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# Trusted Teammates: Commercial Digital Games Can Be Effective Trust-Building Tools

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## Abstract

Trust is a key component of high functioning virtual work teams. This study investigates the effectiveness of a commercial digital game in developing trust in virtual teams compared to a typical virtual team icebreaker. To achieve this, we outline important trust-building aspects that a game must have and identify the commercial digital game *Space-team* as a suitable candidate. Our results show that *Space-team* is more effective at developing trust in virtual teams compared to social icebreaker, indicated by differences in trusting behaviour. We did not find differences in perception of team trust or moderating effects of dispositional trust. Our findings suggest that digital games with trust-building aspects enable the verification of early trusting beliefs through gameplay, which in turn develops trust among team members. As these games are robust against individual differences in dispositional trust, it is applicable across any team composition. Our findings support the use of digital games as viable trust-building tools for virtual work teams.

## CCS Concepts

•Applied Computing → Computer Games; •Human-Centered Computing → Computer Supported Collaborative Work;

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### How to identify a suitable commercial digital game for trust-building

#### Corporate use requirements [32]:

- Easy to learn.
- Short completion time (i.e. under 30 minutes).
- Draw parallels with the virtual work context.

#### Trust-building requirements:

- Have clear, shared, interdependent goals [30, 31]. This creates a context of risk and uncertainty and necessitates interaction between players.
- Require team members to plan, strategise and communicate to coordinate their actions. This provides opportunity for swift trust beliefs to be verified [9].

### Author Keywords

Digital Games; Virtual Teams; Trust; Team Effectiveness; Workgroups

### Introduction

Interpersonal trust is the foundation of collaborative, interdependent work in teams and develops over time through repeated interactions [26, 10, 18, 8]. It enables risk-taking behaviours such as cooperation, providing help and investing effort because of expectations that these actions will be positively reciprocated [25, 5, 16]. As team members gain more knowledge and information about each other, social bonds develop and trust increases. In virtual work teams, however, trust develops differently. High trust exists prior to the formation of relationships [21, 22, 23, 36]. This form of trust is known as 'swift trust'. Sustaining swift trust during the initial stages of the team is necessary for interpersonal trust to develop during the later stages of the team [19, 9, 17].

The dominant approach to developing interpersonal trust early in the team's life cycle is through social ice breakers. Social icebreakers are thought to help team members get acquainted and develop social bonds [42, 14, 17]. However, this approach is limited because it lacks the contextual factors that facilitate trust development – risk and interdependence [34, 35]. Furthermore, the emphasis on personal information exchange does little for verifying swift trust, which is based on presumptions of competence and reliability rather than social bonds.

Research on the viability of digital games as team-building tools has begun to emerge [15, 27, 4, 32, 12, 6]. This interest is driven by the fact that digital games are cost-effective compared to a physical team-building activity, easily deployable, engaging and can be tailored to meet specific team

needs. As such, digital games have the potential to provide the contextual factors necessary for trust development. Indeed, a recent study found that a trust-building digital game was more effective than a social icebreaker at developing trust in virtual teams consisting of two individuals [12].

However, their findings have several limitations. For example, only survey measures of trust were used. As stated by [7], trusting behaviours (i.e. cooperating in situations with uncertain reciprocation) distinguish the *willingness* to be vulnerable to the actions of others from the *actual behaviour* of becoming vulnerable. Without understanding whether trust-building digital games have an impact on behaviour, it is difficult to recommend the use of these games in the real world. Their study also uses two-person teams. This does not reflect real-world teams as virtual work teams rarely comprise of only two persons. We address these limitations by using four-person teams and a behavioural measure of trust (i.e. a variant of the Prisoner's dilemma) to supplement survey measures.

We also chose to use a *commercial* digital game instead of a purpose-built game because organisations are likely to lack the capacity or skill to make their own trust-building game as [12] did. Therefore, it is important to investigate whether commercial digital games can be effective for trust-building in virtual work teams. In order to further investigate the effectiveness of digital games in facilitating trust development in virtual teams compared to a social icebreaker, we address the limitations of [12] and identify and test a trust-building *commercial* digital game for this purpose.

### Background

#### *Digital games as trust-building tools*

There are currently two approaches to swift trust development. The first emphasises its development through enthu-

### Icebreaker Activities in Each Condition

**Spaceteam:** A multiplayer cooperative mobile game. Players are assigned a random control panel with buttons, switches, sliders and dials. Players have to coordinate to complete time-sensitive instructions. These instructions are different for each player and may correspond to either their own or their teammate's control panel. The objective is to progress through as many levels as possible [20].

**Hollywood Stars:** A typical social icebreaker where individuals state the name of an actor or character they like or identify with. The team has to guess why the individual chose the character. During the study, a list of questions was provided to facilitate the conversation. Participants were required to speak for at least two minutes to ensure they were engaged [14].

siastic social communication at the team's inception [23, 43]. The second relies on actions that reinforce presumptions about competence and reliability [9, 12]. Since swift trust is "not so much an interpersonal form as it a cognitive and action form" [30], we argue that trust-building activities based on the second approach are more effective. Digital games may be viable trust-building tools because they promote certain behaviours through gameplay. For instance, some games need cooperation to achieve game objectives which could facilitate trust development. Furthermore, immediate feedback and a playful environment allow team members to verify and adjust swift trust beliefs in a safe environment.

#### *Measuring the effect of the trust-building tool*

As trust has attitudinal and behavioural components [28, 30], we expect:

**Hypothesis 1:** Perception of team trust (attitude) will be positively related to cooperative behaviour (behaviour).

**Hypothesis 2:** Teams using Spaceteam will have higher perception of trust (attitude) and higher cooperation (behaviour) compared to teams using Hollywood Stars.

The trust literature states that an individual's dispositional trust affects interpersonal trust [28, 36], even after trustworthiness has been gauged [7]. Dispositional trust is the general willingness to trust others [28]. However, [12], on which this study builds on, found no moderating effect of dispositional trust on perception of trust. Hence we expect:

**Hypothesis 3:** The effect of Spaceteam on cooperation will *not* be moderated by an individual's dispositional trust.

## Method

### *Design*

This study adopted a between-subjects design. Our independent variables were condition (Spaceteam or Hollywood Stars) and dispositional trust, and our dependent variables were perception of team trust and behavioural trust.

### *Participants*

Eighty participants (Male = 44, Female = 36), aged between 20 to 53 years (mean age = 25.64) took part in the study. There were 20 four-person teams, randomly allocated to either the *Spaceteam* condition or Hollywood Stars condition.

### *Materials*

#### *General Trust Scale (GTS)*

This six-item measure of dispositional trust identifies an individual's general belief about the honesty and trustworthiness of others (e.g. 'most people are basically honest') [41]. The questionnaire is answered on a 5-point Likert scale.

#### *Intrateam Trust Scale (ITS)*

This four-item measure of team trust, adapted from [38] assesses group members' perceptions of group-wide trust, their perception of group-wide expectations of truthfulness, integrity and living up to one's word, and their sense of shared respect of group members' competence [25]. The ITS uses a 5-point Likert scale.

### *Icebreaker Conditions*

*Spaceteam* was identified as a suitable commercial digital game and *Hollywood Stars* was identified as a typical social icebreaker used in virtual teams. Descriptions of each icebreaker can be found in the side bar.

Measure	Cond.	Mean	Std Dev.
ITS	HS	14.53	2.11
	ST	15.43	2.37
DT	HS	2632	993.47
	ST	3002	475.23

**Table 1:** Means and standard deviations for Intra-team Trust Scale (ITS) and Daytrader (DT) group payoff. HS = Hollywood Stars, ST = Spaceteam. N = 40 for each condition

### Daytrader

Daytrader is an iterated Prisoner's Dilemma originally adapted from [3]. It is a mixed-motive game characterized by conflict between the individual and groups best interest [33, 40, 2]. Mixed-motive games are widely used to measure trusting behaviours like cooperation. Group payoff was used as an indicator of behavioural trust.

### Communication Medium

To simulate the virtual work team context, the experiment was conducted over video call via Google Hangouts.

### Procedure

Participants provided informed consent and completed the General Trust Scale before joining the video call on Google Hangouts where they met the rest of their team. During the experiment brief, participants were told to imagine that they were a virtual project team working together for the next six months. The team were told that they had no prior work history and were unlikely to have future work relations after project completion. This brief was meant to frame the experiment in a way that mimicked real-world virtual team conditions.

Each team had two-minutes of free-flow conversation and the experimenter was present throughout the experiment. The study was conducted entirely online. After the free-flow conversation, teams completed the icebreaker activity: Hollywood Stars or *Spaceteam*. Each condition was approximately 15 minutes. After the activity, participants individually completed the Intra-team Trust Scale. To measure behavioural trust, teams played Daytrader - the game automatically ran until completion. There were 5 rounds in total. Participants were debriefed at the end of the experiment and entered into a £30 cash prize draw as compensation

## Results

The data were analysed in the Statistical Package for the Social Sciences (SPSS). An independent samples t-test revealed that there was no significant difference in team-level disposition to trust across conditions as measured by the GTS,  $t(78) = -1.15, p = .882$ . This indicated that teams in both conditions had similar baseline levels of disposition to trust.

### *H1: Perception of team trust will be positively related to cooperative behaviour*

To test Hypothesis 1, data from the ITS were correlated with group payoff in Daytrader using a Pearson correlation analysis. While the analysis revealed a small positive correlation between the dependent variables, it was non-significant ( $r = 0.11, p = .333$ ). Thus, Hypothesis 1 was not supported.

### *H2: Teams using Spaceteam will have higher cooperation and higher perception of trust compared to teams using Hollywood Stars.*

Table 1 provides means and standard deviations of ITS scores and Daytrader group payoff, separated by condition. An initial inspection of the ITS data showed that the data had no outliers as indicated by a box plot, were normally distributed for each condition as indicated by the Shapiro-Wilk's test ( $p > .05$ ), and had homogeneity in variances as indicated by a Levene's test for equality of variances ( $p = .419$ ).

An independent samples t-test revealed that there was no significant difference in the ITS scores for the Spaceteam or Hollywood Stars condition,  $t(78) = -1.79, p = .077$ . To investigate whether there was a difference in cooperation between the conditions, an independent samples t-test was conducted on the Daytrader group payoff. Group payoff was used as a measure of cooperation because a higher group payoff was only possible when all team members

cooperated throughout the rounds. A significant main effect of condition on Daytrader group payoff was found such that teams in the Spaceteam condition had significantly higher group payoff than teams in the Hollywood Stars condition,  $t(78) = -2.13$ ,  $p = .037$ . Thus, Hypothesis 2 was partially supported – teams in the Spaceteam condition have higher cooperation than teams in the Hollywood Stars condition but did not have any difference in perception of team trust.

*Hypothesis 3: The effect of Spaceteam on cooperation will not be moderated by an individual's dispositional trust*

A hierarchical multiple regression was conducted to test Hypothesis 3 with Daytrader group payoff as the dependent variable. An initial analysis showed evidence of multicollinearity, leading to the independent variables being mean-centered. Variance inflation factor (VIF) scores were calculated for the variables in each regression model to check for multicollinearity. Multicollinearity was found between the interaction variable and condition ( $VIF = 4.44$ ). According to [1], this can be expected since the interaction variable is a product of the condition variable and can be safely ignored. Hence, we did not expect any adverse consequences. All other VIF scores were below 1.

The hierarchical multiple regression analysis (see Table 2) revealed that Condition contributed significantly to the regression model,  $F(1, 78) = 4.51$ ,  $p < .05$  and modestly accounted for 6% of variance in Daytrader group payoff. While the addition of the General Trust Scale and interaction variable explained additional variance, the result did not reach significance. Therefore, Hypothesis 3 was not supported.

## Discussion

This study investigated the effectiveness of a commercial digital game, *Spaceteam*, in developing trust in virtual teams compared to a social icebreaker. The results

<i>Steps and Variables</i>	$\beta$	$F$	$R^2$	$\Delta R^2$
<i>Step 1:</i>				
Condition	.23*	4.51*	.06	.06
<i>Step 2:</i>				
Condition	.23			
GTS	.07	2.42	.06	.01
<i>Step 3:</i>				
Condition	.93			
GTS	.42			
Condition x GTS	-.79	2.04	.07	.02

**Table 2:** Results of hierarchical multiple regression analysis,  $n = 80$ . \* $p < .05$

support an early study [12] and show that a commercial digital game with trust-building aspects is more effective than a social icebreaker, as reflected in the group payoff in Daytrader. This was expected because games with clear shared goals and high interdependence necessitate cooperation for success. Games that present this context have been shown to facilitate social closeness through requiring players to interact and communicate [11, 31]. Through collective planning and strategising [37], combined with instantaneous feedback on behaviour, provided through the game, team members are able to quickly assess trust-worthiness. As team members follow through on collective decisions, swift trust beliefs are verified. This in turn influences decisions in future trust-warranting situations like Daytrader.

On the other hand, no differences in perceptions of team trust were found despite the observed behavioural differences. A possible explanation is that team functioning was sustained through swift trust until the end of the experiment. The short time span of the study might not have

been enough for deeper forms of trust to emerge. Indeed, studies showing successful swift trust development have typically observed teams over weeks [22, 36, 9]. Similar patterns have been observed in digital games – deep social bonds are found between players who interact over weeks and months [39]. Future work can investigate the minimum time required for developing swift trust into a deeper form of trust.

In line with [12], we also found no moderating effect of dispositional trust. This can be attributed to the situational strength – the ability of a situation to restrict or encourage certain behaviours [29] – of *Spaceteam*. *Spaceteam* provides a 'cooperative social situation' [13, 24] where personal goals can only be achieved if others achieve their goals. This creates a 'strong situation' which influences the expression of dispositional trust. Individuals with lower dispositional trust *have* to trust and cooperate for their own benefit. Thus, no moderating effect of dispositional trust on Daytrader group payoff was found. This is a positive attribute of trust-building digital games because it implies that their effectiveness applies across team compositions.

### **Limitations and Future Work**

Although our study has provided new insights, it has several limitations. The study faced technological difficulties where some team members had problems during the video call. This prevented some individuals from fully participating in the tasks and may have negatively biased others' perception of their trustworthiness and reduced perception of team trust. It is also unclear whether communicating via video call has a significant mediating effect on the results of Daytrader. Future work might compare different communication conditions (e.g. no communication, text chat only etc.) to isolate the effect of the game and Daytrader output.

It is also uncertain whether a commercial digital game for trust-building is naturally perceived as valuable by employees without explicit instruction from the organisation. As a controlled experiment, this study could not account for the influence of organisational norms and procedures. A collaboration with an industry partner would benefit future work on the feasibility and effectiveness of commercial digital games in the corporate sector.

Finally, future studies could focus on understanding *why* digital games are more effective than social ice breakers. Several theories about the action-oriented nature of games has been put forward but which lack direct, empirical support. Future studies might test. This may be better understood by tapping into the perceptions of participants via a follow-up interview study or open-ended survey. Nonetheless, this preliminary study showed that a commercial digital game with trust-building aspects is more effective than a typical virtual team icebreaker at developing trust – a core but elusive component of successful virtual work teams.

### **Conclusion**

In conclusion, our study highlights a new opportunity for cooperative commercial digital games. Specifically, we provide a guideline for selecting an appropriate commercial digital game for virtual team trust-building (see side bar). We select the commercial mobile game *Spaceteam* using these guidelines and show that it is effective at building trust between members of 4-person teams. Our findings provide support for the viability of digital games as trust-building tools for virtual work teams. For practitioners, this implies that a trust-building digital game can accelerate the process of swift trust verification. Doing this in a safe environment allows team members to adjust trusting beliefs before engaging in high consequence tasks. For game designers, this study sheds light on the mechanisms through which

gameplay encourages pro-social behaviour.

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