

# A Weighted Group EI Incorporating Role Information for More Representative Group EI Measurement

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**Abstract**—Emotional intelligence (EI) is a well-established personal characteristic. It has been viewed as a critical factor which can influence an individual's academic achievement, ability to work and potential to succeed. When working in a group, EI is fundamentally connected to the group members' interaction and ability to work as a team. The ability of a group member to intelligently perceive and understand own emotions (Intrapersonal EI), to intelligently perceive and understand other members' emotions (Interpersonal EI), and to intelligently perceive and understand emotions between different groups (Cross-boundary EI) can be considered as Group emotional intelligence (Group EI). In this research, a more representative Group EI measurement approach, which incorporates the information of the composition of a group and an individual's role in that group, is proposed. To demonstrate the claim of being more representative Group EI measurement approach, this study adopts a multi-method research design, involving a combination of both qualitative and quantitative techniques to establish a metric of Group EI. From the results, it can be concluded that by introducing the weight coefficient of each group member on group work into the measurement of Group EI, Group EI will be more representative and more capable of understanding what happens during teamwork than previous approaches.

**Keywords**—Emotional intelligence, EI, Group EI, multi-method research, teamwork.

## I. INTRODUCTION

EI, a multi-dimensional construct, refers to emotional skills involving emotional perception, emotional facilitation, emotional understanding and emotional management [1]. Research on EI has revealed that people could make themselves more effective in their work and personal lives by enhancing their EI [2]-[4]. Moreover, recent research also demonstrated the contribution of EI in work settings [5], [6], [24]. However, one common overlooked problem in these studies is that EI has been viewed only as an individual competency. When working in a group, positive and effective interpersonal relationships are an important element of successful teams. Emotional bonding existing between team members has a profound effect on the work produced and the overall success of the project [7]. Therefore, the ability of a group to intelligently perceive and understand other member's emotions plays an important role in teamwork. This ability is known as Group EI. Despite the acknowledged importance of Group EI, most studies [1], [3], [4], [25] present Group EI using the average of each group members' individual EI. However, none of these studies explain why they used the average value of individual EI

measurement scores. Druskat and Wolff [8] indicated that a team with emotionally intelligent members does not necessarily make for an emotionally intelligent group. A team, like any social group, takes on its own character. At the same time, considering in real life, organisations are more willing to arrange the team roles to construct a team so that the team can achieve the best performance in a project [9]. Thus, using the average value of EI means that the individual EI of each group member has the same proportion of the whole group's EI. This implies that every group member's EI plays the same role in Group EI. Even if they have different positions and tasks, their individual EI makes the same contribution to Group EI. This method is the opposite of the findings in the studies of EI and leadership [10] [11], which claim that the team leader's EI affects group member's emotions and substantially affects work attitudes and performance. In particular, Jordan [6] argues that one limitation of his study is that the effects of the internal structure of the groups, such as the EI of the leader, were not analysed. This means that the simple average of individual EI scores cannot be used to representatively describe and represent the overall EI of a group.

This study proposes a more representative Group EI measurement approach which incorporates the information of the composition of a group and an individual's role in that group. To demonstrate the claim of being a more representative Group EI measurement approach, this study involves 12 case studies on 12 project groups composed of 72 MSc Engineering Management students, and quantitative data collection from individuals as well as groups using two questionnaires. The information recorded from the case study is interpreted to reflect the emotional characteristics of each group, and the data collected using the questionnaires are analysed using statistical analysis. The results demonstrate that the proposed Group EI measurement is more representative than previous approaches.

### A. Group EI

Based on Mayer and Salovey's EI model [1], EI comprises four abilities, emotional awareness (own and others), emotional management (own and others), emotional understanding and emotional facilitation. In both of the theoretical development of EI [1], [13] and empirical studies [14], researchers have claimed that it is important to distinguish between intrapersonal EI and interpersonal EI. Intrapersonal EI involves abilities relating to dealing with own emotions, and interpersonal EI involves abilities relating to deal with others' emotions. While other models [2], [10] of EI vary from Mayer and Salovey's EI construct, the main abilities they commonly purpose are on emotional awareness and emotional management.

While working in a group, emotion is fundamentally

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connected to the group members' interaction and abilities to work as a team. Furthermore, emotional interaction is essential at a group level to enhance relationship between group members [15].

In terms of understanding how EI works in teams, Druskat and Wolff defined Group EI as "the ability of a group to generate a shared set of norms that manage the emotional process in a way that builds trust, group identity, and group efficacy" [16]. They focused on Group EI with three levels: individual level, group level, and cross-boundary level. Individual level means intrapersonal abilities, which is how emotionally intelligent groups with their individual members' emotions. Group level means interpersonal abilities, which are abilities relating to how the group members understand and deal with others' emotions. Cross-boundary level means abilities of one group relating to how to deal the emotions with other groups.

Goleman [5] adapted Mayer and Salovey's EI model to develop five emotional and social competencies in teamwork: self-awareness, self-regulation, motivation, empathy and social skills. Self-awareness is the ability to understand and interpret one's own feelings through internal reflection [7]. Self-regulation is the ability to unitize emotions to facilitate the progress of the task or the project. Motivation is the ability that can motivate the fellow members so that they will contribute their best in the teamwork. Empathy is understanding and interpreting other group members' feelings and being able to identify their feelings. Social skills are essential for the development of positive, effective relationships with group members [7], which involves the abilities to interact with group members to deter conflict, be aware of, and resolve conflict so that the team can reduce the negative impact on working relationships and project. Based on Goleman's EI model, Luca and Tarricone [7] indicate that one team with lack of EI skills such as not being aware of others' feelings, not controlling feelings directly contributed to the team become dysfunctional. They also summarised the characteristics of the group with high Group EI and the group lack of Group EI (in Table I) through in-depth interview and survey investigation.

Jordan and Lawrence [17] developed a model of EI abilities in teams which mainly focuses on emotional awareness (own and others) and emotional management (own and others) in teamwork as shown in Fig. 1. The core abilities of both of Druskat and Wolff's model and Jordan and Lawrence's model are the individual EI level and the Group EI level. Meanwhile, Jordan and Lawrence [17] developed Workplace Emotional Intelligence Profile (WEIP) to measure Group EI in teamwork.

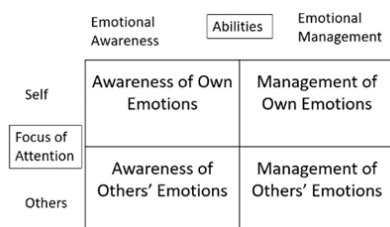


Fig. 1 A model of EI abilities in teams

TABLE I  
"COMPARATIVE" GROUP EI IN TEAMWORK

	Functional Team	Dysfunctional Team
Self-awareness	Team was aware of their emotions and the possible impact they could have on the team.	Team members seemed unaware of the impact their behavior had on other team members.
Self-regulation	Team members tried to sort out problems as soon as possible by trying to beware of other's problems.	When problems occurred, team members tended to take it personally. Team members didn't predict the comments would upset others.
Motivation	Team was product focused, and regulated their emotions so that they did not have a negative impact on the product.	Team members did not realise they had upset peers, and didn't seem to understand the effect the emotional outburst has on the rest of the team.
Empathy	The team facilitated the smooth progress of the project and promoted positive working relationships with team members to the job done.	Team members didn't control their emotions well under pressure and reacted quickly to trivial situations. In communicating problems, team members were overly emotional and personal.
Social Skill	Team members felt comfortable and supported in discussing their problems.	The team didn't create an empowering environment, to allow all members freedom of expression and encouragement to contribute.
	The team created a positive and motivating team environment. They tried to motivate team members with constructive criticism.	Team members lost motivation, especially when their work criticized in a negative fashion.
	The team was very goal oriented and focused on the "big picture".	
	Team members had previously worked with others and knew when others were getting upset, which helped to deter conflict.	Could see that a team member was angry and upset, but didn't make any effort to understand why the team member was angry.
	Team members felt supported in discussing their problems.	Some team members were aware of each other's feeling, particularly when some were getting upset.
	Team members respected different personalities, cultures and sensitivities.	Team members considered other's inadequacies as "downfalls" rather than something they could help them with.
		The team didn't consider everybody's needs during planning sessions.
		Some team members felt alienated and didn't feel part of them
	The team never took issues in a personal manner, as it would detract from developing a quality final project.	Lack of communication was evident in the team. For example, some team members believed that were making allowances for different learning styles, but this wasn't perceived that way.
	The team felt that talking about or communicating problems to each other was a "health thing".	The team didn't communicate their feelings, which resulted in resentment and bad feeling to others.
	The team felt that developing a healthy working environment with good relationships was important.	
	They often socialized together.	

### B. Group EI and Leadership

Wong and Law's study [10] shows that the leader's emotions can affect the group members' emotions and substantially affect members' attitude, behaviour and performance. Wong and Law [10] demonstrate that leaders with high EI are more sensitive to their own emotions and those of their followers. Subsequently, leaders have an impact on their followers' attitudes, behaviours and performance. Meanwhile, Goleman stresses that "the foremost job of leaders today is to drive the collective emotions of their organisations in a positive direction and to clear the smog created by toxic emotions" [18, p.5]. This is also demonstrated in [11], who investigate whether leaders have a strong impact on their team members' feelings in terms

of frustration and optimism, and subsequently their performance. Pescosolido's case examples [19] also argue that the leadership can influence the process of managing subordinates' emotions, resulting in improved performance. Stubbs' study [20] of 81 teams (422 people) in a military organisation demonstrates that the team leader's EI is significantly related to the presence of emotionally competent group norms in the teams they lead, and subsequently emotionally competent group norms are related to group performance. The team leader's EI has a direct influence on the group performance. Goleman [5] indicates that EI accounted for 67% of the abilities deemed necessary for superior performance in leaders and mattered twice as much as technical expertise or intelligence quotient (IQ). Therefore, above studies imply that the contribution of different roles to the Group EI is different.

## II. METHOD

### A. Participants

In present study, 12 multi-case studies within a survey have been carried out on 72 MSc Engineering Management students when they were doing their group projects. The selection was made based on two main considerations regarding the requirements from the mixed-method philosophy: the amount of data sources and the requirements for the data sources. Furthermore, this study is focused on group work, and each group is one unit of research data sample. According to the consent agreement and ethical approval, if any member of a group wanted to withdraw from the research study, data from the whole group become invalid. Therefore, the valid data are 47 students within 8 groups. This involves 26 females and 21 males with a mean age of 23.68 years (S.D.=2.02) (range from 21 to 31).

### B. Measuring Group EI in Teamwork

WEIP-S, a short version of WEIP, is a self-report questionnaire to measure the EI of individuals in groups. WEIP-S comprises four abilities involved in Jordan and Lawrence's model as displayed in Fig. 1. There are four items in each ability, which takes approximately 15 minutes to complete. For each item, participants are required to choose whether they agree or disagree with the statement (e.g., 'I can explain the emotions I feel to team members') based on a 7-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = undecided; 5 = somewhat agree; 6 = agree; 7 = strongly agree). A high score indicates a higher level of EI in the group. Jordan and Lawrence [17] demonstrate that the reliability of WEIP-S through Test-retest is good, with average reliability of 0.82.

### C. Measuring Measurement of the Weight Coefficient of Each Group Member

360° assessment is a peer to peer survey designed to supply feedback to participants, not only from a self-assessment perspective, but also from a variety of other perspectives, including managers and other group members. It is a way to perceive both the individual through themselves and others, and

the impact of individuals on other group members in the team [21]. This is more helpful than a self-assessment alone as it provides objective feedback.

In this study, the 360° assessment based on a 5-point Likert scale is used to determine the weight coefficient of each group member on Group EI. The influence is based on each group member's contribution to the establishment of Group EI, which depends on individual behaviour in the group work. The result of assessment can be used to assess each group member's proportion of Group EI. The peer to peer evaluation in 360° assessment can be explained in Fig. 2. And six dimensions are assessed in the 360° assessment as following:

**Attendance:** attendance is a significant concern for many groups or organisations, which use such information to gauge the effectiveness of their efforts and to plan for future efforts.

**Work** is involved in forming a group member's attitude; it refers to each member's participation, and whether they work actively and conscientiously.

**Communication:** Gardener [22] suggests that communication abilities and conflict resolution abilities are two important abilities involved in interpersonal abilities. George [12] argues that accurate appraisal and expression of one's emotions is necessary for people to develop beneficial interpersonal relationships, to communicate with others about their needs and thus to fulfil their goals through high-level job performance.

**Conflict resolution:** Conflict is an inevitable part of work, if there is any disagreement between group members in their group meetings. There are a wide range of methods and procedures for conflict resolution. How to deal with conflict is an essential skill in group work, especially for the group leader.

**Respect:** refers to one's attitude to other group members.

**Trust:** reveals that one group member is able to trust other members and also can be trusted by others.

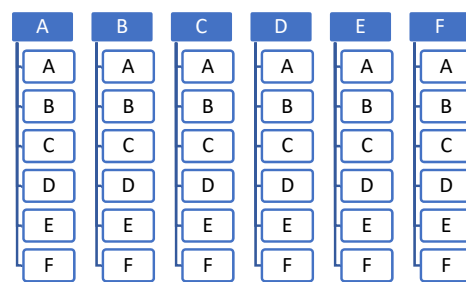


Fig. 2 360° assessment evaluation

In 360° assessment, each group member is required to evaluate all group members also including themselves. If there are 6 people in one group, and T is the total mark of 360° assessment for each group member.  $M_{i \rightarrow j}$  means the mark of the  $i^{th}$  group member evaluates the  $j^{th}$  group member, the weight coefficient of the  $j^{th}$  group member is

$$W_j = \frac{\sum_{i=1}^6 M_{i \rightarrow j}}{T \times 6} \quad (1)$$

#### D.Procedure

In this study, as the participants are students doing a master degree in the same subject, their master project was chosen to be the task of the group. The study involves the use of questionnaires to measure individual's EI and the individual's role's weight coefficient within that group, and the use of case study to analysis the emotional characteristics of the group based on existing definition of high and low Group EI.

During one-year period of the project, this study needs to collect data two times. The first data collection started at the beginning of the project. And the final data collection has been finished near the end of the project. Since the period of their projects are one year, during the case study, the meetings of each group are recorded in two ways: video recording and meeting note. The video is used to observe the group member's emotions and behaviours. Thus, it is necessary to attend all group meeting for each group during this period.

### III. FINDINGS FROM CASE STUDY

This section will present the results and findings from the case study. Due to the page limitation, only the first case study (Group 1) is being analysed in detail to demonstrate the analysis method. Other 7 case studies are analysed using the same approach, but only the results will be presented here.

#### A. Case Study 1

Group 1 was composed of 3 males and 3 females with a mean age of 23.33 (S.D = 2.13) (ranging from 22 to 28). They came from different countries and had different cultural backgrounds. From observing and analysing this group's meeting notes and videos, this group is a team with high group EI characteristics according to Luca's results in Table I. The Group EI characteristics of Group 1 are summarised in Table II.

#### Leader's EI Characteristics

The group leader was a 23-year-old male. He arranged group meeting on a schedule and notified everyone in advance. Before each meeting, he prepared questions and tasks on the list. During the meeting, he encouraged his group members to share their ideas and emotions, and he was able to present his ideas and emotions clearly. Moreover, when group members presented their ideas and feelings, he could respond to them and make a decision quickly. For example, one male student was late in one meeting, he was aware some members felt upset and he made a quick decision saying:

"OK, we can wait another 10 minutes. After 10 minutes, we will start our meeting no matter he comes or not. I will email our meeting notes and tasks to him if he cannot attend this meeting."

In addition, the leader had an ability to solve problems and conflicts between group members. He arranged each member's work properly so that he facilitated the smooth progress of the project. He promoted a positive working relationship between group members to finish their work. Thus, all group members agreed that he was a responsible and conscientious leader. One female member of 22 years said:

"He is a responsible, earnest and friendly group leader.

We feel relaxed and pleasure when we work together."

Another male member of 28 years commented that:

"He scheduled our meeting and communicated with us timely and actively. He was responsible for his work and encouraged us to work as a group. I can trust him and does not hesitate to help us if we need."

TABLE II  
GROUP EI CHARACTERISTICS OF GROUP 1

	Functional Team	Dysfunctional Team
Self-awareness	Group members were aware of their own emotions, others' and possible impact they could have on the team. Group members have an ability to express their emotions clearly.	N/A
Self-regulation	Group leader facilitated the smooth progress of the project, and promoted the positive working relationships with team members to complete the work. Group members have an ability to regulate their emotions and their behaviours. Group was goal oriented, and each group member focused on their project.	N/A
Motivation	Group leader could arrange group meeting scheduling and notice everyone in time. Group members could quickly engage themselves into topic and work in their meetings, and everyone could complete their own works before the meeting. Group members felt comfortable and relax in the meeting time.	In rarely, some group members overly relied on group leader.
Empathy	Group members felt supports in discussing problems. Group members could carefully listen others' ideas, and respect everyone even if they have different ideas. Group members respected different personalities, cultures and backgrounds.	N/A
Social Skill	Group members communicated with their supervisor actively and timely, and communicated with other groups. The group felt that developing a healthy working environment with good relationships was important. Group members often socialise together.	N/A

One female member of 22 years pointed out that the leader's emotional understanding and emotional awareness was important for group work. She said:

"Our leader has an ability to be aware of our feelings, emotions, and respect our feelings. He can listen our ideas carefully and explain his opinions patiently even if we have disagreement."

#### Self-Awareness

Group 1 was able to be aware of their own emotions and others'. They tried to understand each other's ideas and feelings during the meeting. For example, if a group member was late in one meeting, this member felt very apologetic for other group members and explained the reasons. He/she also emailed group leader his work in advance, in order to reduce the effect of his/her late. At the same time, other group members understood that member and did not express any negative emotions to that member. If problems occurred, they could communicate with each other in a timely way, and tried to sort out problems as soon as possible, by trying to be aware of other problems.

#### Self-Regulation

Group members had the ability to control their emotions and understood the possible impact of their emotions on the group work. Everyone could regulate their behaviours in order to

avoid any negative impact on their project and relationships.

#### Motivation

Their group meetings were very effective. The group focused on the project and everyone worked hard. They looked up a lot of information and prepared their own work before their group meetings. Everyone actively participated in discussions during the meeting.

#### Empathy

Although the members of Group 1 came from different countries with three of them from the same country, they could respect each other's culture and background. This was manifested in them all speaking English when they got together. The three students from the same country never spoke their own language, in order to avoid misunderstandings and feelings of discomfort between other members. After they completed their project, every member felt pleasure and relaxed about this one-year study.

#### Social Skills

Group members communicated with their supervisor actively and in a timely way, and they also communicated with other groups actively. The group felt that developing a healthy working environment with good relationships was important. Group members often socialised together. Overall, Group 1 was a high-efficiency group. This was also agreed with by their supervisor.

#### *B. Case Study 2*

Group 2 was composed of 3 males and 3 females with a mean age of 24 years ( $S.D = 2.77$ ) (range from 22 to 30). They came from three different countries and had different cultural backgrounds. Compared with Group 1, Group 2 is a team with a certain amount of low group EI characteristics.

#### Leader's EI Characteristics

The leader of Group 2 was a 30-year-old male. The group leader could not arrange group meetings to a schedule and notify everyone in time. In some situations, he arranged a group meeting in hurry, when a deadline was coming. This resulted in some students not able to attend the group meetings on time and some students were even absent from group meetings. During the meetings, he was unaware of group members' emotions and the possible impact they had on the team. In one meeting, a group member was late to the group meeting by about one and a half hours. He failed to do anything to rearrange the meeting and to understand members' emotions, although some students started to get upset and anxious. Subsequently, the group members feel that the situation is unfair and start worrying the progress of their project. Meanwhile, group members thought they could not trust their leader, and felt it was difficult to share their ideas and feelings. When group members presented their ideas and feelings, he often ignored group members' feelings, as he was not good at solving problems or conflicts between group members. When problems occurred, group members tended to take it personally. One female group member of 23 years commented that:

"I felt he is an invisible group leader, he failed in his duty."

Another female group member of 22 years also commented that he was absent from his job. The group leader's job was important in the group work:

"He hasn't fulfilled his responsibility, because he nearly didn't do anything about one leader's job. Including arrange group meeting, communicate with us about work, communicate with our supervisor, and so on. We need one group leader good at promoting the positive working relationships with group members. Mostly we worked individually and are lack of communications."

A male group member of 22 years pointed out that emotional awareness and emotional expression were important when working in a team:

"He didn't have an ability to attend to other people's emotions and understand group members' situations. Even if he realised our feelings and emotions, he mostly ignored it. He did nothing about group leader's responsibility."

#### Group Self-Awareness

Most members of this group were only aware of their own emotions. They did not have the ability to be attentive to others' emotions and the possible impact they had on the group. The group did not know how to express their feelings, and they were often overly emotional and personal in communication. In particular, one male student of 23 years, (A), constantly thought he was unquestionable and very easily became aggressive if anyone doubted his ideas.

#### Group Self-Regulation

Most group members understood about regulating their behaviour to avoid conflict between them. However, student A was unable to control his emotions during group meetings. He often pushed others to accept his ideas using sentences like:

"This idea is terrible, you look so unenlightened."

"Why do you often ask so mindless question?"

"Who tell you this understanding?"

"Can you think one question by your brain?"

This resulted in most group members being unable to express their ideas and feelings actively. Most people preferred to work individually.

#### Motivation

Group members lost motivation. One third of group members were unable to attend the group meetings on time, without notification or apology. In group meetings, group members started their work and topic slowly, as most of them were unable to finish their own work before the meeting. Moreover, most group members did not clearly understand what their tasks were. The group leader did not have any counter plan when group members did not finish their work.

#### Empathy

Group member A considered others' inadequacies as "downfalls" excluding himself. In this situation, the other members often privately complained that they felt depressed

when they worked with student A, but no one tried to understand him and to communicate with him.

Three group members come from one county. These three students often spoke their own language when they worked together. This resulted in the other three members not being able to understand what they were saying and feeling embarrassed and uncomfortable. Meanwhile, this reflects that Group 2 did not have enough for respect all group members. Although the group leader was aware of the dissatisfaction of the group members, he often ignored it and did not try to facilitate a healthy working environment. Overall, Group 2 did not behave like a team, as everyone did not feel they were part of one group.

#### Social Skills

Group 2 could communicate with their supervisor on time and actively, as the department required. However, the group had almost no communication between group members in private. In addition, they never communicated with other groups to share ideas and experiences. Overall, Group 2 had a lack of self-awareness, self-regulation, communication, empathy and motivation.

#### C. Case Study 3

Group 3 was composed of 3 males and 3 females with a mean age of 24.83 years (S.D =2.91) (range from 22 to 31). They came from three different countries and had different cultural backgrounds. Group 3 is a team with mostly high group EI characteristics and a few low group EI characteristics.

#### Leader's EI Characteristics

The leader of Group 3 was a 25-year-old male. Most group members thought he was an earnest and self-disciplined leader. One male group member of 24 years commented:

"He is a hard-working leader with some introverted personalities. He can share his ideas with us when we work together. But sometimes, I cannot distinguish his emotions as he often looks serious."

Another female student of 31 years said:

"Absolutely he is a conscientious leader. He communicated with our supervisor actively if we have any questions about the project. I just think sometimes his arrangement is unreasonable. For example, sometimes he notices us to take a group meeting suddenly when we are on holiday, or arranges many works when we are very busy preparing for examinations. I prefer if he could reasonably arrange our meeting and our work. "

These opinions also are reflected in group meeting notes and videos. The leader could arrange group meeting to a schedule. During group meetings, the leader was aware of his own emotions and expressed emotions clearly. He paid too much attention to work, so that he delayed responding to other's emotions sometimes. The leader tried to facilitate the smooth progress of the project and solve problems. He made quick decisions and was responsible for the decision if there was a disagreement between group members. The group leader often prepared a counter plan to avoid group members missing each deadline during the project. He would email group members to

track their work progress and remind them to submit their work in time. He could respect different cultures and personalities of group members.

#### Group Self-Awareness

Group members were aware of their own emotions and those of others and the possible impact they could have on the team. Most of them had the ability to express their emotions clearly. During group meetings, they shared their ideas and feelings.

#### Group Self-Regulation

Group members had the ability to control their emotions and their behaviours so that they did not have a negative impact on the project. Although they had different opinions, they tried to understand other's feelings and respect others. At the same time, they could explain their ideas and feelings carefully and patiently. They often presented ideas with sentences like "How about we...", "Can we try...", and "Why not consider. . .".

#### Motivation

The group was goal oriented, and each group member focused on their project. They could quickly participate in a discussion during their meetings, and half of them could finish their own work before the meetings. Most of them realised that creating a healthy working environment was necessary in order to ensure smooth progression of the project.

#### Empathy

Group members felt supported in discussing problems. They could carefully listen to others' ideas, and respect different cultures, personalities, and backgrounds. Most of them were willing to help group members when they met any problem. On the whole, group members felt comfortable and relaxed in the meeting time.

#### Social Skills

Group members communicated with their supervisor actively and on time. Sometimes, they were lacking in communication due to unreasonable arrangements. In that situation, they preferred to work alone and solve problems by themselves.

#### D. Case Study 4

Group 4 was composed of 3 males and 3 females with a mean age of 23.5 years (S.D = 1.71) (range from 22 to 27). They came from three different countries and had different cultural backgrounds, with three of them coming from one country. Group 4 is a team with mostly high group EI characteristics and a minimal amount of low group EI characteristics.

#### Leader's EI Characteristics

The group leader was a 27-year-old male. He arranged group meetings to a schedule and notified everyone in time. Before each meeting, he communicated with the supervisor in advance to report their current work and to ask what to do next. He had the ability to encourage his group members to share their ideas and emotions in discussion, and he was able to present his ideas and emotions clearly. Moreover, when group members presented their ideas and feelings, he listened to them carefully.

The leader was good at solving problems and conflicts between group members. If group members felt disappointed in their work, he comforted them and inquired whether they needed help. He arranged each member's work properly, so that he facilitated the smooth progression of the project and promoted a positive working relationship between group members to finish their work. Thus, all group members agreed that he was a responsible and conscientious leader.

#### Group Self-Awareness

Group members were aware of their own emotions, other's emotions and the possible impact they could have on the team. Group members had the ability to express their emotions clearly.

#### Group Self-Regulation

Group members had the ability to control their emotions and their behaviours so that they did not have a negative impact on the project.

#### Motivation

The group was goal oriented, and each group member clearly understood their own tasks. Despite sometimes not finishing their own work before the meeting, they tried to analyse the reasons and reduce the negative influence on the progression of the project. All of them could quickly participate in the discussion. Everyone wanted to contribute to the project. Thus, group members felt comfortable and relaxed in the meetings.

#### Empathy

Group members felt supported when they discussed problems. Group members could carefully listen to others' ideas, and respect everyone, even if they had different ideas. Group members respected different personalities, cultures and backgrounds.

#### Social Skills

Group members communicated with their supervisor actively and on time, and communicated with other groups to share experiences. They often organised social activities to promote their relationships.

#### *E. Case Study 5*

Group 5 was composed of 3 males and 3 females with a mean age of 23.17 (S.D = 0.37) (range from 23 to 24). The age range is much smaller than the above groups. All of them came from one country and they had a similar cultural background. Compared with the above groups, Group 5 is a team with a medium amount of low group EI characteristics.

#### Leader's EI Characteristics

The group leader was a 23-year-old female student. She arranged group meetings to schedule and notified everyone in advance. Before each meeting, she searched for information about their project using self-learning. She tried to encourage her group members to share their ideas and emotions in discussion, and she was able to present her ideas and emotions clearly. Moreover, when group members presented their ideas and feelings, she listened to them carefully. However, the

leader was not good at solving problems and conflicts between group members. If group members had arguments during the meeting, she often felt nervous and did not know how to deal with the disagreements. She said she feared conflict between group members. She tried to arrange each member's work properly, so that they could carry out the project with smooth progress, but the effect was weak. She wished to promote a positive working relationship between group members to finish their work. In fact, the group leader undertook the majority of the group work by herself. Most group members agreed that she was a hard-working leader.

#### Group Self-Awareness

Group members were aware of their own emotions, others' emotions and the possible impact they could have on the team. Group members had the ability to express their emotions clearly. However, group members lacked responsibility for their work. When problems occurred, they often thought it was not their responsibility first.

#### Group Self-Regulation

Most group members had the ability to regulate their emotions. Sometimes, group members were unable to regulate their behaviours, even if they knew some behaviours had a negative impact on the project.

#### Motivation

Most group members were less motivated as they did not have a clear view of their project and the tasks they were assigned to. Despite group members taking an active part in discussions and sharing their ideas, work efficiency was low. Most of them did not want to work hard and wished the group leader could help them to do more work. This was also reflected in group members being unable to finish their own work before the meeting excluding the group leader. Thus, in most situations, the group members overly relied on the group leader and lacked motivation for self-study. The group was unable to focus on their work as they were used to being lazy.

#### Empathy

All group members came from one country, there was nearly no difference in cultural background. They respected different personalities.

#### Social Skills

The group leader communicated with their supervisor actively and timely, and they also communicated with other groups actively. When problems occurred, group members were unable to communicate with others in a timely way, as they were used to depending on others to solve their problems.

#### *F. Case Study 6*

Group 6 was composed of 2 males and 3 females with a mean age of 24 (S.D = 0.89) (range from 23 to 25). They came from three different countries, four of them coming from one country. Compared with the above groups, Group 6 is a team with half high group EI characteristics, and half low group EI characteristics.



### Leader's EI Characteristics

The group leader was a 24-year-old male student. The group leader arranged group meetings to schedule and notified everyone on time. He reviewed a lot of literature in advance and prepared for the project before each meeting. He was aware of his own emotions and express emotions clearly in discussions. The leader tried to facilitate the smooth progress of the project, and solve problems. He wished everyone could make their best contribution to the project. However, he was not good at balancing different people's requirements. The leader did not prepare a counter plan in order to avoid group members missing deadlines, although he knew some members could not finish their work every time. He respected different cultures and personalities of group members. Overall, all the group members agreed that their leader was a friendly and hard-working leader. One 25-year-old female student said:

"I agree that he is a hardworking and enthusiastic leader.

He is friendly to everybody. However, he cannot arrange our work properly. I finish my own work every time, but I have to wait for other people who didn't finish work for a long time during the meeting. This reduces our working efficiency."

Another 23-year-old female student commented that project management is very important for the group leader:

"I often felt our meetings wasted a lot of time. He paid more attention to the people who cannot finish the work, but ignored other people's feelings. It's important for group leader to improve his ability of project management."

### Group Self-Awareness

Most group members were aware of their own emotions and their possible impact on the group work. However, there was one female group member (A) who overly expressed her own emotions and ignored others' emotions. She was unaware of the possible influence of her negative emotions and behaviour on other members. This resulted in other members feeling it was difficult to express their emotions in the group. Most group members complained:

"Why did she ask us to take care her emotions and feelings? We respect her feelings, but she didn't realise that respect is mutual."

### Group Self-Regulation

Most group members had the ability to control their emotions and their behaviours. At the same time, most of them thought student B was unable to control her emotions and behaviour. She could not accept any mistakes made by others, but she did not allow other members to point out her problems if she made any mistake. For example, she became very angry if any member was late to group meetings, and argued with other members directly. But she did not make an apology if she was late to the group meeting and did not accept any reminders from other group members.

### Motivation

Most group members focused on the project, and clearly understood what their tasks were. Student B lacked motivation

and self-learning ability. She was often late to the group meetings without notification in advance. In this situation, the group leader was unable to ensure the group meeting ran smoothly and efficiently. Meanwhile, the leader ignored others' feelings, so that other group members felt it was unfair and a waste of time. During the meeting, most conversation between student B and the group leader was like the following:

Leader: "A, how about you are responsible for writing introduction part of final report?"

B: "I don't know what software to use to write the report."

Leader: "Word will be fine."

B: "I don't have Word software."

Leader: "You can download it from our university website, it's free."

B: "I don't know how to download."

Obviously, one uncooperative and unmotivated group member had a significantly negative impact on other members' motivations and work efficiency. Group 6 was unable to create a relaxed environment in order to encourage all members to make their best contributions to the project.

### Empathy

The group respected different cultures and backgrounds. Most group members could carefully listen to others' ideas, and respect everyone, even if they had disagreements. Only one group member thought that her ideas should not be questioned. Student B communicated with others in an emotional and egotistical way. It was difficult for her to realise that she had communication and social problems. The group leader was aware of problems and conflicts; however, he was not good at solving problems. Therefore, the group members tended to work alone in some situations.

### Social Skills

The group communicated with their supervisor actively and on time. However, they lacked communication with other groups and they were unaware of the communication problem within group.

### G. Case Study 7

Group 7 was composed of 1 male and 6 females with a mean age of 22.83 (S.D = 1.95) (range from 21 to 27). They came from two different countries, with five of them from one country. Compared with the above groups, Group 7 is a team with a large amount of low group EI characteristic.

### Leader's EI Characteristics

During the beginning phase of the project, none of the group members wanted to take responsibility for being group leader. As it was necessary to elect a group leader for each group according to the project requirements, a 27-year-old female student in this group was nominated, based on the other members' votes. Consequently, she became the group leader, although she did not intend to take such responsibility. Due to this issue, Group 7 lacked motivation in both internal and external factors from the beginning of the project.

The group leader did not arrange group meetings with a suitable schedule, and did not notify everyone on time. She



never tried to encourage group members to focus on the project and facilitate the smooth progression of the project. In most situations, the leader paid more attention to her own work and ignored other members, no matter whether it was others' ideas or feelings. She was unaware of the positive influence of a healthy relationship between group members.

#### Group Self-Awareness

Group members were aware of their own emotions and ignored others' emotions in most situations. They did not realise the possible impact of their emotions on the group work. Group members were less willing to share their ideas and feelings. When problems occurred, group members tended to take it personally.

#### Group Self-Regulation

Most group members were unable to appropriately control their emotions. During group meeting, some group members often felt upset due to the complicated work. They expressed anxiety directly during the meetings and did not realise they had upset their peers. Group members were overly emotional and personal in communication.

#### Motivation

Group members did not focus on their group project, and most group members did not understand their project or their own tasks clearly. The group lost motivation and most of them were always late to every group meeting, without any notification, even if they had a meeting with the supervisor. For one group meeting with their supervisor, three students were absent, even with notification two week before. The group started their work and topic slowly during group meetings, and most group members were unable to finish their own work before the meeting. This resulted in them needing to take a long time to finish their own work during group meetings.

#### Empathy

The group respected different cultures and backgrounds. However, most group members only focused on their own feelings and emotions, and they seemed unaware that they were part of a group. The group was unable to accept suggestions, even if the suggestion was from their supervisor. Overall, Group 7 was unable to create a relaxed environment to encourage all members to speak their ideas freely and make contribution. Group members felt uncomfortable, depressed, and tended to work on their own.

#### Social Skills

The group did not communicate with their supervisor actively and on time and they lacked communication between group members and with other groups. Although there were five students from one county with the same language and cultural background, they never socialised together in the one-year study.

#### H. Case Study 8

Group 8 was composed of 3 males and 3 females with a mean age of 23.83 years (S.D = 1.07) (range from 22 to 25). All of them came from one country with the same language and

cultural background.

#### Leader's EI Characteristics

The group leader was a 25-year-old female student. She was a hard-working leader. The leader was unable to arrange group meeting to a schedule and notify everyone in advance sometimes, so that she could not communicate with group members on time if any problems occurred. The leader had an ability to recognise her own emotions and others' emotions. However, she was not good at dealing with group members' emotions. She paid much more attention to project outcomes and believed that the result was more important than the process. Consequently, facilitating a relaxed and healthy environment was neglected by the group leader.

#### Group Self-Awareness

Group members were aware of their own emotions, others' emotions and the possible impact they could have on the team. Most of them had the ability to express their emotions clearly.

#### Group Self-Regulation

Group members had the ability to control their emotions in order to avoid them having any negative impact on other members' feelings and group work.

#### Motivation

The group was goal oriented, and most group members focused on the project. When they experienced some blocking issues or problems during their work, two scenarios were observed. In the first scenario, the workers actively sought help from other parties (e.g. other students, supervisors or lecturers) whereas, in the second scenario, students passively waited for help from others, no matter if it was from their supervisor or a group mate. In most situations, Group 8 could participate actively in discussions. Some members were often late to group meetings, and unable to finish their own works before the meetings. In some situations, most group members tended to work on their own.

#### Empathy

Group members could carefully listen to others' ideas, and respect everyone, even if they had different ideas. Group members respected different cultures, personalities and backgrounds. Most of them felt comfortable and relaxed during the meetings.

#### Social Skills

Group members communicated with their supervisor actively and on time. When problems occurred, group members were unable to communicate with others in a timely manner.

### IV. FINDINGS FROM QUESTIONNAIRE SURVEY

The quantitative data were analysed using Excel 2016 for descriptive and inferential statistics. The overview of the collected data is demonstrated in Table III.  $i$  of  $M_i$  is the number of each group member, IM is individual mark of this group member ( $M_i$ ), and W is weight coefficient of this group member ( $M_i$ ).

### A. EI Changes

During the study, individual EI as a group member is measured twice. The first time the individual EI is measured at the beginning of the project. The second time the individual EI is when the participants have finished their projects. The results revealed that individual EI scores as a group member generally declined over the period of the project term. The overall average EI score went down from an average score of 75.17 (S.D. = 15.61) to 74.60 (S.D. = 14.86), or a loss of 0.58 points. To determine whether the decrease in overall EI scores over the period of the project was statistically significant, a T-test was applied. The result in Table IV revealed that no statistically significant difference was found between the two EI tests for the entire sample.

TABLE III  
OVERALL MEASURED DATA FOR EACH GROUP AND EACH MEMBER

Group No.	Measured Items	Leader	M1	M2	M3	M4	M5
1	1 <sup>ST</sup> EI	102	88	49	84	78	91
	2 <sup>ND</sup> EI	102	85	70	84	72	89
	IM	57	61	62	67	68	69
	W	0.18	0.14	0.14	0.13	0.12	0.13
2	1 <sup>ST</sup> EI	80	74	89	96	80	55
	2 <sup>ND</sup> EI	78	70	85	92	75	45
	IM	52	63	58	80	68	68
	W	0.13	0.16	0.11	0.15	0.13	0.06
3	1 <sup>ST</sup> EI	88	93	89	82	73	90
	2 <sup>ND</sup> EI	89	91	90	80	75	90
	IM	68	70	68	63	62	64
	W	0.15	0.14	0.13	0.12	0.13	0.12
4	1 <sup>ST</sup> EI	93	65	71	84	71	71
	2 <sup>ND</sup> EI	95	70	70	88	75	72
	IM	79	72	72	7	72	72
	W	0.15	0.16	0.14	0.15	0.16	0.14
5	1 <sup>ST</sup> EI	62	56	73	67	81	64
	2 <sup>ND</sup> EI	60	62	71	65	81	61
	IM	65	56	53	55	55	51
	W	0.15	0.13	0.09	0.12	0.09	0.13
6	1 <sup>ST</sup> EI	71	45	73	80	79	-
	2 <sup>ND</sup> EI	65	45	72	80	75	-
	IM	77	61	58	77	63	-
	W	0.16	0.12	0.11	0.12	0.09	-
7	1 <sup>ST</sup> EI	77	76	79	45	50	40
	2 <sup>ND</sup> EI	75	72	80	42	51	40
	IM	60	60	65	60	66	65
	W	0.14	0.10	0.14	0.13	0.14	0.06
8	1 <sup>ST</sup> EI	87	88	106	88	65	45
	2 <sup>ND</sup> EI	85	85	102	86	68	51
	IM	73	47	74	73	62	52
	W	0.16	0.13	0.15	0.14	0.15	0.14

TABLE IV  
THE DIFFERENCE BETWEEN TWO EI TESTS

	Mean	S.D.	p-Value
1 <sup>st</sup> EI test	75.17	15.61	0.20
2 <sup>nd</sup> EI test	74.6	14.86	

### B. EI and Gender

Exploratory analysis was conducted to determine whether

demographic factors, such as gender, were a significant contributor to the difference between the first and second EI test scores. Table V displays the mean, standard deviation and individual EI changes for gender over the test-retest period. The results revealed that no significant EI change was found between female students and male students for the scores taken in the first EI assessment. However, males generally scored significantly higher than females in the second EI assessment. Fig. 2 demonstrates that both female EI and male EI slightly decreased after an academic year, and the variance was almost the same. The overall EI mean scores of female students between the EI first test and second test were 74.29 (S.D. = 15.30) and 73.76 (S.D. = 14.53), respectively, or a loss of 0.53 points. In addition, the overall EI mean scores of male students between the EI first test and second test were 75.24 (S.D. = 15.13) and 74.51 (S.D. = 14.61), respectively, a loss of 0.73 points.

TABLE V  
AVERAGE EI SCORE AND EI DIFFERENCES FOR GENDER OVER THE TEST AND RE-TEST PERIOD

	Female		Male		EI Differences Mean(M) – Mean (F)
	Mean	S.D.	Mean	S.D.	
1 <sup>st</sup> EI test	74.27	15.3	75.24	14.53	0.97
2 <sup>nd</sup> EI test	73.76	15.13	74.51	14.61	0.75

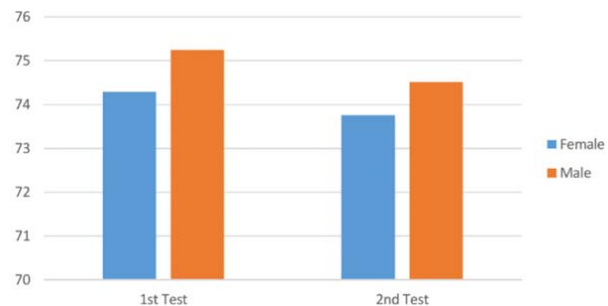


Fig. 3 EI and gender

### C. The Weight Coefficient of Each Group Member

From Table III, the weighted coefficient of each group member in Group 1 is similar; the difference of each group member's weight is small. At the same time, the group leader's weighted coefficient is the largest compared to other members. This means the group leader played an important role in Group EI, and the influence of every group member was equally important. All group members tried to contribute to Group EI and group establishment.

The circumstances of Group 3 and Group 8 are similar to Group 1. All weighted coefficients of Group 4 are slightly higher than Group 1 whereas, Group 2 has contrasting circumstances.

For Group 2, one group members' weighted coefficient (0.06) was much lower than the other five members. In addition, one group member's weighted coefficient (0.16) was higher than the group leader's (0.13). This means all group members agreed that the group leader's role in contributing to Group EI was less than other group members.

The situation for Group 5, Group 6 and Group 7 is similar,

the weighted coefficients of the group leaders were the largest compared to other group members. The weighted coefficients of one or two members are much lower than the others. This means there was an obvious gap in the influence of all group members on Group EI.

#### D. Group EI

The Group EI results of the 8 groups are shown in Table VI. In the table, 1<sup>st</sup> Average Group EI is the first-time measuring results which is using the average scores of individual EI, whereas the 1<sup>st</sup> New Group EI is the first-time measuring results which is using the method proposed in this study. From this table, it can be seen that the Group EI would change with time. Some group's EI become higher, while some group's EI become lower with time. This means Group EI would change with in-depth understanding between group members. Moreover, it can be seen that Group EI measured by two measurement approaches are different. The proposed measurement approach, in general, has a lower measured value compared to the existing Group EI measurement approach. In addition, it can be seen from the table that the group with the highest measured Group EI using the existing approach does not have the highest Group EI if the proposed measurement approach is used. Similarly, the group with the lowest Group EI when using the existing approach is not the group with the lowest Group EI if the proposed measurement approach is used.

TABLE VI  
A SUMMARY OF GROUP EI FOR 8 GROUPS

Group No.	1 <sup>st</sup> Average Group EI	2 <sup>nd</sup> Average Group EI	1 <sup>st</sup> New Group EI	2 <sup>nd</sup> New Group EI
1	79.83	83.67	69.65	71.19
2	79.00	74.17	60.13	56.94
3	85.83	85.83	69.7	69.73
4	75.83	78.33	68.19	70.53
5	67.17	66.67	46.8	46.47
6	69.60	67.4	41.5	40.07
7	61.16	60	44.69	43.9
8	82.00	79.5	69.63	69.33

#### V. DISCUSSION

##### A. Average Group EI and New Group EI

Prior studies [3], [6], [7], [24] on Group EI used the average of individual EI scores, whereas this study proposed that "the weighted average of individual EI scores as an indicator of the overall EI of a group based on different role's contributions to group work is more representative than the average of individual EI."

For the second time measuring results, the average Group EI of 8 groups in sequence from highest score to lowest score are Group 3, Group 1, Group 8, Group 4, Group 2, Group 6, Group 5, and Group 7. For new Group EI, using the weighted average of individual EI scores, the results of 8 groups in sequence from highest score to lowest score are Group 1, Group 4, Group 3, Group 8, Group 2, Group 5, Group 7, and Group 6.

For the highest EI group, Group 3 has the highest average Group EI score, while Group 1 is the one in new measurement approach this study proposed. From case study results, Group 1

has more characteristics of high Group EI than Group 3, especially in leadership. Leader in Group 1 was more likely to know how to arrange teamwork, to understand and deal with group members' emotions, and balance the relationships between group members. Furthermore, the difference between Group 1 and Group 8 is large. Group EI of Group 8 is higher than Group 1 in average Group EI approach. However, Group 8's EI is lower than Group 1 in new Group EI measurement approach. From both of average Group EI results and new Group EI results, Group EI of Group 1 became higher with time, while Group EI of Group 8 became lower. This is also reflected in case study. Group 8 was not good at dealing with conflict during teamwork. Sometimes, members in Group 8 tended to work individually, and could not communicate in time. Members in Group 1 are more likely to understand and manage their emotions than Group 8.

Another difference between Group 2 and Group 4 also is large. As was analysis in the case study, Group 2 was not behaving like a group, as no one felt they were part of one group. Some group members in Group 2 seemed unable to control their emotions and behaviours. They lacked motivation and empathy. As a consequence, a large amount of negative emotions was brought into the group. This resulted in Group 2 being overly emotional and personal in communication. They were also not good at expressing their emotions and solving conflicts, which could be seen in them often feeling overwhelmed when they faced one member's aggressive attitude. Except for the issues with group members, the leader of Group 2 also failed in his responsibility. He was less sensitive to feeling his own emotions and those of his group members. He did not perform what a leader is supposed to do when the negative emotions were spread across the group. The same observation can also be seen from the weight coefficient calculated from 360° assessment questionnaire. As shown in Table III, leader's weight coefficient is lower than some group members' weight coefficient, which indicates that the group leader did not behave as other members had expected. Also, the weight coefficient of group member 5 is much lower than other group members, which indicate that group member 5 is the one who brought the negative emotions to the group. On the other hand, Group 4 was a group with higher Group EI characteristics than Group 2. The leader of Group 4 showed more characteristics of high EI than the leader of Group 2. At the same time, Group 4 was aware that facilitating a healthy and relaxed environment was beneficial for group relationships and good group work. Consequently, Group 4 was performing more like a team as they presented higher Group EI characteristics. The weight coefficient of each member of Group 4 does support the observation of the behaviour of Group 4 as each member, including leader, has similar weight coefficient.

In similar circumstances of Group 5 and Group 7, Group 5 was more likely to be aware of their own emotions, others' emotions and the possible impact they could have on the team. The leader of Group 5 worked hard and tried her best to ensure project progress. For example, the leader often encouraged the group members to focus on the project, and summarised their work periodically as following:

"Our last report results were not ideal; we need to pay attention to our own work and focus on the project in the next term. I believe we can achieve a better result if we try our best."

However, Group 7 tended to work individually as they did not realise that they needed to perform as a group. No group member was willing to take the responsibility of being leader, but they also did not support the leader's work. None of them tried to build a relationship with another group member. Their supervisor could not get a response from them on time when he wanted to communicate with Group 7. Subsequently, the supervisor often felt dissatisfied and worried about their project work. Therefore, Group 5 showed more characteristics of high EI than Group 7.

The weight coefficients from 360° assessment results show that it is difficult to make the same contribution to Group EI for every group member in real teamwork. Some group members even had a negative influence on other group members' emotions, which subsequently influenced Group EI and group work.

Through combining the analysis results of the case study and the questionnaire, having the high average individual EI on the team does not necessarily equate to a high Group EI team. From the case study results, it can be concluded that by introducing the weight coefficient of each group member on group work into the measurement of Group EI, Group EI will be more representative and more capable of understanding what happens during group work. The weighted average of individual EI scores considered the weight coefficient of the team member roles and the contributions of the group members to Group EI. Therefore, the weighted average of individual EI scores as an indicator of the overall EI of a group based on different roles' contributions to group work is more representative than the average of individual EI.

#### *B. Group EI and Leadership*

As reviewed in previous studies, the group leader's EI has a direct influence on group performance. Dansereau et al. [23] suggest that leaders could influence their group members' performance through supporting their positive feelings. The finding reveals that leader's emotions could affect group members' emotions and substantially affect the members' attitude, behaviour and performance. Group leaders with high EI characteristics are more likely to understand their own emotions and group members' emotions. They also understand the possible impact of their emotions on group members' emotions, and the possible impact of the group's emotions on group performance. Meanwhile, group leaders are aware of the importance of building a healthy and relaxed environment, which is important and could improve relationships between group members and group work. This is demonstrated in case study 1 and case study 4. In particular, the emotional regulation of the group leader was found to help group members by proactively controlling their negative emotions or redirecting irrational or destructive behaviours stemming from negative emotions into constructive behaviour. One student expressed:

"Our group leader can understand our feelings and

challenges we are facing. Because of such understanding, we are happy to work with him, and tell him what we think and how we feel during group work. As a result, we all believe that we can perform well even when the situation is challenging."

Another student said:

"Our group leader tried to build positive relationships within group. For example, he often organized us to socialise together. It's easier for us to understand each other's personality. And then I can share my ideas and feelings as I can trust my team mates."

One student in Group 1 also expressed that:

"Our leader has an ability to be aware of our feelings, emotions, and respect our feelings. He can listen our ideas carefully and explain his opinions patiently even if we have disagreement."

The findings are well supported by the literature suggesting that leaders influence their group members' performance by supporting their positive feelings. In addition, leaders with high EI are more sensitive to their own emotions and their followers' [11], [18], [19]. In contrast, case study 2 and case study 6 revealed that lack of awareness of one's own emotions and the group members' emotions resulted in a lack of trust and empathy during group work. For example, one student said:

"I have to admit that our group leader is hard working, but sometimes we feel that it's hard to let him understand our feelings. He hardly realises that there are some problems between our relationships. Therefore, we find it's hard to communicate within a group."

The group leader's ability to solve problems could influence group members' motivation (case study 5). In particular, Group 7 shows that a lack of motivation from the group leader will lead to a lack of motivation for the entire group. On that lack of motivation, a student expressed:

"Our group leader nearly didn't communicate with us.

She was also often late to the group meetings. So, I don't think we are one group, we often work individually."

Thus, team leaders have a strong impact on their team members' feelings in terms of frustration and optimism, and subsequently, on performance. A group leader with high EI can improve group performance by managing their own emotions and having a positive influence on subordinates' emotions.

#### VI. LIMITATIONS AND FUTURE WORK

Through revisiting results and discussion, it can be concluded that by introducing the weight coefficient of each group member on group work into the measurement of Group EI, Group EI will be more representative and more capable of understanding what happens during group work. However, there are also some limitations, which are acknowledged below:

- Participants - As introduced before, all of the participants in this research were master's students, not people from other industries. As a result, it cannot be concluded that the proposed Group EI measurement approach is more representative than existing approaches under all

conditions.

- Group Composition - In this research, a group is composed of only two types of character: group leader and group worker. In reality, a group may be composed of more than these two types of character. It is still unknown so far how the group composition will impact the measurement accuracy of the proposed Group EI measurement approach. Therefore, this is also considered as a limitation.

Based on the limitation of the work in this thesis, the following future work is proposed to overcome the limitations:

- Carrying out study on more participants from different domains: As this research only carried out an experiment with participants from the university, the conclusions only apply to a certain type of participant. Although it is believed that the proposed Group EI measurement approach will be able to accurately measure the Group EI in different domains, it is not able to show this belief so far. In order to do this, it is necessary to carry out the experiment with more participants from different domains in the future. Furthermore, there are limitations in the group composition. It has been explained that only two types of characters are used in this research. If more experiments are carried out on participants from different domains, the group composition will become more complex, which can then address the group composition limitations of this research.
- Understanding the impact of role and contribution assessment: Possible future work could evaluate the impact on the proposed Group EI measurement approach if different role and contribution assessment approaches are used. So far in this study, only the 360° assessment was used to perform this duty. There are other approaches available to perform this duty. For example, it is possible to design one more complicated 360° assessment according to characteristics of Belbin team roles. By using Belbin, individuals have a greater self-understanding of their strengths (and weakness). Therefore, it is necessary to compare different approaches and evaluate how each approach affects the proposed Group EI measurement approach.

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