave in the next step (P37). One participant proposed the creation of a forecast based on previous negotiations with the partner, utilising historical data on the partner's negotiating style (P17).

One participant of the control group suggested the **utility calculator** as a feature to calculate aspiration level and reservation level, with the objective of simplifying the process, providing clarity, and assisting negotiators in maintaining their acceptable range of outcomes (P35).

Two participants considered improvements for the feature **setting goals** to make it even more user-friendly and effective (P2, P25). In particular, they recommended offering advice when setting reservation level and aspiration level to ensure realistic goals (P2) match the actual feature. One participant even suggested more detailed goal setting by defining individual issues to define more precisely how the desired utility can be achieved, which could also further increase the learning effect (P25).

One participant proposed the incorporation of a feature analogous to the **recommended utility** that displays the user's distance from the goals (P4). Additionally, the participant suggested a button that enable the adjustment of the utility up or down, along with one or two additional negotiations that would exclusively focus on the formulation of effective (counter-) offer (P4).

5.7 Discussion

The results of the study indicate that seven out of the nine designed advice features were stated by the participants to be useful in achieving their goals. These features should, therefore, be used to support decision-making in digital negotiations, namely setting goals, utility calculator, recommended utility, example packages, advice graph, advice text, and self-reflection. The remaining two features were not explicitly mentioned as being useful, but this does not mean that they do not support the participants at all. The TKI feature (Feature 1) is a prerequisite for utilising all of the aforementioned features, and thus its implementation is essential in all cases. As Feature 9 (goal achieved) only indicates whether an individual has achieved their aspiration level and reservation level, and there are already features in the literature

that support self-reflection in the post-negotiation phase, e.g. Meyer and Schoop (2024), this feature should only be used with the support of others in the post-negotiation.

The remaining advice features for the preparation (i.e., Feature 2 setting goals, and Feature 3 utility calculator) were mentioned the least, which can be justified by the fact that they are prerequisites for starting the negotiation. However, those participants who mentioned these features stated them to be useful. A recommendation was made with regard to Feature 3, namely the addition of a function to save the identified issue packages so that they could be reflected later. This recommendation could further support self-reflection and should therefore be implemented in the system.

The utilisation of the advice feature example packages was observed to occur in approximately half of the offers. The example packages can be transferred directly to the offer, especially at the beginning of negotiations or when reaching a deadlock. If partial agreements have already been reached on specific issues, the example packages are typically adapted. Overall, the utilisation of the recommended utility (Feature 4) with the example packages (Feature 5) was found to be substantial. The findings demonstrate that the usage of the recommended utility with the example packages is slightly higher in comparison to the average percentage of advice accepted (39%) as reported in literature. While our features provide expert advice, the literature did not distinguish their findings between the expertise levels of advisors (Bailey et al., 2023). Since expert advice has been shown to have a higher acceptance rate than novice advice (Bailey et al., 2023), the higher average percentage of accepted advice observed in this study can be explained by this. These two features therefore support individuals in their making-decisions.

The advice graph (Feature 6) was the most frequently mentioned feature and was also described as being most useful of all advice features. Furthermore, only a small number of participants who used the advice graph mentioned improvements by adding predictions, and some of the control group only suggested improvements that had

already been implemented in the advice feature. Thus, this feature is well suited to support decision-making in digital negotiations.

The self-reflection feature (Feature 8) was predominantly mentioned as being supportive, but it should be improved through more detailed descriptions of the advice text (Feature 7). In particular, the level of detail should be reconsidered, e.g., through the use of predictions. The results of the judge advisor system (cf. Fig. 5.11) demonstrate that almost all participants applied the system's advice to proceed to the next offer. The advice was given immediately after the participants saved their preferred decision for the next offer, and was thus taken more frequently, this is analogous to the results in the literature (Meshi et al., 2012). The self-reflection feature is, therefore, highly relevant to support participants in making-decisions for the next offers according to their negotiation style. It was proposed that the judge-advisor system be improved by either displaying the advice after every second offer if a participant is not on-track or enabling the participant to deactivate it. Initially, the advice should be given after each offer. Since the participants negotiated in at least two negotiations, the system could be improved by not only activating the functionality to enable/disable the advisor function, but also by setting the interval when advice is given on their own.

The importance of the advice features is further emphasised by the findings of the control group. The majority of them indicated improvements that specify the implemented advice features, including support regarding the achievability of the set goals, assistance in establishing aspiration level and reservation level, the provision of context-specific advice during negotiations, and an extended history graph with the set goals. The designed advice features have therefore proven to be beneficial.

The following section will discuss the suggested improvements from participants; however, these have to be examined in future research.

One participant suggested integrating prediction into the advice graph by providing different offer. However, not different offers but

behavioural changes would have a greater impact on the negotiation outcome, i.e., further advice could be provided in the graph by showing different curves on how the negotiation could change if the negotiation style is maintained or changed in the dimensions (own concern vs. relationship concern).

With regard to setting goals and the utility calculator, it was proposed that the selection be stored in order to facilitate reflection during the negotiation progress. This approach has the potential to provide a valuable aid, particularly in the context of reflection in the post-negotiation phase.

One participant suggested an on-track variable for the negotiation partner's curve. Currently, an on-track variable is utilised to calculate whether the participant is on-track to reach the partner's goal. However, we are not in favour of revealing this information, as there is no way to obtain such information outside of a training programme. The aim of this research is to provide advice for decision-making with realistic information, i.e., information one knows from one's own perspective. A similar suggestion was made regarding the partner's negotiation style. We argue similarly for the ongoing negotiation but consider an evaluation in the post-negotiation phase to be supportive, by letting the user estimate the partner's negotiation style and providing a reflection and explanation from the system as to whether the estimated style was correctly identified.

In addition, one participant suggested that predictions should be made about the partner and the partner's negotiation style based on historical data. However, in the experiment, the negotiation partner was an agent with complete information, i.e., no predictions would be necessary. Instead, the participants should be able to identify the negotiation style independently with the information provided by the advice features. To obtain such information with a human partner, it would be necessary for the negotiators to have negotiated with the system on multiple occasions, and further training data would be required to build a neural network based on the negotiation behaviour.

5.8 Outlook and Future Work

In the previous section, the proposed improvements by the participants were discussed, and future implications were derived. These included enhancing the level of detail in the feature advice text and increasing customisation of the features. Despite these improvements, the conducted experiments indicate that the designed advice features supported the participants in their decision-making in negotiations.

This research has some limitations. The usefulness of the implemented features was examined via subjective ratings from the participants. Subsequent evaluations could be conducted by evaluating learning outcomes and motivation from a greater sample size.

In a next step, improvements should be implemented in the system with conducting further experiments to increase the sample size of the experiment. In addition, it could also be examined whether forecasting algorithms can be used to provide advice in decision-making scenarios with incomplete information within or outside a training set with a large amount of data.

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6. Training of Self-Reflection: An Artefact for Negotiation Support Systems

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Abstract
Negotiation effectiveness is a skill required especially in organisational contexts. To become an effective negotiator and to gain negotiation competence, practice is essential. In addition, reflection on the good and the bad of those negotiation processes is vital. In particular, to learn from mistakes and to learn from successes, negotiators need to receive feedback. Feedback must be accurate, targeted towards the negotiators, and purpose-driven to genuinely support training of negotiation effective-ness. Digital system support in the form of negotiation support systems (NSSs) can provide such support for self-reflection. Whilst NSSs document all the data of a negotiation process such as preferences, utilities, message, and concessions, the question as to which feedback elements using the rich negotiation data promote self-reflection remains unanswered. As yet, NSSs do not provide dedicated self-reflection elements. The present paper designs and evaluates seven feedback elements using a design science research approach. Four of these designed elements (namely TKI evaluation, behaviour evaluation, history graph, and feedback from the partner)

can be shown to be useful in supporting participants to self-reflect on effectiveness in their concluded negotiations.

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6.1 Introduction

Effective negotiation is a critical skill in modern professional and personal contexts yet developing negotiation competence remains challenging. While negotiation support systems (NSSs) have advanced significantly in facilitating decision-making and communication during negotiations (Kersten and Lai, 2007; Schoop, 2021), a fundamental challenge persists: how can digital systems help negotiators learn from their experiences and improve their skills over time? This challenge is particularly acute given that negotiation effectiveness depends not only on real-time decision-making but also on the ability to reflect critically on one's strategies and outcomes after negotiations conclude (Thompson, 2022).

Digital negotiations—defined as decision-making and communication processes between parties conducted through dedicated digital systems (Bichler et al., 2003; Lewicki et al., 2015)—can be conceptualised across three distinct phases. The pre-negotiation phase involves preparation, including identifying preferences, styles, and goals. The negotiation phase encompasses the actual exchange and conclusion. The post-negotiation phase focuses on evaluating outcomes and reflecting on strategies employed (Kersten, G. and Noronha, S., 1999). While existing NSSs provide substantial support during the pre-negotiation and negotiation phases through information management

and decision support (Schoop et al., 2003), the post-negotiation phase remains comparatively underserved.

This gap is significant because effective negotiator development requires structured reflection and feedback—core components of experiential learning (Kolb, 1976; Lewicki, 1997). Post-negotiation reflection enables negotiators to compare intended versus actual strategies, identify areas for improvement, and generalise learning to future negotiations (Thompson, 2022). Moreover, digital negotiations automatically document offers and exchanges, creating rich datasets that could support sophisticated feedback mechanisms (Holtom and Kenworthy-U'Ren, 2006). However, current feedback literature provides limited guidance on how to design support for self-assessment and peer assessment in negotiation training contexts (Panadero and Lipnevich, 2022). While preliminary research has explored gamified elements such as rankings and Pareto graphs (Sailer et al., 2017; Schmid and Schoop, 2022), systematic investigation of feedback elements that promote self-reflection on negotiation strategies in the post-negotiation phase remains underdeveloped.

This study addresses this gap by identifying and evaluating feedback elements designed to support participants in reflecting on their completed digital negotiations. Drawing on cognitive fit theory (Vessey, 1991), which demonstrates that performance improves when information representation matches task requirements, and experiential learning theory (Kolb, 1976), which emphasises the importance of reflection in skill development, we adopt a design-oriented approach to develop and assess feedback mechanisms for post-negotiation training. Our research is guided by two questions:

RQ 1 **Which feedback elements can support participants in reflecting on their finished digital negotiations in the post-negotiation phase?**

RQ 2 **Which negotiation skills are enhanced through self-reflection enabled by the designed feedback elements in the post-negotiation phase?**

To answer these questions, we employ a multi-method design science approach. We first establish the terminological foundation regarding negotiation skills and conflict types (Sect. 6.2) before introducing our design-oriented research methodology (Sect. 6.3). We then design and evaluate feedback elements through surveys (Sect. 6.4) and written interviews (Sect. 6.5), using insights from the interviews to refine the initial designs. The refined feedback elements are subsequently evaluated using Bloom's Taxonomy to assess their cognitive impact (Sect. 6.6), and we discuss the main findings (Sect. 6.7). The paper concludes by summarising key contributions, addressing methodological limitations, and outlining directions for future research (Sect. 6.8).

6.2 Background

This section establishes the theoretical and terminological basis required for the current work.

6.2.1 Cognitive Fit Theory

Cognitive Fit Theory (Vessey, 1991) postulates that a task-technology fit is essential for problem solving. Decisions require data; if the data matches the type of problem task to be performed, then the performance is better than in the case of a missing match or fit. For example, the theory shows that data in tables is better for symbolic tasks than graphical representations of data.

Each decision maker has individual skills. If data or information exists that provides a good representation of the problem to be solved, then the person's mental problem representation can lead to solving the problem effectively using their individual skills. Tools and technology to support problem solving must also match the task requirements.

6.2.2 Experiential Learning

Experiential learning (Kolb, 1976) argues that feedback is essential for understanding, for extending one's knowledge, for developing skills and for applying theoretical concepts to real-world problems. Feedback must be structured and targeted towards the learner for them to reflect on a problem situation. Furthermore, by applying knowledge to new problems, it can be tested, amended, extended and shared.

In negotiation research, experiential learning was used for developing a blended learning framework to teach digital negotiation skills to students (Melzer and Schoop, 2016). It could be shown that teaching new negotiation concepts is more effective based on experiential learning than on traditional theoretically-oriented knowledge acquisition.

Another approach based on experiential learning is a gamified digital negotiation training (Schmid et al., 2020; Schmid and Schoop, 2018). The trainees were more engaged in the training process and showed a more enduring learning effect.

6.2.3 Negotiation Skills

Effective negotiation necessitates a sophisticated array of skills that are employed to manage processes and resolve conflicts (Lewicki, 1997). Skilled negotiators have the ability to facilitate win-win agreements through strategic action. The development of such expertise requires dedicated negotiation skills training (Roloff et al., 2003; Thompson, 2022). Moreover, personalised training has been demonstrated to enhance skills (Melzer and Schoop, 2016; Thompson, 2022). The present study examines which negotiation skills can be improved through designed feedback elements. Therefore, it is essential to clearly define negotiation skills, as outlined by Meyer et al. (2020), emphasising self-reflection during post-negotiation phases (cf. Table 6.1).

Table 6.1 Negotiation Skills for Self-Reflection

6.2.4 Conflict Styles

The Thomas Kilman Conflict Mode Instrument (TKI) can serve as a tool to support reflection and analysis utilised in training (Holtom and Kenworthy-U'Ren, 2006; Shell, 2001). The present paper employs the TKI to analyse individual conflict styles that indicate negotiation strategies. TKI presents a two-dimensional characterisation of individual conflict behaviour, encompassing the dimensions of assertiveness and cooperativeness (cf. Fig. 6.1).

Assertiveness represents the tendency to prioritise one's own interests; *cooperativeness* represents the tendency to prioritise the interests of the partner. Varying relations between assertiveness and cooperativeness produce five conflict styles (Thomas and Kilmann, 1976, 2008), namely avoiding, competing, accommodating, collaborating and compromising. These conflict styles can be translated into negotiation styles (Ganesan, 1993) and constitute negotiation behaviour in the present research.

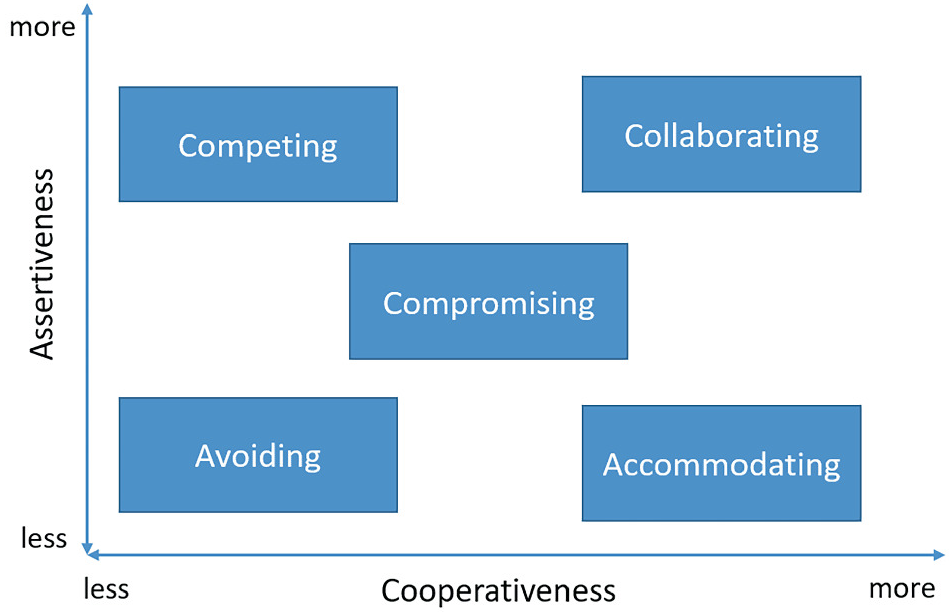

Fig. 6.1 TKI Styles (Thomas und Kilmann 1976, 2008)

6.2.5 Negotiation Feedback

Two distinct categories of feedback exist, namely formative feedback and summative feedback. These categories have been demonstrated to be effective in predicting learning outcomes and motivation (Adarkwah,

2021). Summative feedback evaluates a learner's progress at a specific point in time, often expressed as a numerical grade. Summative feedback can include the expectations or criteria for the task before completion. Grading is usually provided once the task is completed. Formative feedback facilitates a systematic evaluation of the enhancement of the learning process, e.g. by stating strengths and weaknesses without the imposition of a grading system, but rather by means of qualitative feedback (Bloom, 1971; Gikandi et al., 2011; McCarthy, 2015). Whilst summative feedback is considered to be assessment of learning, formative feedback is viewed as an assessment for learning (Adarkwah, 2021; McCarthy, 2015).

Formative and summative feedback can be provided via digital media, such as the internet (Evans 2013; Gikandi et al. 2011). It has been demonstrated that training through NSSs can support the learning process when negotiating with such systems (Kersten, G. and Noronha, S., 1999). Therefore, the feedback provided by NSSs can be defined as formative. In particular, the quality and timing of feedback are crucial factors in enabling effective learning in negotiations (Crook et al., 2012; McCarthy, 2015; Meshi et al., 2012). Feedback does not necessarily have to be provided by experts. Rather, peer feedback can be beneficial if it is constructive and detailed (Falchikov and Goldfinch, 2000).

6.3 Method

The overall research methodology employs a design science research approach, as outlined by Gregor and Hevner (2013). In light of the scarce literature on elements for self-assessment and peer assessment in negotiation training (Panadero and Lipnevich, 2022), a systematic investigation was performed to explore potential feedback elements that promote self-reflection on negotiation strategies in the post-negotiation phase. This investigation involved the design of feedback elements with the objective of addressing the identified gaps. To evaluate the resulting artefact, cognitive fit theory (Vessey, 1991) and experiential learning theory (Kolb, 1976) was used by means of

quantitative data collection, qualitative data analysis, and Bloom's Taxonomy assessment of enhanced feedback elements (cf. Fig. 6.2).

The evaluation was performed by students from European universities who had previously participated in a negotiation experiment using the NSS Negoisst (Schoop et al., 2003; Schoop, 2021). The negotiation experiment comprised a digital negotiation training with a minimum of five negotiations with agents as negotiation partners and at least one digital negotiation with a human negotiation partner. The human negotiation partners also participated in the experiment. A range of case studies were employed in the course of the negotiations, comprising issues, values (numerical or categorical), and the negotiation message that is intertwined with the issues and values.

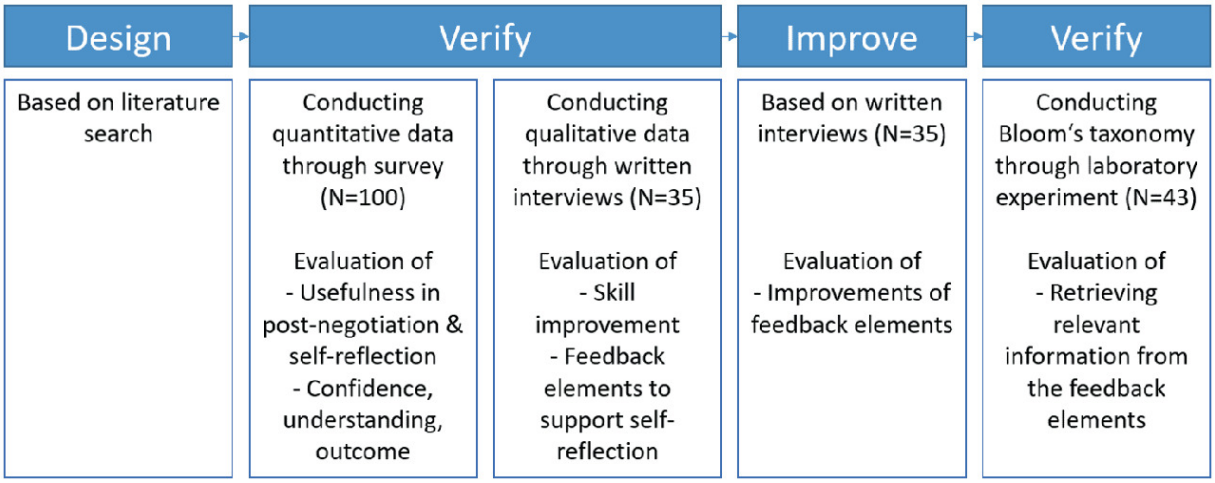

Fig. 6.2 Methodology

Based on Meyer et al. (2020), seven feedback elements were designed to support negotiators in evaluating their concluded negotiations within an NSS. The purpose of these feedback elements is twofold: firstly, to improve negotiation skills (cf. Table 6.1), and secondly, to promote self-reflection during the post-negotiation phase.

A convergent mixed methods approach was employed (Creswell and Plano Clark, 2018). In a first step, a quantitative survey utilised a 7-point Likert scale (1 = totally disagree, 7 = totally agree) with 100 students (43 male, 56 females, 1 gender unknown; with a mean age of

24.19) to determine (1) whether the designed feedback elements would facilitate self-reflection on behaviour in the post-negotiation phase and (2) how these elements influence confidence, understanding, and outcome.

Subsequently, the four highest-rated feedback elements were identified from the quantitative data, followed by written interviews through open-ended survey responses with a focus group (N = 35). The purpose of the focus group was to examine in-depth whether these elements could support participants in self-reflection and negotiation skills improvement. The focus group comprised a subgroup of the 100 participants of the quantitative survey, designated as participants S1-S35. In addressing each of the four feedback elements, participants were tasked with considering the following: (1) to assess whether and how the element in question could have facilitated self-reflection during the post-negotiation phase or why the feedback element would not have helped and what improvements would have been needed; (2) which negotiation skills (cf. Table 6.1) would have been improved by the feedback element. The quantitative and qualitative findings underwent a comparative analysis. Furthermore, the same subgroup (N = 35, participants S1-S35) invited to propose enhancements to the feedback elements, should they be able to think of any. The four feedback elements were refined based on the recommendations provided by the participants.

To assess the enhanced feedback elements, a further experiment was conducted. In this experiment, a task was assigned to new participants (N = 43, 21 male, 22 female; mean age = 24.67 years) with the objective of assessing their ability to retrieve relevant information from the feedback elements for self-reflection. The evaluation of the additional experiment was conducted by applying the adapted Bloom's Taxonomy based on Krathwohl (2002). This taxonomy is a framework for the classification of statements pertaining to the learning outcomes expected to result from instruction. The task demanded participants to reproduce and reflect on behaviour, while recognising findings from current negotiations that were presented in the form of example

feedback elements. These elements served to illustrate the intended purpose of the feedback. This approach enabled an examination of whether the improved feedback elements achieved the objective.

The following section introduces the designed feedback elements as well as the evaluations.

6.4 Designed Feedback Elements

Seven feedback elements were designed and incorporated into a survey. These elements include TKI evaluation, behaviour evaluation, history graph, feedback from partner, achieving aspiration level (AL) and reservation level (RL), goals for issue selections, and dashboard.

TKI evaluation examines the participants' predominant conflict style using TKI (Thomas and Kilmann, 1976, 2008) and analyses how participants behaved in each offer.

Behaviour evaluation measures a potential shift in the participant's behaviour throughout the negotiation. Whilst the system is able to determine conflict styles through the feedback element of TKI evaluation, behaviour evaluation captures the participant's self-assessment after each offer. Participants rated their own offers using a 7-point Likert scale (from "totally agree" to "totally disagree") across five dimensions: compromising, avoiding, collaborating, competing and accommodating. The present study does not consider dependencies between behaviour types; instead, it examines all characteristics identified within the sent offers (textual content and concessions).

The *history graph* tracks utility values for each offer, alongside the participant's aspiration level and reservation level (cf. Fig. 6.6). This element evaluates whether and which offers meet the defined goals of the participant.

Feedback from partner is designed to provide feedback to the partner and receive feedback from the partner following the conclusion of the negotiation. Feedback from partner is a reciprocal process, i.e. the receipt of feedback is contingent on the provision of feedback. Such

feedback requires each participant to reflect upon the negotiation while revealing mutual perceptions.

Achieving aspiration level (AL) and reservation level (RL) enables evaluation of whether an issue in an offer meets the defined goals. AL is the best utility a negotiator aims to achieve whereas RL is the utility the negotiator is willing to accept as the worst case.

The identification of the zone of possible agreements (ZOPA) in received offers is facilitated by *goals for issue selections*, which assist in determining which issue selection effectively achieves AL and/or RL.

The *dashboard* provides a comprehensive overview of the current negotiation by specifying negotiation duration, current status (e.g., ongoing, accepted), current utility value, whether AL and RL have been reached, and recommendations to achieve the goals.

Following the introduction of the seven feedback elements, a survey was conducted. The survey evaluated the effectiveness of each feedback element for supporting participants during two distinct phases: firstly, the post-negotiation phase, and secondly, enhanced self-reflection. The results were consolidated into a ranking (Sect. 6.4.1). Further evaluations were conducted to ascertain whether these elements would enhance the participants' confidence, understanding, and negotiation outcomes (see Sect. 6.4.2).

6.4.1 Ranked Feedback Elements

The survey results indicate the mean usefulness of the feedback elements after the negotiation concluded and for self-reflection. The participants' perception of the usefulness of each designed feedback element was assessed using a 7-point Likert scale during the post-negotiation phase and for self-reflection.

The elements of feedback are presented in Table 6.2, with their ranking indicating descending usefulness in the post-negotiation phase. The three elements that received the highest ratings in the post-negotiation phase were TKI evaluation, behaviour evaluation and history graph. The three elements that received the highest ratings in terms of self-reflection were TKI evaluation, behaviour evaluation, and

feedback from partners. The usefulness of the feedback elements during the post-negotiation phase and the usefulness of the feedback elements for self-reflection are equally important.

Therefore, the top three elements of each class resulted in four elements that were deemed most useful, according to our findings. The remaining elements were found to be less useful to participants because as certain elements were considered to be more beneficial during the negotiation phase (e.g. achieving AL and RL, goals for issue selections).

Some elements were deemed to be more useful during the negotiation phase (such as Achieving AL and RL, Goals for issue selections). Conversely, other elements provided a general overview of the negotiation and were deemed to offer redundant information (e.g. the dashboard). Consequently, only the top four elements were considered in further evaluation.

Table 6.2 Feedback Elements

A quantitative evaluation was applied to examine the usefulness of the seven feedback elements in supporting participants during the post-negotiation phase, and in self-reflection. Subsequently, a further evaluation was conducted for the top four elements: TKI evaluation, behaviour evaluation, history graph, and feedback from partner.

6.4.2 Improving Confidence, Understanding, and Outcome

Furthermore, participants were asked to indicate whether they believed that the feedback elements would enhance their confidence, their understanding of their behaviour, and their negotiation skills (cf. Table 6.3). The results indicated that none of the four elements exhibited a significant impact on improving the outcome. All four elements yielded means between neutral and slight agreement regarding the enhancement of participants' confidence in subsequent negotiations.

Considering whether feedback elements would facilitate comprehension of the partner's behaviour in future negotiations, the data revealed that feedback from the partner tended to support understanding, with a mean score of 4.5. The *history graph* and *behaviour evaluation* neither particularly facilitate nor impede understanding (mean 4.38 and 3.81), while the *TKI evaluation* showed slight opposition to supporting understanding (mean 3.09).

Table 6.3 Quantitative Results

Following the presentation of the results regarding the support of outcome, confidence, and understanding, a comparison was made between these results and the results of the previous section regarding the usefulness of the elements in the post-negotiation phase and in self-reflection. As shown in Table 6.2, the elements that received the highest ratings were those pertaining to negotiation behaviour (1 and 2), the change in utility values over time (3), and the perception by the partner (4). The *feedback from partner* was found to be a valuable source of insight, as it allowed for an assessment of the one's behaviour from the partner's perspective.

The findings are constrained by three distinct factors. Firstly, the negotiation process is characterised by the distinct individual styles of each individual negotiator. Secondly, the negotiation process is defined by the goals of the parties involved. Thirdly, the negotiation process is influenced by the perceptions of the negotiation partner. Nevertheless, the findings can serve as an indicator of the factors that determine negotiation outcomes.

The four feedback elements with the highest rankings regarding self-reflection and usefulness following the conclusion of the negotiation have been shown to have a positive impact on the outcome of future negotiations while improving participant's confidence. It appears that direct *feedback from partner* and the *history graph* are the only elements that facilitate enhanced comprehension among participants regarding their partner and associated preferences, in

comparison to other feedback components. The primary function of *behaviour evaluation* and *TKI evaluation* is to examine the participant's behaviour or TKI. Consequently, these evaluations are not effective in fostering improved understanding of the partner.

An analysis of the rankings reveals that *TKI evaluation* received the highest score in the post-negotiation category, with *self-reflection* ranking second (cf. Table 6.2). However, with regard to outcomes, confidence, and understanding of the partner, *TKI evaluation* was ranked lowest. *Behaviour evaluation* achieved second highest in post-negotiation and highest in self-reflection, as well as highest in confidence and second highest in outcome. *Feedback from partner* was ranked fourth in the post-negotiation phase and third in self-reflection. However, it was ranked highest in terms of outcome and understanding, while achieving second place in terms of confidence. The *history graph* was ranked third in terms of post-negotiation and fourth in terms of self-reflection, as well as third in terms of outcome and confidence. Additionally, it was ranked second in terms of understanding.

Consequently, the relative ranking of feedback elements is contingent upon their intended application. The simultaneous utilisation of multiple feedback elements is expected to facilitate comprehensive reflection during the post-negotiation phase.

A second quantitative evaluation was conducted to examine whether the feedback elements would support the participants in achieving a higher level of outcome, confidence, and understanding when using these elements. Further, the results of both quantitative evaluations were compared.

6.5 Written Interviews

A quantitative evaluation was conducted via written interviews. This section synthesises the results of the interviews. To this end, the support in self-reflection is examined. Furthermore, potential improvements are discussed. Finally, skill improvements are assessed.

6.5.1 Skill Improvements

In order to answer RQ2 (namely which negotiation skills support the self-reflection of participants through the use of the designed feedback elements in the post-negotiation phase), participants were asked to discuss which skills from Table 6.1 could be improved from the feedback elements.

29 of 35 participants were tasked with the evaluation of the potential four feedback elements to facilitate skill enhancement. The frequency with which a particular skill is identified as a target for improvement by a specific feedback element is shown in Fig. 6.3. Participants were permitted to specify multiple applicable skills. As the number of skills cited for each element varied, the total number of skills cited was proportioned against the total number of skills cited per element.

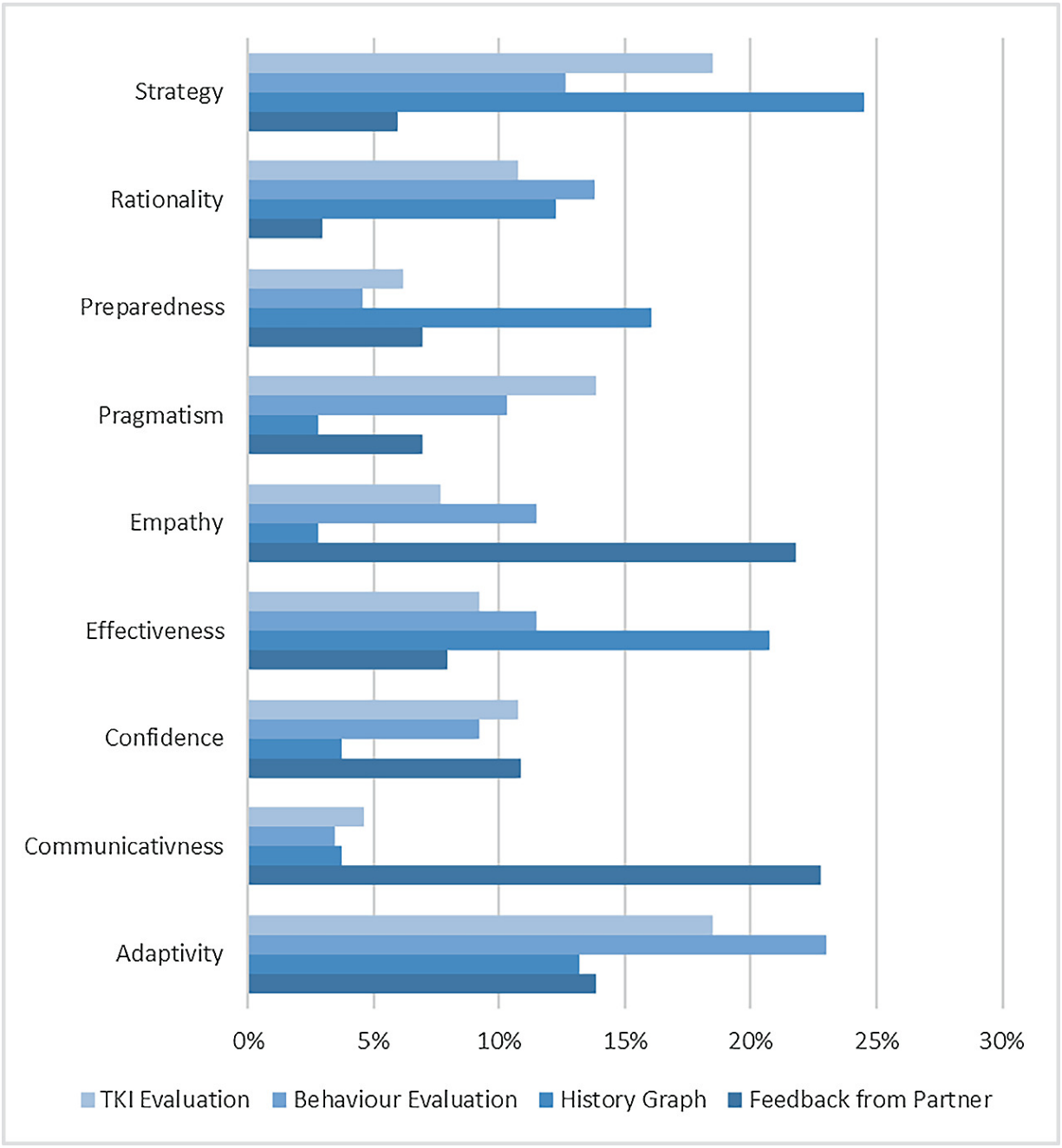

Fig. 6.3 Skill Improvements

TKI evaluation reportedly enhances the skills strategy (18.46%) and adaptivity (18.46%); followed by pragmatism (13.85%), rationality (10.77%), and confidence (10.77%). The skills effectiveness (9.23%), empathy (7.69%), preparedness (6.15%), and communicativeness (4.62%) showed minimal improvement potential. One participant indicated no skills could be improved.

Behaviour evaluation enhanced the skill adaptivity (22.99%); followed by rationality (13.79%), strategy (12.64%), empathy (11.49%), effectiveness (11.49%), and pragmatism (10.34%). The skills confidence (9.2%), preparedness (4.6%), and communicativeness (3.45%) demonstrated lowest improvement potential. Three participants reported no skills could be improved.

The participants indicated that the *history graph* could enhance the skills strategy (24.53%) and effectiveness (20.75%); followed by preparedness (16.04%), adaptivity (13.21%), and rationality (12.26%). The skills confidence (3.77%), communicativeness (3.77%), pragmatism (2.83%), and empathy (2.83%) showed minimal improvement potential.

Feedback from the partner improved the skills communicativeness (22.77%) and empathy (21.78%) followed by adaptivity (13.86%) and confidence (10.89%). The skills effectiveness (7.92%), preparedness (6.93%), pragmatism (6.93%), strategy (5.94%), and rationality (2.97%) showed the lowest improvement potential. One participant indicated that none of the given skills could be improved.

This section presents the findings of the initial qualitative evaluation, in which participants discussed a pivotal component of the experiential learning theory, namely the reflection of skill development. The discussion further concerned when the participants would use the feedback elements.

6.5.2 Evaluating Feedback Elements

In addition to evaluating skill improvements, participants were asked to provide an assessment as to whether the feedback elements had the potential to facilitate self-reflection in the post-negotiation phase. The participants in question constitute a sub-group of those who completed the quantitative survey and are designated as participants S1-S35. The findings are presented in Table 6.4 as positive/negative/neutral regarding support of self-reflection through the feedback elements.

Table 6.4 Results Written Interviews

22 of 35 participants considered the feedback element *TKI evaluation* to be useful for supporting self-reflection, particularly through its lean design which "[…] avoids overloading the user with excessive figures and impressions […]" (S7). The element was stated to enables novices to recognise their individual style and potential improvements (S23). TKI evaluation enables participants to reflect on their behavioural alignment with the intended plan and provides feedback on discrepancies between their behaviour and the planned behaviour, as well as their TKI style (S2). Ten participants remained ambivalent, recognising the element's potential by identifying strengths and weaknesses of their own behaviour (S1), yet experiencing difficulties with the element's design (S29) due to an unclear relation between negotiation style and success of individual offers (S1). S24 found the element to be lacking a general retrospective analysis or in "[…] negotiations skills or [in] the development of more effective offers […]" (S1). One participant noted that the feedback element might lead negotiators to focus solely on their applied TKI style from previous negotiations rather than adapting their behaviour to current situations (S12). Two participants indicated that the element was not conducive to their self-reflection (S19); one found the focus on TKI excessive given TKI's limitations (S18).

25 of 35 participants confirmed that the feedback element *behaviour evaluation* would enhance their reflection on the negotiation. Participants particularly valued the timeline focus, enabling them to identify when the behaviour changed, and where the behaviour could be improved in the negotiation (S20). Furthermore, this element enables negotiators to comprehend the reasons behind the emergence of changes in behaviour (S10), thereby allowing them to "[…] understand the outcome of the negotiation in relation to [the] behaviour […]" (S13) while evaluating the effectiveness of an offer and the influence on the behaviour (S22). It was recognised by four participants that the element had potential, but it was also highlighted that there were limitations, including an insufficient supply of contextual information to support the graph (e.g., reasons for value

changes) (S29) and the absence of factors affecting outcomes (e.g., emotions, attitudes) (S33). Six participants indicated that the current feedback element is not conducive to self-reflection due to its overwhelming (S19) and unclear (S2) design. Furthermore, the process of deriving meaningful insights from the comparison of multiple negotiations, or the reflection on unsuccessful negotiations, is considered to be challenging (S3) since “[…] there is no comparison with a reference value […]” (S12), such as the personal TKI style.

In the course of the study, it was found that 24 out of the 35 participants considered the feedback element *history graph* to be useful for the purposes of self-reflection. The existing history graph in Negoisst was enhanced by incorporating both AL and RL. Participants described the element as "[…] simple and easy to understand […]" (S14) and "[…] a powerful tool for users to analyse, reflect, and refine negotiation skills for future scenarios. […]" (S7). It enables users to determine when and to what extent concessions are made (S28). Three participants indicated that the element is useful solely for reflecting on and adjusting strategies during negotiations (S12, S13). Five participants acknowledged its potential while criticising the necessity to state AL and RL, given their awareness of personal preferences (S5, S19). For the remaining three participants, the element merely visualised past negotiations and utility values (S4, S8), thus it “[…] does not play a big role in reflection after the negotiation […]” (S8).

The *feedback from the partner* was considered beneficial for reflecting on the negotiations by 16 of the 35 participants when context-based feedback was received (S5, S6). Furthermore, it facilitated “[…] sharing perspectives, discussing decision rationales, and providing constructive feedback on the negotiation process.” (S7). Thirteen participants expressed ambivalence, acknowledging the value of feedback from a human partner while acknowledging that its efficacy is contingent on the quality of the feedback, which in turn is influenced by the behaviour of the negotiation partner in conflict situations (S10) and the information received (S34). However, the free-text field format appeared to lack structure and subjectivity (S1). It was emphasised by a

number of participants that feedback must be constructive if it is to be useful for the purposes of reflection. Six participants expressed the opinion that the feedback element was unhelpful, primarily due to concerns regarding dependency on constructive feedback (S3, S18). For instance, it was noted that some participants might perceive negotiations (even in training) as competitive, thereby hindering the provision of open and honest feedback (S14). Furthermore, "[…] especially in […] failed negotiations, there will be cases in which no constructive dispute follows. Also, in my experience, dissatisfied people tend to write feedback rather than satisfied ones […]" (S29).

As the results show, the majority of participants indicated that the feedback elements, namely TKI evaluation, behaviour evaluation and history graph, were conducive to self-reflection. Feedback from partners is commonly reported as being beneficial. Participants who expressed criticism of these elements of feedback raised concerns regarding the constructive nature of the feedback process, which is dependent on the partner.

6.5.3 Improved Feedback Elements

Based on the identified limitations of the feedback elements, participants were asked to provide suggestions that would serve to better support their self-reflection processes. It is important to note that these participants also represent the subgroup of those who completed the quantitative survey. This subgroup is hereafter designated as participants S1-S35. The following sections will analyse the suggestions in order to design refined feedback elements.

TKI Evaluation

Eighteen participants proposed improvements for the *TKI evaluation*. Ten participants recommended improving the design of the dots through numbered identifiers (S1, S17), colour differentiation (S2, S19) or enhanced information density by connecting the dots with corresponding offers (S7, S11, S30). Thus, this feedback element was enhanced using numerical labels and linking dots in the graph to

respective offers, thereby increasing information richness, e.g., enabling users to examine utility values and content of the offer. A filtering mechanism (checkboxes) was implemented allowing participants to select offers for detailed analysis (S30, S34).

Seven participants requested evaluation of their partner's behaviour (S5, S7), recognising its influence on their own behaviour (S1, S25) and enabling style comparisons (S33). While this information could supplement the graph, revealing a partner's behaviour typically faces resistance from the partner, precluding integration into the feedback element.

Two participants emphasised the incorporation of previous negotiations through three mechanisms: i) the display of average behaviour from previous negotiations within current negotiation graphs to assess consistency with previous negotiations (S2); ii) the analysis of change in behaviour across negotiations over time (S15); and iii) the cataloguing of personally effective strategies from previous negotiations (S15). The provision of additional information from previous negotiations enabled participants to identify changes and investigate underlying causes. The potential benefit of additional information remains to be substantiated through future research.

Furthermore, participants proposed the incorporation of additional factors, including concrete examples of how one's own TKI could be conceptualised in offers (S11), one's own utility values per offer and style (S6, S25), and average negotiation behaviour to assess TKI alignment (S21). Further information could include explanations of behaviour-outcome relations (S7), how different expressions of behaviours influence outcomes across negotiation phases (S17), how behaviour emerges from given offers and factors (S2, S24), and how certain offers deviate from TKI styles (S20). One participant expressed a preference for a chronological presentation of evolving negotiation styles (S7). As some participants already reported, the provision of additional information would exacerbate the issue of information overload, thus necessitating the implementation of filtering mechanisms within TKI evaluation.

As depicted in Fig. 6.4, triangles represent a participants' own behaviour. Applied negotiation styles per offer appear as dots. Initial offers display "1" in the dot, second offers show "2". Diamonds depict average styles from previous negotiations. Squares indicate behaviour in specific negotiations, with "N1" representing the first concluded negotiation. All four indicators can be filtered via right-side controls. For each TKI style, percentiles following Shell (2001) determine top 25%, middle 50% or bottom 25% classification. Figure 6.4 demonstrates a competing-compromising style with collaborating tendencies (triangles). The negotiator exhibited strong competitive behaviour in the initial two offers.

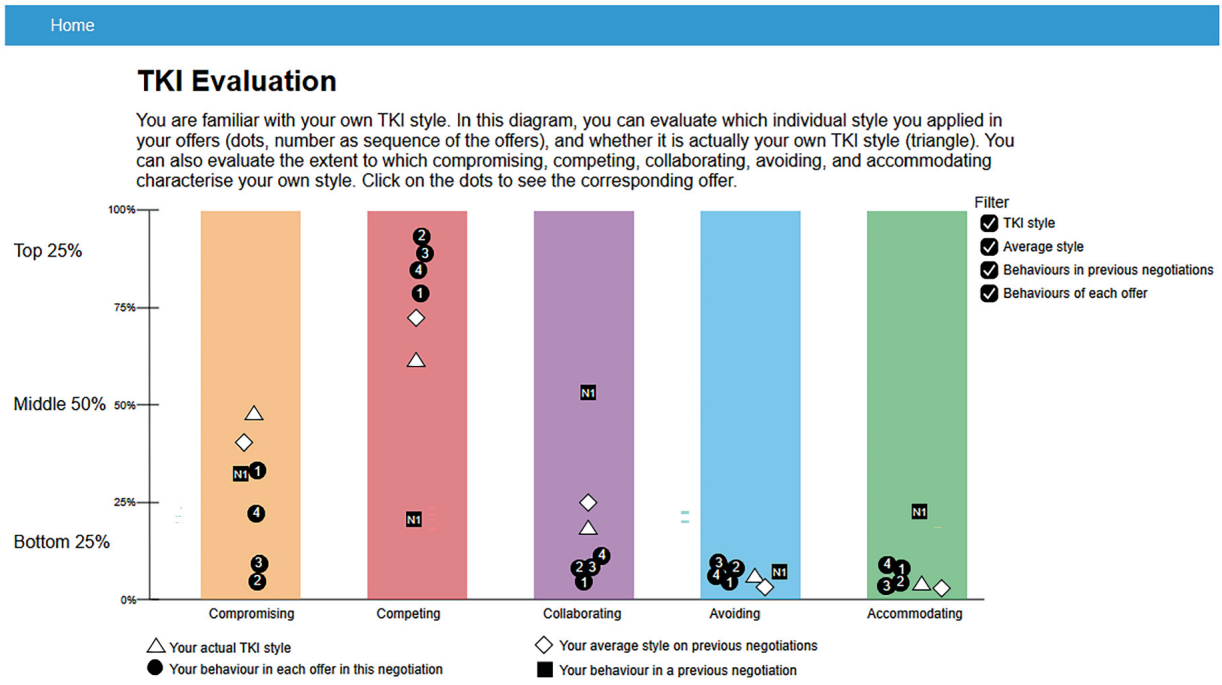

Fig. 6.4 TKI Evaluation

Behaviour Evaluation

Seventeen participants proposed enhancements for *behaviour evaluation*. Seven participants recommended incorporating additional values to enable more comprehensive analyses. The additional values that were recommended included personal TKI style (S1, S5, S12), previous negotiation analysis (S2), utility values of offers (S6, S24, S25),

and set goals (S25). However, TKI necessitates separate consideration due to the potential for integration into behaviour evaluation to result in confusion. It is evident that negotiation behaviour is contingent on a multitude of participant-independent factors, including the characteristics of the partner and the negotiation setting. Consequently, incorporating previous negotiations in behaviour evaluation would be inadequate for a comprehensive analysis. Nonetheless, in the event of negotiations being repeated within the context of training sessions, behaviours from previous negotiations can be integrated to facilitate a comparative analysis.

Eight participants recommended incorporating the behaviour values of their partner (S24, S33, S35), as the partner's style poses a significant influence on one's own behaviour (S1). Nonetheless, it is generally undesirable for the partner to disclose their behaviour. Consequently, this suggestion was not incorporated into the feedback element.

Five participants suggested improving the labelling. To facilitate meaningful comparison of utility values and offer-specific information, linking offers within the graph is recommended (S21, S29). Labelling should be modified according to parameters from 0 (disagree) to 100 (completely agree) (S23). Four participants desired more comprehensive information for each identified behaviour (S2, S17), suggestions for strategic changes to conclude the negotiation (S17), and goal achievement indicators (S17). These improvements, which depend on displaying elements during negotiation, were not incorporated during the post-evaluation phase, but should be considered for feedback during the negotiation phase. The potential value of monitoring trends (S4), such as participant's behaviour at specific times during the negotiation, appears promising but requires further research.

As illustrated in Fig. 6.5, the example participant exhibits high levels of compromising, collaborating, and accommodating behaviour, without avoiding or competing behaviour, in the early phases of the negotiation. Subsequently, there is an evolution of behaviour, with

decreased accommodating, compromising and collaborating behaviour and increased competing behaviour. The factors contributing to these changes are numerous and include the partner's attitude or offers, as well as changes in goals.

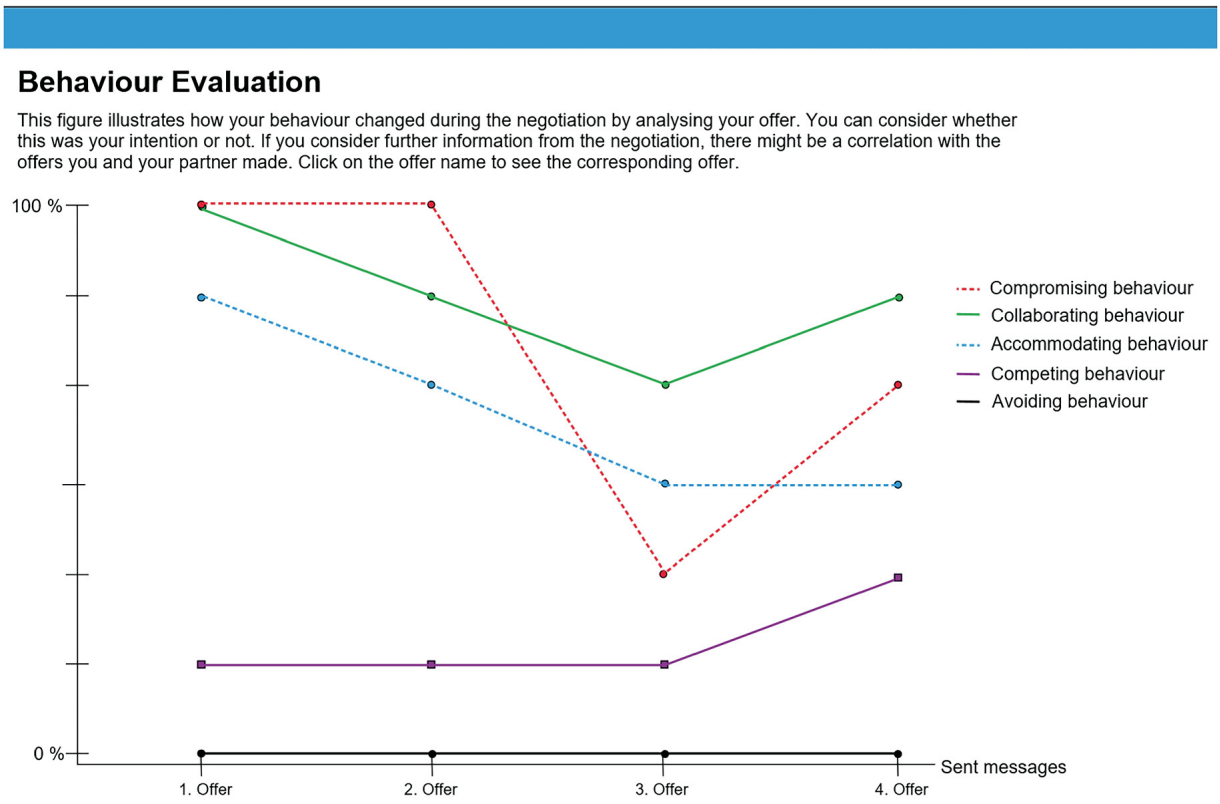

Fig. 6.5 Behaviour Measurement

History Graph

Fourteen participants put forward a series of proposed enhancements for the history graph, thereby indicating a potential for enhancement. Although eight participants requested the display of the partner's utility value (S5, S16, S29, S32), this approach risks exposing their preferences and is typically undesirable for the partner. Whilst this approach may be efficacious in the context of training, and indeed, within certain parameters, we nevertheless stand by our position of maintaining the confidentiality of the partner's preferences. Further suggestions, such as including plotting averaged results from previous participants (S16, S17) and displaying optimal outcomes for particular

styles and defined goals, require further research. Furthermore, the incorporation of the history graph during the negotiation phase remains feasible. In response to the recommendations put forward by three participants (S2, S20, S24), we have incorporated individual issue visualisation through the implementation of filtering mechanisms that enable the selective display of values pertaining to each issue. These modifications have been integrated into the feedback element, as illustrated in Fig. 6.6.

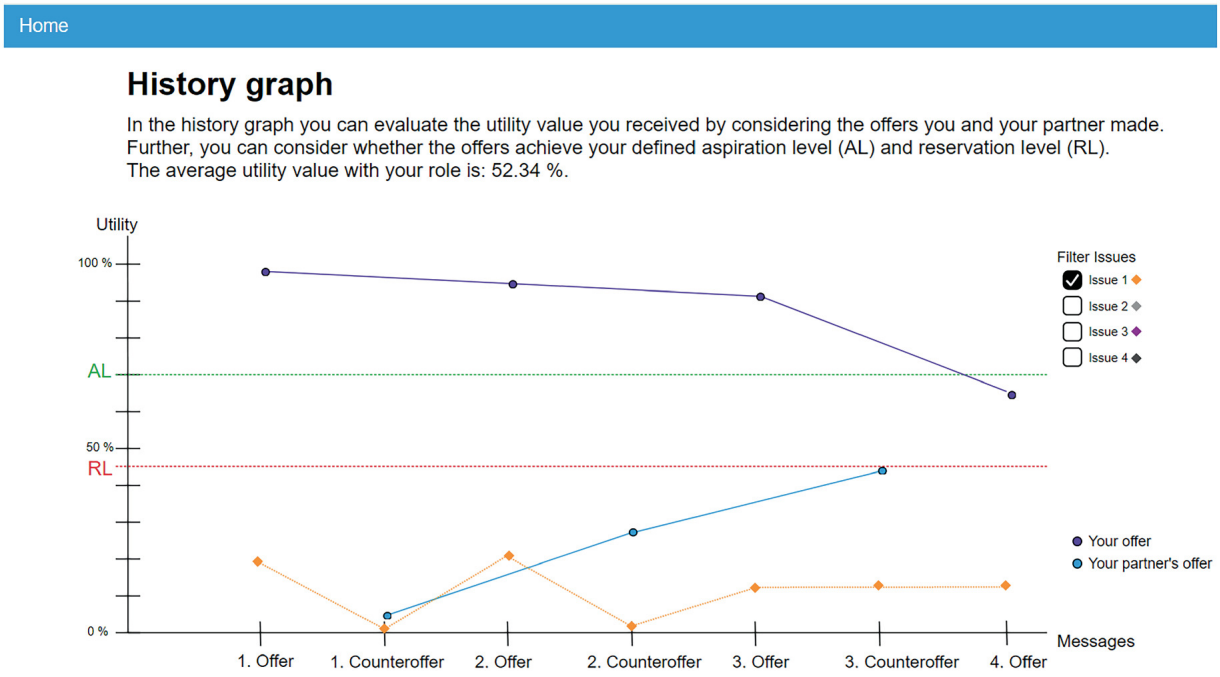

Fig. 6.6 History Graph

Feedback from partner

25 participants proposed enhancements for *feedback from the partner*. In the opinion of nine participants, the implementation of mandatory feedback requirements would serve to enhance the quality of the feedback (S1, S13, S14, S21). Twelve participants advocated for the incorporation of structured feedback presentations, incorporating both open and closed questioning formats (S14), complemented by additional free-text fields for supplementary comments. These free-text fields address the suggestions of seven participants for enabling additional inquiries (S24) or chat functionality to resolve

misunderstandings (S25, S27). Furthermore, the recipients of feedback will be able to utilise scale or star-based ranking systems in order to assess the quality of the feedback, as recommended by a number of additional participants (S1, S6, S15). This enables feedback providers to quantify their feedback effectively. Despite the provision of mandatory feedback, there is a possibility that some individuals may choose to withhold their feedback. Consequently, after a predetermined timeframe during which only one participant provides input, feedback is automatically transmitted to the partner.

This feedback element comprises structured questions, ensuring consistent quality of constructive feedback, plus a free-text field where participants can contribute additional comments (cf. Fig. 6.7). The display of structured questions depends on the final state of the negotiation, i.e. accept or reject.

The example in Fig. 6.7 demonstrates a rejected negotiation; questions adapt accordingly. It is important to note that several questions in the survey accommodate multiple response options.



Fig. 6.7 Feedback from Partner

The participants provided feedback on the four elements of the feedback system, evaluating their usefulness and subsequently integrating these elements into the features of the system. In the following section, an evaluation will be conducted of the enhanced feedback mechanisms in terms of their efficacy in facilitating self-reflection among the participants.

6.6 Evaluating Improved Feedback Elements

It is important to recognise that feedback elements are designed to facilitate the post-negotiation reflection of negotiators. The training with these feedback elements aims to enable negotiators to extract relevant information effectively. Therefore, the enhanced feedback elements are validated using Krathwohl (2002), adapted from Bloom's Taxonomy. An experiment was conducted in which participants were provided with a comprehensive task. The task description encompassed a comprehensive account of a previous negotiation, accompanied by a detailed description of behaviour across all four feedback elements. In addition, it furnished information about a subsequent negotiation, incorporating a preference model, the intended negotiation behaviour, predefined AL and RL, and the initial offers of the new negotiation. The participants were assigned the following tasks:

1. Summarise and interpret why the negotiation ended in rejection by considering all provided feedback elements.
2. Explain the status of the ongoing negotiation with examples.
3. Formulate a new offer based on the given aim and behaviour. Explain why you are making this offer.

According to the cognitive process dimension, task 1 involves understanding through knowledge of specific details and elements (factual knowledge) and conceptual knowledge. In task 2, the cognitive

process constitutes an analysis with conceptual knowledge. Task 3 involves applying new knowledge, which necessitates formulating a new offer with appropriate contextual understanding of the task (meta-cognitive knowledge). This is followed by analysing the formulated offer, which requires explaining the offer (conceptual knowledge) (cf. Fig. 6.8).

		Knowledge Dimension			
		Factual knowledge	Conceptual knowledge	Procedural knowledge	Meta-cognitive knowledge
Cognitive Process Dimension	Remember				
	Understand	Task 1	Task 1		
	Apply				Task 3
	Analyse		Task 2, Task 3		
	Evaluate				
	Create				

Fig. 6.8 The Cognitive Process Dimension

For each task, participants earned points according to their accuracy in completing the assigned tasks. Results were subsequently classified into three distinct categories: up to 25% of the task were correctly answered, between 26% and 74% of the task were correctly answered, and at least 75% of the task were correctly answered. In total, 43 participants completed the tasks. 28 participants (65.12%) successfully summarised and interpreted the concluded negotiations utilising provided feedback elements (Task 1). 41 participants (95.35%) effectively explained the status of the ongoing negotiation (Task 2). 40 participants (93.02%) competently formulated new offers while delivering comprehensive explanations (Task 3). The results of the tasks are consolidated in Table 6.5.

Table 6.5 Results of Bloom's Taxonomy

This section employed Bloom's Taxonomy to validate the four feedback elements and to ascertain the participants' ability to utilise them in reflecting on their negotiations in the post-negotiation phase. The findings demonstrate that the majority of participants were able to answer the task correctly, thus confirming that the feedback elements have been appropriately designed for the purposes of training.

6.7 Discussion

In order to answer the first research question (Which feedback elements can support participants in reflecting on their finished digital negotiation in the post-negotiation phase?), several experiments were conducted, including a literature search, quantitative and qualitative evaluations, and applying Bloom's Taxonomy. The following discussion will address the results in question.

A comprehensive literature review yielded four elements that have been demonstrated to support self-reflection during the post-negotiation phase. Following refinement based on participants' suggestions, subsequent evaluation validated the effectiveness of these elements for the training purpose. The detailed findings are discussed below.

The results of the written interview for *feedback from partner* corroborate the conclusions of the overall ranking of fourth position. The survey results in outcome (first rank), confidence (second rank) and understanding (first rank) present contradictions, which may be attributable to insufficient in-depth reflection during the survey. The primary concern in written interviews pertains to the reliability of partners in providing constructive feedback that remains valid, thereby necessitating adaptation through mandatory participation and the utilisation of structured questions. Given that mandatory participation may constitute external regulation within extrinsic motivation (Ryan and Deci, 2000), these effects warrant further examination.

It is evident that the structuring of inquiries with predetermined response alternatives imposes constraints on the comprehensiveness of potential responses. This limitation necessitates future research and adjustments to the pre-selection process for absent response options. In order to mitigate the risk of an incorrect answer being selected, it is necessary for the adaptations to include an additional input field. This field should be designated as "Others" and enable participants to articulate individual responses to questions. The supplementary responses provided by participants must be subjected to evaluation in subsequent research and incorporated into question-answer pools.

History graph ranked second or third across the categories outcome, understanding, and confidence, while placing second in written interviews. Suggestions have the capacity to enhance the information richness of the history graph; however, they increase the complexity of the feedback element. Filter mechanisms are incorporated to counteract this complexity. The most frequently proposed modification was the incorporation of the partner's utility values, a suggestion that has been shown to provide valuable feedback (Thompson, 2022). While some participants desired further experiences (Schmid et al., 2020) and wanted to experiment with different behaviours, repeated negotiations became impossible once the partners' private information had been disclosed. The feasibility of providing the partners' preferences during the post-negotiation phase in training depends on the capacity to generate case studies autonomously. Balle et al. (2025) introduce a case study generator, though it currently relies solely on utility values and requires further investigation with large language models to assess its contextual suitability for the present purposes.

In the survey, *behaviour evaluation* was ranked second in terms of outcomes, first in terms of confidence, and third in terms of understanding. These results are consistent with those obtained from the written interviews. Additionally, behaviour evaluation was deemed useful in the written interviews (25 of 35 participants).

TKI evaluation ranked highest in the survey, with only three interview participants considering it unsuitable for self-reflection. The

primary enhancements to the system consist of the design of specific, precise information, particularly with regard to the relation of corresponding offers. In order to prevent information overload within the graph, checkbox filter mechanisms have been incorporated. The proposal to comprehend a partner's conduct entails the potential for self-disclosure (cf. partner's utility values in history graph) and subsequently the utilisation of this information during subsequent negotiations. Disclosure of partner behaviour is only possible during the post-negotiation phase of training if the partners in question are agents exhibiting randomised behaviour, as opposed to pre-determined behaviour based on previous actions. Further improvements involve the provision of behaviour values based on previous negotiation averages (S2). Given the potential for negotiations to be contradictory and participants to adapt their behaviour to specific situations, it is only possible to calculate averages using negotiation settings that are similar. The current setting of this training component provides a range of scenarios for comprehensive training; therefore, calculating negotiation averages requires the application of negotiations with comparable case studies, a topic which remains unaddressed in this paper.

The behaviour evaluation relies on the negotiators' self-assessment. The system determines actual TKI styles employed during negotiations, as displayed in the feedback element TKI evaluation. Beyond this distinction, *behaviour evaluation* and *TKI evaluation* share similarities. Several participants suggested consolidating these feedback elements, while others appreciate the lean design of the TKI evaluation element. Thus, both elements are present in the artefact with their interconnection and individual emphasis clarified through additional explanations.

Table 6.4 reveals that more than two-thirds of participants found the feedback elements *behaviour evaluation*, *history graph*, *and TKI evaluation* valuable for self-reflection during the post-negotiation phase. This evaluation confirms the effectiveness of these elements. Feedback from the partner facilitated self-reflection for approximately

half of the participants. Nevertheless, the reliability of this feedback element is contingent upon the contribution of the partner. That is to say, the usefulness of the feedback is directly proportional to the participants' prior experiences with their respective partners. The majority of participants who expressed reservations highlighted this precise concern, proposing suggestions to enhance the usefulness of this feedback element. These suggestions have been incorporated into the refined feedback elements.

Results of Table 6.4, combined with previous findings, demonstrate that these four feedback elements constitute essential components for self-reflection during the post-negotiation phase, supporting negotiators accordingly. Consequently, these elements have to be integrated into a training to facilitate self-reflection on negotiation behaviour after concluding negotiations. To implement this training within an NSS, it is essential to ensure the quality of the feedback provided by the partner. In circumstances where intrinsic motivation proves inadequate, the introduction of training incentives, such as gamified rewards, may be a viable solution.

In order to answer the second research question (i.e. which negotiation skills support self-reflection?), discussion of Fig. 6.3 is required. It is evident that, given the distinct nature of the feedback elements in relation to the evaluation dimensions, there is a corresponding support for different skills. The history graph is a tool used to analyse set goals at preference levels. It has been determined that the skills strategy and effectiveness are primary improvement areas. Feedback from the partner evaluates how the participants' behaviour impacts their partner. The predominant improved skills are empathy and communicativeness, as evidenced by textual feedback and emotions regarding behavioural perception.

Behaviour evaluation enables participants to self-reflect on their individual offers and identify their individual strengths, with adaptivity being the most frequently cited skill. The TKI evaluation determines whether and how the participant's behaviour evolves throughout negotiations, identifying the skills strategy and adaptivity as key areas

for improvement. As illustrated above, the skills to be improved are consistent with each element's intended support function. Consequently, the provision of feedback with the aim of facilitating self-reflection has been demonstrated to enhance a range of skills, including empathy, communication, strategy, effectiveness, and adaptability. It is evident that the purposefully integrated feedback mechanisms enhance negotiation skills through self-assessment. In addition to this, they also support experiential learning in accordance with experiential learning theory.

Nevertheless, the efficacy of an element in enhancing skills varies among individual participants. Therefore, from a comprehensive perspective of skill improvement, it is essential that all four elements of feedback are incorporated into the artefact.

Moreover, training effectiveness depends on the individual and on the training purposes (Mathieu and Martineau, 1997), i.e., the usefulness of a feedback element varies accordingly. It has to be noted that the participants in our experiments come from a heterogeneous group as they conduct different courses of study, come from different nationalities, and have different genders. Post-negotiation reflection proves essential for enhanced effectiveness and for achieving integrative agreements (Thompson, 2022). Given the substantial potential of the feedback elements behaviour evaluation, history graph, TKI evaluation, and feedback from partner, as well as their interconnection, these feedback elements are incorporated into our artefact to facilitate self-reflection.

NSSs support negotiators in decision-making and communication. They are frequently used in training environments with or without the use of gamified elements (Kersten and Lai, 2007; Melzer and Schoop, 2014; Schmid and Schoop, 2018). Our research explicitly emphasises training negotiation behaviour through feedback elements that promote self-reflection of trainees. Thus, the current paper establishes a training framework as a blueprint for NSS implementation, enabling trainees to self-reflect on their negotiation behaviour and to enhance their negotiation skills.

As this section shows, our designed feedback elements TKI evaluation, behaviour evaluation, history graph, and feedback from partner support the improvement of particular skills and support participants in reflecting on their negotiations in the post-negotiation phase. The following section presents the outlook and future work of this paper.

6.8 Outlook and Future Work

The objective of this paper is to propose a framework for the design of feedback mechanisms that facilitate self-reflection and the development of negotiation strategies within the context of training. The development of the seven feedback elements was informed by established negotiation literature, and their effectiveness in supporting self-reflection during the post-negotiation phase was evaluated. A comprehensive evaluation of the four feedback elements—namely, feedback from the partner, history graph, behaviour evaluation, and TKI evaluation—was conducted through written interviews. The evaluation process revealed the elements to be useful and effective. A series of proposed enhancements were deliberated and subsequently executed with a view to optimising self-reflection.

As part of this research, skills were identified that are essential for supporting self-reflection in the post-negotiation phase. Furthermore, four feedback elements were identified which support negotiators in enhancing these skills and in reflecting on their strategies after they concluded the negotiation.

The focus of the feedback elements is subject to variation, with a range of approaches employed to accommodate negotiators of differing expertise levels. It is evident that each element is designed to target distinct skill improvements. Therefore, it is recommended that all four feedback elements are integrated as a comprehensive artefact, with the purpose of supporting training during the post-negotiation phase. Future research needs to ascertain whether all feedback elements are

equally beneficial to individuals across the full spectrum of expertise and learning aptitude.

This research presents certain limitations. Written interviews constitute asynchronous interaction, preventing immediate responses despite participants' access to clarification through e-learning platforms and email communication. Participants possessed familiarity with the task of written interviews from previous studies. The feedback elements operated exclusively on the post-negotiation phase, precluding investigation of actual usage patterns and measurable skill improvements. Potential correlations between personality traits and particular preferences of feedback elements remained unexplored. While diverse feedback elements address this concern, comprehensive correlation analysis requires future investigation.

It became evident that the results were dependent on a multitude of factors, owing to the heterogeneity of the participant group, which included individuals with varying degrees of experience in prior negotiations. This aspect, in conjunction with the examination of feedback elements during the post-negotiation phase, led to the multifaceted study. As a first step, the individual self-reflection was assessed through surveys and written interviews. Next, the artefact should be integrated into an NSS, with controlled evaluation studies examining skills improvements through the feedback elements, thereby further evaluating the effectiveness of the feedback elements.

Footnotes

1 The content of the published article is identical to the content presented here; the only changes applied are the alignment of references, text formatting, and numbering of figures and tables to be consistent throughout this thesis.

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7. Discussion and Outlook

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The previous chapters focused on answering RQ1–RQ4. This chapter discusses the contributions of the five studies to the overall research objective of this thesis, which is to design and implement a framework for assisting novice negotiators in the correct use of negotiation styles during negotiations. The subsequent section summarises the findings of the five studies. The contributions to the overall research objectives are then discussed, the main limitations are outlined and finally, future research is presented.

7.1 Summary

This thesis addresses four research questions in five studies in order to answer the overall research objective. The studies are summarised in the following and a framework is derived (cf. Fig. 7.1) in order to answer the main research objective.

Study 1 answers RQ1 by conducting an experiment with 112 participants to examine whether and to what extent they can identify their partner's and their own negotiation style. Prior to the experiment, the participants had attended a negotiation course and most of the participants considered themselves to be familiar with negotiation

styles (mean 4.97; SD 0.925). However, the results indicate a degree of uncertainty regarding the intended usage of negotiation styles (mean 4.97; SD 1.346). In those negotiations which concluded with a rejection, at least one participant employed a competitive style. The identification of the partner was conducted with two different negotiation partners: an agent with a mirroring behaviour (tit-for-tat) and a human partner. The majority of participants were unable to identify the mirroring behaviour. Furthermore, the participants regarded their own negotiation style as distinct from that of their partner, perceiving their partner as more competitive than themselves. 18 of 112 participants identified the correct style of their human negotiation partner. Thus, they misinterpreted either their own style or their partners' style. However, applying negotiation styles appropriately in different negotiation scenarios is essential to achieve one's goals (Lewicki, Barry, Saunders, 2010; Salacuse, 1999). Therefore, a more detailed training focusing on the application of the individual style of a participant have to be conducted.

To apply individualised style training to negotiators, the terms negotiation style and negotiation behaviour need to be defined. As there is no universal term in the literature, negotiation styles, negotiation behaviour and the associated negotiation strategies and tactics, as well as their relationship to each other, need to be defined. This is addressed in the RQ2 and is answered with the second study. To do so, a systematic literature review was conducted, encompassing 876 articles. 139 articles were identified as relevant and led to a taxonomy with three dimensions, including styles, meta-strategies, and meta-tactics, and nine subdimensions, including strategies and tactics for digital negotiations. Concrete expressions of the taxonomy can be opposite approaches in styles and behaviours, thus, not all categories of the (sub-) dimensions can be applied in each behaviour/style. Further already existing patterns from the literature were adapted to the taxonomy to provide a framework for behaviour including styles, strategies, and tactics.

The objective of study 3 is to design different agents as negotiation partner in order to train the identification of negotiation styles (including strategies, and tactics) of the partner (cf. RQ3). A DSR approach was applied to design and evaluate this training component. With agents, the training can be repeated and carried out at any time. The taxonomy developed in study 2 forms the basis for the design of different negotiation partners, with varying levels of difficulty. The training encompasses three different negotiations with diverse agents and an evaluation after each negotiation in which trainees had to characterise their partners' styles, strategies, and tactics. These agents implement the functions of a negotiation software agent (NSA) by operating as software components that make decisions on behalf of a principal, thereby becoming actively involved in negotiations (Kersten and Lai, 2007). Following each negotiation, they received feedback on whether their statements about styles, strategies, and tactics were correct. As a result, the training assists participants in identifying their partners' styles (strategies, and tactics) more precisely. The training is designed to support choice of freedom and enhance competence. Thus, the component of study 3 ensures a training to identify the partner's style, strategies, and tactics.

Study 4 and study 5 aim to provide feedback to support negotiators to conduct their intended negotiation style during negotiations and to reflect on their applied negotiation style after the negotiation has been concluded. Since negotiators tend to adjust their negotiation style and perform better in subsequent negotiations when they receive immediate feedback (Thompson, 2022), these two studies address this by exploring feedback components through DSR approaches with quantitative and qualitative research. Study 4 specifically focuses on the design and evaluation of an expert system to support negotiation styles in a digital negotiation training. As a result, the training supports the identification and intentional use of an individual negotiation style during a negotiation, as well as the identification of individual goals by providing advice on how the own goals can be achieved by a specific style. Nine features were designed and evaluated, from which seven

advice features were classified as useful for this purpose, namely setting goals, utility calculator, recommended utility, example packages, advice graph, advice text, and self-reflection. The functionality of these features combine the functions of a negotiation agents-assistant (NAA) by offering advice and support to a human negotiator in a timely manner, and specific to the context (Kersten and Lai, 2007). In study 5, seven feedback elements were designed and evaluated with the purpose to provide negotiators with features to reflect on their negotiation style in the post-negotiation phase. These features included feedback from both the system and the negotiation partner, providing an external perspective on the negotiation style and the perception of the negotiator's own style by the partner. As a result, four feedback elements were identified as being supportive of engaging in self-reflection, namely feedback from the partner, history graph, behaviour evaluation, and TKI evaluation.

Thus, the studies can be summarised in a framework for negotiation style training (cf. Fig. 7.1), which 1) helps to identify the style of the partner and 2) supports the negotiators to negotiate according to their own intended styles by applying various features, such as an agent as a uniform negotiation partner, advice to ensure the intended negotiation style is used during the negotiation, and feedback elements that enable self-reflection in the post-negotiation phase.

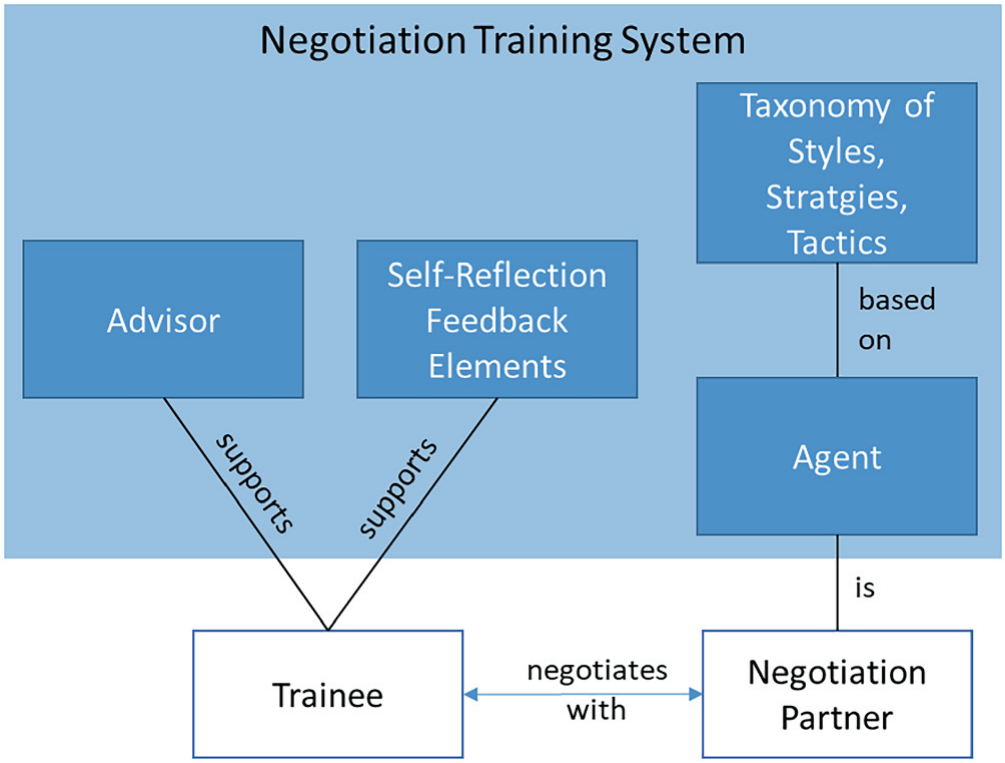

Fig. 7.1 Framework Negotiation Style Training

The findings of this thesis demonstrate that the proposed framework for style training is an effective solution for supporting negotiators in developing an understanding of diverse negotiation styles, strategies and tactics. Furthermore, the framework enables negotiators to use negotiation styles intentionally during negotiations.

7.2 Discussion of Contributions

In accordance with the DSR approach (Peffers et al., 2007), this thesis designs and evaluates an framework for a digital negotiation styles training. The applied approach adopted in this thesis is intended to yield two main contributions: 1) to design and evaluate a new artefact for digital negotiation training that addresses learning outcomes and skills related to negotiation styles; and 2) to derive design principles (Gregor and Hevner, 2013) to the design of negotiation styles training. Both of these contributions are sufficient to be considered part of the

knowledge base in DSR. In the following discussion, the artefact is analysed and design principles for style training are derived.

This thesis proposes a digital negotiation training that focused on different aspects of negotiation styles (including strategies, and tactics). The consolidation of the studies in this thesis leads to an overall approach to negotiation style training. Deriving common terms for negotiation styles, strategies, and tactics as well as the consolidating taxonomy (cf. Chap. 3), provides the basis for the training. Building on this foundation, a training approach based on Kolb (1976) and Lewicki (1997) can be derived since all four components of the process are mapped by the studies. *Theories* are provided in a negotiation course, in the system before reflecting the negotiation styles of the partner, during the negotiation in form of advice and in the post-negotiation phase in form of feedback elements. In addition to personal *goal setting* for training purposes, trainees have to define their own goals. The system provides goal setting support through identifying their AL and RL for a negotiation, thus determining their goals for negotiation styles. During the training, a series of *negotiations* are conducted, beginning with two preliminary negotiations to familiarise the trainees with the system in which the training is integrated. Further three negotiations are provided to support the training of negotiation styles with different negotiation partners. Furthermore, there is the possibility to repeat each negotiation as often as the trainees want. The final component *debriefing* is supported by the findings of Chap. 6, which identified four feedback elements that facilitate self-reflection on one's applied negotiation styles.

At least two parties participate in negotiations. Consequently, when training negotiators through conducting negotiations, at least one negotiation partner is required. All negotiators can influence the negotiation outcome, as the resolution of any disputes need to be solved collectively. In order to reduce external factors in matching negotiators and to ensure a controlled training environment, such as incompatible attitudes or strategies, and gender, a uniform negotiation partner should be used (Vetschera et al., 2014). As negotiating with

humans involves decision-making and communication (Bichler et al., 2003), this has also been addressed by the uniform negotiation partner. Such external factors may be reduced by professional negotiation partners; however, the availability of such experts is limited. The present thesis thus focussed on agents as negotiation partners in such training.

The derived taxonomy (cf. Chap. 3) can be regarded as a template for the decision-making of negotiation agents. This is because it provides a range of styles, strategies, and tactics, which can be combined to ensure all possible negotiation behaviours can be modelled. This template can therefore be used for trainings between human negotiators and rule-based agents, i.e. rule-based characterises the behaviour of an agent to be expressed by rules (Hindriks et al., 1999; Poggi and Tomaiuolo, 2009; Shoham, 1993).

The primary focus of this thesis has been on decision-making processes; however, communication has been included through the implementation of rule-based text modules utilising the Event Processing Language (EPL) Drools (Paschke and Kozlenkov, 2009; Red Hat). The implementation rule-based text modules enable variations for the different styles (strategies, and tactics) and limited reactions on the received offers from the trainees based on decision-making. However, it should be noted that the interpretation of messages from the trainees at the content level is not supported by our expert system. This issue is addressed in some research, for example by the use of chatbots as agents (Schmid et al., 2021), by agents using voice or natural language to negotiate (Mania et al., 2020; Mollick and Mollick, 2024; Schlimbach et al., 2022; ur Rehman and Riaz, 2011).

In the context of advice and providing feedback, there have been preliminary investigations through artificial intelligence approaches (Mollick and Mollick, 2024). However, these approaches are currently too abstract to facilitate the training of negotiation styles in a profound manner. Furthermore, concerns have been raised regarding the utilisation of (generative) artificial intelligence in learning as learners tend to rely on the usage which reduces the learning of skills (Bastani et

al., 2024) and they tend to be incapable of ignoring incorrect AI advice (Schemmer et al., 2022). Thus, this thesis focuses on ensuring training with correct feedback at any time and less bias among the negotiators as possible. Rule-based agents and expert systems have been developed to this end. Expert systems (also called rule-based systems) employ knowledge and encode it into a series of rules. The system is programmed to identify a rule that is similar or accurate with the present scenario and if such a rule is found, the system will execute it in a manner consistent with the actions of an expert (Grosan and Abraham, 2011).

In order to provide advice during the negotiation (cf. Chap. 5) and feedback after its conclusion (cf. Chap. 6), the present thesis focused on negotiation styles. Firstly, it is important to be aware of one's own negotiation styles as this is a first step to negotiate effectively (Miller, 2014) and thus to ensure that novice negotiators are not overwhelmed by the large number of different strategies and tactics. Secondly, it is important to provide an efficient expert system with a manageable number of rules (Grosan and Abraham, 2011).

Researchers have identified that negotiators may vary their negotiation styles while negotiating (Preuss and van der Wijst, 2017). This issue is addressed in the provided feedback in the post-negotiation phase, as all potential negotiation styles are included in the analysis and thus any shift in style during the negotiation process would also be identified. In order to ensure an efficient expert system, the complexity of the system should be kept as low as possible (Grosan and Abraham, 2011). Whilst the advice given during the negotiation focuses solely on the dominant style, the training ensures a decreased complexity for the system.

While digital skills are already supported through the utilisation of the NSS Negoisst, this framework, in particular the advice features and feedback elements, supports the skills perspective-taking, pragmatic, creative, visionary, and strategic, as well as cognitive intelligence, emotional intelligence, and interpersonal intelligence.

As previously stated, negotiators require cognitive, emotional and interpersonal intelligence (Lewicki, Saunders, Barry, 2010). Although these intelligences are fundamental requirements, they can also be enhanced by the proposed framework as they can learn from experiences. Self-regulation, self-awareness, patience, and empathy are supported through the providing of information regarding the partner and how the partner perceived the own behaviour. The received information enables trainees to understand the motives of their partners. The skill pragmatism is supported by providing features to set realistic goals (cf. Fig. 5.5). The skill creativity is supported by providing recommended utility as well as example selections (cf. Fig. 5.7, Fig. 5.8) to enable the exploration of new ideas, the modification of offers and the combination of unrelated issues into one set. The skill vision is supported by the advice features, in particular with regard to setting goals (cf. Fig. 5.5), as well as during the negotiation with the features self-reflection, advice text, advice graph, and recommended utility (cf. Fig. 5.7, Fig. 5.9–Fig. 5.11). The skill strategy is supported by the ability to repeat negotiations, the advice feature of the goal setting and the feedback elements of post-negotiation. These features facilitate reflection on the set negotiation styles and goals (cf. Fig. 5.5, Fig. 6.4–Fig. 6.7). Perspective-taking is supported by the evaluation of the negotiation partner (cf. Chap. 3), in which trainees state the style of their partner and receive feedback from the system confirming the accuracy of the applied styles. This is further supported by the advice features, in particular the advice texts which specify among others when the trainee do not consider the partner (cf. Fig. 5.9). Finally, perspective-taking is supported by the provision of feedback in the post-negotiation phase, in particular when receiving feedback from the partner as well as providing feedback to the partner (cf. Fig. 6.7). This thesis is designed to address the comprehensive skill training of negotiation styles (including strategies and tactics) by creating awareness to identify the partner's styles, supporting the application of the negotiator's own styles during negotiations, and facilitating self-reflection after the negotiation have completed.

Design principles are derived from the framework of this thesis. These design principles, which have been derived from the present work, do not claim completeness; rather, they may be extended in future research. The design principles outlined in this thesis also extend a list of design principles for learning negotiation skills proposed by Zahn and Schöbel (2024):

1. Designers deriving the requirements for the training should consider different learning theories and theories of motivation in order to examine how users learn.
2. Designers should consider utilising training that involves continuous re-evaluation, facilitating the adaption of the training to enable new theories and requirements on a regular basis. This can be achieved through the application of a DSR or an agile approach.
3. Designers should consider utilising a training that is individualised for each trainee, considering their unique conflict behaviour.
4. Designers should consider using training that encompasses the entire negotiation process. This should include the setting of goals, the selection of strategies, the implementation of these strategies in negotiations, and the evaluation of the applied strategies in the post-negotiation phase.
5. Designers should consider utilising a training that provides a uniform negotiation partner (agent) to mitigate external factors and enable trainees to repeat negotiations as well as focus on different styles.
6. Designers should consider using training that provides multiple negotiation partners to train different styles and to enable learning adaption in different scenarios.
7. Designers should consider using training that includes negations

partners who possess decision-making ability and communicate in natural language, in order to train both aspects of negotiations.

8. Designers should consider the creation of training that provides individual feedback and advice through various forms of representations, including textual and visual representations.
9. Designers should consider utilising training that provides feedback from the negotiation partner.
10. Designers should consider incorporating training that fosters freedom of choice, with the objective of enhancing motivation through customisation.

7.3 Limitations

The present thesis is subject to several limitations, which are rooted in the design and evaluation process of the applied DSR approach. These limitations need to be considered in terms of generalising the results.

Firstly, the present framework provides primarily a digital negotiation training of negotiation styles. Thus, digital skills and basic negotiation skills are prerequisites for participation in this training.

Secondly, the training utilises case studies that have already elicit preferences. Consequently, this training does not encompass the preference elicitation process (Schoop, 2021). Typically, negotiators adjust their preferences during the course of negotiation as they communicate and receive new information from their partner (Lenz and Schoop, 2019). As the trainees are not permitted to adapt their preferences during the training, they are only able to set their goals prior to each negotiation. NSSs generally provide support to negotiators in the process of negotiating changes to the agenda (Fernandes, 2016). Nevertheless, the intention at this time is not to make changes to the agenda, such as adding or deleting, negotiation issues. In this regard, the scope of creativity (Lewicki, Saunders, Barry,

2010) in these aspects are limited with the training, but the training may be expanded regarding this in the future.

In the evaluation conducted in Chap. 2–6, participants were students from European universities who had participated in a negotiation course. As demonstrated in the literature, negotiation training is frequently conducted in courses of universities (Köszegi and Kersten, 2003; Melzer and Schoop, 2016). Thus, the utilisation of students in the evaluation process provides a valid metric for evaluating the training. Given that the participants of the evaluation were exclusively students from European universities, the results may be subject to bias with regard to cultural influences (Brett and Thompson, 2016), and thus, the results should be generalised with caution. Further factors, including emotions, motivation, personality, trust, relationship, gender, and power, can influence negotiations and the use of negotiation styles (Brett and Thompson, 2016). Thus, the findings need to be confirmed through the utilisation of a more heterogenous sample.

Finally, since negotiations encompass decision-making and communication processes (Lewicki et al., 2015; Thompson, 2022) and training is essential to become a good negotiator (Steensma and Groeneveld, 2010), both processes should be supported through training in NSSs. Whilst the framework of this thesis includes an in-depth analysis of the decision-making aspect of negotiation styles, the communication process has to be integrated in a more detailed manner for negotiation styles by using agents which provide arguments in natural language, like Mollick and Mollick (2024), Schlimbach et al. (2022), and ur Rehman and Riaz (2011). With the exception of study 5, the proposed framework was implemented in an NSS. For the purpose of further evaluation, in particular, to examine the actual usage of the feedback elements of study 5, they should be implemented as well. The learning effects of the advice and feedback elements should be examined via motivation theories, such as SDT.

7.4 Future Work

This dissertation aimed to raise awareness of various negotiation styles and to provide support for trainees in following their intended style and in identifying their partner's style. The findings indicate that the conceptualised framework is beneficial in assisting trainees in the execution of these tasks. Nevertheless, questions that extend beyond the scope of this thesis remain unanswered, and further research is necessary to enhance digital training in negotiation styles.

Firstly, the simulated utility curves for advising the trainees can be further individualised by e.g., an individual message count (Sect. 5.4.3). The message count was defined as a static value to define when the negotiation properly ends by examine previous experiments. Even the results show a median 10 messages and a mean 10.15 messages, there could be future research by conceptualising an individual message count to enable providing adapted advice for trainees who like to exchange more messages than the mean. To do so, the planned number of exchanged messages could be asked before the negotiation start, i.e., during the pre-negotiation phase in preparing the negotiation and together with defining goals. Whether pattern recognition could be applied in this context has to be examined as sufficient training data and already participated negotiations of the trainees have to be available.

The current implemented advice features of study 4 focus on one recommended style, which is intended to simplify the training complexity for novice negotiators (cf. Sect. 7.2). As for some negotiators the negotiation styles changed during the negotiation process (Preuss and van der Wijst, 2017), training of multiple (dominant) styles could be from relevance too. Considering negotiation strategies and tactics in the advice feature could further support the level of detail in individualised negotiation style training. However, there is a tremendous large number of possible style-strategies-tactic combinations (cf. Chap. 3) which would be in contradiction with the importance of providing an efficient expert system (Grosan and

Abraham, 2011). Thus, in order to implement this, other data analysis methods should be considered in future research such as pattern recognition.

Further, the feedback in the training can be extended by providing an agent as a tutor, like the approaches of Traum et al. (2003) and Zahn and Schöbel (2024), with whom trainees can communicate via natural language by using (AI-) chatbots. Application programming interfaces (APIs) can be used to integrate extant (AI-) chatbots, such as ChatGPT. These tutors can be used to provide assistance in understanding the provided advice and feedback elements, how to apply the intended negotiation style, or assistance to identify the negotiation style of the partner.

As demonstrated in Sect. 7.2, the majority of the aforementioned agents tend to show deficiencies in terms of style and its training. However, the agent developed by Balle et al. (2025) uses genetic algorithms to train negotiation styles of the agent negotiation partner for a training purpose. The agents in Balle et al. (2025) exclusively focused on the agent's style, excluding strategies and tactics, during training, and are at this stage only a prototype. However, it demonstrates an additional approach for designing negotiation styles. The integration of this approach with the agent design outlined in this thesis holds potential for enhancing individualisation of negotiation partner behaviour. Regardless of this, the proposed agents in this thesis can be extended by a feature to create the negotiation partner by the trainee. Whilst this approach would limit the training in identifying the partner's negotiation styles, it could be advantageous for negotiators to prepare for a specific negotiation with a known negotiation partner (and established negotiation style of this partner). This would allow the negotiator to experiment with different negotiation styles to ascertain which style would be most effective in achieving the own goals.

Furthermore, the negotiation partner could be extended by providing arguments for offers through the utilisation of (AI-) chatbots, a concept that has been explored in previous studies, such as Kerlyl et al. (2007), Mollick and Mollick (2024) and Schlimbach et al. (2022).

Nevertheless, further research is required in the context of potential effects regarding negotiation styles.

Finally, the proposed training outlined in this thesis could be further expanded by designing the negotiation partner and its behaviour based on several factors of the trainee, such as TKI type, and cultural background. The TKI type of an individual determines their behaviour in conflict situations (Thomas and Kilmann, 1976, 2008). Depending on the style, it can be more or less challenging for trainees to achieve an (satisfied) agreement, for example when two highly competing negotiators negotiate with each other (cf. Chap. 2). Depending on the cultural dimensions, such as individualism vs. collectivism, hierarchy vs. egalitarianism, and high- vs. low-context cultures, the cultural background of the negotiators can vary and thus, can cause failed negotiations when negotiators are unaware of the partners' cultural background (Brett, 2000; Hofstede, 2011; Lewicki, Barry, Saunders, 2010; Lewicki, Saunders, Barry, 2010). In order to consider culture within this framework, agents have to adopt behaviour that are representative of different cultures. Hofstede et al. (2012) have already designed an agent-based simulation model to address this. However, these findings have to be adapted and validated in further research in the context of training negotiation styles.

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Table 6.5 Results of Bloom's Taxonomy

Categories	Task 1	Task 2	Task 3
At least 75%	28	41	40
Between 26% and 74%	11	0	3
At most 25%	4	2	0

Table 2.3 Used Negotiation Styles and Conclusion Statement of the Negotiation

Negotiation Style	**N**	**Conclusion Statement of the Negotiation for N Participants**	
		Reject	**Accept**
Accommodating	1	0	1
Accommodating & Avoiding	1	0	1
Accommodating & Compromising	9	0	9
Avoiding & Competitive	3	3	0
Collaborative	29	0	29
Collaborative & then Compromising	1	1	0
Competitive	10	6	4
Competitive & Collaborative	2	0	2
Compromising	31	0	31
Compromising & Collaborative	2	0	2
Compromising & Competitive	23	0	23
Total	112	10	102

Table 2.8 Identified Negotiation Style in Simulation—Accommodating

Negotiation Styles	**N**	**TKI Accommodating**				
		Min	**Max**	**Median**	**Mean**	**SD**
Accommodating	1	4	4	4	4	-
Accommodating & Avoiding	1	6	6	6	6	-
Accommodating & Compromising	9	2	8	7	6.2222	1.9309
Total	112	0	11	6	5.4821	2.3867

Table 6.1 Negotiation Skills for Self-Reflection

Negotiation Skills	Description
Adaptivity	Adapting e.g., negotiation behaviour through improved understanding of the negotiation partner (ElShenawy, 2010).
Communicativeness	Sharing information to the partner to decrease confusion and misinterpretation (Lewicki et al., 2015).
Confidence	Acquiring as much knowledge as possible for the negotiation to be well informed (Lewicki et al., 2015).
Effectiveness	Identify, prioritise, set, and achieve objectives stated for future negotiations (Lewicki, Barry, Saunders, 2010).
Empathy	The ability of building on self-awareness, understanding the feelings of others and considering their views in formulating messages (Lewicki et al., 2015).
Pragmatism	The ability of understanding various meanings of syntax, semantics, and communication style, concerning the intention of additional, hidden information (Lewicki, Barry, Saunders, 2010).
Preparedness	Achieving an understanding of goals and interests of oneself and the partner (Lewicki, Barry, Saunders, 2010).
Rationality	The ability to reduce irrationality and avoid decision biases (Lewicki, Barry, Saunders, 2010).
Strategy	The ability to plan effectively and to set goals (Lewicki, Barry, Saunders, 2010).

Table 2.7 Identified Negotiation Style in Simulation—Competing

Negotiation Styles	**N**	**TKI Competing**				
		Min	**Max**	**Median**	**Mean**	**SD**
Avoiding & Competitive	3	5	12	11	9.3333	3.0912
Competitive	10	2	12	6	6.1	3.2078
Competitive & Collaborative	2	2	8	5	5	3
Compromising & Competitive	23	0	11	5	5.4783	3.215
Total	112	0	12	5	5.4821	3.6253

Table 2.1 Overview of Mapped TKI Conflict Styles and Negotiation Styles (Lewicki, Saunders, Barry, 2010; Thomas and Kilmann, 1976, 2008)

TKI Conflict Style	**Negotiation Style**	**Outcome of ...**		**Synonym**
		Negotiator	**Counterpart**	
Avoiding	Avoiding	Lose	Lose	
Competing	Competitive	Win	Lose	Distributive
Accommodating	Accommodating	Lose	Win	
Compromising	Compromise	Split the Difference		Trading Issues
Collaborating	Collaborative	Win	Win	Integrative, Cooperative, Expand the Pie, Logroll

Table 2.5 Identified Negotiation Style in Simulation—Compromising

Negotiation Styles	**N**	**TKI Compromising**				
		Min	**Max**	**Median**	**Mean**	**SD**
Accommodating & Compromising	9	3	12	9	9	2.4944
Collaborative & then Compromising	1	11	11	11	11	-
Compromising	31	4	12	9	8.4839	1.9489
Compromising & Collaborative	2	6	9	7.5	7.5	1.5
Compromising & Competitive	23	2	12	8	8.1739	2.2775
Total	112	2	12	8	8.3125	2.053

Table 5.1 Results of the Usefulness of the Derived Features

No.	Category	Description	Mean	SD
1	Setting goals	General advice in setting goals	4.83	1.572
2		Goal setting independent of suitability for personal negotiation style	4.52	1.638
3		Support setting realistic goals in terms of the own negotiation style	5.24	1.397
4		Support setting realistic goals in terms of the setting of the negotiation	5.28	1.375
5	On-track above	Advice when above on-track to reach goals	4.50	1.608
6	On-track	Note that one is on the right track and provide advice on how to proceed with the next offer	5.42	1.116
7	On-track but not optimal	General advice when not optimal on-track to reach goals	6.07	0.855
8		Advice to be still able to reach the own goals, but concession-making strategy has to be changed	5.66	1.062
9		Only advice, when the offer is also below the own goals	3.51	1.539
10		Also advice even if it contradicts the own negotiation style*	5.01	1.354
11	Not on-track & above goals	General advice when not on-track but above goals	5.96	1.047
12	Not on-track & below goals	General advice when not on-track and below goals	6.08	0.977
13		Advice to undo a concession	4.85	1.458
14		Advice to reject the negotiation	3.69	1.721
15		Only give general advice regarding the next offer	4.43	1.397
16		Specific advice for a subset of the decision-making for the next offer	4.68	1.33
17		Advice with concrete concessions to be made in the next offer	4.78	1.335
18		Provide a concrete offer that achieves the defined goals	4.46	1.607
19		General advice for future offers by not addressing a concrete offer, e.g., you should insist to reach your goals	4.63	1.328
20		Provide a figure to identify whether one is on-track or not	5.51	1.17
21		Advice to reach the own goals dependent on the own negotiation style	5.00	1.26
22	Scope of	Provide feedback on every offer	4.78	1.533

No.	Category	Description	Mean	SD
23	advice	Provide feedback on every second offer	3.78	1.608
24		Provide feedback 2–3 times in a row and then stop if it is ignored	3.89	1.703
25		Only provide feedback if the second offer is also not on track, even if I no longer could achieve my goals	3.92	1.625
26		Provide feedback in general*	6.08	0.977
27	Evaluate ended negotiation	Possibility to deactivate the assistant	5.64	1.441
28		Advice when the decision-making process is concluded	5.86	1.343
29		Provide feedback on whether the goals are reached not matter whether they are aligned with the negotiation style or not	5.46	1.092
30		Provide feedback on whether the goals are reached based on the own negotiation style	5.65	1.026
31		Provide feedback on whether the goals were realistic with regard to the negotiation partner	5.66	1.225

Table 4.2 Specification of Level A, B, C

	Level A	**Level B**	**Level C**
Behaviour category	Compromise	Moderate	Tough
Information exchange	Share Information (or n.s.)	Share Information (or n.s.)	Withhold Information (or n.s.)
Strategy composition	Mixture of strategies	Mixture of strategies	Mixture of strategies
Time dependent	Immediate	Delayed	Delayed
Behaviour dependent	Concession reciprocity	Concession reciprocity (or n.s.)	Concession reciprocity (or n.s.)
Central concern	Partner & own	Partner & own	Own
Concession-making degree	Gradual (or n.s.)	Gradual (or n.s.)	Gradual (or n.s.)
Concession-making approach	Fixed (or n.s.)	Fixed (or n.s.)	Random
Used algorithm	Conceder	Linear	Randomised
Target utility	60%	100%, then 65%	100%, then between 100% and 75%
Behaviour category	Compromise	Moderate	Tough

Table 2.9 Comparison of Negotiation Styles in Training

TNT's Negotiation Style	Participant's Negotiation Style	N	Identical
Accommodating	Compromising	1	-
Accommodating & Collaborative	Accommodating & Collaborative & Compromising	1	-
Accommodating & Collaborative & Competitive	Compromising	1	-
Accommodating & Competitive	Competitive	1	-
Accommodating & Competitive & Compromising	Accommodating & Competitive & Compromising	1	1
	Accommodating & Compromising	1	-
Accommodating & Compromising	Competitive & Compromising	1	-
	Compromising	2	-
Avoiding	Compromising	1	-
Avoiding & Competitive	Competitive & Compromising	1	-
Collaborative	Collaborative	7	7
	Collaborative & Competitive	2	-
	Competitive	1	-
	Compromising	1	-
Collaborative & Competitive	Collaborative	4	-
	Collaborative & Competitive	5	5
	Collaborative & Competitive & Compromising	1	-
	Collaborative & Compromising	1	-
	Competitive	1	-
	Compromising	1	-
Collaborative & Compromising	Collaborative	1	-
	Collaborative & Competitive	1	-
	Collaborative & Compromising	1	1
	Compromising	1	-
Competitive	Accommodating & Compromising	1	-
	Collaborative	8	-

TNT's Negotiation Style	Participant's Negotiation Style	N	Identical
	Collaborative & Competitive	2	-
	Competitive	7	7
	Compromising	2	-
Competitive & Compromising	Accommodating & Competitive	1	-
	Competitive	1	-
	Competitive & Compromising	2	2
	Competitive & then Compromising	1	-
	Compromising	1	-
Compromising	Collaborative	1	-
	Collaborative & Competitive	1	-
	Competitive	5	-
	Compromising	5	5
Not Identified		35	-
Total		112	28

Table 6.4 Results Written Interviews

Feedback Elements	Positive	Negative	Neutral
TKI Evaluation	22	2	11
Behaviour Evaluation	25	6	4
History Graph	24	3	8
Feedback from Partner	16	6	13

Table 5.4 Results Judge Advisor System

Self-Reflection Advice	Negotiation 1	Negotiation 2
Total Usage	380	257
Prefer own approach	13	2
Prefer system's approach	367	255

Table 5.3 Results Usage of Feature Example Packages

		Negotiation 1	**Negotiation 2**
General	Started negotiations	81	54
	Concluded negotiations	77	51
	Attempt number 1	66	48
	Attempt number 2	12	5
	Attempt number 3	3	1
	Total sent messages by participants	474	315
Agenda Advice	Total Usage	232	164
	Usage with identical agenda selection	109	68
	Usage with adapted agenda selection	123	96

Table 4.5 Results Learning Outcome

Category		**Median**	**MLE (SD)**
Skill improvement	General	5.143	5.197 (1.138)
	Identification of partner's behaviour	4.667	4.431 (1.578)
	Training own behaviour	5.000	4.702 (1.348)
Satisfaction training		5.000	4.953 (1.290)
System knowledge		5.500	5.442 (1.169)

Table 2.6 Identified Negotiation Style in Simulation—Collaborating

Negotiation Styles	**N**	**TKI Collaborating**				
		Min	**Max**	**Median**	**Mean**	**SD**
Collaborative	29	1	8	5	5.2069	1.4943
Collaborative & then Compromising	1	4	4	4	4	-
Competitive & Collaborative	2	1	6	3.5	3.5	2.5
Compromising & Collaborative	2	5	7	6	6	1
Total	112	1	8	5	4.9286	1.8503

Table 2.4 Identified Negotiation Style in Simulation—Avoiding

Negotiation Styles	**N**	**TKI Avoiding**				
		Min	**Max**	**Median**	**Mean**	**SD**
Accommodating & Avoiding	1	9	9	9	9	-
Avoiding & Competitive	3	2	5	3	3.3333	1.2472
Total	112	1	10	6	5.7857	2.343

Table 5.6 Results Stated Features by the Focus Group

Category	Name of Feature	N (Group 1)	N (Group 2)
Advice features	Advice text (Feature 7)	9	10
	Advice/ History graph (Feature 6)	22	13
	Self-reflection with advice text (Feature 8)	7	–
	Setting goals (Feature 2)	5	8
	Recommended utility & example packages (Feature 4 + 5)	17	–
	Utility calculator (Feature 3)	6	–
Conceived features	Optimal solution advice	–	1
	Agreement Progress Indicator	–	1
	Recommending utility	–	1
Already existing features		2	14

Table 4.3 Correctly Identified Behaviour Expressions of the Agents

		Level A	**Level B**	**Level C**
Concluded Negotiations		117	119	127
Correctly identified	Central concern	76	36	104
	Strategy composition	77	72	72
	Concession-making degree	89	81	69
	Behaviour category 1)	36	19	69
	Behaviour category 2)	17	17	17
	Information exchange	96	83	81
	Total 1)	15	6	13
	Total 2)	19	2	3
	Total 1) and 2)	34	8	16

Table 4.4 Results IMI

	Before Training		**After Training**		**Levene test for equal variance**		**t-test for equality of means**
	Median	**MLE (SD)**	**Median**	**MLE (SD)**	**F**	**p**	**p**
Interest-Enjoyment	5.6	4.51 (1.261)	4.2	4.482 (1.465)	12.242	0.008	0.921
Effort	6	5.73 (1.000)	5.667	5.453 (1.164)	0.876	0.377	0.089
Perceived Competence	-	-	4.5	5.010 (1.180)		-	-
Pressure	-	-	4	3.578 (1.657)		-	-
Perceived Freedom of Choice	-	-	5.333	5.153 (1.199)		-	-

Table 2.2 Participant's Knowledge Level of Negotiation Styles

	N	Min	Max	Mean (SD)
I am familiar with various negotiation styles.	112	2	7	4.97 (0.925)
I am insecure which negotiation styles I should choose in a negotiation.	112	1	7	4.25 (1.346)
I am aware of negotiation styles, but I never used specific strategies with intention.	112	1	7	4.97 (1.485)
I know how to use my negotiation knowledge for my advantage in negotiations.	112	2	7	5.10 (0.930)
The training helps me to understand negotiation processes better.	112	2	7	5.62 (0.979)
The training helps me to understand negotiation styles better.	112	2	7	5.22 (1.264)
The training helps me to improve my negotiation skills.	112	1	7	5.23 (1.280)
I learned how to negotiate while doing the training.	112	2	7	4.72 (1.261)
I learned how to use negotiation styles in negotiations.	112	1	7	4.73 (1.139)

Table 4.8 Results Level C

Level C	**Group 2.1 (N = 63)**	**Group 2.2 (N = 64)**	**Levene test for equal variance**		**t-test for equality of means**
	Mean (SEM)	**Mean (SEM)**	**F**	**p**	**p**
Central concern	0.79 (0.051)	0.84 (0.046)	2.145	0.146	0.468
Strategy composition	0.60 (0.062)	0.53 (0.063)	2.107	0.149	0.417
Concession-making degree	0.54 (0.063)	0.55 (0.063)	0.026	0.873	0.936
Behaviour category	0.54 (0.063)	0.55 (0.063)	0.026	0.873	0.936
Information exchange	0.67 (0.060)	0.61 (0.061)	1.738	0.190	0.506

Table 3.1 Steps of Systematic Literature Review

Step	Description	Remaining Papers
Search	Google scholar as search engine; Search strings: 1) "negotiation style" OR "negotiation strategy" OR "negotiation tactic" "electronic negotiation" -culture 2) "negotiation style" OR "negotiation strategy" OR "negotiation tactic" "e-negotiation" -culture 3) "negotiation style" OR "negotiation strategy" OR "negotiation tactic" "software agent" "e-negotiation" -culture"	876
Exclusion 1	Reason for exclusion: duplicates, language (not English), no access	397
Exclusion 2	Reason for exclusion: missing relevance of title and abstract	167
Exclusion 3	Reason for exclusion: missing relevance of the full text	139

Table 2.10 Comparison of Negotiation Styles in Simulation

Styles Identified by Researcher	Style Identified by Counterpart	N	Identical
Accommodating & Avoiding	Competitive & then Collaborative	1	-
Avoiding & Competitive	Competitive	2	-
Accommodating & Compromising	Accommodating & Compromising	1	1
	Avoiding & Competitive & Compromising	1	-
	Collaborative	2	-
	Collaborative & Competitive	1	-
	Collaborative & Compromising	1	-
	Compromising	1	-
Collaborative	Accommodating & Collaborative & Compromising	1	-
	Accommodating & Compromising	1	-
	Collaborative	9	9
	Collaborative & Compromising	2	-
	Collaborative & Competitive & Compromising	1	-
	Competitive	5	-
	Competitive & Compromising	2	-
	Competitive & then Collaborative	2	-
	Compromising	3	-
Collaborative & Competitive	Collaborative	1	-
Collaborative & Compromising	Collaborative	2	-
	Collaborative & Competitive	5	-
	Collaborative & Compromising	2	2
	Collaborative & then Competitive	1	-
	Competitive	8	-
	Competitive & Compromising	1	-
	Compromising	3	-
Collaborative & then Compromising	Competitive	1	-
Competitive	Avoiding & Competitive	1	-

Styles Identified by Researcher	Style Identified by Counterpart	N	Identical
	Collaborative & Competitive	1	-
	Collaborative & Compromising	1	-
	Competitive	4	4
	Competitive & then Compromising	1	-
Compromising	Accommodating & Competitive	1	-
	Accommodating & Compromising	1	-
	Collaborative	4	-
	Collaborative & Competitive	2	-
	Collaborative & Compromising	4	-
	Competitive	8	-
	Competitive & Compromising	4	-
	Competitive & then Collaborative	2	-
	Competitive & then Compromising	1	-
	Compromising	2	2
Not Identified		15	-
Total		112	18

Table 6.2 Feedback Elements

Rank	Name	Min	Max	Mean Ended Negotiation (SD)	Mean Self-Reflection (SD)
1	TKI evaluation	2	7	5.61 (1.37)	5.63 (1.26)
2	Behaviour evaluation	1	7	5.18 (1.41)	5.70 (1.30)
3	History graph	1	7	5.11 (1.41)	5.38 (1.15)
4	Feedback from partner	1	7	5.05 (1.55)	5.52 (1.62)
5	Achieving AL and RL	1	7	4.74 (1.44)	4.89 (1.35)
6	Goals for issue selections	1	7	4.60 (1.49)	4.90 (1.33)
7	Dashboard	1	7	4.09 (1.76)	4.82 (1.53)

Table 4.1 Expressions of Behaviour Parameter

Parameter	Expressions
Information exchange	Share information, withhold information, none
Strategy composition	Pure strategy, mixture of strategies, none
Time-dependency	Delayed, immediate, none
Behaviour-dependency	Concession reciprocity, none
Central concern	Partner, own, own & partner, none
Concession-making degree	Large, gradual, no, none
Concession-making approach	Random, trade-offs, fixed, none

Table 6.3 Quantitative Results

Supporting	Name	Min	Max	Mean (SD)
Outcome	Feedback from partner	1	7	4.82 (1.424)
	Behaviour evaluation	1	7	4.76 (1.334)
	History graph	1	7	4.64 (1.382)
	TKI evaluation	1	7	4.33 (1.531)
Confidence	Feedback from partner	1	7	4.71 (1.297)
	Behaviour evaluation	1	7	4.59 (1.393)
	History graph	1	7	4.58 (1.312)
	TKI evaluation	1	7	4.13 (1.680)
Understanding	Feedback from partner	1	7	4.5 (1.521)
	Behaviour evaluation	1	7	4.38 (1.516)
	History graph	1	7	3.81 (1.680)
	TKI evaluation	1	7	3.09 (1.602)

Table 4.6 Results Level A

Level A	**Group 2.1 (N = 53)**	**Group 2.2 (N = 64)**	**Levene test for equal variance**		**t-test for equality of means**
	Mean (SEM)	**Mean (SEM)**	**F**	**p**	**p**
Central concern	0.49 (0.069)	0.78 (0.052)	24.025	0.000	0.001
Strategy composition	0.64 (0.067)	0.67 (0.059)	0.457	0.500	0.733
Concession-making degree	0.75 (0.060)	0.77 (0.053)	0.074	0.786	0.892
Behaviour category	0.26 (0.061)	0.34 (0.060)	3.509	0.064	0.357
Information exchange	0.75 (0.060)	0.88 (0.042)	11.800	0.001	0.102

Table 4.7 Results Level B

Level B	**Group 2.1 (N = 56)**	**Group 2.2 (N = 63)**	**Levene test for equal variance**		**t-test for equality of means**
	Mean (SEM)	**Mean (SEM)**	**F**	**p**	**p**
Central concern	0.34 (0.064)	0.27 (0.056)	2.603	0.109	0.415
Strategy composition	0.61 (0.066)	0.60 (0.062)	0.008	0.930	0.965
Concession-making degree	0.68 (0.063)	0.68 (0.059)	0.008	0.927	0.963
Behaviour category	0.14 (0.047)	0.17 (0.048)	0.887	0.348	0.640
Information exchange	0.70 (0.062)	0.70 (0.058)	0.002	0.963	0.981

Table 5.2 Requirements for Advising Decision-Making Processes in Negotiations

Negotiation Phases	Scenario	No.	Requirements
Pre-Negotiation		1	Providing information to justify realistic goals regarding the negotiation style and setting is recommended, although the user has to set their goals by themselves in order to ensure self-determined behaviour.
		2	Providing information to justify whether the desired negotiation style is contradicting with the goals set.
Negotiation	General requirements	3	Providing possibility to deactivate advice function.
		4	Which goals should be used to measure whether the user is on-track depends on conflict type.
		5	Providing for each offer an advice when user is not on-track to reach goals.
		6	Providing graphical support to visualise whether the user is on-track or not.
	On-track	7	Providing hint to continue behaviour.
	On-track but not optimal	8	Providing advice to change behaviour in order to reach goals.
		9	Even if contrary to style, advice should be provided to achieve goals.
	Not on-track & above goals	10	Providing advice to return on-track, e.g., increase concession degree for the next offer.
	Not on-track & below goals	11	Providing advice to undo concession if necessary.
		12	No advice for rejection the negotiation.
		13	Advice should be provided in general how the goals can be reached during the negotiation and how the next offer can be made to reach the next step.
Post-Negotiation		14	Providing short advice whether goals were reached.
		15	Providing advice for reflection.

Table 5.5 Results Number of Stated Features

Number of stated features per participant	Group 1 (N = 23)	Group 2 (N = 17)
1 existing feature	0	3
2 existing features	2	10
3 existing features	18	2
1 existing + 2 conceived features	0	1
2 existing + 1 conceived features	0	1
4 existing features	3	0