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## Collective Intelligence Analytics Dashboard Usability Evaluation

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## **D4.6 Collective Intelligence Analytics Dashboard Usability Evaluation**

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<b>OU</b>	The Open University	United Kingdom
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## Executive summary

The present document is a deliverable of the CATALYST project, funded by the European Commission's Directorate-General for Communications Networks, Content & Technology (DG CONNECT), under its 7th EU Framework Programme for Research and Technological Development (FP7).

This deliverable reports the outcome of usefulness and usability studies about ten visualisations of the Collective Intelligence Analytics Dashboard.

Stakeholders deliberating about a wide range of societal issues generate a huge amount of contributions. Tool support helping to make sense of all these contributions is an essential aid for effective deliberation. From the analysis of pain points (D2.1, and especially for the CI dashboard D3.9) it is known that users and moderators of such tools would benefit from analytics to get an overview about the state of the deliberation. CATALYST developed a range of analytics visualisations supporting users to summarise facets of the conversations, to explore conversations, and to raise awareness about the state of the deliberation.

The collective intelligence dashboard (see D3.9) makes these visualisations available to moderators or end users in one place. The evaluation of the collective intelligence dashboard is based on newly developed visualisations and visualisations already described in D3.9. The data format for all visualisations is the CATALYST Interchange Format (CIF) (specified in D3.1). The visualisations act either directly on CIF data or on the results returned from the metric server, which implements a range of deliberation analytics as outlined in D2.2. The visualisations and the metrics respond to the pain-points summarised in D2.1 and D3.9.

This deliverable presents results from the usefulness and usability evaluation of these visualisations. Based on the results of the evaluations we prepared a set of recommendations to inform CI tool providers about the usefulness and usability of each visualisation. In addition the feedback received by the participants will guide the improvement of the evaluated visualisations.

The evaluation of the visualisations for the Collective Intelligence Analytics Dashboard took place in two settings.

1.) We conducted a field experiment of participants debating on Debate Hub in collaboration with Purpose. The participants of this study evaluated ten visualisations. The data for each visualisation was taken from the debates of this group. The participants therefore could see their debate through the lenses of the analytics visualisations. In addition the participants gave feedback about their top favourite visualisation to be included in a CI analytics dashboard.

2.) In addition to the field experiment we conducted a usefulness and usability study in the usability lab of the Open University. The lab setting helped to inspect the interaction of the users with the visualisation and to pinpoint problems, which cannot be derived from questionnaire data.

These two settings were chosen over a log-file analysis approach in order to gather a rich set of empirical data ranging from questionnaire and interview data to video and screen recording data.

Taking both studies in account, the usability of most the visualisations was rated as good to excellent. The participants performed well on the tasks. Rich feedback was gathered about what the participants of the studies liked and what they recommend to improve the visualisations.

## Introduction

Online deliberations can reach a size where it is not possible anymore to quickly infer what is going on in a debate. Long discussion forum threads can reach hundreds of posts and require scrolling along and across different Webpages for a reader to get a sense of the overall online discussion. Alternative visualisations to forum threading, such as network graphs, are often used to support discussion structuring and improve sense making, but the effectiveness of these visualisations also tend to quickly fail when the number of posts and participants increases. The following illustration serves as an example of this, showing a partial view of a large online deliberation in form of a debate network. Hundreds of people contributed their ideas to several issues. The ideas were vividly discussed, which can be seen by the large amount of pro and counter arguments (in red and green). While this example is about one large online deliberation, the problem of sense-making exacerbates when considering the job of a moderator in charge of many online deliberations. Moderators are in need of tools to quickly get an overview of what is going on in each of the deliberations they are in charge of.



**Figure 1: Example of a large online deliberation**

Considering the above outlined scenario, visual analytics can help to summarise the state of a deliberation and provide insights, which can be used to make informed decisions to advance the deliberation. The CATALYST Collective Intelligence Dashboard is the place where CATALYST provides facilities to instantiate individual and collections of visualisations (custom dashboard) to the members of the CATALYST projects and everyone interested in their usage.

The following picture gives an overview of the building blocks of the Collective Intelligence Dashboard. First, the CI tool providers transform the raw conversation data into the CATALYST Interchange Format (CIF) (Conversation -> link 1 in Figure 2). The CIF data serves as input to either the metric server (link 2 in figure 2), which transforms the data into collective intelligence metrics, or as direct input to the Collective Intelligence Dashboard (link 3), or both (link 4). The Collective Intelligence Dashboard takes as input either only the CIF or the CIF with the calculated metrics coming



from the metric server. Based on these two types of input data the dashboard provides several visualisations of the data. Each visualisation shows a facet or perspective of the underlying data. In the illustration below users can request a histogram of user's contributions, an overview of activity and contribution types, or they can inspect the data returned by the metric server to check for biases of the deliberation.

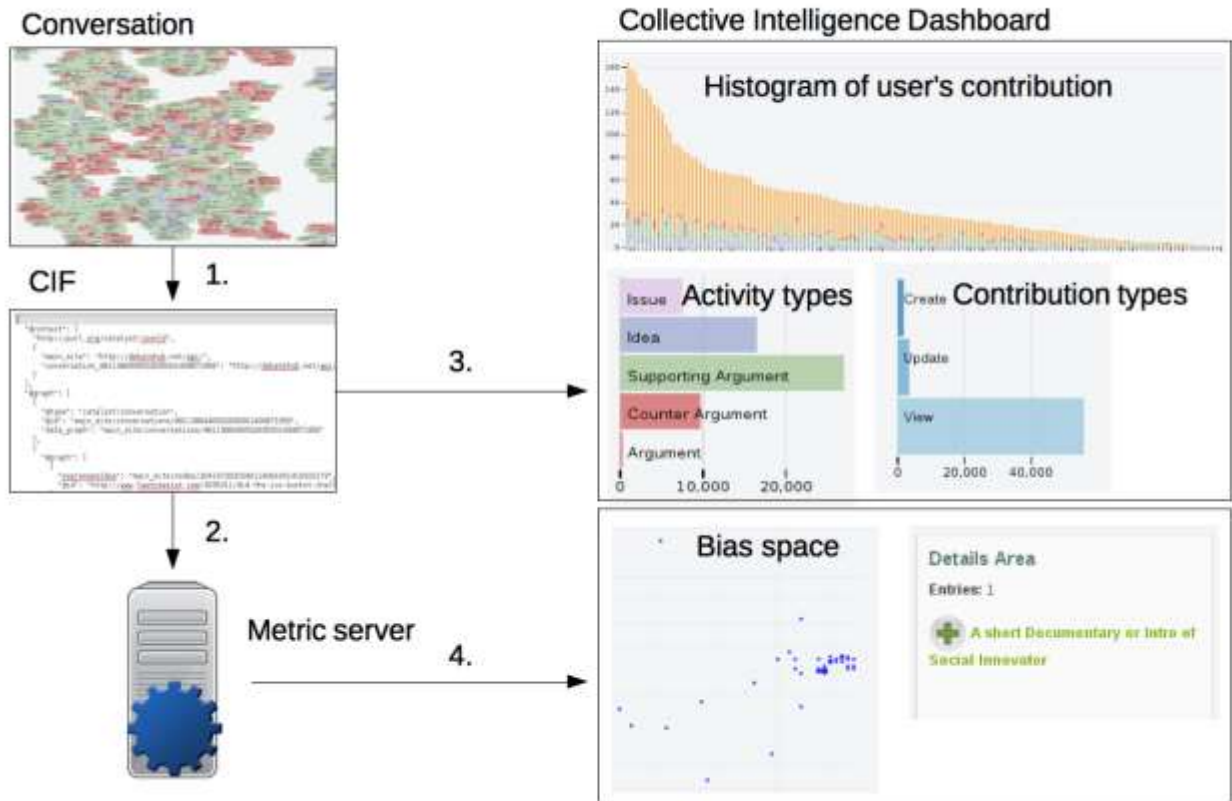


Figure 2: Building blocks of the Collective Intelligence Dashboard

## 1. The Collective Intelligence Dashboard

The online tool provisioning the analytics visualisations is the CATALYST Collective Intelligence Dashboard (the Collective Intelligence Dashboard was reported in deliverable D3.9. Here, we present a short recap about its function and features).

The CI dashboard is the place where people can get an overview of available visualisations, to view them with default data (demo function), to test visualisations with their own data, to compile their own dashboard, or instantiate an individual visualisation.

The individual visualisations are displayed in a grid layout. Each cell contains one visualisation. Each visualisation comes with a screenshot, a short description, and a description about any data dependencies (i.e. specific requirements of the data). CI dashboard users can demo each visualisation with a default data set, and they can preview the visualisation with their own CIF data. In addition the dashboard provides for each visualisation the embed code, or can generate a link which will display the visualisation with the provided data source. The CI Dashboard is the mechanism by which: the CATALYSTs's CI Visualisations can be used and embedded in other project websites or tools, and the CI analytics can be applied and delivered to third parties as reusable service.

Furthermore, users can compile their own dashboard. They can choose any of the visualisations to be included in the dashboard and can arrange their order of appearance in the custom dashboard. The CI dashboard generates an embeddable HTML code or a link to the custom dashboard (see the lower part of the following figure).

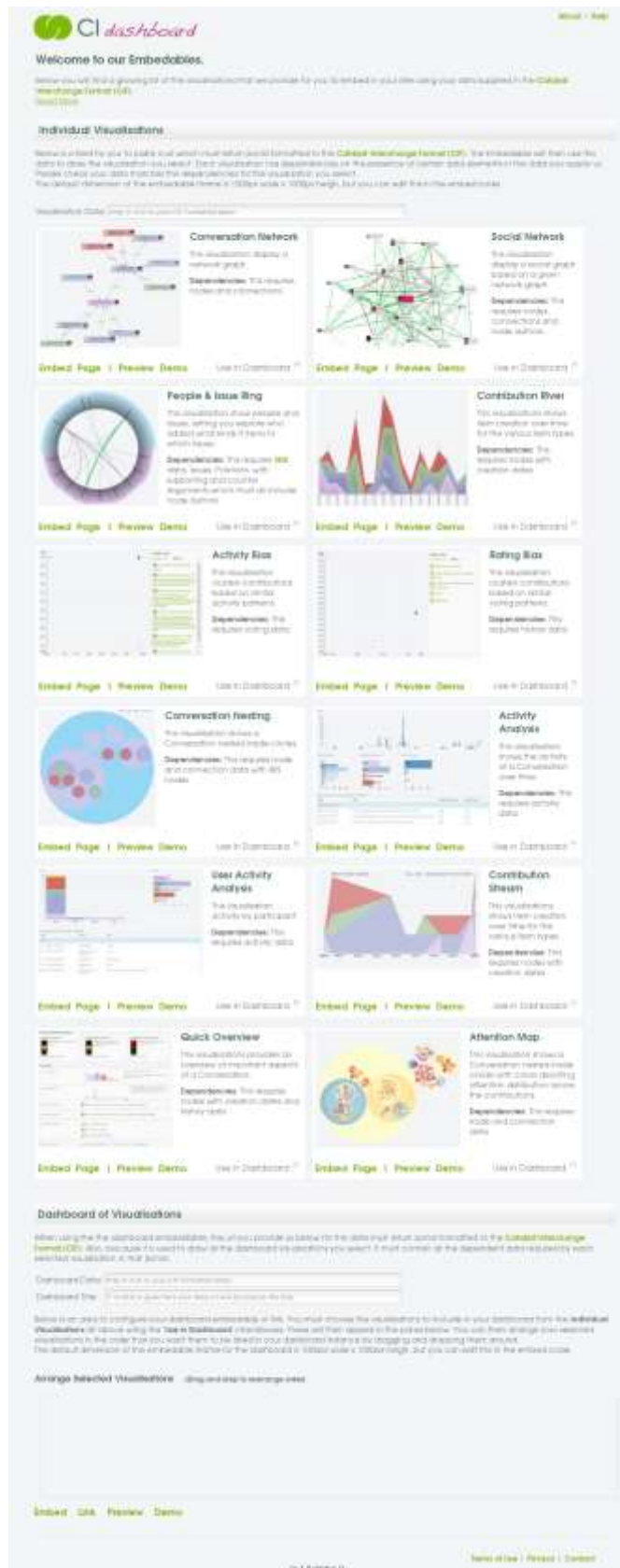


Figure 3: CI Dashboard

## 2. The Collective Intelligence Analytics Dashboard Visualisations

The next section gives an overview of the visualisations that have been evaluated regarding their usefulness and usability. These do not represent all visualisations available from the CI dashboard. As we follow an agile development methodology, new visualisations have been added since the end of the evaluation as direct feedback from the most recent testing-design cycle. These visualisations may be object of further evaluation in the remainder of the project (depending on the quick assessment of their potential value during the next phases of development and testing).

Three types of collective intelligence analytics visualisations have been explored: Visualisations to explore data, visualisations to summarise data, and visualisations raising awareness about the state of the conversation. The third type is based on the idea of attention-mediated feedback (D2.2, and D3.9) and consists of mini-visualisations to focus users attention on specific analytics results, such as, for instance, the participation, contribution or lurking level in a group being below or above certain acceptable thresholds (indicators of debate's health).

New visualisations, implemented after the submission of deliverable D3.9 and which took part in the evaluation, are explained in depth, while visualisations reported in D3.9 are briefly recapped. The visualisations reported in D3.9 are marked with an asterisk.

### 2.1 Quick overview visualisation

The quick overview visualisation provides several sections summarising important facets of the conversation in one single view. It contains three conversation health indicators (**general participation, viewing and contribution**) and several overview visualisations about user contributions, users' viewing activity, most voted entries, recent contributions, and word counts.

The three health indicators on top of the page follow the traffic light metaphor. A red traffic light indicates a problem with the conversation, yellow that there might be a problem, and green that there might be no problem (similar to real traffic lights where green has the meaning to proceed with caution). The traffic lights switch depending on the state of the conversation. Switching is based on a threshold concept. If a certain threshold is reached the traffic light switches its state from green, to yellow, to red.

The **participation** health traffic light (on the left) gives a quick indication of whether or not enough people participated/voices were heard in the conversation. The thresholds are set at the time of writing as follows. If less than three people participated in the conversation then show a red traffic light. If between three and five people have participated then show a yellow traffic light. If more than five people participated then show a green traffic light. Participation is based on users' contributions (i.e. adding a contribution to the conversation for example an idea, supporting argument, counter argument, etc.). Viewing activity was excluded from what counts as participation.

The **viewing** activity indicator is based on the viewing activity of logged in users. The longer the conversation was not viewed the more the traffic light switches towards red. The current thresholds are set to the following: If a logged in user viewed the conversation in the last five days then it shows a green traffic light. If the conversation was viewed between six and 14 days, then it shows a yellow traffic light. If the conversation was not viewed with 14 days then it shows a red traffic light.

The **contribution** activity indicator takes into account the time of the last contribution made to the conversation. If a user added a new entry within the last five days it shows a green traffic light. If a user contributed five to 14 days ago then it shows a yellow traffic light. If the conversation did not receive any contribution within 14 days then it shows a red traffic light.

These thresholds may change based on the feedback of users or the requirements of the application using the traffic lights.

Below the traffic light two mini visualisations display conversation data. The first visualisation shows a bar chart of contribution types for the whole conversation. Contribution types are issues, ideas, supporting and counter

arguments, as well as the number of votes. Hovering over the visualisation displays the count for each type. In addition, the information displayed in the bar chart is also shown in textual form.

The second mini visualisation is a sparkline visualisation of the viewing activity over the period of the whole conversation. The highest, lowest, and last viewing activity is visually marked with coloured dots. Users can hover over the sparkline to see the viewing activity of the day at the position of the mouse pointer. In addition to the sparkline visualisation this block also contains a textual description of key events on the sparkline.

These two mini visualisations follow three blocks, which show the most voted entry, the most recently voted entry, and what got recently added to the conversation. Each block shows a symbol indicating the contribution type, its description, and additional information.

The last block of this page shows word count statistics of the conversation. It shows how many words have been contributed on average, the smallest number of word contribution, and the largest word count.



Figure 4: Quick overview visualisation

## 2.2 Debate network visualisation

The debate network visualisation is described in depth in deliverable D3.9 (p. 16). It shows a single or multiple graphs of the whole conversation. The root element of each graph is the issue of the conversation. The children of the root elements are its ideas, and the leaf nodes are the supporting and counter arguments of the idea.

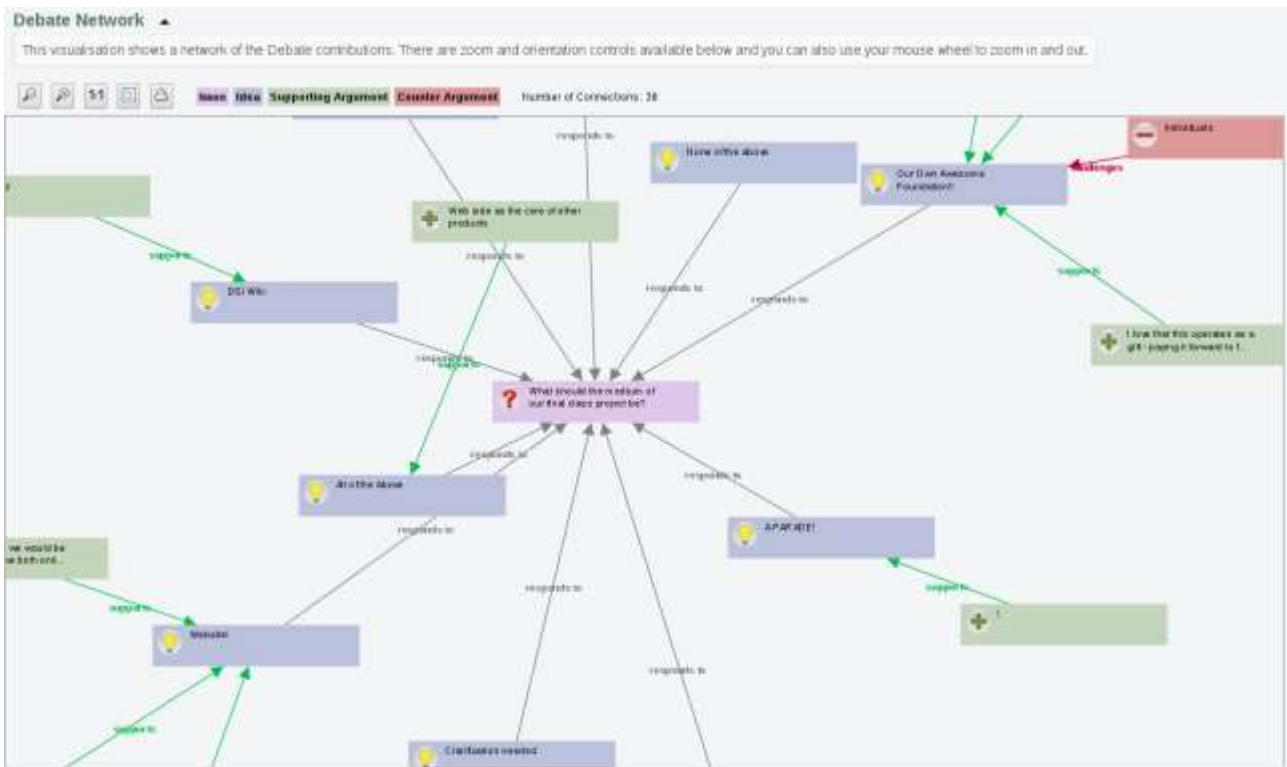
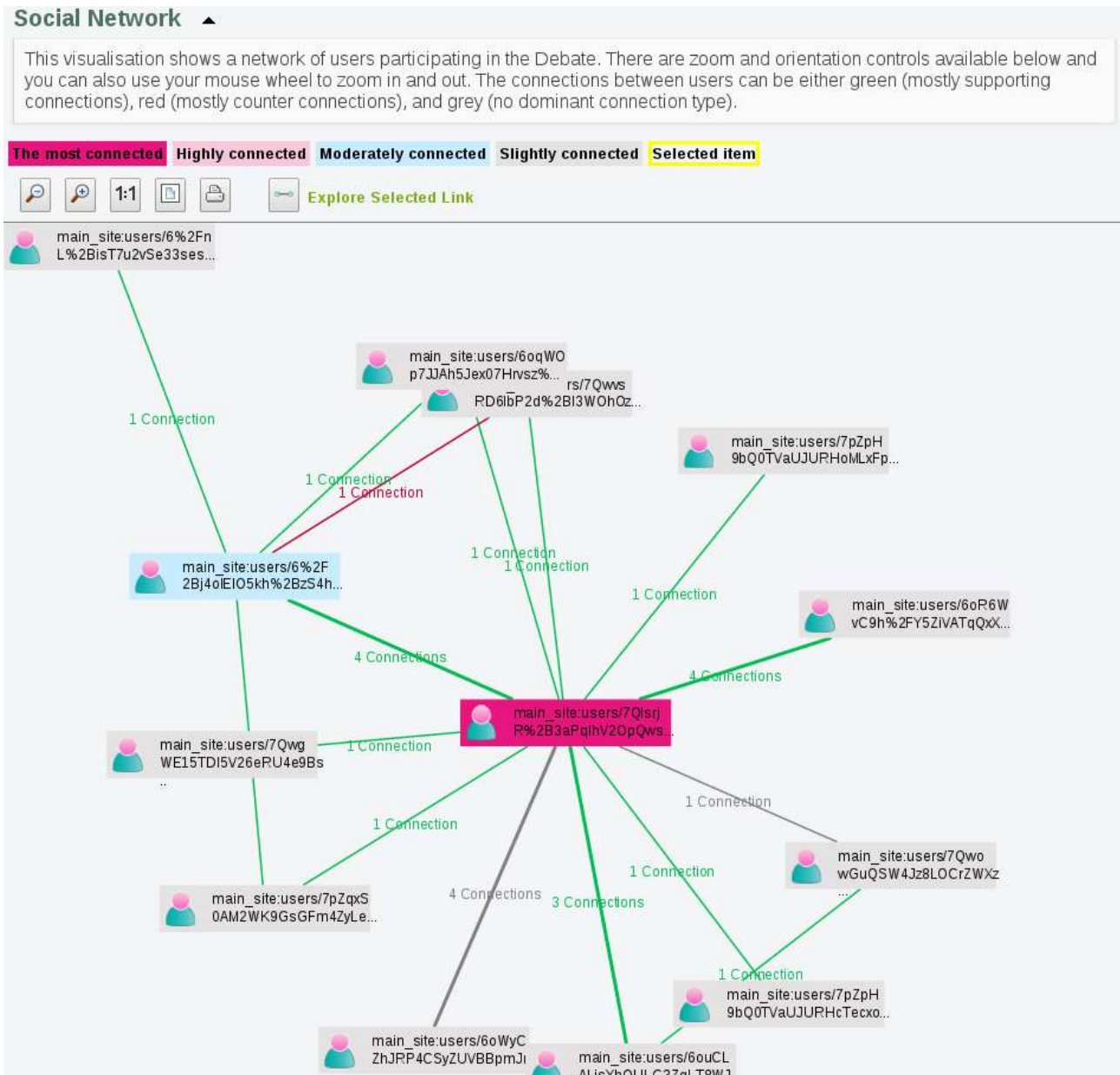


Figure 5: Debate network visualisation

## 2.3 Social network visualisation

The social network visualisation is described in depth in deliverable D3.9 (p. 15). The visualisation shows a social network of participants of the conversation. A link between user A and B is formed if user B contributed to the node of user A. For example, user A wrote an idea and user B provided a supporting argument to this idea.



**Figure 6: Social network visualisation**

## 2.4 People and issue ring visualisation

The people and issue ring visualisation is described in depth in deliverable D3.9 (p. 15). This visualisation shows the relation between people and issues and in particular how a user distributed her activities across different issues and what was her average attitude toward each issue (represented with different links between issues and users and coloured grey for neutral, green for positive, and red for negative attitude). The segment size for users represents their amount of contributions proportionally to all other users. The colour and weight of the links represents the main argument type and the amount of contributions.

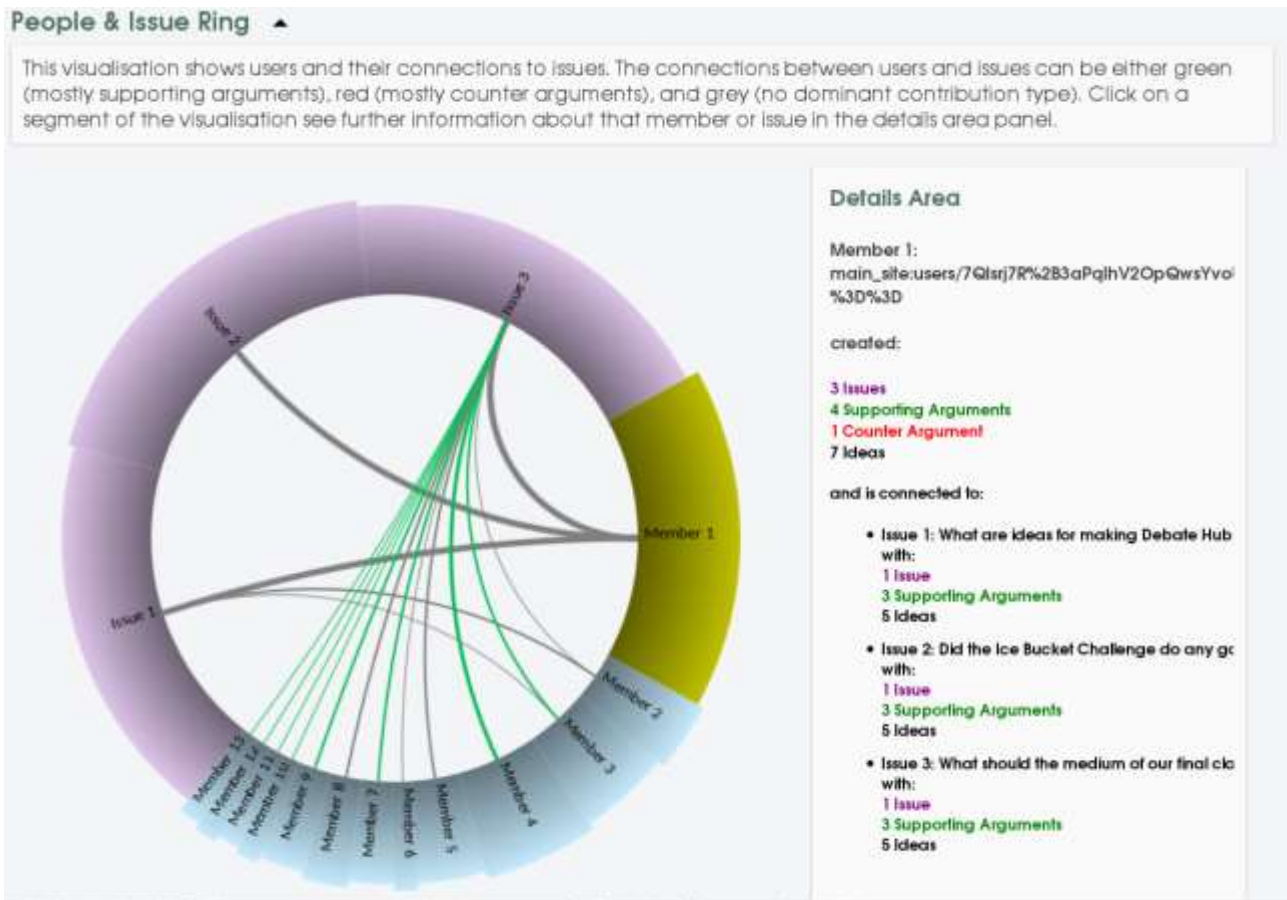


Figure 7: People and issue ring visualisation

## 2.5 Activity bias visualisation

The activity bias visualisation is based on the results of the metric server for the request "interest\_space\_post\_coordinates". This metric calculates how active each post is in each topic. It clusters posts, which tends to be viewed, edited, updated, etc. together. The metric is based on singular value decomposition (SVD) (Golub & Kahan, 1965). SVD is applied to represents each post in an N-dimensional space. The visualisation shows the first two dimensions for all posts, which are also the most important dimensions.

The visualisation can be used to detect clusters/groupings of contributions. A cluster of contributions represents similar contributions based on the activity of users with them (viewing, editing, updating of contributions, etc.).

The description of the visualisation contains two examples helping people to spot clusters in the visualisation. The example on the top-right shows two clusters (two distinct groups of contributions with each having a distinct activity pattern). The example on the bottom-right shows only one cluster. Often there are no distinct clusters. If the visualisation shows more than one cluster, then this is an indicator of the conversation being biased regarding the interest people show by interacting with the conversation. If there is only one cluster or no cluster, then this is an indicator that the conversation is unbiased.



## Activity Bias ▲

The following visualisation shows contributions to a Debate arranged on a xy-plot. Use this visualisation to find clusters/groupings of contributions. A cluster of contributions represents similar contributions based on the activity of users with them (viewing, editing, updating of contributions, etc.).

The example on the top-right shows two clusters (two distinct groups of contributions with each having a distinct activity pattern). The example on the bottom-right shows only one cluster. Often there are no distinct clusters.

Use this visualisations to spot clusters. If the visualisation shows more than one cluster, then this is an indicator of the Debate being biased regarding the interest people show by interacting with the Debate. If there is only one cluster or no cluster, then this is an indicator that the Debate is unbiased.

Hover over a contribution point to see more information in the "Detail area".

Two clusters



One cluster

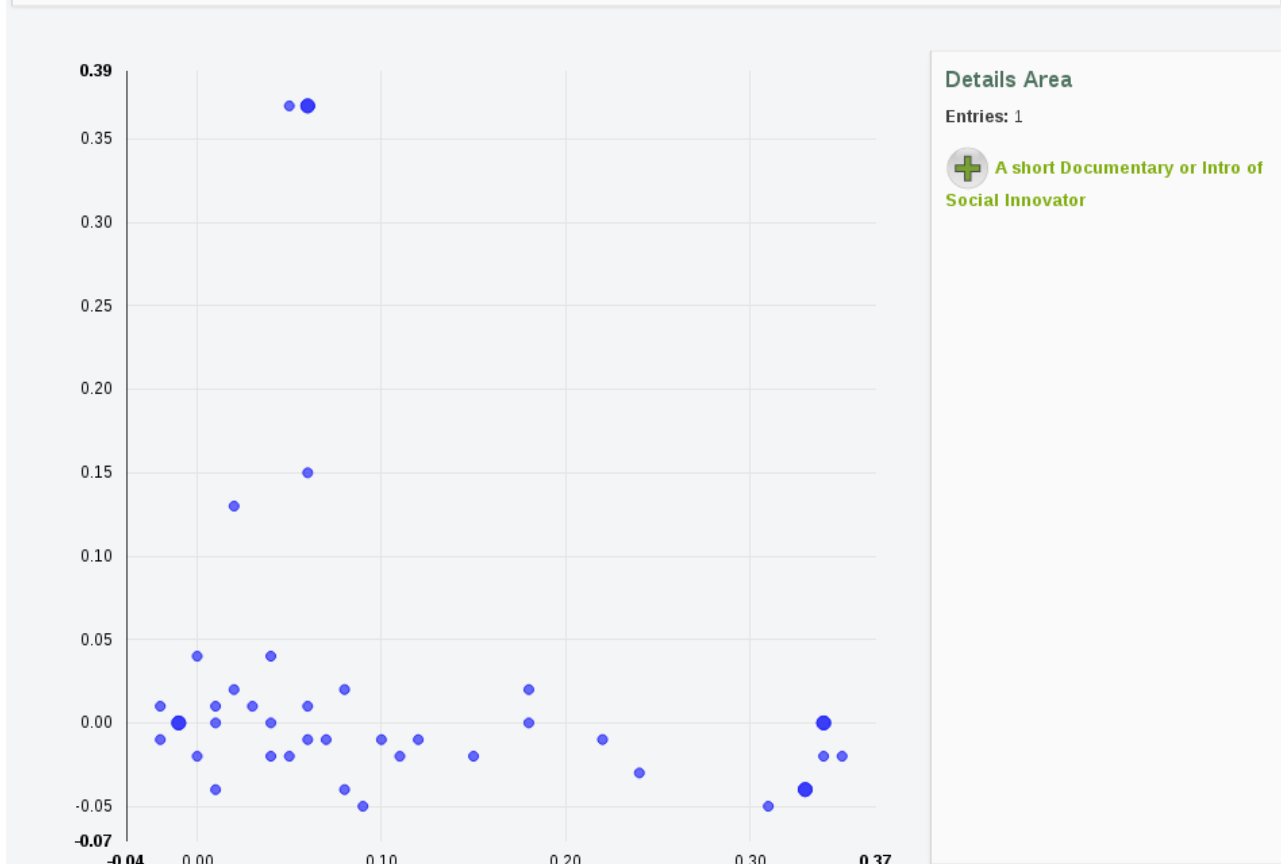


Figure 8: Activity bias visualisation

## 2.6 Rating bias visualisation

As with the activity bias visualisation the rating bias visualisation is based on the results of the metric server. The specific request to the metric server is "support\_space\_post\_coordinates" to receive the values for the visualisation. The metric calculated for each post coordinates in an N-dimensional space based on rating activity. It uses singular value decomposition (SVD) for this transformation. The visualisation shows the first two dimensions, as they are the most important ones.

The visualisation can be used to detect clusters/groupings of contributions. A cluster of contributions represents similar contributions based on the rating activity of users.

The description of the visualisation contains two examples aiding users to make sense of the visualisation. The example on the top-right shows two clusters (two distinct groups of contributions with each having a distinct voting pattern). The example on the bottom-right shows only one cluster. Often there are no distinct clusters.

If the visualisation shows more than one cluster, then this is an indicator of the conversation being biased regarding the voting behaviour of people. If there is only one cluster or no cluster, then this is an indicator that the conversation is likely unbiased.

This visualisation could be particularly useful to extract activity patterns in large datasets. The downside of the analytical method used to build the visualisation, is that the type and nature of the identified patterns is not explained. This means that the visualisation is useful to identify clusters of “similar” posts but it will not tell the users anything about why they are “similar”.

### Rating Bias ▲

The following visualisation shows contributions to a Debate arranged on a xy-plot. Use this visualisation to find clusters/groupings of contributions. A cluster of contributions represents similar contributions based on the voting by users.

The example on the top-right shows two clusters (two distinct groups of contributions with each having a distinct voting pattern). The example on the bottom-right shows only one cluster. Often there are no distinct clusters.

Use this visualisations to spot clusters. If the visualisation shows more than one cluster, then this is an indicator of the Debate being biased regarding the voting behaviour of people. If there is only one cluster or no cluster, then this is an indicator that the Debate is unbiased.

Hover over a contribution point to see more information in the "Detail area".

Two clusters



One cluster

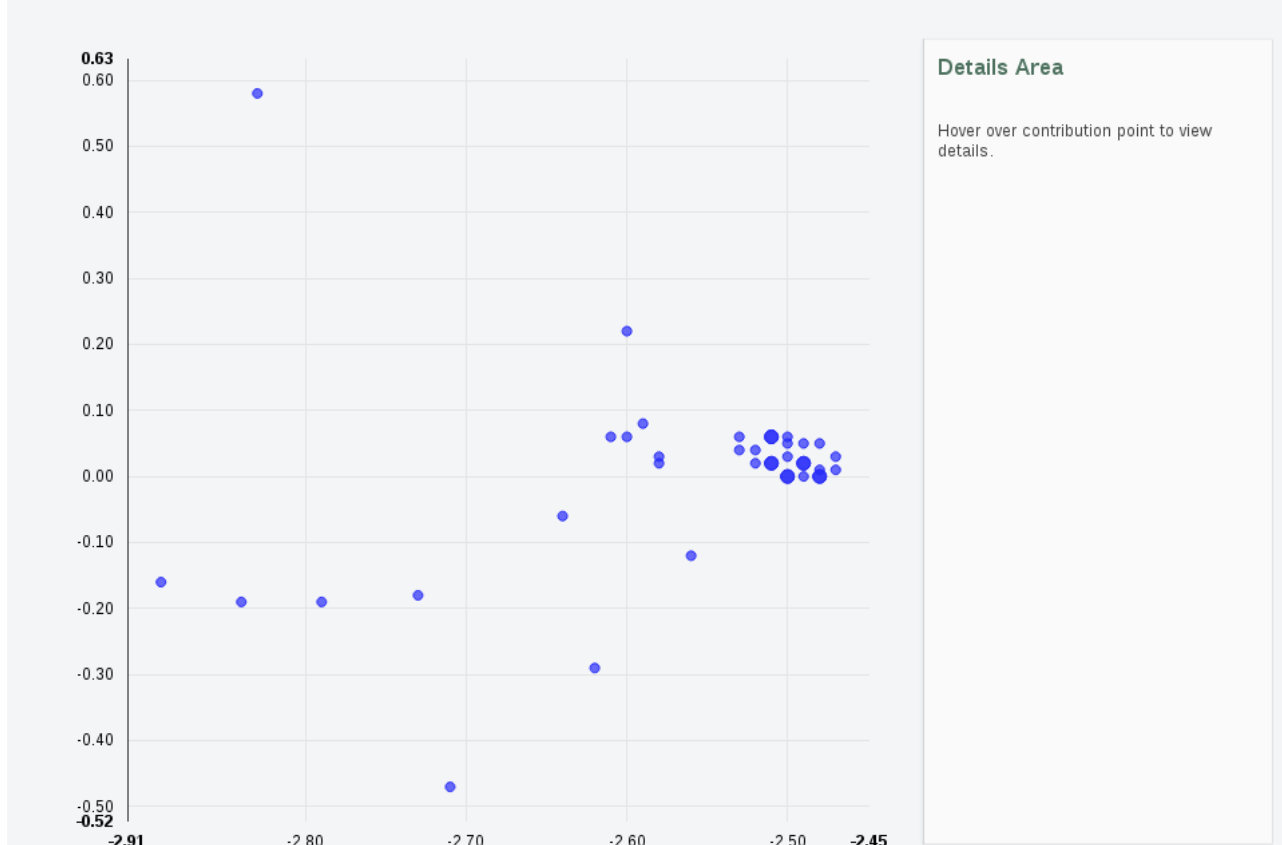


Figure 9: Rating bias visualisation

## 2.7 Conversation nesting visualisation

The conversation nesting visualisation shows an entire conversation as nested circles of contributions. It gives a visual overview of which issue received most contributions (in purple in figure 10), and how the contributions' types (solutions, pro and con arguments) are distributed across different issues. In Figure 10 for example the group conversation (clustered under the blue circle) contained three issues of which one (purple circle at the top) much more contributed to than the other two. We can also deduce that overall people contributed much more pro (green circles) than counter-arguments (red circles). In summary: the outer circle represents the whole conversation, the next level down is the issue level. Each issue can then consist of solutions or ideas; and finally each solution can contain pro-/supporting and con-/counter arguments. People can zoom into each circle, which is particularly useful for larger conversations.

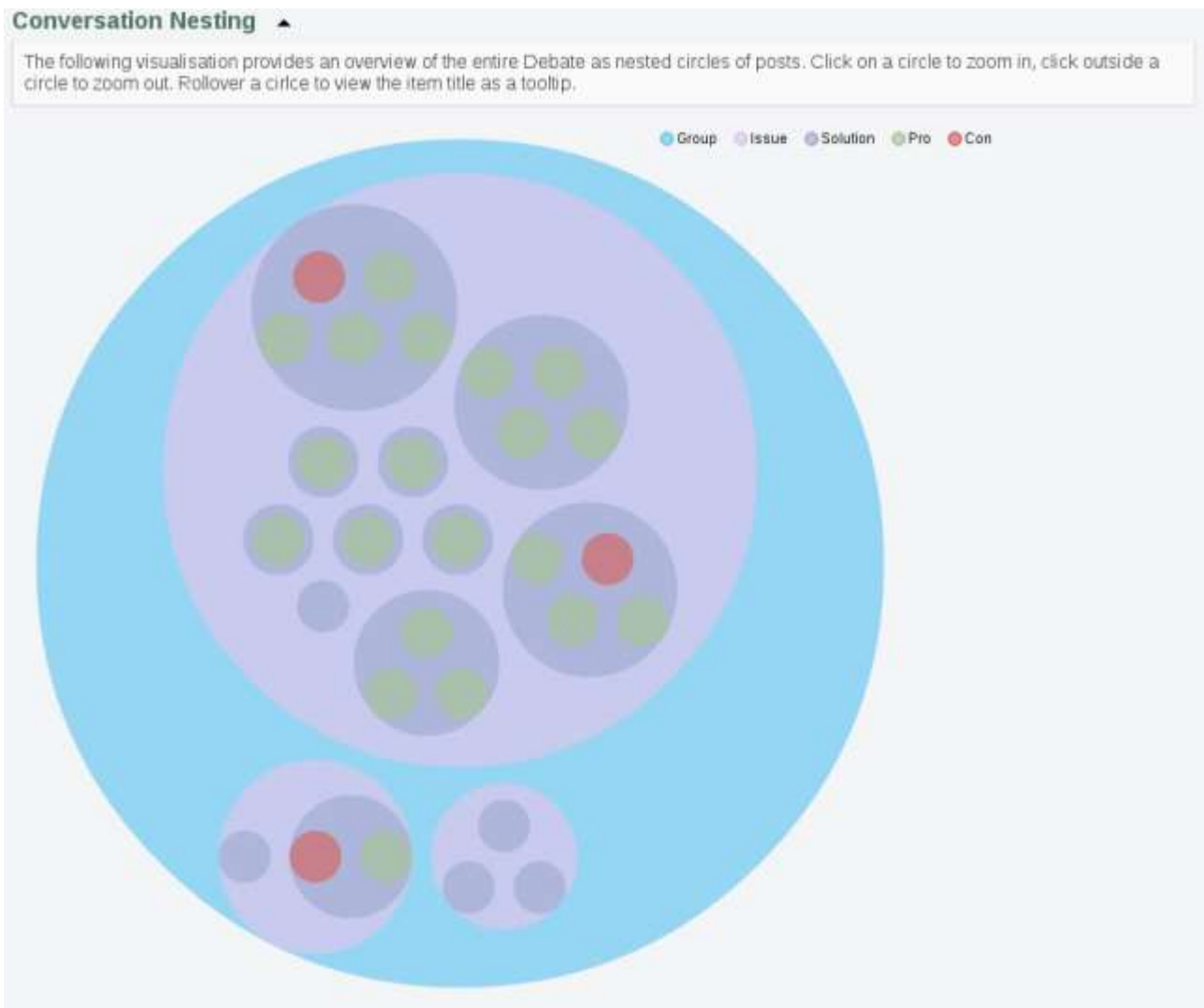
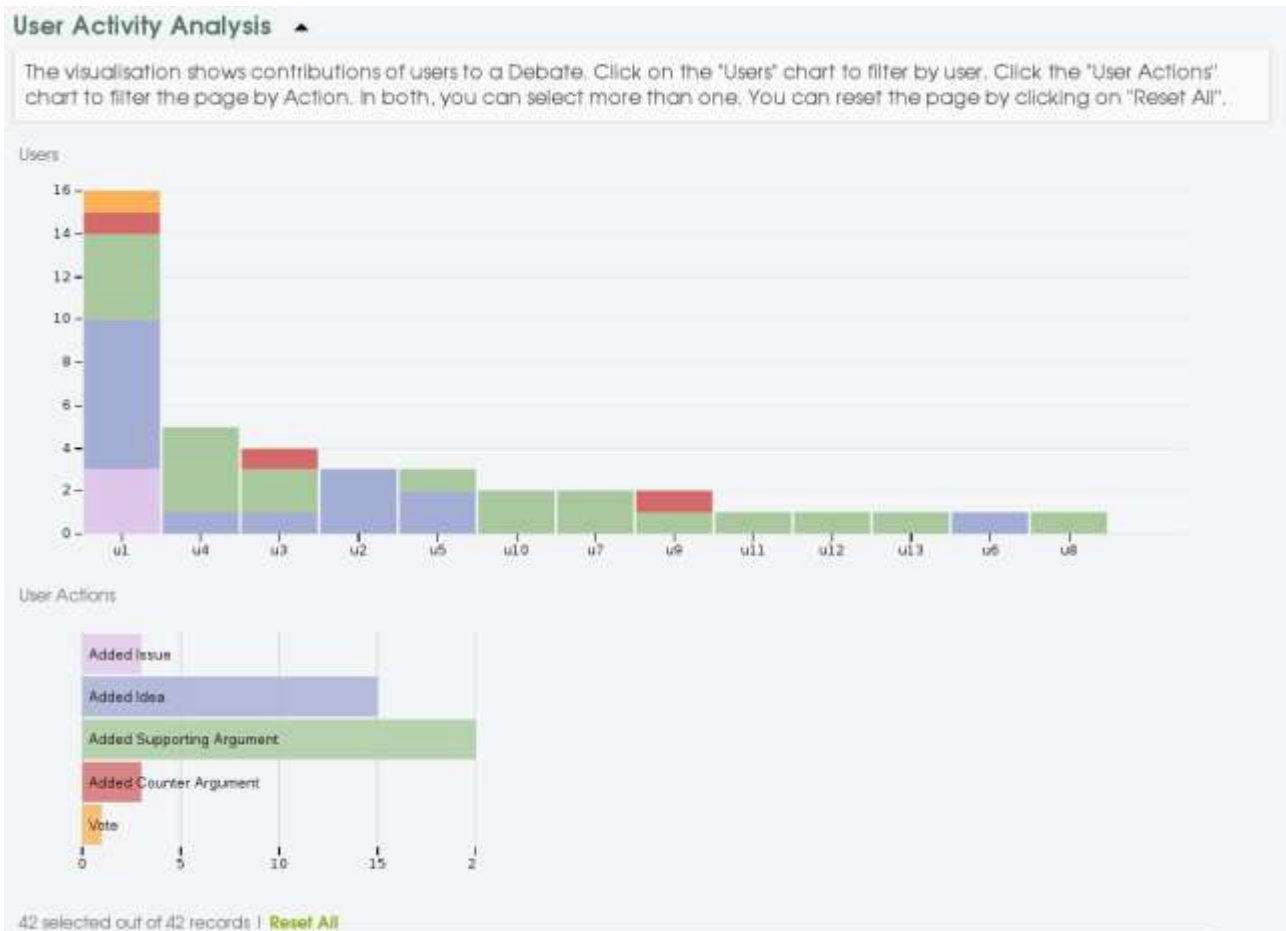


Figure 10: Conversation nesting visualisation

## 2.8 User activity analysis visualisation

The user activity chart shows an ordered bar chart of users' activities. Users are ordered by decreasing activity magnitude from left to right, basically the most active user is displayed on the very left, while the least active user is to

the very right. The activity types of each user are shown as a stacked bar. There are 5 activity types: adding issues, ideas, supporting arguments, counter arguments, and voting. In figure 11, below, the vertical bar chart there is another horizontal bar chart showing the count of each action type in the entire conversations. The two visualisations are coupled and allow group filtering (by consecutively selecting more than one bar). This means that by clicking on one user bar (e.g. U1) the horizontal bar chart will filter the results to show only the activities form U1 in the user actions chart. If in sequence we then click on another user bar (e.g. U3) then the horizontal bar chart will show the activities of U1+U3. In the same way, by clicking on the horizontal chart below the vertical chart will be filtered accordingly. The Reset all link allows removing any filter and start again.



**Figure 11: User activity analysis visualisation**

Below both charts there is a table with the data of the visualisation (Figure 12). The table will update with each filter action. The table shows for each user the date of the action, action type, and the title of the action. For example user u2 added an idea on Tuesday with the title "clarification needed".

7 selected out of 42 records | [Reset All](#)

Date	User Action	Title
<b>u2</b>		
Tue 16 2014 09:31 PM	Added idea	Clarification needed
Mon 29 2014 05:13 PM	Added idea	Slow to load pages
Mon 29 2014 05:14 PM	Added idea	No paragraph formatting
<b>u3</b>		
Tue 23 2014 04:04 AM	Added Idea	LILE/DISLIKE ICONS
Sat 13 2014 05:15 AM	Added Supporting Argument	Mini documentary
Sat 13 2014 05:17 AM	Added Counter Argument	A physical book needs more than its publication
Sat 13 2014 05:20 AM	Added Supporting Argument	Web side as the core of other products

**Figure 12: Table of the user activity analysis visualisation**

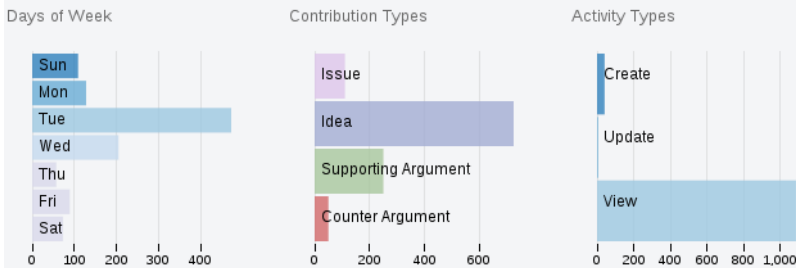
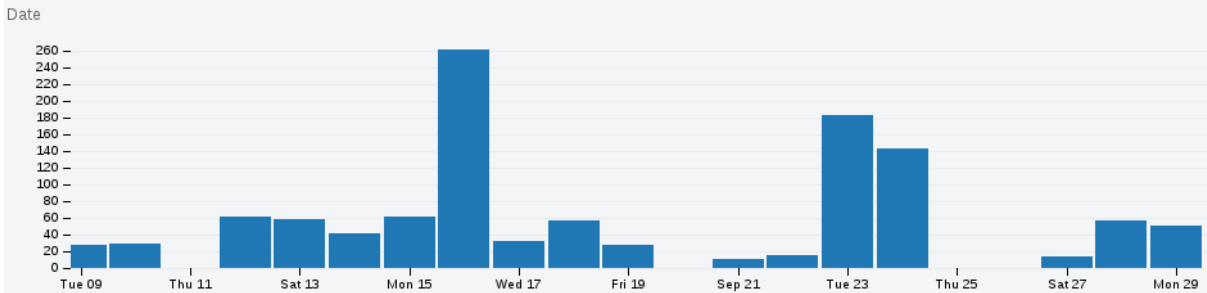
## 2.9 Activity analysis visualisation

The activity analysis visualisation shows the activity of a conversation over time. It consists of three main building blocks. On top is a bar chart that shows the activity for each day of the conversation. The middle block shows horizontal bar charts for day of the week, contribution type, and activity type. The third building block is a table showing the underlying data of the visualisation. All three blocks and their visualisations are coupled and will update according to the filter actions of the user.

Users can filter the timeline by selecting a date range (click and drag). They can also filter according to days of weeks, contribution types, and activity types by selecting one or several of the horizontal bars. The data table will update its information accordingly.

### Activity Analysis ▲

The following visualisation shows activity of a Debate over time. Click on the timeline to cover a period of time (click and drag). The visualisations below will change and will show the frequency of activity per day, the type of Debate (issue, idea, pro and con arguments), the type of activity (viewing, adding, or editing), and in the table below you can see the data underlying the visualisations. There you can also reset the visualisation to its original state. You can click on the bars of the visualisations to filter for a specific type. You can also select several types by clicking on several bars. Click for example on the issue and idea bar and on the viewing bar to filter for all viewed issues and ideas.



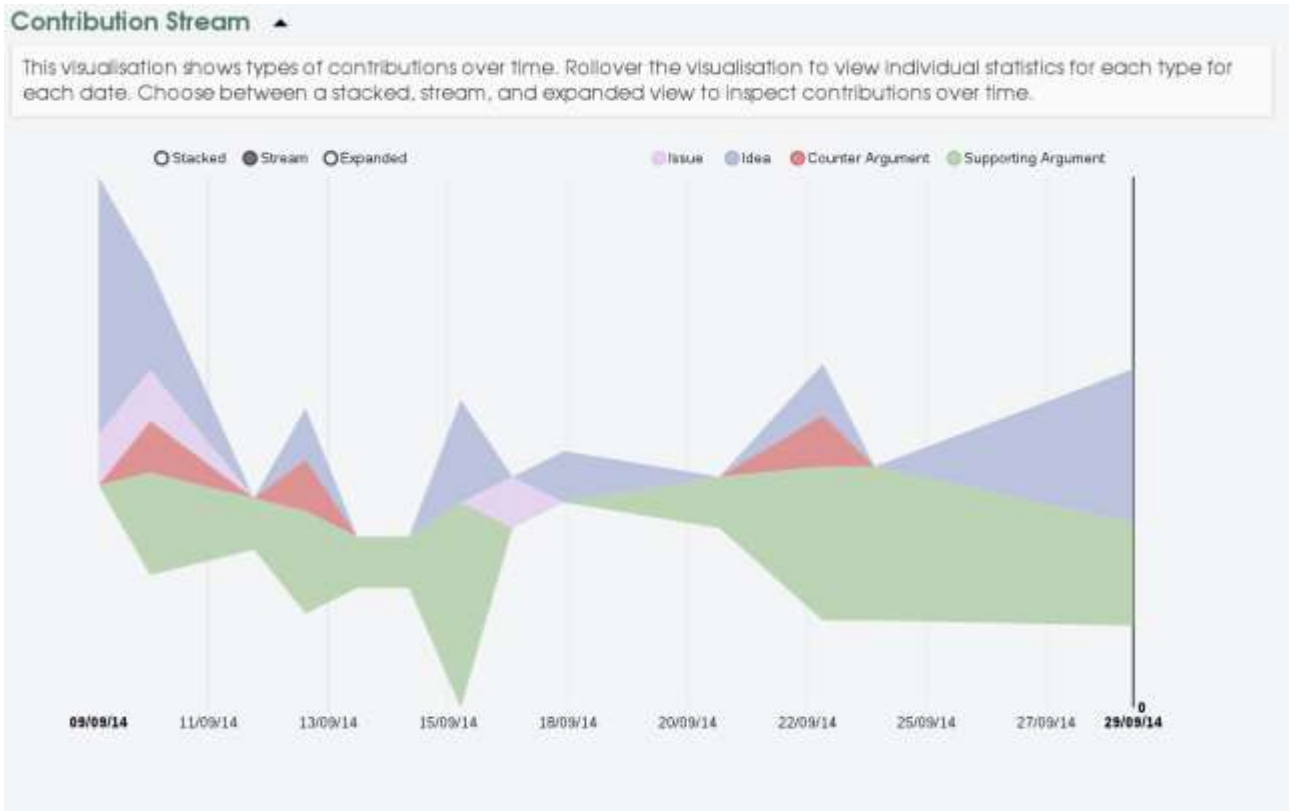
1,134 selected out of 1,134 records | [Reset All](#)

Date	Title	Contribution Type	Activity Type
September 2014			
Mon 29 05:14 PM	Slow to load pages	Idea	View
Mon 29 03:40 PM	What should the medium of our final class project be?	Issue	View
Mon 29 03:40 PM	A PARADE!	Idea	View
Mon 29 03:40 PM	Book	Idea	View

**Figure 13: Activity analysis visualisation**

## 2.10 Contribution stream

The contribution stream is similar to the activity river reported in deliverable D3.9 (see page 16). It shows contributions over time. Each colour represents a contribution type (issue, idea, counter argument, supporting argument). The user can flip between a stacked, stream, and an expanded view of the contribution stream. The following figure shows the stream view of contributions. Users can filter the visualisation by contribution type. Hovering over a specific date will show a pop up with the exact count for each contribution type.



**Figure 14: Contribution stream visualisation**

### 3. Evaluation of usefulness and usability of the CI dashboard visualisations

The collective intelligence analytics dashboard usability evaluation tests the usefulness and usability of several deliberation analytics visualisations provided by the CI dashboard (T3.9). The dashboard visualisations are generated from data specified in the CATALYST interchange format (D3.1) and the deliberation analytics (D3.5) returned by CATALYST metrics server.

The evaluation follows a multi-method approach applying a mix of qualitative and quantitative methods in lab and field experiment settings. The experiments were designed in a way that participants work on realistic tasks in which they answered questions about the debate with the help of the analytics visualisation. The methods used for the evaluation ranged from questionnaires to video and screen recordings, providing a rich data source about aspects of usefulness, usability, and use of the collective intelligence dashboard visualisations. Two main settings are evaluated, which structure the following sections.

#### Field Experiment

The first study was a field experiment. Our test bed partner PURPOSE recruited participants for this trial. The participants took part in an online deliberation on Debate Hub (D3.6). They formed the group "Design community 2014" to debate design issues of web projects, for example, the "Beyond Fear Project", a project aiming to help people overcoming their personal fears. The participants had ample time to familiarise themselves with the tool. The data, which they generated while debating, served as data source for the analytics visualisations. The evaluation of the usefulness and usability of the visualisations was gathered with an online questionnaire. PURPOSE disseminated the links for the online questionnaire to the participants of this group.

#### Lab Experiment

The second setting was a usefulness and usability study in a usability lab setting. Participants recruited by the OU conducted several tasks with the visualisations. The sessions were screen captured and video recorded. This evaluation collected rich data about the usefulness and usability of different visualisations in a controlled environment and with a small group of participants.

The field experiment study and the usability lab study consisted of four major parts. The first part collected background information about the participants, especially the familiarity of the participants with analytics visualisations. The second part measured the use of the visualisations based on performance tasks. The third part measured the usefulness and usability with the SUS (System Usability Scale) questionnaire (Bangor, Kortum, & Miller, 2009, 2008; Brooke, 2013), and the fourth part gathered information about what the participants liked and did not like about the visualisations, and what they would improve.

#### 3.1 Evaluation of the analytics visualisation with a field experiment

Purpose initiated the creation of the "Design Community 2014" group on Debate Hub. Several people participated in multiple debates. The questionnaires used for the evaluation of the usefulness and usability of the CI analytics dashboard was sent to this user group (see the annex section "Field experiment questionnaires"). Participants in the evaluation had the time to familiarise themselves with the collective intelligence debate tool. The data generated during their activity with the Debate Hub group until the start of the evaluation were used as data source for all visualisations. This choice was made to enhance the authenticity of the evaluation. The participants were then able to see their debate through the lenses of several analytics visualisations.

The questionnaires were generated with the maQ-online Questionnaire Generator (Ullmann, 2004) freely available at <http://maq-online.de>. Purpose sent the questionnaire links to 26 participants. The task for each participant was to fill



out 11 questionnaires: One questionnaire to assess each of the 10 visualisations and one final questionnaire to compare visualisations and gather data about users' favourite visualisations.

Each participant received unique links to the online questionnaires. Each participant received for each visualisation two links. The second link served as a backup in case the participant got interrupted during the first time they filled out the questionnaire. The following procedure was applied to ensure that only one questionnaire of each participant got included into the sample. If a participant used both questionnaires, the questionnaire with most filled out questionnaire pages was kept and the data from the other questionnaire was discarded. In addition, questionnaires were deleted if the person only filled out the first page, but not any of the other 7 pages. All participants gave their consent to use their data for research.

### 3.1.1 Background information

In total six questions were asked to get to know more about the background of the participants. One question asked for their gender, two questions asked about their participation on Debate Hub, and three questions were used to gather data about the participants' familiarity with visualisations.

#### 3.1.1.1 Gender

Most of the participants were females. At least one male person filled out each questionnaire.

**Table 1: Gender**

Questionnaire	N	Male	Female
Quick overview visualisation	12	2	10
Debate network visualisation	8	2	6
Social network visualisation	9	1	8
People and issue ring visualisation	8	1	7
Activity bias visualisation	8	1	7
Rating bias visualisation	8	2	6
Conversation nesting visualisation	7	1	6
Activity analysis visualisation	4	1	3
User activity analysis visualisation	6	1	5
Contribution stream visualisation	7	2	5

#### 3.1.1.2 Usage of Debate Hub

The next two questions are indicative of how familiar the participants are with the collective intelligence tool Debate Hub.

The first question was: "How often did you visit the discussion about 'Designing Community 2014' on Debate Hub?" Most people visited Debate Hub between 2 to 10 times. None of the participants had never visited Debate Hub.

**Table 2: Visits of Debate Hub**

Questionnaire	N	Never	1 time	2 to 4 times	4 to 10 times	more than 10 times
Quick overview visualisation	12	0	1	4	6	1
Debate network visualisation	8	0	1	2	4	1
Social network visualisation	9	0	1	4	3	1

Questionnaire	N	Never	1 time	2 to 4 times	4 to 10 times	more than 10 times
People and issue ring visualisation	8	0	1	3	3	1
Activity bias visualisation	8	0	1	2	4	1
Rating bias visualisation	8	0	0	4	3	1
Conversation nesting visualisation	7	0	1	2	3	1
Activity analysis visualisation	4	0	0	1	2	1
User activity analysis visualisation	6	0	0	2	3	1
Contribution stream visualisation	7	0	1	3	2	1

The next question was: "How often did you make a contribution to the discussion about 'Designing Community 2014' on Debate Hub?" A contribution could have been to add an idea, write a supporting or counter argument, or voting. Most of the participants contributed one or more times to the conversation.

**Table 3: Contributions to Debate Hub**

Questionnaire	N	Never	1 time	2 to 4 times	4 to 10 times	more than 10 times
Quick overview visualisation	12	4	3	3	2	0
Debate network visualisation	8	1	4	1	2	0
Social network visualisation	9	3	4	0	2	0
People and issue ring visualisation	8	2	3	1	2	0
Activity bias visualisation	8	2	3	1	2	0
Rating bias visualisation	8	2	3	1	2	0
Conversation nesting visualisation	7	1	4	0	2	0
Activity analysis visualisation	4	0	2	0	2	0
User activity analysis visualisation	6	1	3	0	2	0
Contribution stream visualisation	7	1	3	1	2	0

Overall, all participants stated that they have seen Debate Hub, and most people have contributed at least once to the debate.

### 3.1.1.3 Familiarity with visualisations

Three questions were designed to gauge information about the participants' familiarity with visualisations. The first question was: "How familiar are you with analytics dashboards in general?" Most people answered that they are novices or have basic experiences.

**Table 4: Familiarity with analytics dashboards**

Questionnaire	N	Expert	Advanced	Average	Basic experiences	Novice
Quick overview visualisation	12	0	1	2	4	5
Debate network visualisation	8	0	1	1	2	4
Social network visualisation	9	0	0	1	4	4
People and issue ring visualisation	8	0	0	0	4	4
Activity bias visualisation	8	0	0	1	2	5
Rating bias visualisation	8	0	1	0	3	4

Questionnaire	N	Expert	Advanced	Average	Basic experiences	Novice
Conversation nesting visualisation	7	0	0	0		3 4
Activity analysis visualisation	4	0	0	0		1 3
User activity analysis visualisation	6	0	0	0		2 4
Contribution stream visualisation	7	0	1	0		3 3

The next question was: "How familiar are you with visualisations for analysing and exploring data?" As with the first question most participants answered with being novices or having basic experiences. Overall there is a slight move away from answering as novice.

**Table 5: Familiarity with visualisations**

Questionnaire	N	Expert	Advanced	Average	Basic experiences	Novice
Quick overview visualisation	12	0	2	3		3 4
Debate network visualisation	8	0	1	1		3 3
Social network visualisation	9	0	0	1		5 3
People and issue ring visualisation	8	0	0	1		4 3
Activity bias visualisation	8	0	0	0		4 4
Rating bias visualisation	8	0	0	2		2 4
Conversation nesting visualisation	7	0	0	1		3 3
Activity analysis visualisation	4	0	0	0		2 2
User activity analysis visualisation	6	0	0	1		2 3
Contribution stream visualisation	7	0	1	1		3 2

The last question was: "How familiar are you with visualisations for analysing and exploring debates?" While the previous questions asked about general familiarity with visualisations to explore data, this question narrowed the context to debates. Most participants rated themselves as novices or as having basic experiences. Compared to the other two questions, participants reported the least amount of experience with debate visualisations.

**Table 6: Familiarity with debate visualisations**

Questionnaire	N	Expert	Advanced	Average	Basic experiences	Novice
Quick overview visualisation	12	0	1	1		4 6
Debate network visualisation	8	0	1	1		2 4
Social network visualisation	9	0	0	1		4 4
People and issue ring visualisation	8	0	0	0		4 4
Activity bias visualisation	8	0	0	1		2 5
Rating bias visualisation	8	0	0	1		2 5
Conversation nesting visualisation	7	0	0	0		3 4
Activity analysis visualisation	4	0	0	0		1 3
User activity analysis visualisation	6	0	0	0		2 4
Contribution stream visualisation	7	0	1	0		3 3

#### 3.1.1.4 Summary

We gathered answers from 77 questionnaires in total. Each of the 10 visualisations was assessed by an average of 8 people. Most of the participants were female. All of them have seen Debate Hub and most of the contributed to the deliberation at least once. Most of the participants reported to have basic experiences with analytics visualisations or analytics dashboards. Having only limited experiences with analytics visualisations will be true for most of the users of collective intelligence tools, as their primary focus is on online debating and not on analysing their conversation. Considering this, the following results will be indicative for most users, with no or little experience in using analytics visualisations.

#### 3.1.2 User Interaction

To assess the user interaction with the visualisations, small tasks were constructed for each visualisation. The tasks were designed in a way that they cover the core functionalities of the visualisation. After the tasks followed a yes/no question together with a free-text answer questions. This final question was used to allow qualitative insights of users' reactions, ideas and open comments. The tasks of the questionnaire will be presented for each individual visualisation. The results are summarised at the end of this section.

##### 3.1.2.1 Quick overview visualisation

The first question asked, "How many people participated in the debate?" Nine out of ten participants answered this question correctly. All 10 participants correctly answered the second question "How many counter arguments have been contributed?" Eight out of 10 answered the question "What is the highest viewing count?" correctly. Nine out of 10 could answer the question "What is the average word count over all contributions?"

Overall, most participants were able to successfully answer the questions of the task.

After this task the participants were asked their opinion regarding the question: "Is the debate a healthy debate?" Three people answered with yes, five with no, and 2 could not tell.

From the five people who think that the debate is not healthy four saw the lack of activity as a problem. They mentioned low viewing activity and low contribution activity as reasons.

From the three people who think that the debate is a healthy debate, two people mentioned that there is a good amount of ideas, which received supporting arguments.

From the free-text answer replies of the participants it seems that two different blocks of the visualisation sourced their judgement about the health of the debate. The explanations of the five people thinking that the debate is not healthy indicate that they looked at the debate health indicators. Two of the health indicators showed a red traffic light for the viewing activity indicator and the contribution activity indicator. The explanations of the three people judging the debate as a healthy debate indicate that they took their information from the user contribution bar chart, which showed a proportionally larger amount of ideas and supporting arguments than the other contribution types. Interesting is that both types of visualisations were used as source to judge the healthiness of a debate. This may indicate that besides the health indicators the distribution of debate types plays a role as well to judge the healthiness of a debate.

##### 3.1.2.2 Debate network visualisation

Five out of six people answered the question "Which issue received the most responses?" correctly. Half of the participants answered the question "How many ideas got challenged?" correctly. Five out of six correctly answered the question "Which idea has the most connections?"

Five participants answered the question "Is the debate dominated by one of the two argument types" in the affirmative. The two argument types were supporting arguments and counter arguments. One participant answered in the negative. All five participants explained that the debate was dominated by supporting arguments. Two of them

elaborated that there is an imbalance between supporting and counter arguments with many more supporting arguments than counter arguments.

#### 3.1.2.3 Social network visualisation

Five out of seven participants answered the question "Who is the most connected user?" and four out of seven answered the question "How many connections are between the most connected user and the user which is the second most connected user?" correctly.

They were then asked "Is the debate dominated by one or more users?" Six participants answered with yes and one participant with no. These six users explained it with the amount of connections of this user. The visualisation showed indeed a very central user with many connections to other users, which was identified as the dominating user.

#### 3.1.2.4 People and issue ring visualisation

All eight participants correctly answered the questions "Which member contributed most issues" and "Which member contributed to issue 2?" Five out of eight answered correctly the question "How many ideas were contributed by member 1?" The three participants who incorrectly answered with three seemed to mismatch ideas with issues, which might be caused by overseeing the information in the detail area and only checking links in the visualisation, which shows three outward links from member 1. Seven out of eight participants correctly answered the question "Which issue received the most supporting arguments?"

Seven participants thought that the debate was dominated ("Is the debate dominated by one or more users?"). One person could not tell. The explanations ranged from member 1 having the largest section, to member 1 has thicker lines, to member 1 contributed the most issues.

#### 3.1.2.5 Activity bias visualisation

The question "How many clusters can you see?" was an open question without right or wrong answers. The scatterplot showed a pattern, which did not show a specific amount of clusters. Three out of eight participants saw two clusters, two saw three clusters, one person saw one cluster, another one saw 5 clusters, and one person saw 27 clusters. Assuming that the correct answer is between two and three clusters, then five out of 8 correctly answered the question.

Most people could not tell whether the debate was biased or not ("Is the debate biased?"). Out of eight two answered with yes and two with no. Their explanations revealed that it was difficult for them to assess whether the scatterplot showed clusters or not.

#### 3.1.2.6 Rating bias visualisation

Similarly to the activity bias visualisation there was not a clear-cut answer to the question "How many clusters can you see?" Five out of seven people saw one cluster. One person saw two, and one person 12 clusters. Assuming that the correct answer lies between one and two then six out of seven participants correctly answered the question.

Most people (5) could not tell if the debate was biased. One person said yes, and one person no. In their explanation they stated that they found the visualisation confusing, or did not understand how the visualisation relates to the concept of bias.

#### 3.1.2.7 Conversation nesting visualisation

All seven participants answered all three questions correctly. The questions were: "How many pro arguments can you see?", "How many contra arguments can you see?", and "How many solutions do not have any pro or contra arguments?".

There was no further free-text answer question in this section.

This visualisation therefore proved to be very intuitive and easy to explore and interpret (100% of participants had no problem with the information seeking tasks).

#### 3.1.2.8 Activity analysis visualisation

The first three questions were answered correctly by all four participants ("What day of the week shows most activity?", "What is the most frequent contribution type?", and "What is the most frequent activity type?"). The question "Between Thu 11 and Fri 19, how often was an idea created?" seemed to be difficult to answer. None of the four answered it correctly. To find the answer to this question several steps are necessary. First, selecting the time range, and then filtering only for the activity type "create" to find the answer in the contribution type chart. This is a more complex information seeking tasks, which required the use of the time range filtering function in association to other type of filtering, which seemed more difficult to answer.

All four participants answered with yes to the two statements "Is the debate dominated by one or more types of debate (issue, idea, supporting argument, counter argument)?" and "Is the debate dominated by one or more activity types?"

Regarding the first question they briefly explained that the dominating type was ideas, and that the most dominating activity type was views.

The visualisation showed indeed a proportionally higher count of ideas than other types of the debate. The same applied to the activity type views. In this case the visualisations helped the participants to spot dominating debate and activity types.

#### 3.1.2.9 User activity analysis visualisation

All six participants correctly answered the question "How many counter arguments have been made in the whole debate?". Four correctly answered the question "How many users are very active?" as well as the question "How often did the most active user contribute to the debate?", and "How many ideas did user u1 (user on the left) add?".

All six participants thought that the debate was dominated by one or more users ("Is the debate dominated by one or more users?"). The two main explanations were that there was one user contributing the most, and that there were more contributions to the left side of the chart than to the right. The visualisations showed indeed one very active user. After this user was a steep drop of activity. The remaining users had a more equally spread amount of contributions slowly fading out towards the last user. The explanations of the participants indicate that it was this gap of high activity of the first users and the activity of the other users, which helped them to infer that this first user dominated the debate.

#### 3.1.2.10 Contribution stream visualisation

Five out of seven participants correctly answered the following three questions: "Which day has the highest count of supporting arguments?", "Which of the contribution types (issue, idea, counter argument, supporting argument) has overall the smallest count?", and "Which of the contributions types (issue, idea, supporting argument, counter argument) has overall the highest count?".

After seeing this visualisations six people thought that a contribution type dominated the debate ("Is the debate dominated by one or more contribution types (issue, idea, supporting argument, counter argument)?"). One person could not tell. Their explanation highlighted that it was dominated by supporting arguments. One person mentioned that this was very visible with the expanded view of the visualisation.

### 3.1.2.11 Summary

The following table summarises the task performance for all visualisations of the field experiment. The order of the visualisations is aligned to the task performance evaluation of the usability lab study. It shows for each visualisation their tasks, how many people answered the question correctly and incorrectly. In addition it shows the percentage of correct answers.

**Table 7: Task performance field experiment**

Visualisation	Question	Correct	Incorrect	Percentage
Conversation nesting	How many pro arguments can you see?	7	0	100
	How many contra arguments can you see?	7	0	100
	How many solutions do not have any pro or contra arguments?	7	0	100
User activity analysis	How many counter arguments have been made in the whole debate?	6	0	100
	How many users are very active?	4	2	67
	How many times did the most active user contribute to the debate?	4	2	67
	How many ideas did user u1 (user on the left) add?	4	2	67
Quick overview	How many people participated in the debate?	9	10	90
	How many counter arguments have been contributed?	10	0	100
	What is the highest viewing count?	8	2	80
	What is the average word count over all contributions?	9	1	90
Debate network	Which issue received the most responses?	5	1	83
	How many ideas got challenged?	3	3	50
	Which idea has the most connections?	5	1	83
Activity analysis	What day of the week shows most activity?	4	0	100
	What is the most frequent contribution type?	4	0	100
	What is the most frequent activity type?	4	0	100
	Between Thu 11 and Fri 19, how often was an idea created?	0	4	0
Social network analysis	Who is the most connected user?	5	2	71
	How many connections are between the most connected user and the user which is the second most connected user?	4	3	57
People and issue ring	Which member contributed most issues	8	0	100
	Which member contributed to issue 2?	8	0	100
	How many ideas were contributed by member 1?	5	3	63
Contribution stream	Which day has the highest count of supporting arguments?	5	2	71
	Which of the contribution types (issue, idea, counter argument, supporting argument) has	5	2	71

overall the smallest count?			
Which of the contributions types (issue, idea, supporting argument, counter argument) has overall the highest count?	5	2	71

In general most people could correctly answer the task performance questions. This is a notable result considering that most of the users rated themselves as novices or as having basic experiences with analytics visualisations.

Some of the tasks, however, seemed to be more difficult. For example the question "How many ideas got challenged" in the debate network visualisation, or the question "How many connections are between the most connected user and the user which is the second most connected user?" of the social network analysis visualisation. Tasks with low performance can be seen as indicators where the users of the visualisations need better support. One way of providing this support is to extend the help text of these visualisations and to explicitly provide information about how to solve these tasks.

The activity and rating bias visualisations were not listed in the summary table above. As outlined above the aim of the visualisation is to spot clusters. There is however not a definite answer about the correct cluster count. Taking this into account it is notable that most participants agreed on the cluster count if a derivation of 1 is allowed. This indicates that the visualisation can indeed help to detect clusters.

Nonetheless, qualitative feedback from the user study demonstrates that these two visualisations were possibly the least usable. Users' feedback and reactions to the activity and rating bias visualisations showed that people did not understand what to do with the information provided by the visualisation. They found this visualisation confusing and often did not understand how to interpret it. This could be both due to the type of analytical method used (which does not disclose the meaning of the detected similarity clusters) or that it is challenging to identifying clear-cut clusters of points. In any case this visualisations did not show promising results.

### 3.1.3 Usefulness and usability of the visualisations

The usefulness and usability of the visualisation was measured with the SUS usability questionnaire (Bangor et al., 2009, 2008; Brooke, 2013). The questionnaire consists of 10 items. These 10 items are used to create a single usability index. In addition we asked for an overall rating of the visualisation, and how responsive the visualisation was. The following table presents the results. A highlight marks the highest usability values. The usability of the conversation nesting visualisation is between good and excellence. The activity bias, rating bias, and contribution stream visualisation was rated between poor and ok. The remaining visualisations were rated between ok to good. The rating scale for the responsiveness of the visualisation ranged from 1 to 5. All values are slightly higher than the midpoint of the scale.

**Table 8: Usefulness and usability of 10 visualisations**

Questionnaire	N	SUS	Overall	Responsive
Quick overview visualisation	9	57.50	4.22	3.11
Debate network visualisation	6	67.08	4.50	3.17
Social network visualisation	6	71.67	4.67	3.33
People and issue ring visualisation	8	65.31	4.50	3.50
Activity bias visualisation	7	23.57	3.14	3.43
Rating bias visualisation	7	31.43	3.43	3.14
Conversation nesting visualisation	6	81.67	5.83	3.83



Questionnaire	N	SUS	Overall	Responsive
Activity analysis visualisation	4	53.75	4.50	3.75
User activity analysis visualisation	6	67.08	4.67	3.17
Contribution stream visualisation	7	44.64	3.29	3.57

### 3.1.4 The good and the bad of the visualisations

After the participants had filled out the usefulness and usability questionnaire we asked them to explain what they liked about the visualisation, what they did not like, and what they would improve. This information was gathered with free-text forms. The following sections present the results by visualisation. Instead of reporting all participants' recommendations the following section will only present answers, which were common amongst the participants. Only if two or more people reported the same idea it was included in the results.

#### 3.1.4.1 Quick overview visualisation

*Please explain what you liked about this visualisation:*

Three people said that they quickly could find answers to the questions of the task. Three people mentioned the *user contribution mini bar chart*, and two people liked the *traffic lights*.

*Please explain what you did not like about this visualisation:*

Two people mentioned that there was *too much text*.

*What improvements should be made?*

Two people mentioned to have *more graphical visualisations*. Two people mentioned that the text should be integrated into the visuals

#### 3.1.4.2 Debate network visualisation

*Please explain what you liked about this visualisation:*

Participants liked the idea of *having the whole debate in one picture*.

*Please explain what you did not like about this visualisation:*

Three people referred to having *issues with the zooming*. These issues were expressed on several levels. One person mentioned that this *visualisation needs a bigger screen*. Another person noted that it was *not possible to see the individual nodes* without losing the overview. And one person could not zoom without using the buttons.

*What improvements should be made?*

There was no overlap of participants' comments. One user recommended *adding user information*, one user to have *improved zooming*, and one user to *more quickly load* the visualisation.

#### 3.1.4.3 Social network analysis

*Please explain what you liked about this visualisation:*

Two people liked the *colour* of the visualisations as they *helped to make sense of the relations*. Two people mentioned that this visualisation makes it *easy to spot the connection between people*.

*Please explain what you did not like about this visualisation:*

Three people mentioned the anonymous user name (too long or confusing). Two people had *problems with the connections* between users.

*What improvements should be made?*

The responses of the participants did not overlap.

#### 3.1.4.4 People and issue ring

*Please explain what you liked about this visualisation:*

Two people liked the *varying size of the ring segments*.

*Please explain what you did not like about this visualisation:*

Two people mentioned that the *detail area information was confusing* for the members and issues statistics.

*What improvements should be made?*

Two people recommended *improving the detail area*, and two people briefly mentioned changes to the *style of the visualisation* (graphic style, user labels, colours).

#### 3.1.4.5 Activity bias visualisation

*Please explain what you liked about this visualisation:*

Three people noted that they could not say much about what they liked about the visualisation. The responses did not come with any further explanation than that.

*Please explain what you did not like about this visualisation:*

Four people explained that they *could not make sense of the information* provided by the visualisation.

*What improvements should be made?*

Three people expressed that they were not sure what improvements could be made to this visualisation. Two people referred to *needing more information*.

#### 3.1.4.6 Rating bias visualisation

As with the activity bias visualisation, most comments confirmed that the participants *could not make sense* of the visualisation and *did not like it*.

*What improvements should be made?*

Two people mentioned that this visualisation needs better explanation. Two people were not sure how to improve it.

#### 3.1.4.7 Conversation nesting visualisation

*Please explain what you liked about this visualisation:*

Five people mentioned that the visualisation was *easy to understand*.

*Please explain what you did not like about this visualisation:*

There was no overlap of comments.

*What improvements should be made?*

There was no overlap of comments.

#### 3.1.4.8 Activity analysis visualisation

*Please explain what you liked about this visualisation:*

There was no overlap of comments.

*Please explain what you did not like about this visualisation:*

Two people referred to the count of numbers. One person found the *numbering system confusing* (values too high), and one person described that it was necessary to count the table rows in order to find the count.

*What improvements should be made?*

Three people mentioned that the *axis should be labelled*.

#### 3.1.4.9 User activity analysis visualisation

*Please explain what you liked about this visualisation:*

Five people liked the *details provided* about each user.

*Please explain what you did not like about this visualisation:*

There was no overlap of comments.

*What improvements should be made?*

There was no overlap of comments.

#### 3.1.4.10 Contribution stream visualisation

*Please explain what you liked about this visualisation:*

Two participants liked the *colours*.

*Please explain what you did not like about this visualisation:*

Four people found it *confusing* and *did not know how to interpret* the visualisation.

*What improvements should be made?*

There was no overlap of comments.

We asked the participants which view of the contribution stream they prefer the most. Preference is nearly equally split between all three types. Two participants prefer the expanded view, two the stream view, and three the stacked view. They explained that their chosen type was easier to understand than the others. One person mentioned that the stream view was not understandable; while another person highlighted that the stream view was the most understandable view.

### 3.1.4.11 Summary

The following table summarises the free-text usability questions. For each visualisation the recommendations of the participants are condensed into what they liked and what should be improved.

Visualisation	Liked	Improve
Quick overview visualisation	Quick way to find answers to their questions. They liked user contribution bar chart and the traffic lights.	Less text and more graphical visualisations. Better integration of text and visualisation.
Debate network visualisation	Whole debate in one picture.	Zoom functionality.
Social network visualisation	Makes it easy to spot connections. Colour scheme helps to make sense.	Anonymised user text string to bulky. Better explanation of how to use the connections between users.
People and issue ring visualisation	The varying size of the ring segments is a good indicator.	Better detail area.
Activity bias visualisation	It is difficult.	Needs more explanation.
Rating bias visualisation	It is difficult.	Needs more explanation.
Conversation nesting visualisation	Easy to understand.	-
Activity analysis visualisation	-	Labelling of axes. Better explanation of how the numbers of the charts are influenced by filtering.
User activity analysis visualisation	Good level of details about the users.	-
Contribution stream visualisation	Nice colours.	Better explanation.

### 3.1.5 Favourite visualisation

After the participants have worked through the questionnaires about the visualisations, they filled out a last questionnaire, which was about choosing their favourite visualisation. This questionnaire aimed at getting to know *which of the visualisations the participants would include in an analytics dashboard*. The questionnaire aimed at getting insights about what are the top five visualisations and which are the least favourite visualisations.

The results of this questionnaire determined the priority of visualisations evaluated in the usability lab setting. Visualisations, which are deemed as important for inclusion in the Collective Intelligence Dashboard were analysed in depth using qualitative methods. This process ensures that further development of the visualisations is based on an empirical determined research process, which guides the progress of the dashboard visualisations.

The questionnaire was designed in a specific way in order to prepare the participants for the question about their favourite visualisation. First, they had to vote what is their most favourite visualisation. Then they were asked to vote for the least favourite visualisation. They had to explain both choices. These questions were aimed at helping them to think about which visualisation they would include in a dashboard. Here, we present the outcome of the final question, where the participants had to vote for their favourite visualisations.

We asked the participants "Which five visualisations would you add to the debate analytics dashboard?" Each person was allowed to give his or her vote to five visualisations. The following table summarises the results.

**Table 9: Favourite visualisation**

Visualisation	Votes
Conversation nesting visualisation	5
User activity analysis visualisation	5
Quick overview visualisation	4
Debate Network visualisation	4
Activity analysis visualisation	3
Social network analysis visualisation	1
People and issue ring visualisation	1
Contribution stream visualisation	1
Activity bias visualisation	0
Rating bias visualisation	0

The table shows the most important visualisations in a sorted order. The conversation nesting visualisation received the most votes, together with the user activity analysis visualisation. It follows the quick overview visualisation, the debate network visualisation and the activity analysis visualisation.

### 3.2 Usability lab study

Based on the results of the field study where we gathered information from participants of the platform Debate Hub, five visualisations were selected, which were further evaluated. The evaluation took place at the Open University usability lab. The usability study was announced through various channels of the Open University. The advertisement did not include any restrictions regarding experience with visualisations. People freely choose to take part in the usability study. In total 12 participants took part in this study. All 12 participants gave their consent to participate in the study.

Five visualisations were chosen based on the results of the field experiment, where we asked the participants what five visualisations they would include in an analytics dashboard (see the previous section) Five participants rated each visualisation. Two participants evaluated each three visualisations, while the other ten participants evaluated each two visualisations. Five participants are already sufficient to get a good first impression about the usefulness and usability of the tool in question. The visualisations were administered in two batches. The first batch of visualisations shown to the participants consisted of the conversation nesting visualisation, the user activity analysis visualisation, and the quick overview visualisation. The second batch consisted of the debate network visualisation and the activity analysis visualisation. In order to control for sequence effects, each participants saw the visualisations in a different order. For example if the first participant saw visualisation A, B, and C, then the second participant saw visualisation B, C, and A.

The slots in the usability lab were set to one hour. In two cases the evaluation took longer than one hour.

The usability lab followed a structured interview. The session protocol was standardised for every participant. This means that the instructions were read out from a paper, and the questions were asked always in the same way. The whole sessions protocol is available in the appendix of this deliverable. The utterances and the interactions with the participants were recorded with a screen capture software as well a second camera took a picture of the participants back area with mouse pad, and the screen.

### 3.2.1 Background information

Before the sessions started the participants were asked to fill out an initial form request, which gathered background information about the participants. Five of the participants were female and 7 were male. All of the participants had 10 or more years of Internet experience.

**Table 10: Familiarity**

Question	N	Expert	Advanced	Average	Basic experience	Novice
How familiar are you with analytics dashboards in general?	12	0	4	2	2	4
How familiar are you with visualisations for analysing and exploring debates?	12	1	1	2	2	6
How familiar are you with visualisations for analysing and exploring data?	12	2	5	4	1	0

The same amount of people stated that they were advanced or average as the people who rated themselves as having basic experiences or are novices regarding their experience with analytics dashboards. Most people stated basic experience or being a novice with visualisations for analysing and exploring debates. But there were also two people with advanced and expert familiarity. Most people reported average to advanced familiarity with visualisations for analysing and exploring data. Compared to the field experiment group the participants of the lab study reported higher familiarity with analytics visualisations and analytics dashboards.

### 3.2.2 User Interaction

The user interaction with the visualisation was again measured with a series of information seeking tasks for each visualisation. Compared to the field experiment questionnaire, where people could only enter one answer, which got rated as either correct or incorrect, this time another approach was chosen to figure out where people got stuck and why. For the usability study a protocol was developed in which the person conducting the usability study gave help to people who did not find the right answer. Once a person did not find the right answer, the interviewer gave help in this specific order:

The first level of support was to repeat the question. If the participant could not find the answer after repeating the question, then the interviewer explained the visualisation to the participants. The next level of help was that the interviewer showed the interaction with the visualisation, but not the solution. And as last resort the interviewer showed the participant the correct solution.

#### 3.2.2.1 Conversation nesting visualisation

Four out of the five participants correctly answered the question "How many pro arguments can you see?". One person could answer the question correctly after explaining the visualisation. All five participants correctly solved the task for question "How many contra arguments can you see?". Two out five correctly answered the question "How many solutions do not have any pro or contra arguments?". The interviewer showed the solution to one of the participants.

#### 3.2.2.2 User activity analysis visualisation

All participants correctly answered the question "How many counter arguments have been made in the whole debate?". The interviewer had to repeat the question for the task "How many users are very active?". The interviewer showed the correct answer for one participant for the task "How many times did the most active user contribute to the debate?". All participants correctly answered the question "How many ideas did user u1 (user on the left) add?".

### 3.2.2.3 Quick overview visualisation

All participants correctly answered the tasks "How many people participated in the debate?", "How many people viewed the debate in the last 5 days?", "How many counter arguments have been contributed?", and "What is the highest viewing count?". The interviewer explained the visualisation to one participant to correctly answer the question "What is the average word count over all contributions?". In addition we asked the participants if the debate is a healthy debate. Four participants stated that they do not think it is a healthy debate and one participant could not tell.

### 3.2.2.4 Debate network visualisation

All participants correctly answered to the question "Which issue received the most responses?". The interviewer repeated the question for two participants for the question "How many ideas got challenged?", and three times for the question "Which idea has the most connections?".

### 3.2.2.5 Activity analysis visualisation

The interviewer repeated the question for one participant about the question "What day of the week shows most activity?". All participants correctly answered the question "What is the most frequent contribution type?" and "What is the most frequent activity type?". The question "Between Thu 11 and Fri 19, how often was an idea created?" was harder to answer. The interviewer repeated the question for one participant, showed the interaction of the visualisation to another participant, and had to show the solution to a third participant.

### 3.2.2.6 Summary

The following table summarises the task performance for all visualisations of the usability lab study. For each visualisation it shows the specific tasks, how many people answered the question correctly and incorrectly, and the percentage of correct answers.

**Table 11: Task performance usability lab**

Visualisation	Question	Correct	Incorrect	Percentage
Conversation nesting	How many pro arguments can you see?	4	1	80
	How many contra arguments can you see?	5	0	100
	How many solutions do not have any pro or contra arguments?	4	1	80
User activity analysis	How many counter arguments have been made in the whole debate?	5	0	100
	How many users are very active?	4	1	80
	How many times did the most active user contribute to the debate?	4	1	80
	How many ideas did user u1 (user on the left) add?	5	0	100
Quick overview	How many people participated in the debate?	5	0	100
	How many people viewed the debate in the last 5 days?	5	0	100
	How many counter arguments have been contributed?	5	0	100
	What is the highest viewing count?	5	0	100
	What is the average word count over all contributions?	4	1	80
Debate network	Which issue received the most responses?	5	0	100
	How many ideas got challenged?	3	2	60

	Which idea has the most connections?	2	3	40
Activity analysis	What day of the week shows most activity?	4	1	80
	What is the most frequent contribution type?	5	0	100
	What is the most frequent activity type?	5	0	100
	Between Thu 11 and Fri 19, how often was an idea created?	2	3	40

Overall most participants were able to answer all tasks in the correct way. Two tasks however indicate that the visualisation needs a better explanation. The tasks in question were "Which idea has the most connections?" of the debate network visualisation, and the last question of the activity analysis visualisation ("Between Thu 11 and Fri 19, how often was an idea created?").

### 3.2.3 Usefulness and usability of the visualisations

The usefulness and usability of the visualisation was again measured with the SUS usability questionnaire as described above (Bangor et al., 2009, 2008; Brooke, 2013).

**Table 12: Usefulness and usability of five visualisations**

Visualisation	N	SUS	Overall
Quick overview visualisation	5	86.0	5.2
Activity analysis visualisation	5	79.5	5.4
Conversation nesting visualisation	5	78.5	5.4
User activity analysis visualisation	5	71.0	5.2
Debate network visualisation	5	68.0	4.4

The quick overview visualisation and the activity analysis visualisation got higher SUS scores than in the field experiment setting. The other three visualisations stayed on the same level. All visualisations except the debate network visualisations were rated between good and excellent. The debate network visualisation was rated as ok to good.

### 3.2.4 The good and bad of the visualisations

#### 3.2.4.1 Conversation nesting visualisation

##### *What did you like about the visualisation?*

Four people emphasised its *simplicity*. One participant elaborated that although it is so simple what it shows is quite complex. Four participants liked the *structure* of the visualisation. This refers to the nesting and how the conversations types are split up. Two people mentioned that they liked the *colours* of the visualisation.

##### *What would you change to make the visualisation better?*

Three participants recommended *adding a summary* to the visualisation. For example this could be a panel with further information about the number of supportive and counter arguments within an issue or idea. Three people would like to have a better mechanism for how text is displayed within the circles. Mainly they found it *difficult to remember what text was in which circle as the text disappears* after moving the mouse pointer outside a circle. Three people prefer a different colour scheme; this is in contrast to the two people who liked the colours. Two people stated that they would like to have a *link* from inside the circle *to the actual conversation*. Two participants noted *problems with the circles*. One person argued to use blocks instead of circles while another person argued that not everything should be represented as circles, especially on argumentation level.



#### 3.2.4.2 User activity analysis visualisation

##### *What did you like about the visualisation?*

Three participants liked that it is possible to *filter* and group users and user actions, and that all selections instantly update all other parts of the visualisation. Three participants liked the data table as it gives *detailed information about the underlying data* of the visualisations.

##### *What would you change to make the visualisation better?*

Three participants noted that *labelling* of the x- and y-axis of both charts was missing. Two participants would like to see the *activity count* for each stack within a user bar. And two people mentioned the need for a *better explanation of the interaction* of the visualisations.

#### 3.2.4.3 Quick overview visualisation

##### *What did you like about the visualisation?*

Four out of five people stated that they liked the debate health indicators (traffic lights), the user viewing section (spark lines), and the user contributions section (bar chart). Three people liked that the bar chart displays the count for each bar once hovering over it.

##### *What would you change to make the visualisation better?*

Three participants did not find the section "most recently added" as useful. Two people left remarks about the *traffic light*. One person would like to have the additional functionality to either explore the problem or pointers on how to fix it. One person explained that it would be good to have a *functionality to sense check* if there is really a problem.

#### 3.2.4.4 Contribution network visualisation

##### *What did you like about the visualisation?*

Four people mentioned that they liked the *colour* scheme, especially colour coding for pro arguments (green) and counter arguments (red). Two participants liked that the visualisation shows them how issues, ideas, supporting and counter arguments are connected to each other.

##### *What would you change to make the visualisation better?*

Three participants recommended adding a form of *filtering* to the visualisation. One person advised to add a functionality to remove all supporting and counter arguments. Another person would like to filter according to topmost supported ideas. This person also outlined that filtering will become important for graphs with thousands of nodes.

Two participants had problems with the *font size*. For them it was hard to read the text without zooming. Two participants also argued about the space layout of the graph. One person recommended to horizontally space out the graph as the display is portrait. Another person noticed that other issue graphs disappear and might get forgotten once zoomed in on a graph.

#### 3.2.4.5 Activity analysis visualisation

##### *What did you like about the visualisation?*

Three participants did like the functionality allowing them to explore data based on date ranges. Three participants liked the *filtering with multiple dimensions* and the instant update of all views. Three people liked the information provided by the data table. And two people mentioned that they liked the colour scheme.

##### *What would you change to make the visualisation better?*

Two participants highlighted that if a bar of one of the horizontal charts is small compared to the other bars, then it looks like that there is no activity and is easy to overlook as a filter option.

### 3.2.4.6 Summary

The following table summarises the free-text usability questions. The table lists for each visualisation what the participants liked and what they would change to make the visualisation better.

Visualisation	Liked	Improve
Quick overview visualisation	Health indicators, user viewing sparkline, user contribution bar chart.	Rethink or remove the more descriptive parts of the visualisation, especially the "most recently added section". Consider separating the whole visualisation into three separated ones (health indicators, user contribution bar chart, and viewing activity sparkline). Consider sense-checking functionality to the traffic lights.
Debate network visualisation	Keep the colour coding. Linking of debate types is from value.	Consider filter. Text size is too small when zoomed out. Consider different layout algorithm to remove empty space.
Conversation nesting visualisation	Simple yet powerful structure.	Consider adding a summary, especially with the labels of each node. Consider reworking the colour scheme. Consider adding links to the text labels.
Activity analysis visualisation	Vis is great for exploring data. Big plus is the data table.	Consider the problem with small values and thus very small bars for filtering.
User activity analysis visualisation	Good filter mechanism. Data table is great.	Label axes. Consider adding activity count to each stack segment of the user bar. Add better explanation about the interaction with the visualisation.

## Conclusions

This deliverable reported the outcome of the usefulness and usability study of ten visualisations of the Collective Intelligence Analytics Dashboard. It presented the results from the usefulness and usability evaluation of these visualisations in two settings: A field experiment study with participants who were familiar with online debating on Debate Hub, and a usability lab study following a standardised session protocol, which captured the interaction of the participants with the visualisations with video and screen recordings.

Each of the settings provided empirical data (ranging from questionnaire data, interview data to video and screen recording transcripts) about the usefulness and usability of the visualisations. Each study outlined a set of recommendations of how to improve the visualisations and gives indication about the current usefulness and usability of the visualisations. This information will guide the further development of the visualisations and the CI dashboard as well as informing CI tool providers about the benefits of each visualisations and the CI dashboard.

The CI dashboard provides a wide range of useful and useable visualisations readily available for their application to analyse a multitude of different facets of online deliberation. The usefulness and usability of most of the visualisations was rated as good to excellence. Also the participants performed well on typical tasks in using the visualisations. In addition the deliverable contains a list of the top five CI dashboard visualisations.

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## Annex 1 – Field experiment questionnaires

The questionnaires for the evaluation of the collective intelligence dashboard visualisations consists of a general part, which was the same for all questionnaires, and a specific part, which is tailored to each visualisation. This annex shows these questionnaires. In order to save space first the questions for all participants are shown and afterwards the specific questions for each individual questionnaire. The position of the individual questions within the general questionnaire is marked.

### 1. The general part of the questionnaires

#### Usefulness and usability study of the CATALYST debate visualisations

Welcome to our survey about the usefulness and usability of visualisations analysing debates. The visualisations are part of an analytics dashboard. Each visualisation shows facets of a debate and highlights certain aspects of a debate.

The general aim of this research is to inform the design of new technologies to improve online discussion. Specifically, we are interested in your experience using these visualisations. Your contribution will be of great help to improve the analytics visualisations.

This short survey will not take longer than 15 minutes.

This research is facilitated by Lee-Sean Huang (PURPOSE) and conducted by Anna De Liddo, and Thomas Ullmann (The Open University, UK) in the scope of the CATALYST project (<http://CATALYST-fp7.eu>) funded by the European Commission. If you have any questions about this questionnaire or the accompanying research, please do not hesitate do contact Lee-Sean Huang ([leesean@purpose.com](mailto:leesean@purpose.com)) or Thomas Ullmann ([thomas.ullmann@open.ac.uk](mailto:thomas.ullmann@open.ac.uk)).

#### Your confidentiality

Participants will not be identified by name in any publications resulting from this research unless specific authorisation is first given for this purpose.

#### Consensus

Are you willing to take part in this research project, and do you give your permission for the data collected to be used in an anonymous form in any written reports, presentations and published papers relating to this study?

Yes  No

#### Background information

Gender:

Male  Female

How often did you visit the discussion about 'Designing Community 2014' on DebateHub?

- Never  
 1 time  
 2 to 4 times  
 5 to 10 times  
 more than 10 times

How often did you make a contribution to the discussion about 'Designing Community 2014' on DebateHub?

- Never
- 1 time
- 2-5 times
- 5-10 times
- more than 10 times

How familiar are you with analytics dashboards in general?

- Expert Advanced Average Basic experiences Novice

How familiar are you with visualisations for analysing and exploring data?

- Expert Advanced Average Basic experiences Novice

How familiar are you with visualisations for analysing and exploring debates?

- Expert Advanced Average Basic experiences Novice

Insert here the questionnaire pages for the individual parts of the questionnaires (see below)

---

### Usability

I think that I would like to use this visualisation frequently  
Strongly disagree (1)      Strongly agree (5)

I found the visualisation unnecessarily complex  
Strongly disagree (1)      Strongly agree (5)

I thought the visualisation was easy to use  
Strongly disagree (1)      Strongly agree (5)

I think that I would need the support of a technical person to be able to use this visualisation  
Strongly disagree (1)      Strongly agree (5)

I found that the various functions in this visualisation were well integrated  
Strongly disagree (1)      Strongly agree (5)

I thought that there was too much inconsistency in this visualisation  
Strongly disagree (1)      Strongly agree (5)

I would imagine that most people would learn to use this visualisation very quickly  
Strongly disagree (1)      Strongly agree (5)

I found the visualisation very awkward to use  
Strongly disagree (1)      Strongly agree (5)

I felt very confident using the visualisation  
Strongly disagree (1)      Strongly agree (5)

I need to learn a lot of things before I could get going with this visualisation



Strongly disagree (1)      Strongly agree (5)

Overall, I would rate the user-friendliness of this visualisation as:

Worst Imaginable     Awful     Poor     OK     Good     Excellent     Best Imaginable

The visualisation is responsive (loads quickly, no lag)

Strongly disagree (1)      Strongly agree (5)

Please explain what you liked about this visualisation (required)

Please explain what you did not like about this visualisation (required)

What improvements should be made? (required)

Any other comments?

---

Would you like to participate in follow up studies? Please leave your name and email address and we may contact you. (optional)

Name: \_\_\_\_\_

Email: \_\_\_\_\_

---

Thank you very much for completing the survey! Your feedback will be used to improve the analytics visualisations.

If you have any further questions, please do not hesitate to contact Lee-Sean Huang (leesean@purpose.com) and Thomas Ullmann (thomas.ullmann@open.ac.uk)



## 2. The individual parts of the questionnaires

These are the specific questions unique for each visualisation.

### 2.1. Quick overview visualisations

#### Quick overview visualisation

Please visit the visualisation by following this link: [Quick overview visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

The visualisation provides an overview of important aspects of a debate.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

#### Short task

How many people participated in the debate?

How many counter arguments have been contributed?

What is the highest viewing count?

What is the average word count over all contributions?

#### In your opinion

Is the debate a healthy debate?

Yes       No       Cannot tell

Please explain: (required)



## 2.2. Debate network visualisations

### Debate network visualisation

Please visit the visualisation by following this link: [Debate network visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

The visualisation shows contributions of users to a debate.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

### Short task

Zoom out to see all debate networks.

Which issue received the most responses? (write down the text within the node)

How many ideas got challenged?

Which idea has the most connections? (write down the text within the node)

### In your opinion

Is the debate dominated by one of the two argument types?

Yes       No       Cannot tell

Please explain: (required)

### 2.3. Social network visualisations

#### Social network visualisation

Please visit the visualisation by following this link: [Social network visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

The visualisation shows the social graph of the debate.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

#### Short task

Zoom out to see the whole social network.

Who is the most connected user? (please write down the anonymised user name. An example of an anonymised user name is: `main_site:users/52Waisdf%Bdwe925f...`)

How many connections are between the most connected user and the user which is the second most connected user?

#### In your opinion

Is the debate dominated by one or more users?

Yes       No       Cannot tell

Please explain: (required)

## 2.4. People and issue ring visualisation

### People and issue ring visualisation

Please visit the visualisation by following this link: [People and issue ring visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

This visualisation shows people and issues.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

### Short task

Which member contributed most issues? (member1, member2, member3, etc.?)

Which member contributed to issue 2?

How many ideas were contributed by member 1?

Which issue received most supporting arguments?

### In your opinion

Is the debate dominated by one or more users?

Yes       No       Cannot tell

Please explain: (required)

## 2.5. Activity bias visualisations

### Activity bias visualisation

Please visit the visualisation by following this link: [Activity bias visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

The visualisation clusters entries based on a similar activity patterns.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

### Short task

How many clusters can you see?

### In your opinion

Is the debate biased?

 Yes No Cannot tell

Please explain: (required)

## 2.6. Rating bias visualisations

### Rating bias visualisation

Please visit the visualisation by following this link: [Rating bias visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

The visualisation clusters entries based on a similar rating patterns.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

### Short task

How many clusters can you see?

### In your opinion

Is the debate biased?

 Yes No Cannot tell

Please explain: (required)

## 2.7. Conversation nesting visualisation

### Conversation nesting visualisation

Please visit the visualisation by following this link: [Conversation nesting visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

The visualisation provides an overview of the entire debate as nested circles of posts.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

### Short task

How many pro arguments can you see?

How many contra arguments can you see?

How many solutions do not have any pro or contra arguments?

## 2.8. Activity analysis visualisation

### Activity analysis visualisation

Please visit the visualisation by following this link: [Activity analysis visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

The visualisation shows activity of a debate over time.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

### Short task

Please reset the visualisation before working on this short task

What day of the week shows most activity?

What is the most frequent contribution type?

What is the most frequent activity type?

Between Thu 11 and Fri 19, how often was an idea created?

### In your opinion

Is the debate dominated by one or more types of debate (issue, idea, supporting argument, counter argument)?

Yes       No       Cannot tell

Please explain: (required)

Is the debate dominated by one or more activity types?

Yes       No       Cannot tell

Please explain: (required)



## 2.9. User activity visualisation

### User activity analysis visualisation

Please visit the visualisation by following this link: [User activity analysis visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

The visualisation shows contributions of users to a debate.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

### Short task

Please reset the visualisation before working on this short task

How many counter arguments have been made in the whole debate?

How many users are very active?

How often did the most active user contribute to the debate?

How many ideas did user u1 (user on the left) add?

### In your opinion

Is the debate dominated by one or more users?

Yes       No       Cannot tell

Please explain: (required)

## 2.10. Contribution stream visualisation

### Contribution stream visualisation

Please visit the visualisation by following this link: [Contribution stream visualisation](#)

It will take a short while until the visualisation is fully loaded. In the meanwhile, you might want to open the questionnaire in one window and the visualisation in another window of your browser. You now can easily switch between the visualisation and the questions of the questionnaire.

This visualisation shows types of contributions over time.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

### Short task

Switch to the staked view.

Which day has the highest count of supporting arguments?

Switch to the stream view.

Which of the contribution types (issue, idea, counter argument, supporting argument) has overall the smallest count?

Switch to the expanded view.

Which of the contributions types (issue, idea, supporting argument, counter argument) has overall the highest count?

### In your opinion

Select any viewing type (stacked, stream, expanded)

Is the debate dominated by one or more contribution types (issue, idea, supporting argument, counter argument)?

Yes       No       Cannot tell

Select your preferred viewing type:

stacked  
 stream  
 expanded

Please explain, why you prefer your selected viewing type more than the other viewing types:

### 3. Favourite visualisation evaluation

#### CATALYST debate visualisation evaluation

This is the final and last questionnaire of this evaluation. Please fill this questionnaire out after you have filled out all previous questionnaires about the individual visualisations.

We would like to know which visualisations were of most use to you. Imagine that you are in charge of assembling a debate analytics dashboard. A dashboard is a collection of visualisations on one page. Your task is to select visualisations from the 10 visualisations that you have previously evaluated. The visualisations you have selected will be shown to other users in form of a dashboard.

#### Consensus

Are you willing to take part in this research project, and do you give your permission for the data collected to be used in an anonymous form in any written reports, presentations and published papers relating to this study?

Yes       No

List of links to each visualisation:

Quick overview visualisation ([link to visualisation](#))  
Debate network visualisation ([link to visualisation](#))  
Social network visualisation ([link to visualisation](#))  
People and issue ring visualisation ([link to visualisation](#))  
Activity bias visualisation ([link to visualisation](#))  
Rating bias visualisation ([link to visualisation](#))  
Conversation nesting visualisation ([link to visualisation](#))  
Activity analysis visualisation ([link to visualisation](#))  
User activity analysis visualisation ([link to visualisation](#))  
Contribution stream visualisation ([link to visualisation](#))

Please choose the most important visualisation to analyse debates:

- Quick overview visualisation
- Debate network visualisation
- Social network visualisation
- People and issue ring visualisation
- Activity bias visualisation
- Rating bias visualisation
- Conversation nesting visualisation
- Activity analysis visualisation

User activity analysis visualisation

Contribution stream visualisation

Please explain (required)

List of links to each visualisation:

[Quick overview visualisation \(link to visualisation\)](#)

[Debate network visualisation \(link to visualisation\)](#)

[Social network visualisation \(link to visualisation\)](#)

[People and issue ring visualisation \(link to visualisation\)](#)

[Activity bias visualisation \(link to visualisation\)](#)

[Rating bias \(link to visualisation\)](#)

[Conversation nesting visualisation \(link to visualisation\)](#)

[Activity analysis visualisation \(link to visualisation\)](#)

[User activity analysis visualisation \(link to visualisation\)](#)

[Contribution stream visualisation \(link to visualisation\)](#)

Please choose the least important visualisation to analyse debates

Quick overview visualisation

Debate network visualisation

Social network visualisation

People and issue ring visualisation

Activity bias visualisation

Rating bias visualisation

Conversation nesting visualisation

Activity analysis visualisation

User activity analysis visualisation

Contribution stream visualisation

Please explain (required)

Which five visualisations would you add to the debate analytics dashboard?



Select 5 visualisations from the 10 visualisations listed below. Please do not select more than five or less than five visualisations.

- Quick overview visualisation (see visualisation)
- Debate network visualisation (see visualisation)
- Social network visualisation (see visualisation)
- People and issue ring visualisation (see visualisation)
- Activity bias visualisation (see visualisation)
- Rating bias visualisation (see visualisation)
- Conversation nesting visualisation (see visualisation)
- Activity analysis visualisation (see visualisation)
- User activity analysis visualisation (see visualisation)
- Contribution stream visualisation (see visualisation)

Please explain (required)

Would you like to participate in follow up studies? Please leave your name and email address and we may contact you. (optional)

Name: \_\_\_\_\_

Email: \_\_\_\_\_

Thank you very much for completing the survey! Your feedback will be used to improve the analytics visualisations.

If you have any further questions, please do not hesitate to contact Lee-Sean Huang (leesean@purpose.com) and Thomas Ullmann (thomas.ullmann@open.ac.uk)

## Annex 2 - Usability lab session protocol

Each usability session in the usability lab followed a specific protocol, which is outlined here. The protocol was read out to the participants in order to standardise the usability session. The session protocol is based on the supplementary material of the Handbook of usability testing (Rubin & Chisnell, 2008). Our thanks especially go to Shailey Minocha from the Open University, who gave invaluable advice on the design of the usability lab session.

Ahead of the session the participants received three documents: Consent form, initial information request form and the project summary sheet. They were asked to read all three documents, and if possible to fill out the consent form and the initial information request to either bring them to the session or to send them.

All these documents and the session protocol are part of this annex.

### 1. Project summary sheet

#### Investigating the usefulness and usability of analytics visualisations of the CATALYST Collective Intelligence Dashboard

##### Project Summary sheet:

We hope this leaflet will answer any questions you might have about participating in our study.

##### Who are we?

We are a team of researchers from The Knowledge Media Institute of The Open University, UK.

##### What do we want to know?

Society is facing immensely complex sustainability challenges that are beyond the capacities of isolated individuals. These challenges require collective processes and tools to engage a broad range of expertise to support large-scale innovation. Every voice matters.

A critical challenge in large-scale social innovation is the allocation of attention to important aspects of the collective deliberation. Analytics visualisations are a key tool to make sense of and to raise awareness about the state of collective online deliberations. We developed several analytics visualisation within the scope of the CATALYST project (<http://CATALYST-fp7.eu/>). These visualisations will be made freely available to provide analytical support for making sense and allocating attention to participants of collective intelligence platforms. These visualisations aim at being useful and usable for everyone.

With this research we are investigating the usefulness and usability of several visualisations showing facets of online deliberations. Our aim is to inform the design of new technologies to improve online deliberations.

We would like to understand how people interact with these visualisations. We really value your experience and hope you will agree to participate in the study.

##### What will it involve?

Your involvement could include (depending on your convenience and availability):

1. Completing a short initial information request form.
2. Participating in a 1 hour interview which would be video recorded and screen captured. We would focus on your experience in using these visualisations and evaluate their usefulness and usability.



If you decide to participate you will be asked to sign a consent form. You maintain the right to withdraw from the study at any time. Upon your withdrawal from the study all data collected from you will be deleted and will not be further used in the research.

**What will we do with the information we collect?**

We will produce case studies, reports and other publications based on the information we collect during interviews. We aim to produce results, which help other people to learn from your experiences.

We will keep all of the information – recordings, notes and picture – secure and as per the Data Protection Act. Only members of the team will have access to this material. We would request you not to provide us with any information, which might force us to inform others and breach confidentiality.

We will only use anonymous quotes in publications. If you request at the time of your participation, we will be happy to send you copies of the materials related to your participation for you to have a look at before it is published.

**How can you contact us?**

If you have any other queries about this study, please email or call Thomas Ullmann, <thomas.ullmann@open.ac.uk>, 01908 655482 (office).

We look forward to hearing your experiences. Thank you for taking the time to read this project summary sheet.

Attached: Consent form



## 2. Consent form

### Recording Consent Form

#### Investigating the usefulness and usability of analytics visualisations of the CATALYST Collective Intelligence Dashboard

I, the undersigned, consent to participate in the study on "Investigating the usefulness and usability of analytics visualisations of the CATALYST Collective Intelligence Dashboard" as outlined in the project summary provided.

I consent to the use of my words and pictures within a scientific publication or report. I understand that this will be used for academic and research purposes only and that copyright will reside with The Open University (OU) UK or the respective outlet of the research publication in print or on the Web.

The data collected from me, my personal details and the personal details of anyone to whom I refer will not be made available to third parties. I understand anonymous quotes only will be used as highlights in publications.

Please complete and return the form to Thomas Ullmann <thomas.ullmann@open.ac.uk> Knowledge Media Institute, The Open University, Walton Hall, Milton Keynes, MK7 6AA.

#### Participant's details

NAME

---

ADDRESS

---

Phone

---

Email

---

Signature

---

Date

---

Thank you for agreeing to participate in our project.

Attached: Project Summary Sheet



### 3. Initial information request form

Investigating the usefulness and usability of analytics visualisations of the CATALYST Collective Intelligence Dashboard

**Initial information request form**

Contact name	
Telephone	
Email	

**Gender:**

- Male  Female

**How long have you been using the Internet?**

- A year or less?  
 Between a year and five years?  
 Five to ten years?  
 Longer than 10 years?

**How familiar are you with visualisations for analysing and exploring data?**

(for example visualisations like bar charts, pie charts, histograms, etc.)

- Expert  
 Advanced  
 Average  
 Basic experiences  
 Novice/no experience

**How familiar are you with visualisations for analysing and exploring debates?**

- Expert  
 Advanced  
 Average  
 Basic experiences  
 Novice/no experience

**How familiar are you with analytics dashboards in general?**

(for example Google analytics dashboard)

- Expert  
 Advanced  
 Average  
 Basic experiences  
 Novice/no experience



## 4. Session introduction

### Session introduction

Thank you for agreeing to take part in our research study. My name is Thomas.  
May I ask you to sign the consent form, please? Thanks. [Hand out consent form]

During the rest of the session, I will be working from a script to ensure that my instructions to everyone who participates in the study are the same. This also means that I will ask questions in a specific order and also that I will give help to questions in a specific way. Don't worry about this right now, but keep it in mind especially when you will work on several small tasks using the visualisations.

I am here to learn about how users interact with debate analytics visualisations to how they make sense of debates.

During the session, I will ask you to work with three different visualisations. While you work with the visualisations, please try to do whatever you would normally do.

Please try to think out loud while you are working. Just tell me whatever is going through your mind. Please know that we are not testing you, and there is no such thing as a wrong answer. This will help us to understand what works or does not work.

By the way, I am an independent researcher who had nothing to do with the design of the visualisations you are about to try out. So please be honest in your feedback - I need to know exactly what you think, not what you think I want to hear.

The whole session will take about 1 hour.  
Do you have any questions before we begin? [Answer any questions.]

### Introduction to the context

Let us get started.  
Please first fill out this short questionnaire [Hand out the background questionnaire]

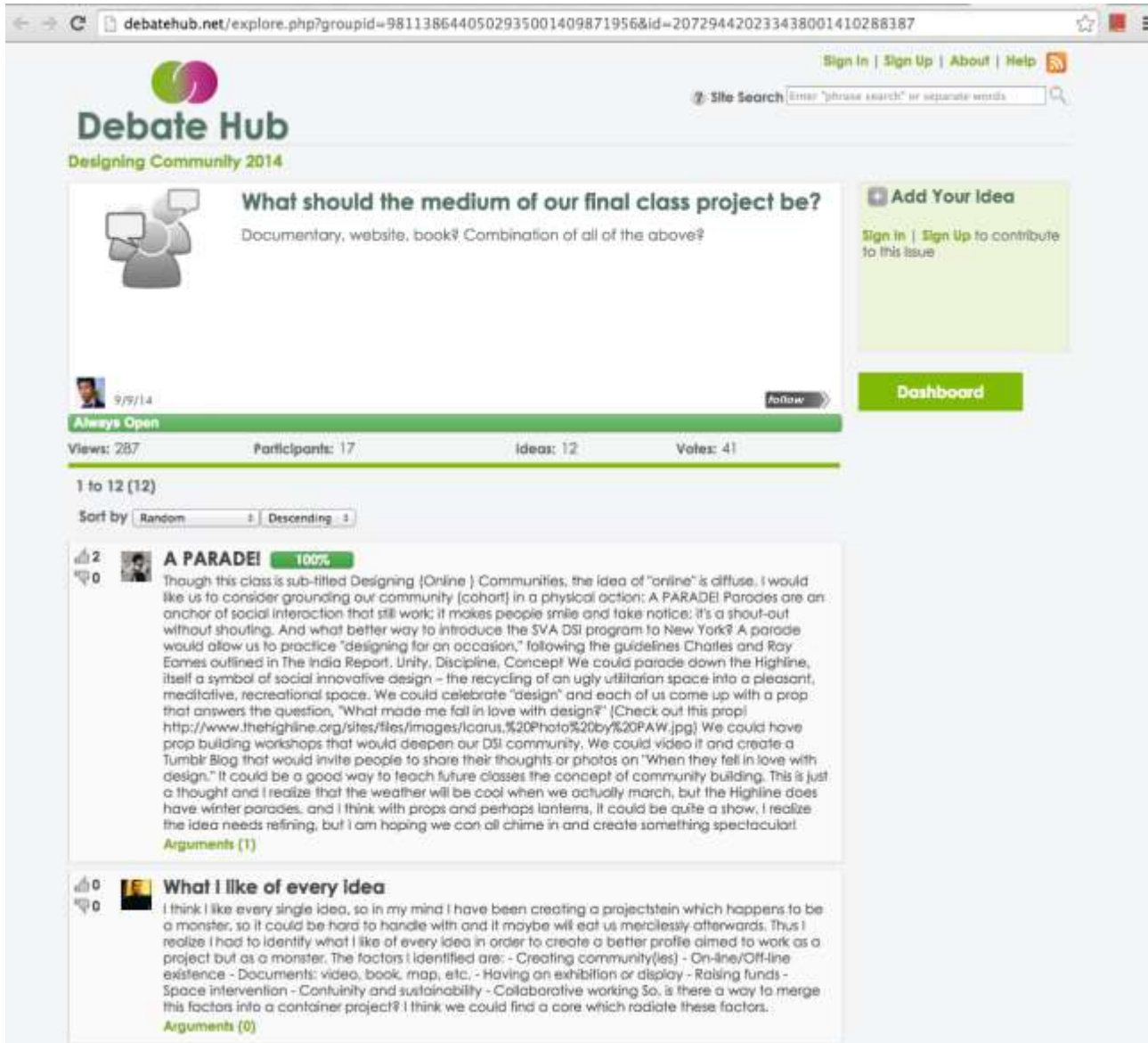
For the session today, I would like you to imagine that you are tasked to make sense of large online discussions. These online discussions are that large that you cannot make sense of them in a reasonable time by inspecting them manually.

Several visualisations have been created that should help you to understand what is going on in such discussion. You will use these visualisations to understand more about the online debate. Each visualisation will show a facet of the online discussion.

There is a certain structure of the discussions, which I will briefly explain.  
The online discussions are centred around topics, so called issues. For each issue participants can contribute ideas. People can argue about these ideas. They support the idea either with pro arguments or are critical about the idea by posing counter arguments. Additional people can up-vote or down-vote arguments and ideas.

Here is an example of an online discussion: [show on Debate Hub the Design Community group the issue "What should the medium of our final class project be?"  
(<http://debatehub.net/explore.php?groupid=9811386440502935001409871956&id=207294420233438001410288387>) and there the idea "Book" (see screenshots below)]

Do you have any questions? [answer all questions]  
I will show you now the first visualisation [see next document]



The screenshot shows the Debate Hub website interface. At the top, there is a navigation bar with links for 'Sign In', 'Sign Up', 'About', and 'Help'. A search bar is also present. The main header features the 'Debate Hub' logo and the tagline 'Designing Community 2014'. The central content area displays a discussion thread titled 'What should the medium of our final class project be?' with a sub-header 'Documentary, website, book? Combination of all of the above?'. The thread is marked as 'Always Open' and shows 287 views, 17 participants, 12 ideas, and 41 votes. Below the thread title, there are two visible posts. The first post, titled 'A PARADE!' and marked as '100%', discusses the idea of a parade as a social interaction tool. The second post, titled 'What I like of every idea', discusses factors for creating a community project. On the right side, there is a sidebar with a 'Add Your Idea' button and a 'Dashboard' button.

6
0

**Website!** 100%

If this is a class on "online communities" maybe we should actually build an online community as our final project? Plus, a website is easily built upon and remixed by next year's class.

Arguments (3)

5
0

**Documentary Video** 100%

By focusing on video, we can capture a moment in time as a cohort, learn to record short-form videos as oral history, and edit together a long form video documentary as the culminating artifact of the Designing Community class.

Arguments (4)

For (4)

Against (0)

**Mini documentary**

I like the idea about produce a mini documentary, it can be linked to a main website. It means that we can have a web site, and material as digital book, mini documentary and probably another visual products at posters, We have to think about it!

1
0

**Documentary + Screening**

I really liked the idea of collaborative storytelling through documentary as Steve Rosebaum talks about in his TED Talk - curating stories through film. So I think it would be cool to work on something like this and then do a screening event with Q&A, that we can make promotional materials for online and in print.

1
0

**Bringing it Offline!**

I like the idea of a screening with discussion, and also having the documentary available online. It would be an interesting paradigm to have a physical discussion (in person/offline) about a documentary that is centered around online communities.

0
0

**A short Documentary or Intro of Social Innovator**

I have friends based in Taiwan did amazing documentaries, which are "Design & Thinking" and "Maker" They get a lot of awards, have a chance to check it out. Therefore, through out the great connection of DS, we can make a short one to see what social innovator do, and bring out what are they/we going to achieve?

0
0

## 5. Tasks for round 1

### 5.1 Conversation nesting visualisation

The visualisation provides an overview of the entire debate as nested circles of posts.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready we will proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

#### How many pro arguments can you see?

Correct answer is: 20

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

#### How many contra arguments can you see?

Correct answer is: 3

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

#### How many solutions do not have any pro or contra arguments?

Correct answer is: 5

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

Spontaneous reactions of the participants during this task

Good about vis

Bad about vis

Questions of the participants

## 5.2 User activity analysis visualisation

The visualisation shows contributions of users to a debate.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready we will proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

Please reset the visualisation before working on this short task

### How many counter arguments have been made in the whole debate?

Correct answer is: 3

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

### How many users are very active?

Correct answer is: 1

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

### How many times did the most active user contribute to the debate?

Correct answer is: 16

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

### How many ideas did user u1 (user on the left) add?

Correct answer is: 7

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

Spontaneous reactions of the participants during this task

Good about vis

Bad about vis

Questions of the participants

### 5.3 Quick overview visualisation

The visualisation provides an overview of important aspects of a debate.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready we will proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

#### How many people participated in the debate?

Correct answer is: 13

Did answer correctly without help

Needed help to answer correctly (tick point below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

#### How many people viewed the debate in the last 5 days?

Correct answer is: 0

Did answer correctly without help

Needed help to answer correctly (tick point below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

**How many counter arguments have been contributed?**

Correct answer is: 3

Did answer correctly without help

Needed help to answer correctly (tick point below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

**What is the highest viewing count?**

Correct answer is: 253

Did answer correctly without help

Needed help to answer correctly (tick point below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

**What is the average word count over all contributions?**

Correct answer is: 131

Did answer correctly without help

Needed help to answer correctly (tick point below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

In your opinion:

Is the debate a healthy debate?

yes  no  cannot tell

Please explain

Spontaneous reactions of the participants during this task

Good about vis

Bad about vis

Questions of the participants



## 6. Tasks for round 2

### 6.1 Debate network visualisation

The visualisation shows contributions of users to a debate.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready we will proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

Zoom out to see all debate networks.

#### Which issue received the most responses?

Correct answer is: What should the medium of our final class project be?

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

#### How many ideas got challenged?

Correct answer is: 3

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

#### Which idea has the most connections? (write down the text within the node)

Correct answer is: Book

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

Spontaneous reactions of the participants during this task

Good about vis

Bad about vis

Questions of the participants

## 6.2 Activity analysis visualisation

The visualisation shows activity of a debate over time.

Read the description above the visualisation. Afterwards familiarise yourself with the visualisation by trying out the points mentioned in the description.

Once you are ready we will proceed to the questions. You will be asked a few questions which you can answer by using this visualisation.

Please reset the visualisation before working on this short task

### What day of the week shows most activity?

Correct answer is: Tuesday

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

### What is the most frequent contribution type?

Correct answer is: idea

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

### What is the most frequent activity type?

Correct answer is: view

Did answer correctly without help

Needed help to answer correctly (tick points below)

Did answer correctly after repeating the question

Did answer correctly after explaining the visualisation

Did answer correctly after showing the participant the interaction with the visualisation

Did answer correctly after showing the participant the solution

Where was the participant stuck:

### Between Thu 11 and Fri 19, how often was an idea created?

Correct answer is: 4

Did answer correctly without help

Needed help to answer correctly (tick points below)



- \_\_\_ Did answer correctly after repeating the question
- \_\_\_ Did answer correctly after explaining the visualisation
- \_\_\_ Did answer correctly after showing the participant the interaction with the visualisation
- \_\_\_ Did answer correctly after showing the participant the solution

Where was the participant stuck:

Spontaneous reactions of the participants during this task

Good about vis

Bad about vis

Questions of the participants



## 7. Usability

We are interested in the usability of these visualisations. I prepared a questionnaire [Hand out questionnaire].

Please read each statement aloud and then circle the choice that most closely matches your answer and tell me what it is.

[Capture only spontaneous reactions. Do not drill in on each question]

### Closing questions

For the following usability questions we are interested in your immediate responses. Do not think too long about each question. If you feel that you cannot respond to a particular question, please mark the centre point of this question.

I think that I would like to use this visualisation frequently  
Strongly disagree (1)      Strongly agree (5)

I found the visualisation unnecessarily complex  
Strongly disagree (1)      Strongly agree (5)

I thought the visualisation was easy to use  
Strongly disagree (1)      Strongly agree (5)

I think that I would need the support of a technical person to be able to use this visualisation  
Strongly disagree (1)      Strongly agree (5)

I found that the various functions in this visualisation were well integrated  
Strongly disagree (1)      Strongly agree (5)

I thought that there was too much inconsistency in this visualisation  
Strongly disagree (1)      Strongly agree (5)

I would imagine that most people would learn to use this visualisation very quickly  
Strongly disagree (1)      Strongly agree (5)

I found the visualisation very awkward to use  
Strongly disagree (1)      Strongly agree (5)

I felt very confident using the visualisation  
Strongly disagree (1)      Strongly agree (5)

I need to learn a lot of things before I could get going with this visualisation  
Strongly disagree (1)      Strongly agree (5)

Overall, I would rate the user-friendliness of this visualisation as:  
 Worst Imaginable  Awful  Poor  OK  Good  Excellent  Best Imaginable



Capturing of spontaneous reactions during the usability questionnaire

**I think that I would like to use this visualisation frequently**

**I found the visualisation unnecessarily complex**

**I thought the visualisation was easy to use**

**I think that I would need the support of a technical person to be able to use this visualisation**

**I found that the various functions in this visualisation were well integrated**

**I thought that there was too much inconsistency in this visualisation**

**I would imagine that most people would learn to use this visualisation very quickly**

**I found the visualisation very awkward to use**

**I felt very confident using the visualisation**

**I need to learn a lot of things before I could get going with this visualisation**

**Overall, I would rate the user-friendliness of this visualisation as:**



Semi-structured interview

**Which are the three things that you liked about the visualisation**

**Which are the three things that you would change to make the visualisation better**

**All other comments**