QLectives – Socially Intelligent Systems for Quality
Project no. 231200

Instrument: Large-scale integrating project (IP)
Programme: FP7-ICT

Deliverable D.3.1.2

Web experiments and initial results

Submission date: 2011-08-01

Start date of project: 2009-03-01 Duration: 48 months

Organisation name of lead contractor for this deliverable: ETH Zurich

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)		
Dissemination level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidental, only for members of the consortium (including the Commission Services)	

Document information

1.1 Author(s)

Name	Organisation	E-mail
Sergi Lozano	ETH Zurich	slozano@ethz.ch

1.2 Other contributors

Name	Organisation	E-mail
Michal Ziembowicz	University of Warsaw	ziembowicz@gmail.com

1.3 Document history

Version#	Date	Change
V0.1	2011-07-07	Starting version
V0.2	2011-07-24	Approved by Deliverables Committee
V1.0	2011-08-05	Approved version to be submitted to EU

1.4 Document data

Keywords	web experiments, ultimatum game, anonymity, power balance
Editor address data	slozano@ethz.ch
Delivery date	01 08, 11

1.5 Distribution list

Date	Issue	E-mail
	Consortium members	QLECTIVES@list.surrey.ac.uk
	Project officer	Jose.FERNANDEZ-VILLACANAS@ec.europa.eu
	EC archive	INFSO-ICT-231200@ec.europa.eu

QLectives Consortium

This document is part of a research project funded by the ICT Programme of the Commission of the European Communities as grant number ICT-2009-231200.

University of Surrey (Coordinator)
Department of Sociology/Centre
for Research in Social Simulation
Guildford GU2 7XH
Surrey
United Kingdom
Contact person: Prof. Nigel Gilbert
E-mail: n.gilbert@surrey.ac.uk

University of Fribourg
Department of Physics
Fribourg 1700
Switzerland
Contact person: Prof. Yi-Cheng Zhang
E-mail: yi-cheng.zhang@unifr.ch

Technical University of Delft
Department of Software Technology
Delft, 2628 CN
Netherlands
Contact Person: Dr Johan Pouwelse
E-mail: j.a.pouwelse@tudelft.nl

University of Warsaw
Faculty of Psychology
Warsaw 00927
Poland
Contact Person: Prof. Andrzej Nowak
E-mail: nowak@fau.edu

ETH Zurich
Chair of Sociology, in particular
Modelling and Simulation
Zurich, CH-8092
Switzerland
Contact person: Prof. Dirk Helbing
E-mail: dhelbing@ethz.ch

Centre National de la Recherche Scientifique, CNRS
Paris 75006,
France
Contact person: Dr. Camille ROTH
E-mail: camille.roth@polytechnique.edu

University of Szeged
MTA-SZTE Research Group on
Artificial Intelligence
Szeged 6720, Hungary
Contact person: Dr Mark Jelasity
E-mail: jelasity@inf.u-szeged.hu

Institut für Rundfunktechnik GmbH
Munich 80939
Germany
Contact person: Dr. Christoph Dosch
E-mail: dosch@irt.de

QLectives introduction

QLectives is a project bringing together top social modelers, peer-to-peer engineers and physicists to design and deploy next generation self-organising socially intelligent information systems. The project aims to combine three recent trends within information systems:

- **Social networks** - in which people link to others over the Internet to gain value and facilitate collaboration
- **Peer production** - in which people collectively produce informational products and experiences without traditional hierarchies or market incentives
- **Peer-to-Peer systems** - in which software clients running on user machines distribute media and other information without a central server or administrative control

QLectives aims to bring these together to form Quality Collectives, i.e. functional decentralised communities that self-organise and self-maintain for the benefit of the people who comprise them. We aim to generate theory at the social level, design algorithms and deploy prototypes targeted towards two application domains:

- **QMedia** - an interactive peer-to-peer media distribution system (including live streaming), providing fully distributed social filtering and recommendation for quality
- **QScience** - a distributed platform for scientists allowing them to locate or form new communities and quality reviewing mechanisms, which are transparent and promote quality

The approach of the QLectives project is unique in that it brings together a highly inter-disciplinary team applied to specific real world problems. The project applies a scientific approach to research by formulating theories, applying them to real systems and then performing detailed measurements of system and user behaviour to validate or modify our theories if necessary. The two applications will be based on two existing user communities comprising several thousand people - so-called ”Living labs”, media sharing community tribler.org; and the scientific collaboration forum EconoPhysics.

Executive summary

Reaching a better understanding of social phenomena such as trust and cooperation, and applying such an understanding to the design of techno-social communities is at the core of QLectives' objectives (see section 1.1. 'Concept and objectives' of Annex I). One interesting aspect to analyze in this line is the influence of anonymity (which is present in many techno-social systems, and even reinforced in some of them) over willingness of individuals to trust and cooperate with each other. Both UWAR and ETH Zurich have developed behavioural experiments to study such a role of anonymity.

In this document we report about a web experiment on bargaining over workload among anonymous individuals. Our experimental design is based on a lab experiment, presented in [5], where subjects played a modified version of the Ultimatum Game. The main difference introduced in that experiment was that participants were bargaining over losses (waiting time in an isolated space without anything to do) instead of gains (the actual payment got from the experimenter), as it is normally the case in this kind of experiments. Besides assuming this change, by making the participants to bargain over a certain number of tasks to be performed, we introduced two additional ones favouring a priori selfish behaviours. First, in our case anonymity could be reinforced by taking advantage of having a web environment for the game. Second, we introduced three different treatments (scenarios) with different power balances, namely weak proposer (treatment 1), weak responder (treatment 2) and equal power (treatment 3).

As mentioned above, ensuring anonymity was a key point in this study. Special attention was paid to this aspect at three stages of the experimental setting, namely recruiting, participants' experience during sessions, and payment. Recruiting was achieved through massive email sending to students at ETH Zurich. Potential participants were provided with the URL of the web application supporting the experiment, date and time for the experiment to take place and a generic access pass-phrase (the same for all of them). During the experimental session, no interaction between the players (except the formulation of the distribution proposal) was allowed. Finally, the payment was based on payment coupons to be exchanged by cash, without prior personal identification, at ETH's cash desk.

Four sessions of the experiment were performed. 4000 invitations were sent, and a total of 246 subjects (6,15%) accessed the experiment's website during one of the sessions. Among them, 196 got through the whole experiment, so we collected information from 98 two-players interactions (38 corresponding to the first treatment, and 30

for each one of the other two). Two kind of results have been analyzed in this report, namely the distribution of workloads offered by proposers and those ones accepted by responders, and the distribution of amounts donated by the participants at the end of the experiment. As a general outcome, we find that the measures introduced to enhance selfish, rational behaviour had little effect on the subjects. For example we observe a general preference towards fair distributions of workload, responders punishing unfair proposals and some cases of participants donating the whole payment they got for participating in the project. A deeper analysis of the results obtained in the experiment will be part of a publication currently in preparation.

Regarding the implications of the work presented here for QLectives' development, we can foresee that the project can benefit in a threefold way. First, data collected can be used as an input for modeling efforts in Stream 1. Second, our findings on collaboration in anonymous web environments can provide qualitative insight for implementing efforts in Stream 4. Finally, lessons learned from a methodological viewpoint on web-based experiments will be useful to perform experiments directly on QLectives' livinglabs.

Contents

Chapter 1

Introduction

Reaching a better understanding of social phenomena such as trust and cooperation, and applying such an understanding to the design of techno-social communities is at the core of QLectives' objectives (see section 1.1. 'Concept and objectives' of Annex I). One interesting aspect to analyze in this line is the influence of anonymity (which is present in many techno-social systems, and even reinforced in some of them) on willingness of individuals to trust and cooperate with each other. For instance anonymity prevents regret and other mechanism of social control, which might enforce egoistic behaviours and undermine trust building.

Both UWAR and ETH Zurich have developed behavioural experiments to study such a role of anonymity. As already reported in Deliverable D6.2, UWAR is performing experimental research on the "Game of Trust" to study the effect of the possibility of choosing an interaction partner on the readiness to express trust. A preliminary analysis of the results obtained showed that the possibility of choosing a partner has the biggest influence on the level of trust. A publication with a more complete analysis is in preparation.

Here we report about a web-based experiment designed to study how anonymity and unequal power balances combined influence individual behaviour in bargaining situations. By means of an experimental setting designed specifically to stress anonymity, and a version of the Ultimatum Game modified to alter power balance, subjects are embedded in different scenarios where they have to distribute a number of tasks with a partner.

The document is structured into four chapters. The first one focuses on the experimental design, providing details about the game played by participants and changes introduced in order to reproduce different power balance scenarios. Then we review the practical aspects of the experimental setting, with an especial insight into measures taken to create an environment enforcing participant's anonymity. A brief analysis of the preliminary results obtained follows, and a final chapter summarizing the work done and deriving implications for QLectives' living-labs and research closes the deliverable.

Chapter 2

Experimental design: Power balance in bargaining over workload

2.1 Ultimatum game over waiting time

The *Ultimatum Game* was proposed by Güth and collaborators as a way to study experimentally ultimatums in 2-person bargaining situations [1]. In this game, the two subjects have to determine how to distribute a given amount of money c. First, players are assigned two different roles, namely the *proposer* and the *responder*. Then the proposer declares which amount $x_p \leq c$ claims for himself, leaving $x_r = c - x_p$ for the responder. Finally, the responder has to decide whether he accepts or rejects the deal offered. If she accepts, the money is distributed accordingly. Otherwise, both players get nothing. Notice that there is no possibility for further negotiation between the players, so the offer made by the proposer is indeed an ultimatum.

Given the experimental design above, it is easy to predict the behaviour of two rational decision makers. A rational proposer would claim for herself the whole amount but 1 monetary unit (i.e. $x_p = c - 1$), anticipating that a rational responder would prefer getting $x_r = 1$ than nothing. However, after performing a series of lab experiments, the authors realized that distributions agreed by subjects were far more fair that expected, as proposers were offering higher x_r's and responders were more keen on rejecting unfair proposals [1]. These kind of other-regarding results have been systematically reported in the literature [2, 3, 4].

Our experimental design is based on a lab experiment, presented in [5], where subjects played a modified version of the Ultimatum Game. The goal was to verify if players' behaviour would get closer to the expected rational one, if they were embedded in a scenario more favorable to selfish behaviours than the *classical* settings. Specifically, the game was redefined in such a way that participants bargained over losses (waiting time in an isolated space without anything to do) instead of gains (the actual payment got from the experimenter). Moreover experimenters set three different anonymity treatments to control for its influence on subjects' behaviour, as anonymity has been found to increase selfishness in experiments [6, 7].

2.2 Three treatments with different power balances

While building on the experimental design described in [5], we introduced two important differences in the setting employed in our web experiment. First in our case anonymity could be further reinforced by taking advantage of the web-based environment. Second we introduced three different treatments (scenarios) with different power balances, namely weak proposer (treatment 1), weak responder (treatment 2) and equal power (treatment 3).

The new version of the Ultimatum Game, including these two changes, was set up as follows. Imagine a certain amount of routine, simple tasks to be performed by two players. Both players are, by far, skilled enough to take care of these tasks so, given a certain distribution of work, solving them is just a matter of investing (wasting) more or less time. Each player is randomly assigned a role (i.e. proposer or responder), and the proposer is asked to offer the responder a way to distribute the workload among the two of them. In case of having an experimental setting similar to the one pointed out above (i.e. bargaining over losses and without power balance treatments), the responder would face two alternatives to choose from, i.e. either accepting the proposer's offer or ending up with a solution clearly negative for both parts (each subject is assigned the whole amount of tasks). Consequently, a rational proposer would suggest the responder to take care of all tasks except one, and a rational responder would accept the deal. In our experiment, the setting is modified in order to introduce the three power balance scenarios already mentioned. Specifically, the alternative to the proposer's offer is not fixed (i.e. the whole amount of work for each player) but depends on the treatment (power balance scenario).

Table 2.1 shows how the alternative workload distributions are calculated for each one of the three treatments. The proposer chooses an amount X for himself between 1 and 9 (assigning the rest up to 10 to the responder). The alternative distribution of tasks is calculated and presented to the proposer, so he can 'try' several options before deciding to submit his proposal to the responder. Then, the two options (i.e. the proposer's definitive offer and its alternative) are shown to the responder and she is asked to chose one of them. Notice that in all treatments we have $x_p + x_r = 10$ in case of accepting the proposal and $x_p + x_r = 20$ otherwise (as in the version of the Ultimatum Games without different power balances).

Table 2.1: Calculation of alternative distributions for each one of the three different treatments from the proposed one.

Proposed distribution	$x_p = X$, $x_r = 10 - X \quad X \in [1, 9]$		
Alt. distribution according to [5]	$x_p = 10$, $x_r = 10$		
Alt. distributions in our experiment	Treatment 1: $x_p = X + 11$ $x_r = 9 - X$	Treatment 2: $x_p = X + 8$ $x_r = 12 - X$	Treatment 3: $x_p = 21 - X$ $x_r = X - 1$

Given the equations in Table 2.1, we can figure out the balance of power implicit in each one of the three treatments, and then predict the behaviour of rational players. In the case of the first treatment (i.e. weak proposer), the responder would reject any distribution offered by the proposer, since her workload in the alternative distribution is always lower. The situation in the second treatment (i.e. weak responder) is exactly the opposite. The third treatment requires a deeper analysis. If the proposer chooses a low X value for herself, she will expect the responder to reject the proposal. On the contrary, if she avoids rejection by setting X to a high value, the resulting distribution would be anyway more favorable to the responder. The optimal choice for the proposer would be then a moderate value, ideally $X = 4$.

Chapter 3

Experimental setting: Anonymous web experiments

Ensuring anonymity (and making it clearly perceivable by the participants) was a key point in this study. Special attention was paid to this aspect at three stages of the experimental setting, namely the recruiting, participants experience during sessions and the payment. In the following, we provide more details on the concrete implementation.

3.1 Recruiting

Participants were recruited by email. Their email addresses were randomly selected from a list containing all student addresses (i.e. with the extension *student.ethz.ch*) that were active during the course 2010-2011. These addresses (13927 in total) corresponded to students at ETH Zurich in all the studies and education levels (from undergraduate to PhD).

For each of the four sessions performed, an invitation message was sent to 1000 addresses. Such an invitation, with the subject 'Call for participation in a web experiment' was written in a generic way (i.e. without including the name of the recipient or any other attribute). It included the URL of the web application supporting the experiment, date and time for the experiment to take place and a generic access pass-phrase. Besides, in order to strengthen the feeling of isolation, recipients were asked not to comment to anyone about the experiment. No reminder of the invitation was sent and addresses chosen once were taken out from the pool, so no participant was contacted twice.

3.2 Participants' experience during sessions

Experimental sessions consisted of four parts or steps: Preparation, the game itself, calculations and donation.

After entering the experiment web application, the player was provided with instructions about the bargaining game (see Appendix) and was matched with another

participant. Once couples were formed, the two roles were assigned and the participants played the bargaining game as already explained. In this case, tasks to be performed were simple mathematical operations (e.g. 3+4, 7-1..). No interaction between the players (except the formulation of the distribution proposal) was allowed.

Finally, once the participant had concluded calculating all the operations assigned, it was suggested that she donated part of the payment to the Red Cross International as a way to quantify her level of altruism. The subject was asked for a concrete amount, having to type '0' in case of deciding not to donate. This is the only information (apart from that one generated by the game) compiled from each participant. No demographic or personal data were collected.

3.3 Payment to participants

Once the experiment was completed, a printable payment coupon was generated for each participant to get her payment. Participants were informed that these coupons could be exchanged for cash at ETH cashier desk without any prior personal identification being required. Instead, each coupon was assigned a unique alphanumerical code, so participants could get correctly paid without revealing their identity.

Chapter 4

Initial results and discussion

The results presented and discussed in the following were obtained from 4 sessions of the experiment. 4000 invitations were sent, and a total of 246 subjects (6,15%) accessed the experiment website during one of the sessions. Among them, 196 got through the whole experiment, so we collected information from 98 two-players interactions (38 corresponding to the first treatment, and 30 for each of the other two). The other 50 participants left the experiment at different stages. 32 did it even before being matched with another user (e.g. while reading the instructions), 13 at the proposal stage (i.e. while waiting for the proposer's offer or responder's reply) and 5 before completing the assigned workload. Finally, notice that the total number of operations that the proposer was asked to distribute was 300, so alternative distributions were obtained by multiplying the values in Table 2.1 by 30.

4.1 Proposals made and responders' reaction

The goal of the experiment was to get a better insight on the influence of power balance in anonymous collaborative environments. Accordingly, in the following we analyse the behaviour of both proposers and responders across the three treatments.

In Fig. 4.1 we show, for each one of the three treatments, the distribution of workloads offered by proposers and those ones accepted by responders. Some initial observations can be made from these results:

Equally distributed workloads: The most relevant result is a general tendency towards equal distribution of tasks. This is not only the case for the third treatment, where such a behaviour is reinforced by the payoff definition, but also for the other two treatments. Such a result could be an indicator of *inequality aversion* among participants, that is, a tendency to avoid unfair / not balanced workload distributions. In [5] Berger and coworkers reported that even introducing bargaining over losses instead of gains and increasing the anonymity of the whole process (both actions favouring, a priori, selfish behaviours), the results were presented the bias towards fair division typically found for 'classical' settings of the Ultimatum Game. In the same line, our experiment was

designed to promote egoist behaviours even more strongly and, nevertheless, we obtained the same kind of results.

Partial perception of power (un)balance by proposers: The percentage of proposals allocating an unbalanced amount of workload on the responder is higher in treatment 2 (weak responder) than in treatment 1 (weak proposer). This might indicate a certain perception of the different balances of power by the proposers. Notice that this finding is not surprising. Since the proposer can 'try' as many as options as she wants before submitting her proposal, she can guess how the alternative proposal is calculated (and, therefore, understand better the scenario).

Non rational behaviour by responders: We observe that responders' behaviour in the first two treatments differs significantly from the predictions made in section 2.2 for rational individuals. More concretely, they neither rejected all proposers' offers in treatment 1, nor accepted them all in treatment 2. Actually, the general tendency looks the other way around, i.e. there is a higher percentage of accepted proposals in treatment 1 than in treatment 2. As a first hypothesis for the phenomenon in treatment 2, this behaviour could be explained as a way of the responder to punish the proposer for an unfair offer by rejecting her offer and taking the alternative option (which is more 'costly' for both of them).

4.2 Donation

As already mentioned in the previous section, no demographic details were collected from the participants. This makes it more difficult to characterize them and interpret their behaviour as a function of their attributes. Instead, as a way to measure subjects' altruism when participainting in the experiment, they were offered to donate part of their payoff after they completed their calculations.

Fig. 4.2 shows the distribution of amounts donated. Besides the expected large majority of subjects donating nothing or close to nothing, we observe a significant number of subjects donating the whole amount. Our goal is to use this information to interpret observed phenomena. For example, can we identify any relationship between the above-mentioned 'inequality aversion' and the altruistic behaviour of some individuals? Such an analysis will be included in a publication currently under preparation.

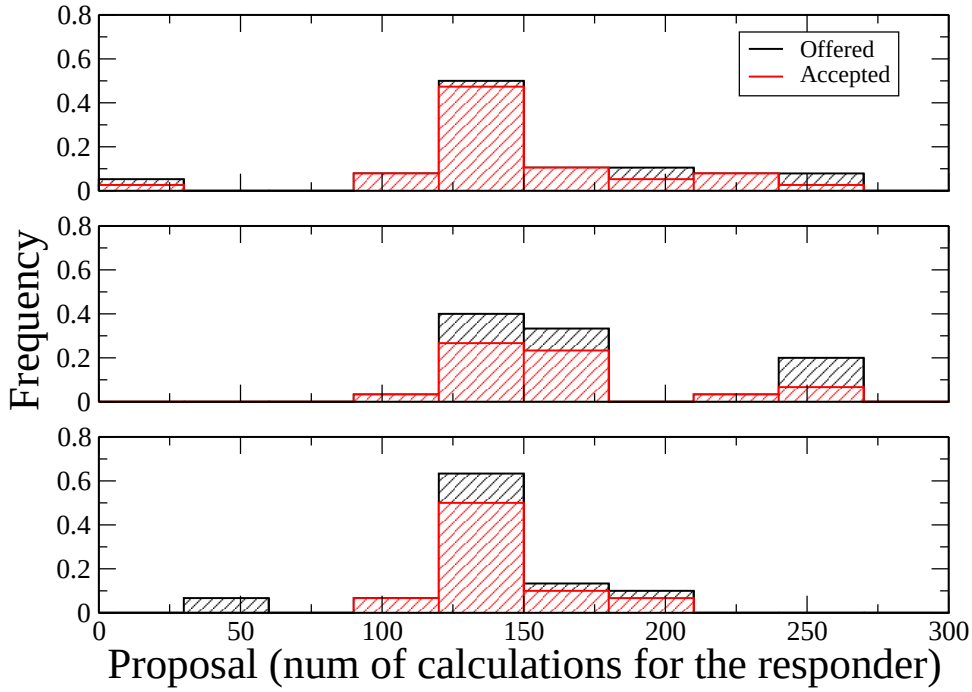


Figure 4.1: Distribution of proposals offered to the responder (black) and accepted by her (red). Each plot corresponds to a treatment, namely *weak proposer* (top), *weak responder*(middle) and *equal* (bottom).

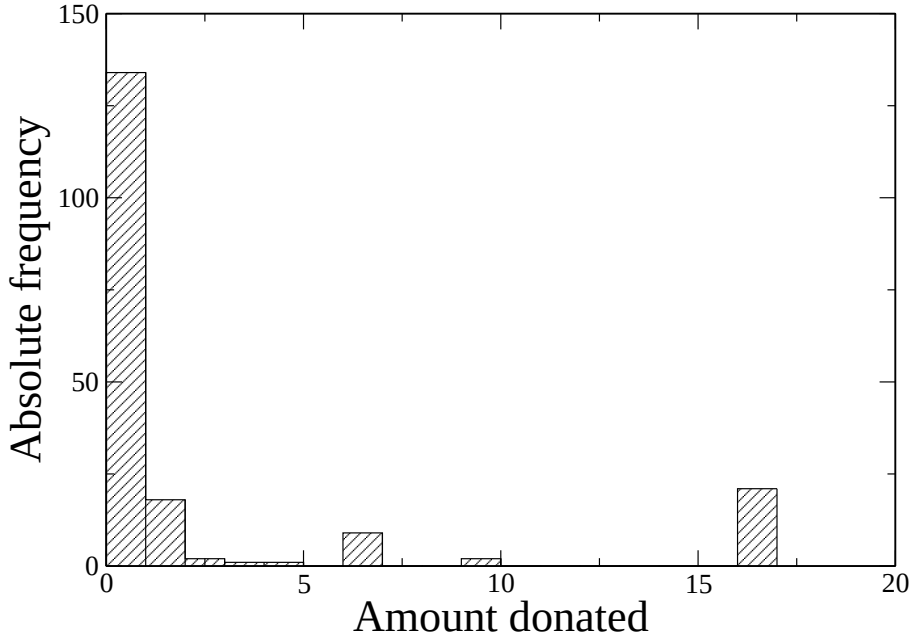


Figure 4.2: Distribution of amounts donated by participants at the final part of the experiment (from 0 to 17 Swiss francs).

Chapter 5

Conclusions

5.1 Summary

Building on the work presented in [5], we designed and performed a web experiment on bargaining over workload by means of an ultimatum-like game. Two main modifications were introduced in order to favour selfish behaviours, namely strict anonymity (supported by the web-based setting) and three treatments with different power balances. In the *classical* Ultimatum Game, the responder is asked to accept the proposer's offer or reject it and end up in a situation that is worse for both players. In our experiment the responder can choose between the proposer's offer and an alternative distribution, which is calculated differently depending on the power balance of the corresponding treatment.

Over 4000 invitations sent, a total of 246 subjects (6,15%) accessed the experiment website during one of sessions. Among them, 196 got through the whole experiment, so information from 98 two-players interactions (38 corresponding to the first treatment, and 30 for each one of the other two) was finally collected. The other 50 participants left the experiment at different stages. 32 did it even before being matched with another user (e.g. while reading the instructions), 13 at the proposal stage (i.e. while waiting for the proposer's offer or responder's reply) and 5 before completing the assigned workload.

In this document we have analyzed results on offers made by proposers and those accepted by responders (Fig. 4.1), and about donations by participants at the end of the project (Fig. 4.2). As a general outcome, we find that the measures introduced to enhance selfish, rational behaviour had little effect on the subjects. For example we observe a general tendency towards fair distributions of workload, responders punishing unfair proposals and some cases of participants donating the whole payment they got for participating in the project. A deeper analysis of the results obtained in the experiment will be part of a publication currently in preparation.

5.2 Implications for QLectives

As mentioned in the introduction, experiments like UWAR's "Game of Trust" (see deliverable 6.2) or the web-based experiment presented here contribute to shed light on the role of anonymity on trust building and cooperation in techno-social systems in general. Focusing more concretely on QLectives' development, this work can be beneficial in three ways:

- *Quantitative input for modeling efforts*: Data collected in these and similar experiments can be used by partners involved in Stream 1 to develop data-driven models on social dynamics related to trust and collaborative work that, eventually, will inform protocol designs in Stream 2. Accordingly, once the above-mentioned publication under preparation is completed, datasets generated from this experiment will be uploaded to QLectives' Living Archive.

- *Qualitative insight for implementing efforts*: Our findings also provide qualitative insight for implementing efforts in Stream 4. This is specially the case for QMedia, because of the inherent (and frequently desired) anonymity of users of file sharing p2p systems. More concretely, the current development of QMedia *channels* could benefit from a better understanding of the interplay between cooperation and anonymity in collaborative techno-social environments. We can see these channels as interaction spaces sitting halfway between public and private BitTorrent communities, a kind of 'anonymous communities' where users collaborate (by rating and sharing materials, for instance) without knowing each other. The observation made in the previous section that several responders seemed to punish unfair proposals (instead of, simply, leaving the experiment) might indicate that users' perception of the situation changes completely when they shift from an 'open' environment to a small one, where their actions affect more directly other users [1]. Translated into practical terms, it might imply that developing QMedia channels in such a way that users felt their actions could directly affect other channel members (without the need of individual identities), could motivate them to reveal their other-regarding preferences. Some examples of concrete measures to take into account could be limiting the number of channels a user can subscribe to (so staying in a certain channel would imply a kind of 'lost opportunity cost') or establishing a maximum 'population' of users per channel.

- *Lessons learned for future experiments*: Knowledge accumulated on methodological aspects of web-based experiments will be useful when performing experiments directly on QLectives' livinglabs. For example, the setting proposed here can be

[1] A 2-person bargaining game, as we have in our experiment, represents an extreme particular case, since each player has a direct impact over the other player's payoff

applied to experiments developed in collaboration with an institution providing support for recruiting and payment (ETH Zurich, in this case). This could be useful for future experiments based on QScience, especially for instances designed to sustain journals or concrete scientific communities. However, in the case of QMedia, it would be interesting to develop a different kind of experimental setting (with a wide diversity of participants worldwide distributed, for example). A good approach in this line could be to perform additional experiments translating the experimental setting developed here to a standardized, more flexible web environment like Amazon's Mechanical Turk.

- *Usage of our experimental web platform for further experiments*: The web platform supporting our experiment was specifically designed and implemented. Despite being highly modular and open-source based, the software was not thought to be directly re-used for other experiments.

Bibliography

[1] Güth, W., Schmittberger, R. and Schwarze, B. (1982) Ultimatum Bargaining Behavior: A Survey and Comparison of Experimental Results. *Journal of Economic Behavior and Organization* 3−4 (December), 367−388.

[2] Güth, W., Schmittberger, R. and Tietz, R. (1990) An experimental analysis of ultimatum bargaining. *Journal of Economic Psychology* 9, pp. 417449.

[3] Camerer, C. and Thaler, R. (1995) Ultimatums, Dictators, and Manners. *Journal of Economic Perspectives* 9, pp. 209219.

[4] Roth, A., Erev, E., and Erev, I. (1995) Learning in Extensive-Form Games: Experimental Data and Simple Dynamic Models in the Intermediate Term. *Games and Economic Behavior* 8, pp. 164212.

[5] Berger, R., Rauhut, H., Prade, S. and Helbing, D. Bargaining over waiting time in ultimatum game experiments. Forthcoming (pending on minor revisions) in *Social Science Research*.

[6] Charness, G. and Gneezy, U. (2008) What's in a name? Anonymity and social distance in dictator and ultimatum games. *Journal of Economic Behavior & Organization* 68(1): 29−35

[7] Cherry, T.L., Frykblom, P. and Shogren, J. F. (2002). Hardnose the dictator. *American Economic Review* 92(4), pp. 1218−1221

Appendix A

Supplementary material

A.1 Sample of invitation email sent to potential participants

Hello,

we would like to invite you to take part in an online experiment. All you have to do is to login to http://www.hermes.ethz.ch/experiment today, Thursday 12, between 20:00 and 20:30 with this password: seem-degree-rail-debt-wat

You will be randomly matched with another participant and will play the game online. The experiment takes normally less than an hour. At the end of it you will receive a coupon worth 17.- CHF. You can exchange the coupon for cash at the official ETH cashier desk in the main building without providing your name or signature.

Please do not talk with anyone about this experiment if you decide to join it.

Thank you very much

The Decision Science Laboratory (www.descil.ethz.ch)

A.2 Instructions provided (English version)

Introduction

Dear participant,

you are currently taking part in a scientific experiment on sharing work (distributing tasks). **The experiment is estimated to take less than an hour, possibly much less.** Please make sure that you have enough time for this experiment. In order to receive the payment of 17 CHF, it is required that you finish the experiment according to these instructions. You will then receive a coupon with a code that can be exchanged for cash without disclosing your name or signature.

The experiment

This experiment involves two participants. We will call them **participant A** and **participant B** from now on. There are a number of simple tasks that have to be solved. Each of these tasks is a simple arithmetic calculation, like “2+2 = 4”.

Participant A will make a proposal how to divide the work between both participants. Participant B will be asked to accept or reject the proposal of participant A.

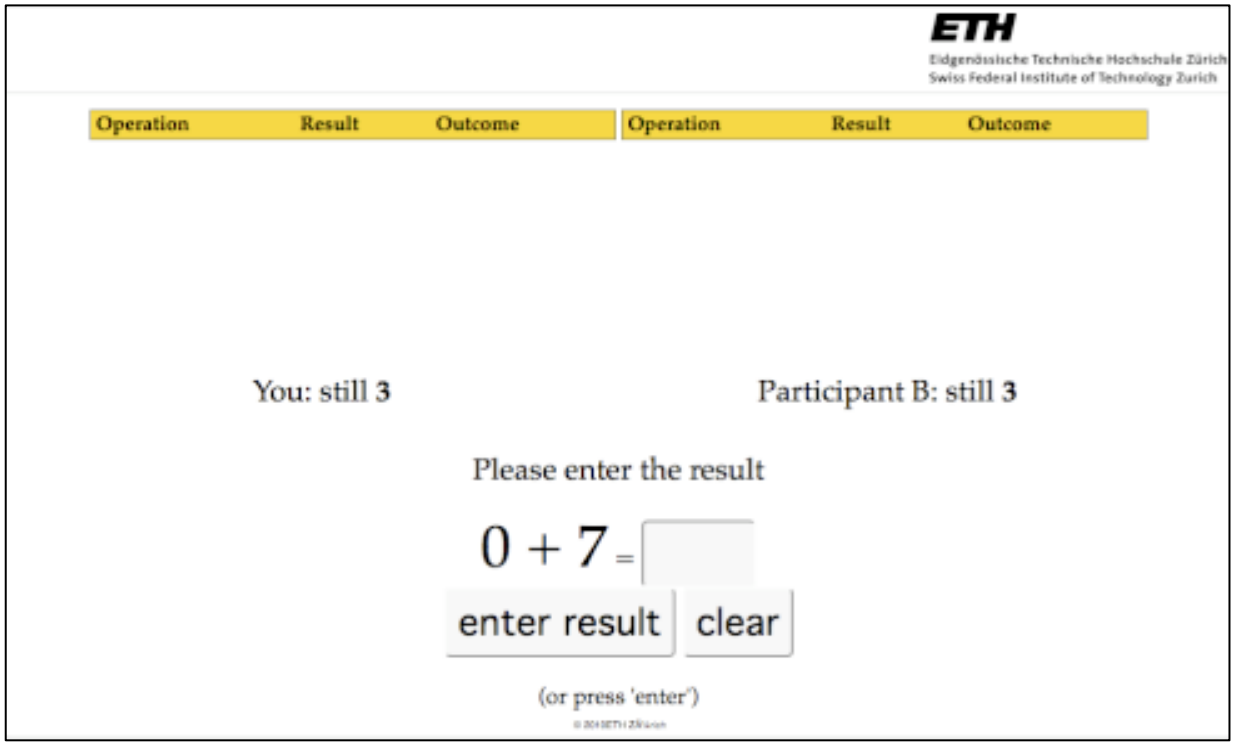
In case of rejection, a higher number of tasks will be distributed. This distribution is coupled to and varies with the proposal of participant A. It’ll be shown to him/her when making the proposal but cannot be independently controlled.

Starting the experiment

After reading all pages of these instructions, please click on the `START` button below in this screen. If the other participant hasn't done so yet, you will have to wait for him or her to do so.

> ***IMPORTANT****: It might take a several minutes for the other participant to log on and read the instructions, so please wait. The screen will refresh automatically. During this period, you can read a book, but please keep an eye on the screen. A sound will be played to notify you that the experiment has started.*

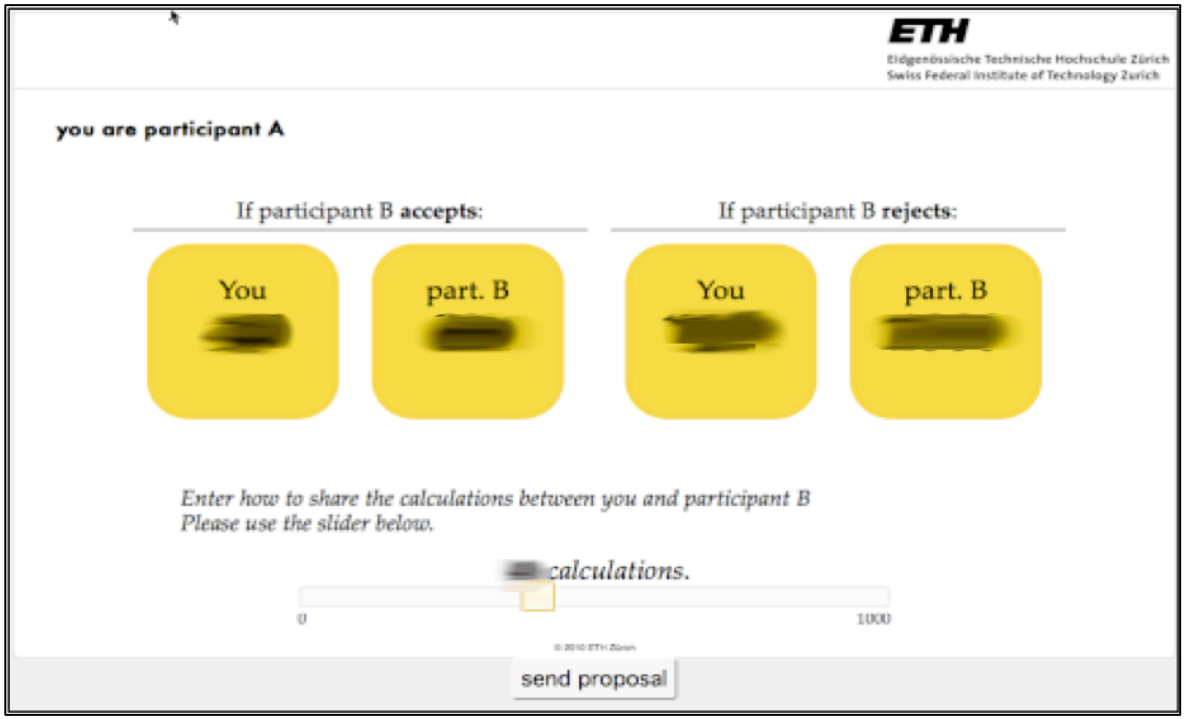
Next, you will be taken to this screen (see picture below), where you will have to solve 3 example tasks. This test will familiarize you with the tasks. After solving the 3 example tasks, you will be taken to the proposal phase.



Proposal phase

If you are participant B, you will have to wait. The page will refresh automatically.

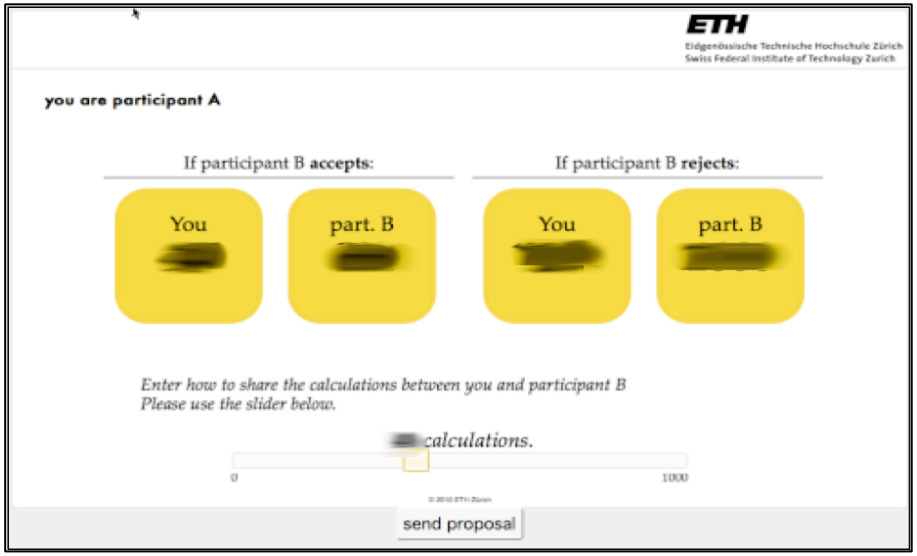
If you are participant A, you will see the screen below.



Instructions (English)

If you are participant A, you can use the slider in the middle of the screen to select how to share the work. *The initial position of the slider is random and has no importance.*

The left panel lists your proposal. The right panel shows the amount of work that both of you will have to solve if participant B rejects the proposal.

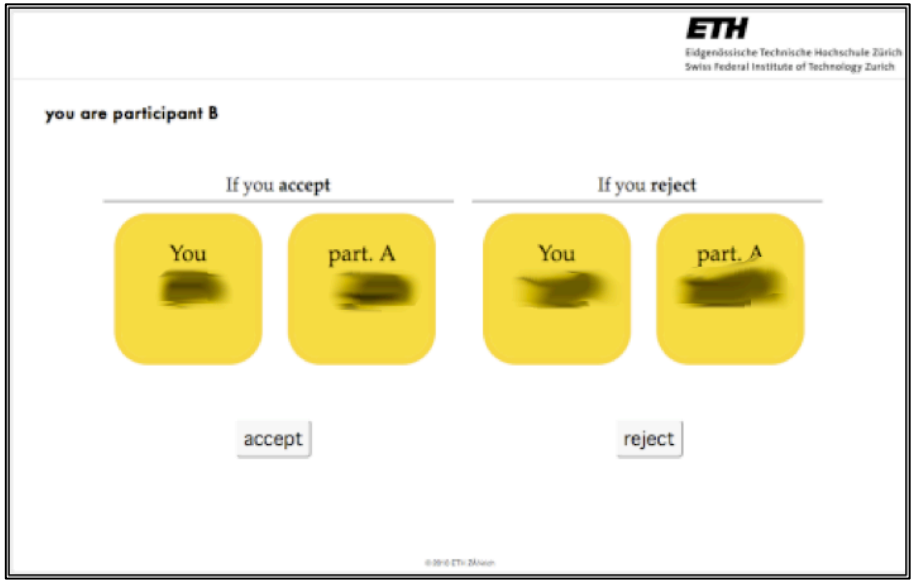


To submit your choice to participant B, please click the button `SEND PROPOSAL`.

This will take you to the Reply phase.

Reply phase

At this point, if you are participant A, you will have to wait. If you are participant B, this is the screen you will see:



Participant B must now click ACCEPT or REJECT to reply to the proposal of participant A. After this, the work phase will begin.

Work phase

Both participants will be taken back to the calculation screen. If you are participant A, you will be notified of the decision of participant B. After that, both participants can start solving the calculations.

If a wrong value is inserted, you will be asked again to insert the correct value. Please note that you will receive the payment only if you solve all calculations that you have been assigned.

Thank you for participating in this experiment!