

# What's the social trust mechanism blending virtual and reality in the context of digital media?

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In the current era of digitalization, trust has emerged as a crucial factor in socialisation through digital media. However, due to the uncertain nature of individual identities in the digital realm, it poses a challenge to translate social trust in virtual identities into social trust in real identities, particularly for social activities that necessitate a blend of online and offline integration. The outbreak of catastrophic public health crises such as COVID-19 in recent years has had a profound impact on people's social trust in the physical world. By scrutinising the attributes of social trust, this study advocates three distinct categories of trust: indirect trust, direct trust, and quantitative trust. This paper establishes a comprehensive social trust mechanism that blends virtual and physical reality to facilitate user socialisation in the digital media context. Subsequently, by conducting user interviews and questionnaires, this study probes sports socialisation as a research subject, that integrates online and offline social needs, and combines the distinctive characteristics of sports social behaviour in the digital media context with the generic trust mechanism. A trust mechanism for sports socialisation is proposed that is applicable to the fusion of virtuality and reality in the epidemic environment. The theoretical model of the social trust mechanism is applied to the development of a mobile application to test its rationality. The social trust mechanism and practical experience proposed in this study can provide valuable insights for the establishment of user social trust in the digital media context, where virtual and real realities intersect.

**Keywords:** *digital media; social trust mechanism; public health crisis; sports socialisation*

## 1 Introduction

With the advent of digital technology, individuals are increasingly engaging in social interactions in the digital realm. As per Statista (2023), more than 4.26 billion people worldwide used social media in 2021, and this number is expected to rise to 6 billion by 2027, making online socialising one of the most popular digital activities worldwide. In this process, trust plays a crucial role. Social media enables users to create virtual identities to interact with others in the online world (Gündüz, 2017).



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However, the vagueness of individual identities in cyberspace creates a significant information gap between users' real identities and behaviours and their virtual counterparts, resulting in a significant translational mismatch between trust in online and offline social interactions (Koidl & Kapanova, 2022). Consequently, establishing trust mechanisms is essential for the development and optimisation of digital media social platforms that blend the real and the virtual.

Furthermore, environmental factors can also impact users' social trust, with the COVID-19 pandemic being a prime example of a public health crisis of global impact that has emerged in recent years. Although pandemic-induced social isolation has contributed to the growth of online social interaction, it has also placed significant limitations on trust in offline social interactions (Gov.UK, 2022). For instance, some sports enthusiasts during the pandemic were concerned about the health of other sports enthusiasts around them, despite the easing of COVID-19 restrictions in some countries where the epidemic situation had improved (Mackintosh et al., 2020). This crisis of trust has directly affected the frequency with which many exercise enthusiasts socialise during COVID-19 (Local Government Association, 2020), creating a low level of exercise and socialisation that poses a significant challenge to the physical and mental health of the population during the epidemic (Ammar et al., 2020a). Consequently, to address the possible future recurrence of social trust crises caused by public health crises and their negative effects, it is crucial to explore ways of establishing trust mechanisms for integrating virtual and real sports socialisation in the epidemic environment through online social platforms in the digital age.

This paper employs literature analysis, user interviews, and questionnaires to investigate how online social platforms can facilitate the establishment of a trust mechanism for integrating virtual and real sports socialisation in an epidemic environment. The second section summarises and analyses current research findings in the field of social trust mechanisms in digital media, presenting the research viewpoints and directions of this paper. The third section proposes and elucidates a general trust mechanism model based on the literature review. The fourth section focuses on ways of applying this trust mechanism in an epidemic environment in the context of sports socialisation. The fifth section constructs a test prototype based on the proposed campaign social trust mechanism in the fourth section, applicable to the epidemic environment, to validate the rationality of the trust mechanism. Finally, the sixth section summarises the study's main findings and outlines future research directions.

## **2 Literature review**

Digital media originated in 1940 with the emergence of the digital computer and became widely popular with the advent of the Internet and social media (Briggs & Burke, 2009). Due to their real-time and global nature, digital media have become widely diffused, and their influence on the vast majority of the human population cannot be underestimated (Acerbi, 2016). As of 2021, approximately half of the world's population was using social media for socialising, and social media and social behaviour have become an integral part of people's daily lives (Statista, 2023). Furthermore, the virtual and opaque nature of digital media and the limitations of using digital media to communicate information have led to a rise in uncertainty about trust between users when interacting socially (Gu, 2006).

Interpersonal trust is a fundamental aspect of building relationships in daily life (Luchies et al., 2013). With the advent and impact of digital media socialisation, researchers have begun to investigate how to build interpersonal trust mechanisms. Early researchers typically used general propensity (i.e.,

dispositional trust) to determine the trustworthiness of others, but the impact of propensity trust decreases over time (Alarcon et al., 2016; Jones & Shah, 2016). However, the theory proposed by Mayer et al. (1995) describes a trustee's trustworthiness as a reference for a trustor's propensity, and trustworthiness is defined as three interrelated factors: ability, integrity, and benevolence. Ability is defined as the extent to which the trustee can fulfil the trust tasks of the trustor. Integrity is defined as the extent to which the trustee's moral and ethical code of conduct is worthy of being trusted. Benevolence is defined as the extent to which the trustor believes that the trustee does not harm the trustor when unsupervised. A strong positive correlation between these three factors was confirmed in the study (Mayer & Davis, 1999; Poon, 2013), as well as in the study by Colquitt et al. (2007).

Although other researchers have proposed a two-factor model of trust based on cognition and emotion and have highlighted the importance of the distinctive psychological processes of cognition and emotion in the formation of trust (McAllister, 1995), the theoretical model proposed by Mayer et al. (1995) is still prevalent as a foundational model and has been applied to a range of research scenarios. For instance, the general interpersonal trust model put forth by Lewicki et al. (2006) approaches trust as an independent, mediating, or dependent variable captured by measuring trust at a single point in time. Jarvenpaa et al. (2000) propose consumer trust in e-commerce, and Lee and See (2004) discuss the challenges of extending trust in people to trust in automation, among others. Furthermore, Previous research has shown that trust-building is crucial in the digital age for establishing interpersonal social connections between individuals or groups, both online and offline (Botsman & Rogers, 2011; Tussyadiah & Pesonen, 2015). Online information has a stronger impact on user trust than offline information (Ert et al., 2016). Researchers also focus on social trust, exploring it from the perspectives of social networks and psychology. For example, Zhang et al. (2022) investigated how social trust influences group decision-making and personalised consensus. Wu et al. (2022) explored the impact of COVID-19 on social trust and socioeconomic segregation. Social trust is also relevant in various domains such as dating, sports, shopping, transit, and education. Wu et al. (2022) examined the cognitive and emotional sources of social trust among social shopping users. Similarly, Sakib et al. (2022) investigated how social trust affected mobile mobility, carpooling, and socioeconomic stratification during the COVID-19 pandemic. Furthermore, Wu (2021) explored the macro-level implications of the micro-association between education and social trust.

Interpersonal trust has suffered throughout the recent public health crisis. This is particularly true within the realm of sports, where mistrust between enthusiasts has been further exacerbated (Mackintosh et al., 2021). Although digital media platforms have become increasingly important in sports, allowing individuals to simulate authentic sports experiences through devices or technological means like virtual reality (VR), augmented reality (AR), and mixed reality (MR) (Miah et al., 2020), people still prefer a more genuine social experience of sports offline. This preference stems from the limitations of current technological capabilities, as well as the inherent attributes and popularity of sports. Therefore, trust mechanisms for virtual and real-world sports social interactions are crucial in the current climate. Unfortunately, little research has been conducted on this topic in the context of epidemics and virtual-real fusion within the sports social field. Thus, the goal of this study is to explore the establishment of trust mechanisms in the fusion of virtual and real sports social interactions during an epidemic using online platforms in the digital media era, and provide an exploratory reference for the related field.

### **3 User social trust mechanism fusion of virtuality and reality in digital media context**

#### **3.1 The definition of user social in a fusion of virtual and real**

The fusion of virtual and real user socialisation entails the seamless integration of online and offline social behaviour via digital media platforms, thereby enabling users to communicate and interact with each other in both virtual and physical social settings. This approach facilitates easier socialisation, transcends time and location, expands social networks, and enriches social experiences. Social media platforms and apps enable users to connect with people from various locations, share images, videos, and other content, and build social networks. The integration of actual and virtual user socialisation can also modify online and offline social environments, allowing people to socialise in diverse contexts and fulfill different social needs.

#### **3.2 The impact of social behaviour on trust in the contemporary digital media context of the fusion of virtual and real**

In the present digital social media context, the amalgamation of virtual and real social behaviours has significant implications for trust. The fusion of virtual and real social behaviours enables social communication across time and geography through digital media platforms, enhancing the connectivity of social networks. Moreover, it expands the scope and forms of social interaction, rendering social engagement more diverse and multifaceted. These attributes offer increased potential and opportunities for constructing social trust among users.

Nevertheless, the mixing of virtual and real social behaviours has resulted in the dissemination of false information and scams, causing users to be skeptical of other users and information on digital media platforms. Therefore, in the current digital media context, it is crucial to establish a reliable user social trust mechanism and ensure information transparency in order to address user social trust issues arising from the integration of the virtual and real.

#### **3.3 The construction of a social trust mechanism for the fusion of virtual and real in the digital media context**

The first thing that needs to be made clear is that establishing trust is not a one-way street but rather a mutually built relationship (Van Lange & Balliet, 2015). When two individuals are interdependent, their trust relationship is established through mutual trust, and in situations of purposive behaviour with homogeneity, both parties become trustors and trustees. There are various factors that people take into account when deciding whether to trust someone, such as their relationship, resources, and mutual interests (Cook et al., 2013). Additionally, Mayer et al. (1995) propose that trust can be viewed as an aggregate of three factors: the trustor's propensity, the trustee's trustworthiness, and environmental factors. The trust relationship between the trustor and the trustee is based on a subjective, asymmetric exchange of interests that is also influenced by environmental factors.

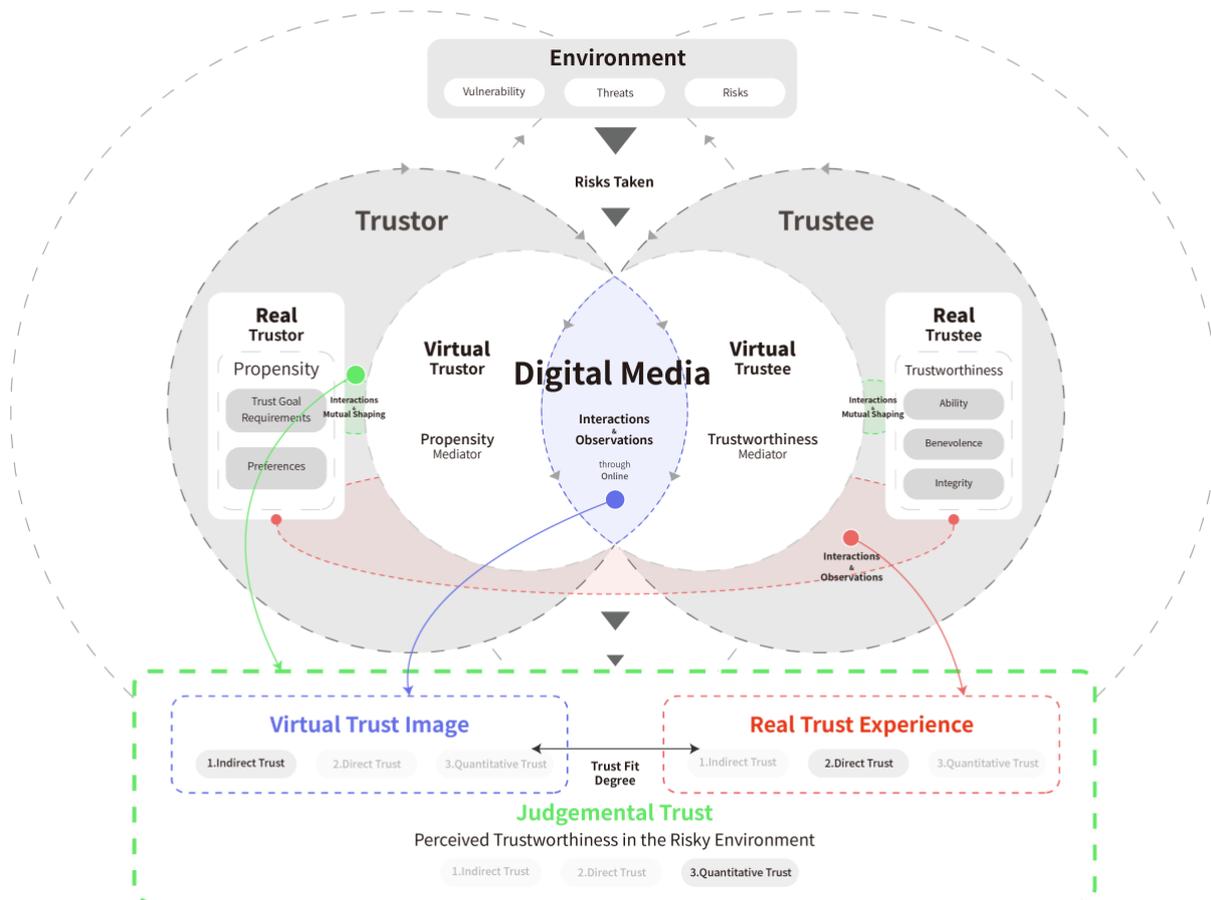


Figure 1. User social trust mechanisms for the fusion of virtual and real in digital media contexts (general trust mechanism model). Source: Made by the Author.

According to the conceptual model illustrated in Figure 1, trust is established through a three-way coordination between the trustor's propensity, the trustee's trustworthiness, and environmental factors. This coordination is achieved through the trustor's observation and interaction with the trustee on digital media platforms, while environmental factors act as risk factors influencing the entire coordination process. It should be emphasised that while social interaction is one of the most fundamental behaviours in human society, the nature of social interaction on digital media is a simulation of real social behaviour. As a result, both the Trustor and the Trustee have a Real and a Virtual aspect, i.e. (Real/Virtual) Trustor and (Real/Virtual) Trustee.

### 3.3.1 Virtual trust image and real trust experience

When participants attempt to communicate with others and build trust through digital social media, the essence of the process is communication and the perception of information. The sender (Trustor or Trustee) edits the message to be communicated and sends it to the audience (Trustor or Trustee), who then waits to receive it. However, the audience is not strictly speaking the passive recipient of the message, but the active user of the message. Therefore, in order for the audience to understand and remember the message sent by the sender, it is necessary to get their attention in the first place. However, it is important to note that audience interpretation of messages is influenced by their own cognitive needs and subjective experiences, which can lead to biased results (Gu, 2006). During this stage, participants often use virtual identities to interact with each other and create a Virtual Trust Image (indirect trust). Once the virtual trust image of both parties meets a certain threshold, they

engage in a deeper level of contact (such as offline interaction) to establish a Real Trust Experience (direct trust).

Although virtual identities are typically based on real identities, participants can also use fictitious identities due to the limitations of digital media (Gu, 2006). Trustors may feel a mismatch between the trustee's virtual and real identities (Trust Fit Degree), and this mismatch may affect the trustor's level of trust in social interactions. This does not mean, however, that digital media or virtual identities only have a negative impact on the trust of both participants. They can have a positive effect in some specific situations. For example, helping introverted participants compensate for deficiencies in their real identities. Thus, when interacting socially through digital media, there is a virtual and a real side to both the trustor and the trustee. And the relationship between the virtual and the real is one that interacts with and shapes each other.

### 3.3.2 Judgemental trust

Trust is not merely a static outcome or process; rather, it is an ongoing and constantly evolving outcome that is always present throughout social interactions, i.e., the act of Judgemental Trust. This evolving state of trust can be measured using Quantitative Trust (QT), which is introduced as a trust metric unit. To determine a set of QTs, trust goal requirements within the trustor's propensity and environmental factors are considered, while preferences are used to combine all QTs and obtain an overall trust value. It is worth noting that having more QTs does not necessarily have a positive impact on trust, as per the cost-effectiveness of the actual social process outlined (Xu, 2018). As the number of service touchpoints grows for both participants, it may lead to more distrustful or low-trust messages. Additionally, Cook et al. (2013) theory suggests that different trust goal requirements affect the weighting of QTs, which in turn affects judgmental trust and the overall trust value.

Based on this conceptual model, it is evident that trustors trust goal requirements and environmental factors combine to generate QTs in both real and virtual trust. These QTs are then combined according to the trustor's preferences to obtain the overall trust.

### 3.3.3 Quantitative trust

Based on the conceptual trust mechanism model proposed above, the process of quantifying trust involves the trustor's determination of the trustee's trustworthiness based on the weighting of QTs, and trustworthiness consists of QTs and indicates the different characteristics of the trustee. To ensure the validity of the trustor's chosen QTs, certain criteria must be established. Mayer and colleagues' conceptualization of trustworthiness incorporates three interconnected factors: ability, integrity, and benevolence (Lee et al., 2022). This classification is widely accepted within the field of social-organisational settings (Mayer et al., 1995) and can serve as a useful reference for the trustor.

- Ability: Evaluates the Trustee's capabilities and expertise in accomplishing trust goals. The Trustee's performance and task completion will enhance trust.
- Integrity: Evaluate the Trustee's integrity and morality. Honesty, trustworthiness, and ethical behaviour enhance others' trust.
- Benevolence: Evaluates the Trustee's compassion and caring. People are more inclined to trust someone who shows compassion and care for others.

The nonexistence of any of these dimensions can significantly impact overall trustworthiness. If the ability dimension is lacking, it may raise concerns about the trustee's trustworthiness since they have

not demonstrated sufficient skills, capabilities, or expertise to accomplish the trust goal. In the case of the absence of the integrity dimension, the trustor may question whether the trustee will treat them with integrity and fairness, as there is no assurance that the trustee's actions to accomplish the trust goal align with moral and ethical norms. The benevolence dimension's nonexistence may lead people to feel that the trustee lacks good intentions towards them. Therefore, these three dimensions are interconnected, and the absence of any one dimension will affect trustworthiness. In order to assess the trustworthiness of a person or organisation, participants need to evaluate all three dimensions.

### 3.3.4 Trust dimension

In the proposed conceptual mechanism model, the trustor evaluates and consolidates quantitative trust (QT) based on the three dimensions of ability, integrity, and benevolence. However, due to varying subjective perceptions and environmental influences, trustors face the challenge of quantifying trust and therefore require a refinement of the three trust dimensions, as presented in Section 3.3.3. This study introduces the concept of Trust Indicators, which are Service Touchpoints that allow the trustor to deepen trust as trust indicators. The QT is assessed based on the number and strength of trust indicators in each trust dimension.

These trust indicators (touchpoints) can encompass various aspects of trustworthiness and can be easily identified by the trustor. As illustrated in Figure 2, the trustor can capture and consolidate QT through the indirect, direct, and quantitative trust stages by utilising propensity along with environmental factors and trust indicators to determine the trustworthiness of the trustee.

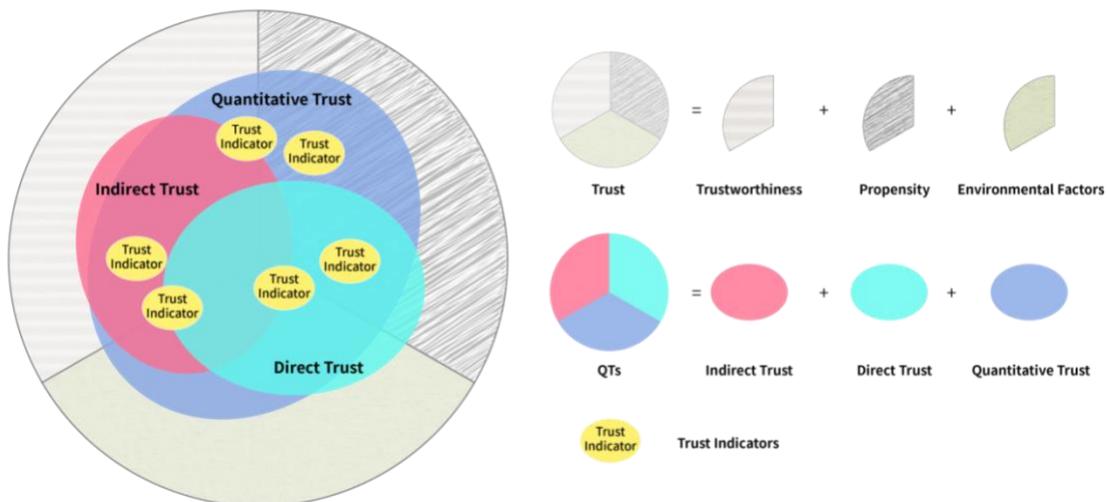


Figure 2. The relationship between Trust Dimensions and Indicators diagram. Source: Made by the Author.

### 3.4 Transparency of trust information

While the trust indicator mentioned earlier can assist the trustor in quantifying trust from different angles, the virtual identity mentioned in 3.3.1 implies that both parties must provide transparent trust information to determine each other's genuine behaviour and intentions. Additionally, Yan et al. (2016) stated that the collection and processing of trust evidence may lead to privacy breaches, making entities reluctant to provide the necessary personal evidence for trust evaluation. Thus, the concept of "credibility value" should be introduced to aid trustors in providing feedback to trustees after the

Judgemental Trust process and as a criterion for other trustors to evaluate the trustee's trustworthiness.

However, the mechanism model discussed in Chapter 3 is only a general trust mechanism model for evaluating trust, and the opportunity, pathway, and effectiveness of feedback are impacted by various factors. For instance, during a long-term trust period, the time required to establish actual trust is excessive, resulting in a low valid referenceable amount of credibility value. Participants may use diverse digital social media platforms, resulting in missing or nonexistent credibility value. Moreover, unrestricted types of trust evaluation can lead to an overly broad range of credibility values being assessed, reducing validity and accuracy. Therefore, the concept of reputation value must meet these three requirements: (1) non-permanent trust, (2) a generalizable third-party platform, and (3) a limited type of trust. The platform construction in Chapter 5 will reflect these conditions.

## **4 A social trust mechanism for sports in an epidemic environment that blends reality and fiction**

### **4.1 An analysis of changes in social trust behaviour in sport in an epidemic environment: the case of COVID-19**

#### 4.1.1 Research methodology and structure

This study investigates the impact of the pandemic on sports social trust, cognitive perceptions, and behaviour. Eight sports enthusiasts and venue owners participated in semi-structured interviews to share their experiences during COVID-19. In addition, the authors designed a self-administered questionnaire, which received more than 100 valid responses from various countries through social media platforms. Survey's structure:

- Personal Information: This section gathered participants' age, gender, occupation, etc.
- Perceived effects of the epidemic on sport social trust: To comprehend participants' perspectives and conceptualizations of social trust in the context of the epidemic, and to gauge their level of understanding and appreciation.
- Behavioural effects of the epidemic on sport social trust: This component investigates participants' behaviours and habits when facing a sport social trust crisis during the epidemic. It examines their behavioural patterns.
- Evaluation Scale: This study utilised two assessment scales, Likert Scale and Ordinal Scale, with appropriate adjustments and modifications to meet the specific requirements of the research, considering the strengths of each scale.
- Open-ended Questions: Participants are encouraged to freely express their thoughts, provide comments, or offer additional information to gain deeper insights and perspectives.

#### 4.1.2 Analysis and presentation of key insights

Of those surveyed, 28.7% strongly agreed that the pandemic has caused a decrease in trust among sports participants.

- To what extent do you agree with the statement that the number of people participating in sports has declined due to the pandemic.

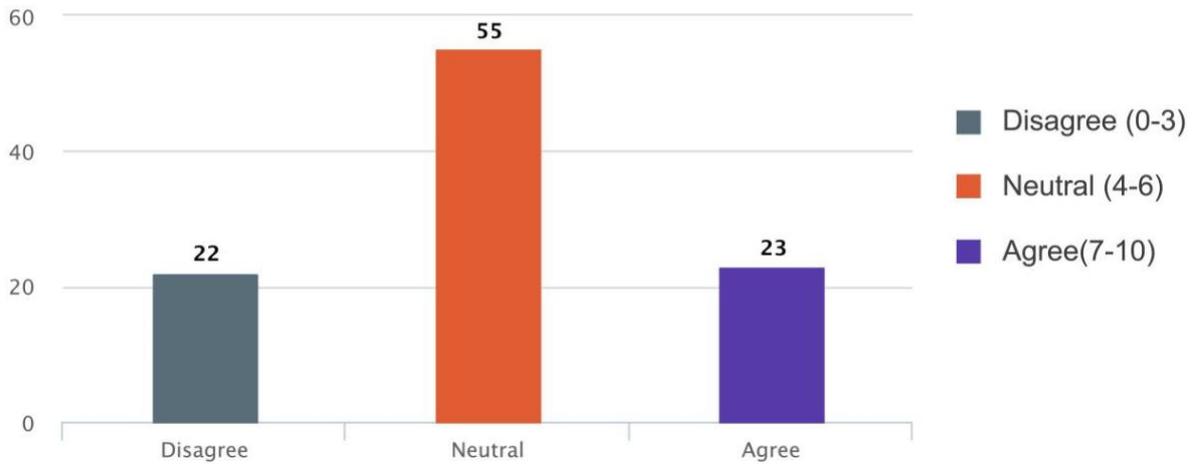


Figure 3. Survey on the decline of sports participation during Covid-19. Source: Made by the Author.

According to Figure 4, 80.1% of sports participants either stopped exercising, exercised alone, or exercised with friends to avoid COVID-19. The pandemic has undermined trust among exercise partners.

- In order to avoid being infected, how did you exercise during the epidemic?



Figure 4. Survey on how sports enthusiasts exercise during the epidemic. Source: Made by the Author.

In light of the open-ended question regarding the improvement of trust among sports participants, the majority of participants expressed their view that transparency of information and vaccination were the most efficacious ways. As such, it is imperative to establish a trust mechanism that prioritises transparency of information in order to enhance trust between sports participants during an epidemic.

"Maintain good sanitation and hygiene among members"	"regular testing and clean venues, no risk of getting covid"	"Communicate"
"I feel that trust among participants comes from <b>transparent relationships</b> "	"I think we need to talk about <b>vaccination status</b> "	"Reducing communication costs and keeping <b>individuals safe</b> is very important"
"Making sure that under every circumstance regarding corona measures it is possible to do the event"	"Gender, need to prevent gender harassment from happening or have prevention mechanisms in place."	"Group selection, e.g. if I need to play ball, there should be a corresponding participant, rather than offering participants who want to swim. Are you aware of the rules for participating in the event, ball games have some scoring rules."
"Wearing a mask"	"Show that it is okay -> scientifically"	"Employers should mention to people to give each other space."
"Take <b>personal protection</b> "	"Improve outbreak prevention and control"	"It's better to be with people you know"
"Build a social platform"	"Friends of my friends, introduce close friends to <b>make sure they can be trusted</b> "	" <b>Upload information</b> at the entrance to the venue and have automatic detection"

Figure 5. Open-ended survey on "How to improve trust between sports enthusiasts". Source: Made by the Author.

## 4.2 The construction of trust mechanisms in epidemic environments and sporting social scenarios

In accordance with the conceptual mechanism model presented in Section 3.3, trust evaluation involves a series of steps: (1) The trustor defines their trust goals; (2) They gain insight into the environmental factors; (3) They observe and interact with the trustee during indirect and direct trust phases to acquire all QTs of their trustworthiness; (4) They assess the service touch-points throughout all phases; and (5) They combine the above factors according to their preferences to arrive at an overall trust score. Nonetheless, this model is solely applicable to user socialisation that involves both blending virtual and real in a general context. In certain unique scenarios, trust may involve multiple parties, such as the establishment of trust in a virtual-real fused social campaign during an epidemic. Such a scenario requires modifications to the original conceptual mechanism model, such as (1) changes in the number of trust threads; (2) variations in the relationships between trust objects; (3) the impact of the scenario on the trustor's propensity and the trustee's trustworthiness and environmental factors; and (4) the transparency of trust information. It should be emphasised that the fundamental operational logic of the trust mechanism model in this particular instance remains the same as that of the general case.

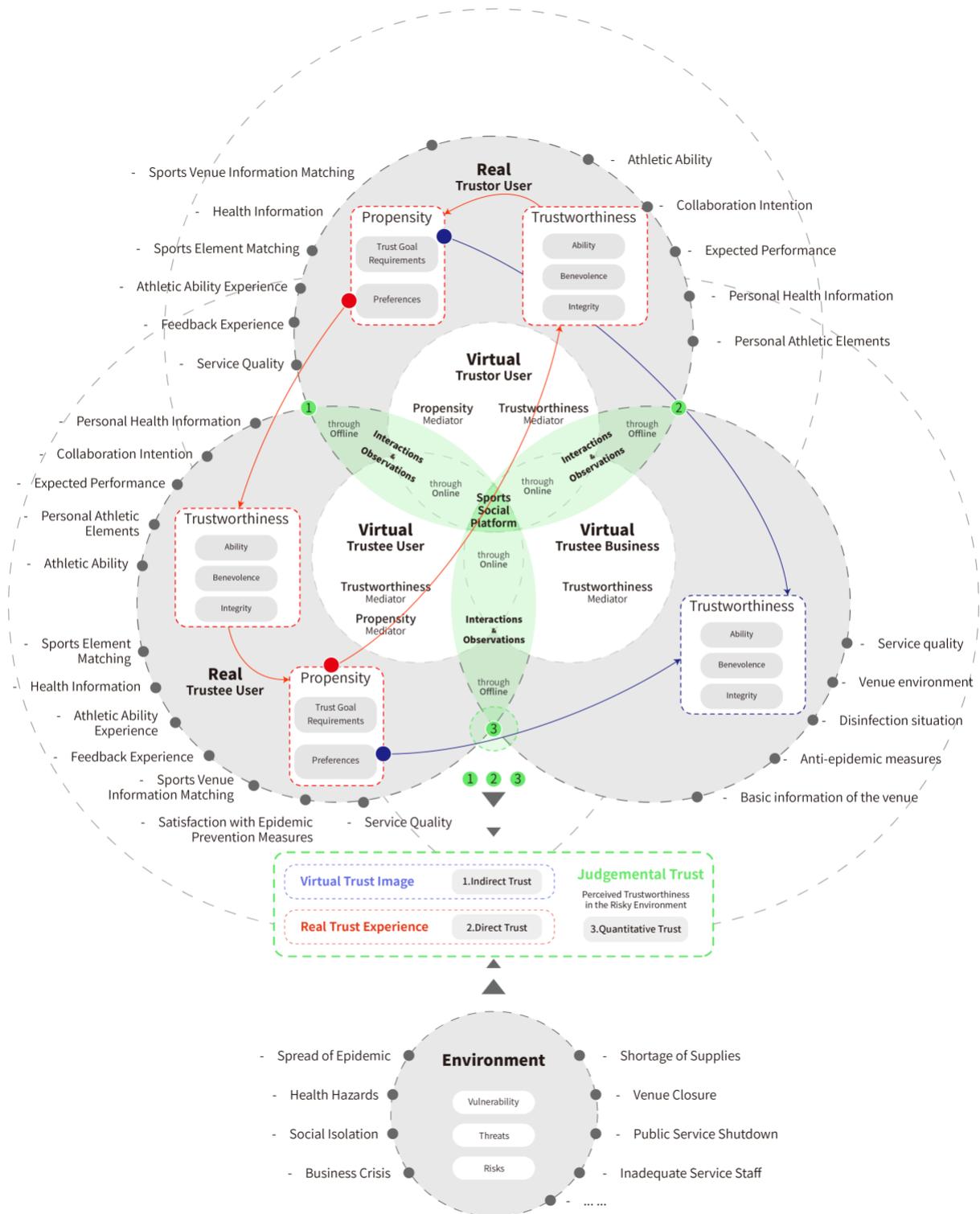


Figure 6. A virtual-real epidemic sports social trust mechanism. Source: Made by the Author.

#### 4.2.1 Change in the number of trust threads

According to the model of social trust in sports during an epidemic context with a fusion of reality and virtuality shown in Figure 6, the development of trust changes from the previous single thread (Trustor to Trustee) to multiple threads (Trustor to Trustee A and Trustee B), namely Trustor User to Trustee User and Trustee Business. This is because in the context of sports, trust between participants involves

other sports enthusiasts and sports venues. Therefore, depending on the type and nature of the sport and the needs of the participant, the threads of trust are divided into three general situations: (1) participant and sports enthusiast; (2) participant and sports venue; and (3) participant, sports enthusiast, and sports venue. For instance, a participant may want to find a companion to go to a swimming pool with a good environment. In this context, the participant needs to establish trust with both the companion and the sports venue. It is noteworthy that the participants in this discourse are also sports enthusiasts, and to distinguish between the initiators of trust, they are referred to as trustor and trustee, respectively.

#### 4.2.2 Changes in the relationship between trust objects

In certain situations, the relationship between objects of trust can vary based on the qualities and number of trust threads. As demonstrated in Section 4.2.1, participants require two trust threads to establish trust with their peers and the sports venue, respectively. Considering the nature of social interaction and sport described in Section 3.3, peers, who are themselves participants, may also need to establish trust with their peers and the sports venue. Consumers, such as participants and sports enthusiasts, can explicitly express their needs (i.e., a trustor user's propensity). On the other hand, businesses, such as sports venues, can typically only fulfil consumers' needs through their own conditions (i.e., the trustee business's trustworthiness) (Lazonick, 2003). Suppliers always act as trustees in the trust mechanism. In conclusion, trust objects and trust threads influence their relationships.

Based on the above information, the three trust threads in the special case presented in Section 4.2.1 can be generalised into three thread classifications with generalities that can be applied to other special cases.

- Cyclic independent trust threads: Participants have only one trust object, and both parties are both trustors and trustees. The completion of the thread is required to meet each other's expectations, and the thread is independent of the trust results of other threads.
- Acyclic independent trust threads: Participants have only one trust object, and the trustors and trustees consist of a trustor and a trustee. The completion of the thread is only required for the trustee to meet the trustor's expectations, and the thread is also independent of the trust results of other threads.
- Comprehensive trust threads: Participants have multiple trust objects (two or more), and the trust objects consist of one or more trustors and trustees. Completion of the thread is required to meet the expectations of all trustors, and the trust result of any one of these threads will affect the overall final result.

#### 4.2.3 Changes in propensity, trustworthiness and environmental factors

As per the information in 3.3, in order to quantify trust using the three trust dimensions, participants require several trust indicators to minimise the impact of their subjective recognition and environmental factors. In a hybrid physical and virtual social scene amidst an epidemic, the trustor's inclination, the trustee's credibility, and environmental elements must also be tailored to decrease the influence of the trustor's subjective recognition and environmental factors while quantifying trust.

Table 1 presents trust indicators for propensity, credibility, and environmental factors in both the epidemic setting and the sports social context. These trust indicators are derived from a summary of

interviews with eight sport participants, including sports enthusiasts and venue owners, regarding their experiences and perceptions of sports during the COVID-19 pandemic, as well as 116 survey responses. Thus, these trust indicators are regarded as a benchmark and a guide for participants in the current scenario.

*Table 1. Trust Indicators in epidemic environments and sporting social scenarios*

<b>Propensity</b>	<b>Trustworthiness</b>	<b>Environmental Factors</b>
Sports element fit, health information, competitive ability experience, feedback experience, information match of sports venues, satisfaction with preventive measures, quality of service, etc.	Athletic ability, intent to cooperate, expected performance, personal health information, personal elements of exercise, etc. Basic information about the site, the site environment, epidemic prevention measures, extermination, the quality of service, etc.	Epidemic spread, health hazards, social blockages, operational crises, inadequate supplies, venue closures, public service closures, and inadequate service staff.

**4.2.4 Transparency of trust information in epidemic environments and sport social scenarios**  
In light of the details outlined in Section 3.4, the concept of credibility values can enable maximum transparency in trust-related information while ensuring user privacy is protected. Additionally, the epidemic context and sports social scenarios satisfy two out of the three requirements for implementing credibility values, namely temporary trust (such as participation in a single sporting event) and restricted trust types (such as in the context of an epidemic and sports social scenarios). Therefore, the development of a relevant third-party platform is necessary to assist users in assessing trust via the trust indicators listed in Table 1 and to offer users a feedback platform following the acquisition of the Real Trust Experience. This feedback would subsequently be converted into a credibility value, which would serve as one of the criteria used by other users to evaluate trust.

## **5 The construction of a social platform for sport in an epidemic environment**

Building upon the previous section, we have developed a trust mechanism for social sports interactions in both virtual and real environments during epidemics. Section 4.2.4 stresses the importance of trust information transparency, and credibility as essential prerequisites, and the notion of credibility values is introduced as a prerequisite for such transparency. Currently, a suitable third-party platform is required to implement credibility values. Due to its mobility, popularity, and ease of development, a mobile application (app) was selected as the platform. The envisioned social platform would enable sports and social interactions during pandemics.

### **5.1 The construction of a social platform for sports in an epidemic environment with a fusion of virtual and real**

To construct the app successfully, it is essential to determine how to implement the model outlined in Section 4. Based on the features of the model, it is crucial to consider the crucial areas of application in the following manners:

- Trust Information Transparency: Users require trust information to make informed social judgments. Displaying trust values and information of other users aids in people's understanding of social trust.
- Social Interaction Function of Virtual Reality Integration: Within the movement social platform, one of the fundamental functions enables users to socialise with others in an epidemic environment and establish trust through communication and sharing.
- Social behaviour recording and feedback: Platforms should record users' sports activity, social interactions, ratings, and user reports. Based on this information, users' trust values can be calculated, and appropriate trust information can be provided.

In the meantime, additional aspects of the platform are presented in Section 5.2.4, including the visual design, interface layout, and interaction logic of the sports social platform in the context of the epidemic, all of which significantly affect the user experience.

## 5.2 Functional design of a social platform for sports

### 5.2.1 Application of transparency of trust information

As depicted in Figure 7, the transparency of trust information is primarily demonstrated through the following means: (1) Upon their initial use of the platform, users are prompted to indicate their preferred type of sport and personal sport preferences; (2) Users are allowed to use filters to find other users or sport venues that match their preferences; (3) the platform provides basic personal information about other users (such as age, sport preferences, reputation value, etc.) or venues (such as operating hours, hygiene conditions, etc.). These features help users quickly narrow their selections during the trust creation process, thereby increasing the likelihood of trust and fostering positive social interactions.

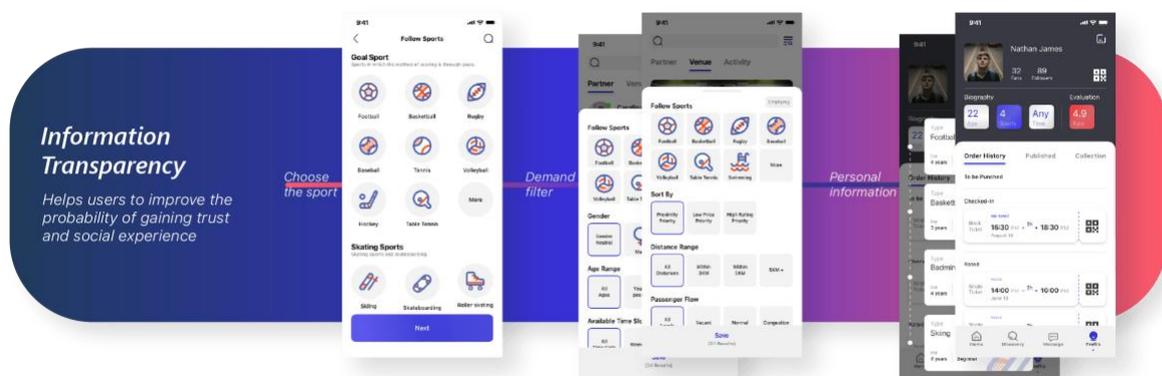


Figure 7. The presentation of trust information transparency in the app. Source: Made by the Author.

### 5.2.2 Social interactive features that blend virtual and real

Once users find a suitable sports enthusiast, they can utilise the virtual platform to communicate and obtain more information. The suitability of sports venues can also be assessed. Users can post their sporting activities and requests or join others in their activities. After each exercise, users can rate each other to establish trust. The platform's social interaction characteristics enhance trust-building and the social experience among users while concurrently increasing the platform's value and user retention rate.

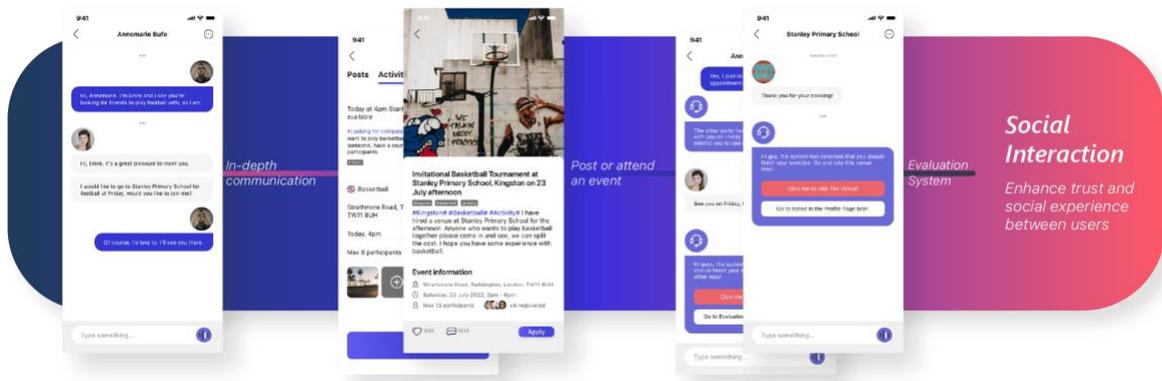


Figure 8. The presentation of blending virtual and real social interaction features in the app. Source: Made by the Author.

### 5.2.3 Social behaviour recording and feedback

To enhance the credibility of evaluations, the platform records appointments when users express an interest in exercising together, as outlined in Section 5.2.2. This ensures that offline interaction has occurred, leading to an authentic trust experience. To analyse trust values and obtain detailed information, the evaluation feature employs both general and descriptive components. Generalisations are derived from a 1–5 assessment of experience satisfaction, while descriptive details are provided through textual narratives. To prevent malicious evaluations due to personal feelings or dissatisfaction with the other party's evaluation, evaluation information is only revealed after both parties have evaluated each other. Exercisers can also rate sports venues. These features can enhance user reference value, trust, and communication. Table 1 in Section 4.2.3 presents trust indicator dimensions for examination.

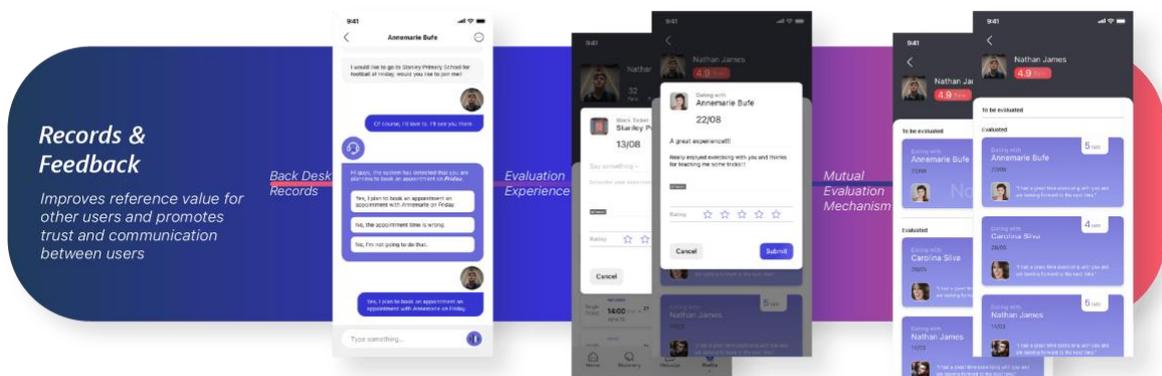


Figure 9. The presentation of social behaviour records and feedback in the app. Source: Made by the Author.

### 5.2.4 Other components of the App and overall presentation

The user flow diagram in Figure 10 presents a comprehensive depiction of the application's visual design, interface layout, and interaction logic.

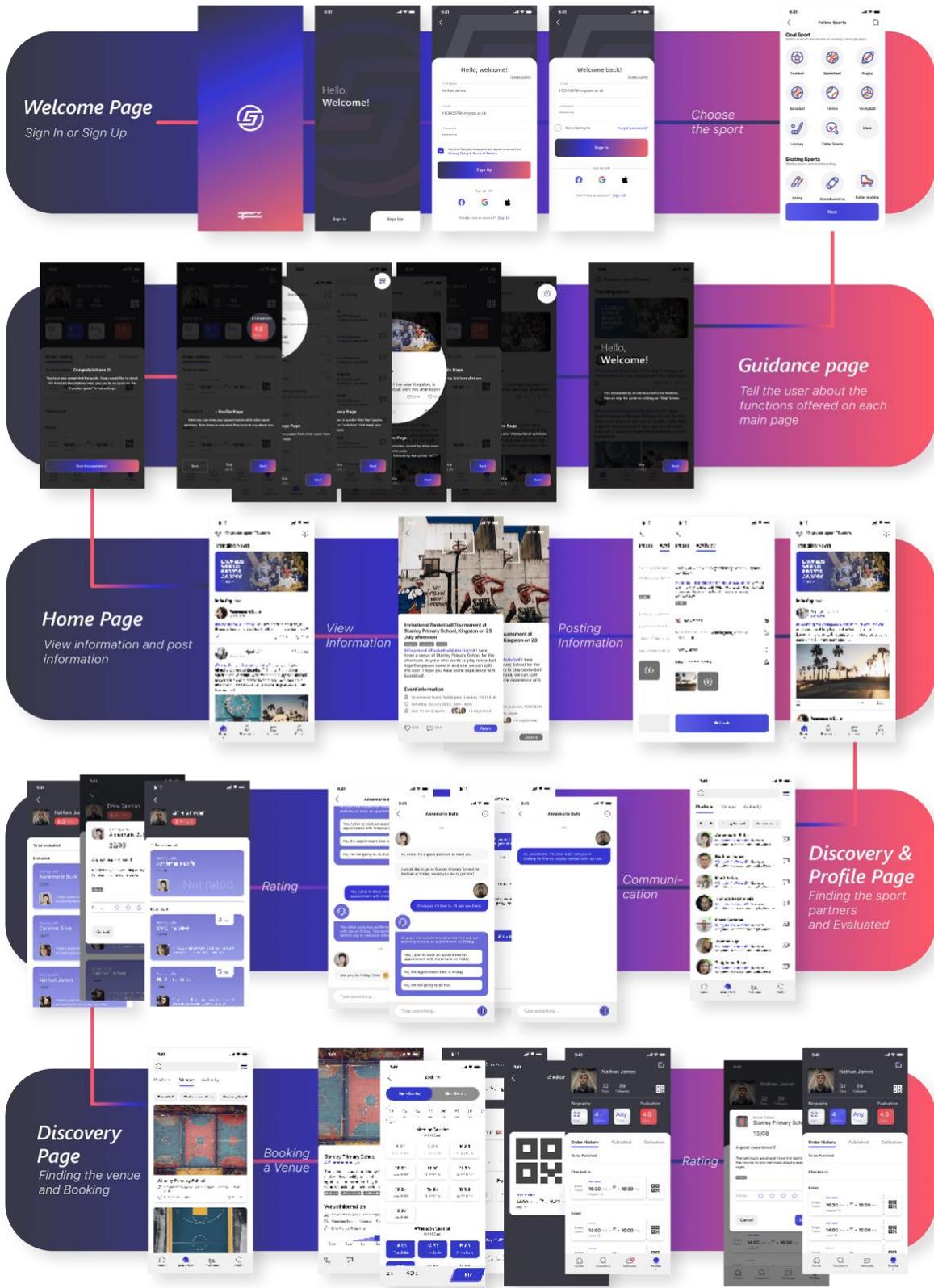


Figure 10. Overall visual design, interface layout and interaction logic of the App. Source: Made by the Author.

## 5.3 Usability testing

### 5.3.1 Formative evaluation method

This project underwent a usability test following the Common Industry Format guidelines, which simulated a real-world setting and provided quantitative statistics on completion, errors, and time to evaluate the trust mechanism and application. Additionally, participants' subjective feelings were assessed to evaluate the trust mechanism's efficiency.

### 5.3.2 Testing process

Five experienced participants were tested both face-to-face or remotely via Microsoft Teams. The tests included three real-world motor socialisation tasks. The researchers observed and recorded all test sessions. Following each exercise, participants provided explanations about their experiences and completed a questionnaire assessing the three trust characteristics for the authors' evaluation.

### 5.3.3 Test results

The test findings and post-test interviews provided valuable data and conclusions.

- **Trust Mechanism Compatibility:** The test was completed efficiently and accurately, with all five users scoring average of 89 (acceptable: > 80.3) on the Likert-based System Usability Scale (SUS). The trust mechanism did not introduce complexity to the APP.
- **Effectiveness of the Trust Mechanism:** After the post-test Trust Perception Rating (TPR), the average ratings of the five participants on the three dimensions of trust (described in Section 3.3.3) were 1.8, 2.4, and 2.4 (acceptable: < 2.5). The interviews also revealed that the APP with the trust mechanism enhanced trust confidence and efficiency. Interviewees said:

*"It boosts my faith in strangers."*

*"It's simple, the functionality is naturally integrated, and the process isn't complicated."*

*"It met my expectations."*

Based on the test results and positive feedback from the participants, it is evident that the trust mechanism proposed in this study is valid.

## 6 Conclusions

This study aims to establish a trust mechanism based on users' social behaviour in a combination of virtual and real environments, specifically in the context of sports socialisation during an epidemic. The authors propose three categories of trust: indirect trust (virtual trust image), direct trust (real trust experience), and quantitative trust (judgmental trust), and introduce QT as the reference unit for quantifying trust. The study also proposes trust indicators as criteria for measuring the strength and number of trust objects, while the concept of "credibility value" is proposed to help minimise the impact of virtual identities on trust in the digital media era.

Furthermore, the study explores variations of the social trust mechanism in the context of epidemic environments and sports socialisation. The authors present a more in-depth analysis of trust objects, trust threads, and their changes, and summarise them into three theoretical concepts: cyclic independent trust threads, acyclic independent trust threads, and comprehensive trust threads. The mechanism is shown to inform research related to social trust in campaigns during epidemics and can

be used as a reference for trust mechanisms in other special scenarios by incorporating relevant factors.

Meanwhile, building on theoretical insights, this study conducted an app design practice implementing the principle of social trust mechanism for sports in an epidemic environment. The usability of the principle was verified through usability testing. The first three metrics evaluated the app's effectiveness and efficiency, the fourth (SUS) assessed its usability, incorporating the trust model, and the last (TPR) evaluated its ability to foster trust based on three trust aspects. The final usability test revealed enhanced user experience, acceptance of the solution, and the ongoing applicability of the generic trust model to specific cases.

This study proposed social trust mechanisms for virtual-reality convergence in digital media. The practical applications of these principles can guide the design of similar apps and the establishment of trust mechanisms in virtual-reality convergence information systems. The app's prototype testing stage is currently unable to conduct large-scale user testing and research. We plan to further explore the following areas: 1. Expanding data samples: by incorporating a broader range of consumers, we aim to enhance the universality and credibility of the research results. 2. Deepening user experience research: we will investigate user emotions, cognitive processes, and usage habits in depth. 3. Iterating and improving the prototype: we will enhance and expand the functionality of the APP to provide a more realistic usage environment, thereby enhancing user trust and satisfaction.

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## Appendix

### The questions used in survey

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**Aims:** This survey aims to investigate the impact of an epidemic on social trust in the context of sports, and explore the subsequent modifications in participants' cognitive concepts and behavioral habits.

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1. What is your gender?
2. What is your age?
3. What is your current work status
4. Do you have any experience of exercising with other people during the epidemic?
5. When you were exercising with other people during the epidemic, were you worried that you might catch the virus?
6. In order to avoid being infected, how did you exercise during the epidemic?
7. Who do you usually exercise with during the pandemic?
8. To what extent do you agree with the statement: As a result of the pandemic, there has been a decline in trust among participants in sports.
9. What do you think is the reason for the decline in trust among the participants of sports?
10. To what extent do you agree with the statement that the number of people participating in sports has declined due to the pandemic.
11. What do you think is the reason for the decline in participation in sports during the epidemic?
12. What factors do you think may be helpful for "rebuilding trust among sports participants during the epidemic" and "mitigating the decline in sports participation"?
13. Which of the following features would you like to have in an online sports community? (Sorting questions)
14. Do you have any ideas or suggestions for improving trust among sports participants? (non-required questions)

### The questions used in semi-structured interviews

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**Aims:** This Interview aims to gain insight into individuals' experiences and emotions and enhance the comprehensiveness and depth of the research data.

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**Note:** This is not the full set of interview questions and the researcher will ask additional questions based on the participants' responses.

1. Please tell us about yourself
2. Do you exercise on a daily basis?
3. What kind of exercise do you usually do?
4. Did you continue to do this exercise during the epidemic?
5. Are you worried about the possibility of getting infected by the virus if you play sports during the epidemic?
6. Do you feel that the epidemic had any impact on your participation in this sport? This includes your overall sense of experience.
7. And how did you cope with this risk?
8. Do you usually exercise alone or with others? Why? Has the epidemic affected you in this way.
9. Have you ever faced a situation where you had nowhere to go because your sports ground was closed due to an epidemic?
10. How did you usually solve this problem?