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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 effectiveness. 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.

Keywords Digital negotiation · Electronic training · Self-reflection · Negotiation skills · NSS

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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 and Noronha 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. 2) before introducing our design-oriented research methodology (Sect. 3). We then design and evaluate feedback elements through surveys (Sect. 4) and written interviews (Sect. 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), and we discuss the main findings (Sect. 7). The paper concludes by summarising key contributions, addressing methodological limitations, and outlining directions for future research (Sect. 8).

2 Background

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

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.

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.

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 1).

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. Figure 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

Table 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 with 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 et al. 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 et al. 2010).
Preparedness	Achieving an understanding of goals and interests of oneself and the partner (Lewicki et al. 2010).
Rationality	The ability to reduce irrationality and avoid decision biases (Lewicki et al. 2010).
Strategy	The ability to plan effectively and to set goals (Lewicki et al. 2010).

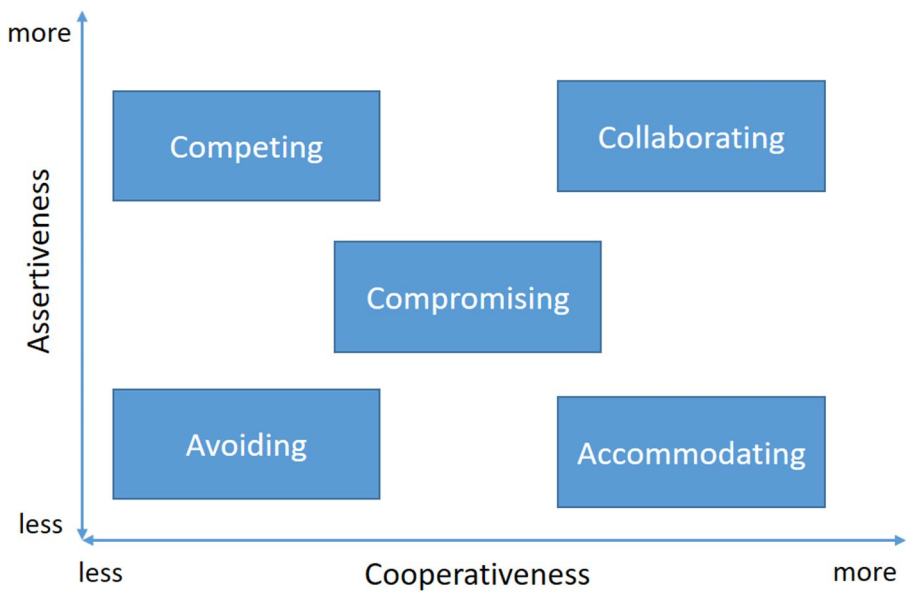


Fig. 1 TKI Styles (Thomas and Kilmann 1976, 2008)

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.

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 and Noronha 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).

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. Figure 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.

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 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;

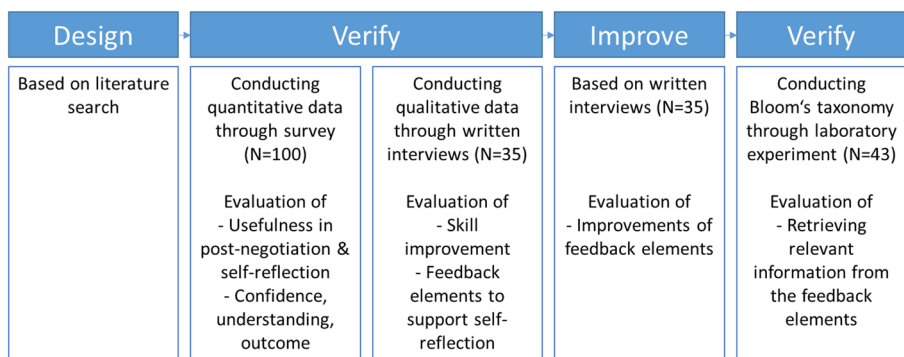


Fig. 2 Methodology

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 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.

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. Figure 5). 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. 4.1). Further evaluations were conducted to ascertain whether these elements would enhance the participants' confidence, understanding, and negotiation outcomes (see Sect. 4.2).

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 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 part-

Table 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)

ners. 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.

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.

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 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 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	4.59 (1.393)
	Behaviour evaluation	1	7	4.71 (1.297)
	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	3.81 (1.680)
	History graph	1	7	4.38 (1.516)
	TKI evaluation	1	7	3.09 (1.602)

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 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 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.

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.

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 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. 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.

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.

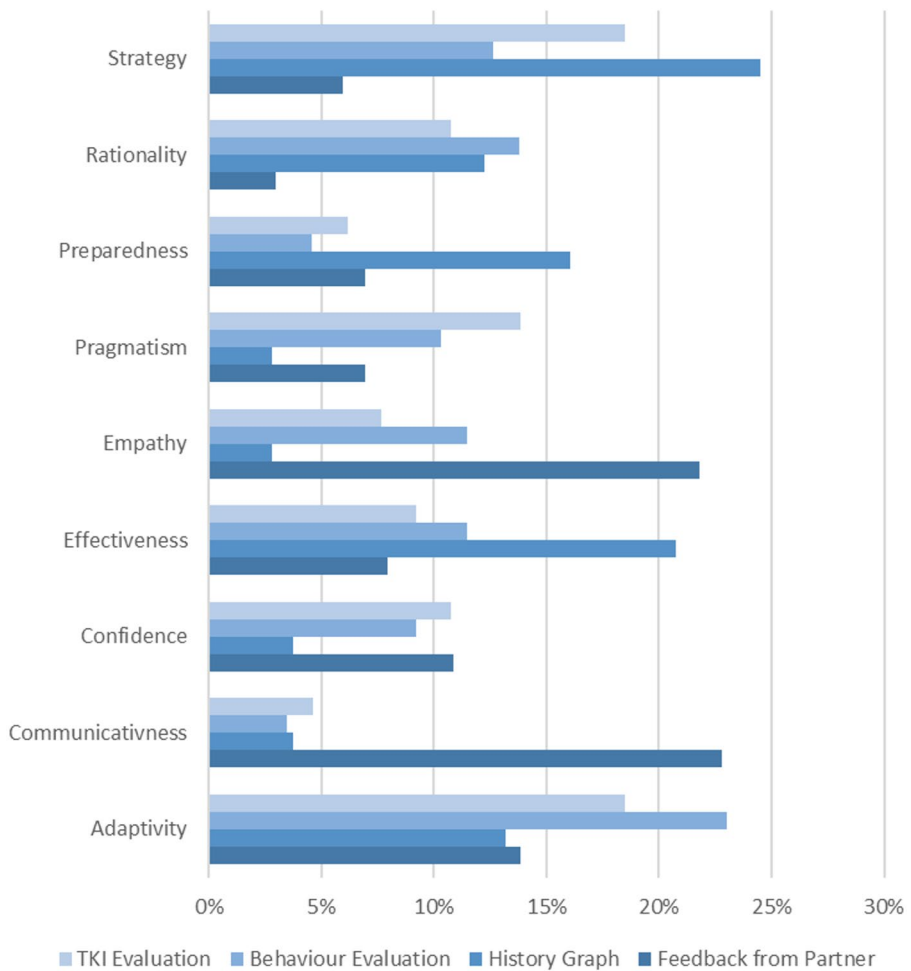


Fig. 3 Skill Improvements

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.

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 4 as positive/negative/neutral regarding support of self-reflection through the feedback elements.

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

Table 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

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.

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.

5.3.1 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. 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 4 demonstrates a competing-compromising style with collaborating tendencies (triangles). The negotiator exhibited strong competitive behaviour in the initial two offers.

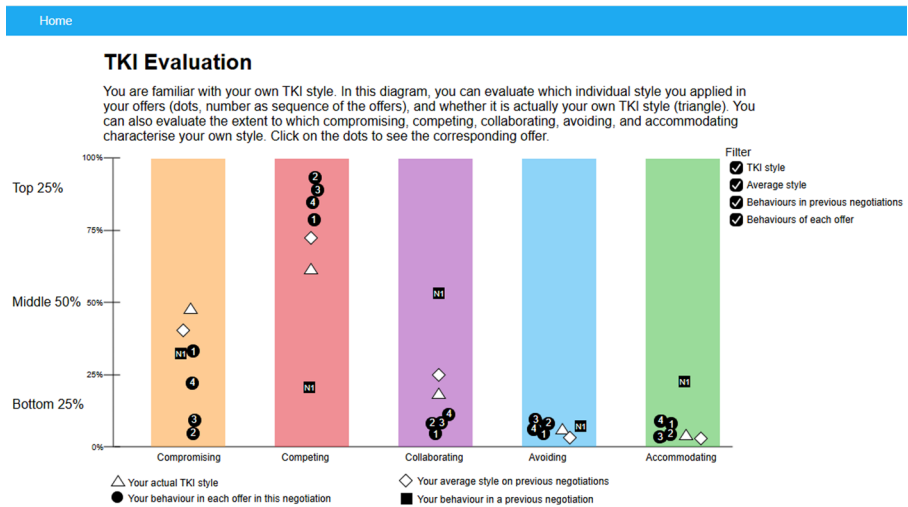


Fig. 4 TKI Evaluation

5.3.2 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. 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.

5.3.3 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

Behaviour Evaluation

This illustrates how your behaviour changed during the negotiation by analysing your offer. You can consider whether this was your intention or not. If you consider further information from the negotiation, there might be a correlation with the offers you and your partner made. Click on the offer name to see the corresponding offer.

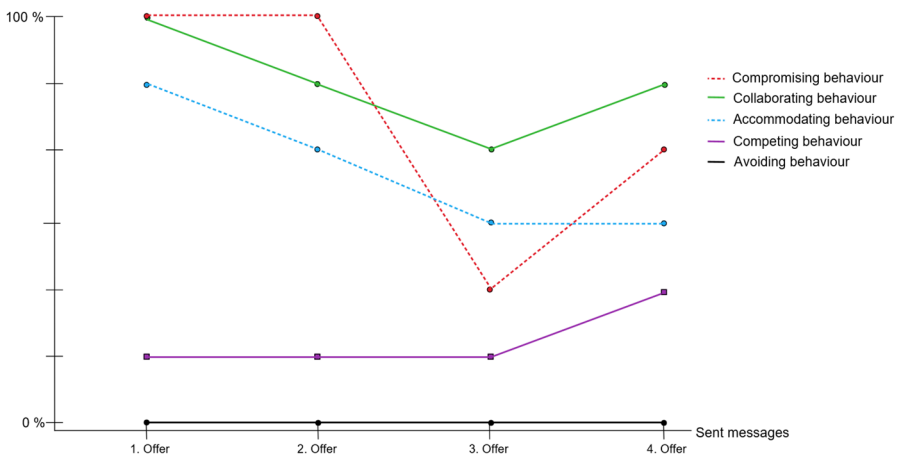


Fig. 5 Behaviour Measurement

issue. These modifications have been integrated into the feedback element, as illustrated in Fig. 6.

5.3.4 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. Figure 7). The display of structured questions depends on the final state of the negotiation, i.e. accept or reject.

The example in Fig. 7 demonstrates a rejected negotiation; questions adapt accordingly. It is important to note that several questions in the survey accommodate multiple response options.

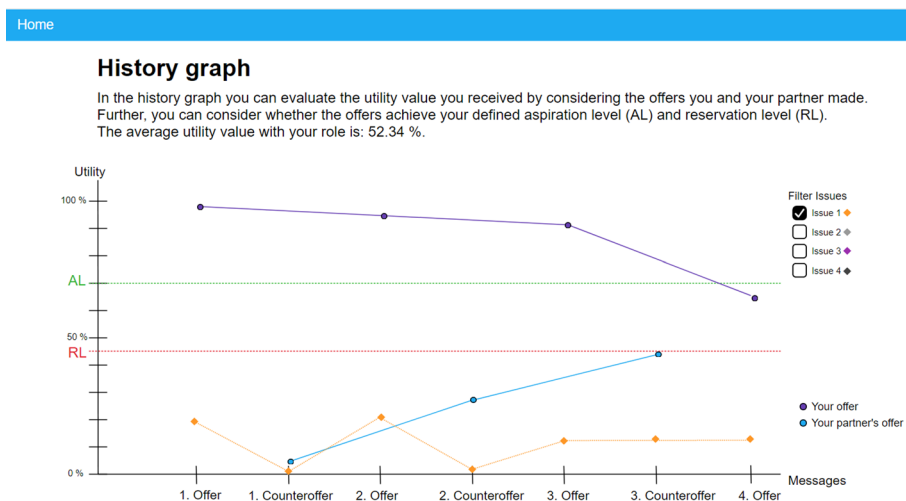


Fig. 6 History Graph

Feedback for your negotiation partner

Now that your negotiation has ended, we invite you to give feedback to your negotiation partner. Please keep in mind to be respectful. You have to provide feedback to finish your negotiation process.

Your feedback can include e.g. reasons why you accepted/ rejected the offer; ideas which strategies your partner applied; degree of satisfaction and reasons for (dis)satisfaction with the outcome.

Are you satisfied with the outcome of the negotiation? *

Which strategies do you think your partner applied? *

What are the reasons that you rejected the offer? *

You can write some more feedback:

Fig. 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 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.

		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. 8 The cognitive process dimension

Table 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

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. Figure 8).

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 5.

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.

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 consis-

tent 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 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 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. 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.

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.

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Declarations

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