



IPB University
— Bogor Indonesia —

Application Module

Social Network Analysis and Qualitative Data Analysis

2023

NVivo
KUMU
UCINET dan NetDraw

Application Module

Social Network Analysis and Qualitative Data Analysis 2023

NVivo | Kumu | UCINET and NetDraw

Authors:

Sonya Dyah Kusumadewi – CIFOR
Dyah Puspitaloka – CIFOR
Lila Juniyanti – IPB University
M. Miftah Rahman – IPB University
Herry Purnomo – IPB University and CIFOR
Suria D. Tarigan – IPB University
Iskandar Z Siregar – IPB University

Center for International Forestry Research (CIFOR)

© 2024 CIFOR
All rights reserved



Content in this publication is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0), <http://creativecommons.org/licenses/by/4.0/>

Kusumadewi SD, Puspitaloka D, Juniyantri L, Rahman MM, Purnomo H, Tarigan SD, Siregar IZ. 2024. *Application Module: Social Network Analysis and Qualitative Data Analysis*. Bogor, Indonesia: CIFOR.

Photos by the authors
Screenshots taken from:
NVivo 14 for Windows
<https://www.kumu.io>
UCINET 6.742 version

CIFOR
Jl. CIFOR, Situ Gede, Bogor Barat 16115
PO Box 161 Bogor 16001, West Java, Indonesia
Tel: +(62) 251 8625 415 Fax: +(62) 251 8625416
E cifor@cifor-icraf.org

cifor-icraf.org

The designations employed and the presentation of material in this publication do not imply the expression of any opinion on the part of CIFOR-ICRAF, its partners and donor agencies concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Foreword

IPB University and CIFOR held training sessions entitled “The 1st Training Series of TRADE Hub Indonesia on Social Network Analysis and Qualitative Analysis” on 7 and 14 November 2020. This TRADE Hub Indonesia training was part of a series aimed at supporting TRADE Hub efforts to increase the relevance of, and promote the application of research, and help policymakers at all levels to develop and apply relevant policies and regulations more effectively. Target participants in the training series were not only TRADE Hub researchers in Indonesia, but also young researchers from universities and other institutions. The TRADE Hub Indonesia Training Series was expected to become a learning platform for stakeholders in Indonesia (policymakers, financial institutions and the private sector), and for students, academics, young researchers and practitioners with knowledge and skills to create robust research products, improve decision-making processes, and formulate and implement effective science-based policies.

The first training series focused on research methodologies and techniques based on the realization that researchers have important knowledge and skills to create robust research products in the topic of sustainable development, which is always complex, and had become even more so in the midst of the pandemic. Material from the training has now been compiled into book form to improve accessibility to this knowledge product.

The authors

Table of contents

1.	PREPARING AND INSTALLING NVIVO	1
2.	QUALITATIVE DATA ANALYSIS WORKFLOW	7
3.	NVIVO AT A GLANCE	8
4.	PREPARING DATA	9
5.	GETTING STARTED WITH NVIVO	10
5.1.	CREATING A NEW PROJECT OR OPENING A RECENT PROJECT	10
5.2.	IMPORTING DATA	11
5.3.	ORGANIZING DATA	12
5.4.	CODING.....	15
5.4.1.	Creating codes.....	15
5.4.2.	Parent and child codes.....	18
5.4.3.	Highlighting pre-coded data	19
5.4.4.	‘Uncoding’	20
5.4.5.	Exporting codebooks from coding results	20
5.5.	VISUALIZING DATA.....	21
5.5.1.	Hierarchy charts	22
5.5.2.	Word frequency	23
5.5.3.	Searching text	26
5.5.4.	Diagrams	27
6.	NCAPTURE	29
6.1.	INSTALLING NCAPTURE IN CHROME	29
6.2.	CAPTURING CONTENT WITH NCAPTURE	30
6.3.	SOCIAL MEDIA ACCOUNT AUTHORIZATION	31
7.	FURTHER READING	31

Training materials

<https://ipb.link/tradehub-nvivo>



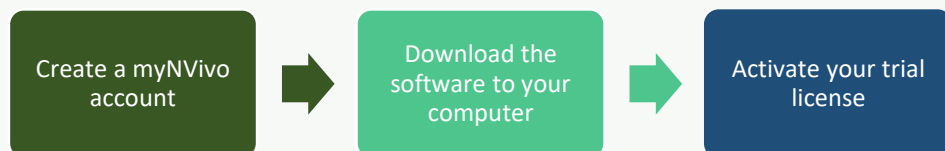
1. Preparing and installing NVivo (trial version)

NVivo¹ is a computer-based software package developed by Lumivero (formerly QSR International). It is a qualitative data analysis package, commonly used by academics worldwide, that helps researchers to prepare, analyse and find important points in non-numerical and unstructured qualitative data such as interview results, the outcomes of surveys with open-ended questions, journal articles, and social media and website content. The software is available through an annual or lifetime license and must be installed before use. NVivo offers a free license to install for a 14-day trial period without the need to register any payment information. An email address can only be used for registration for a one-time trial period.

Minimum system requirements for installing NVivo on your computer are as follows:

Minimum system requirements	Recommended system requirements
<ul style="list-style-type: none"> • 2.0 GHz dual-core processor (64-bit) • 4 GB of RAM • 1680 x 1050 screen resolution • Microsoft Windows 8.1 • A minimum of 5 GB of storage space on your hard disk 	<ul style="list-style-type: none"> • 3.0 GHz quad-core processor • 8 GB of RAM or more • 1920 x 1080 screen resolution or higher • Microsoft Windows 8.1 or a more recent version • A minimum of 8 GB of storage space on your hard disk • An internet connection • Internet Explorer 11, Google Chrome 44 or later

The steps involved in installing the trial version of NVivo on your computer are detailed below. And internet connection and time are required to download and install NVivo on your computer. The three steps shown below are explained in detail in the following pages.



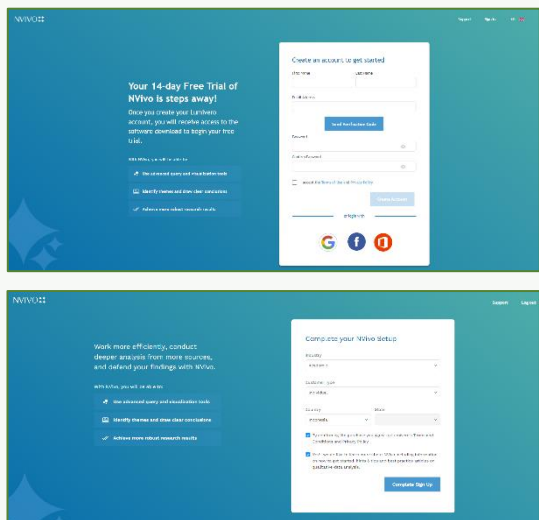
¹ <https://lumivero.com/products/nvivo/>

1. Open the link below through your web browser and select “FREE TRIAL”. Scroll down to NVivo and select “GET STARTED”.

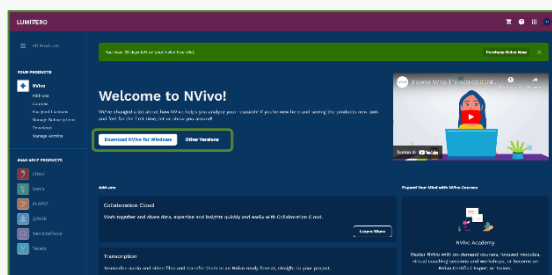


<https://lumivero.com/resources/free-trial/>

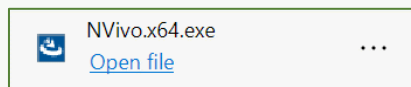
2. First, to create an NVivo account you will be asked to fill in the required information. On completion you will be asked to log in to the Lumivero Dashboard. You will be directed to create an NVivo account first and complete the requested information. Once successful, you will be asked to log in again to the Lumivero Dashboard.



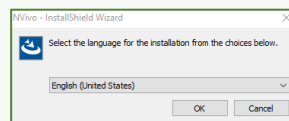
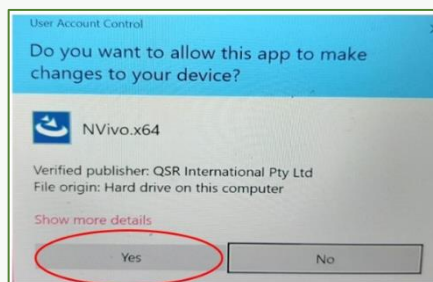
3. After entering the Dashboard, “click Download NVivo for Windows”, or “Other version” for MacOS users.



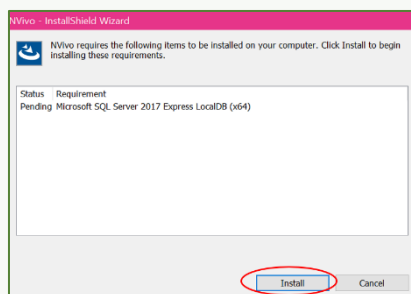
4. Once downloaded successfully, the installer will be located at the bottom of your browser or in the downloads folder on your computer. Click “Open file” to open the installer.



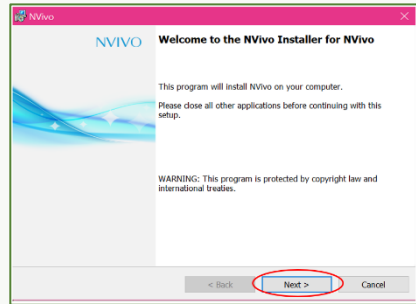
5. Click “Yes” (This dialogue box does not always appear, but is likely to do so if you are using Windows). Select the language for the installation process, then click “OK”. Another dialogue box will appear stating that the settings for installation are being prepared.



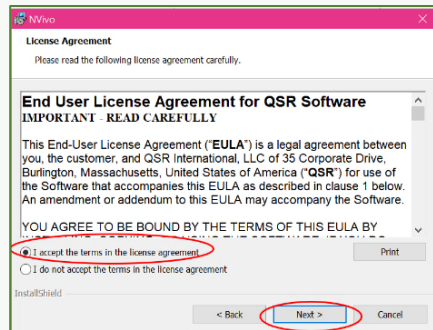
6. During the installation process, NVivo will list other software that needs to be installed. The list will vary from computer to computer. Click “Install” to continue the process.



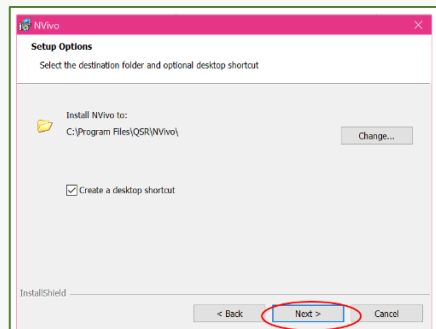
7. Once the necessary requirements have been installed on your computer, you will be ready to install NVivo. To do so, Click “Next”.



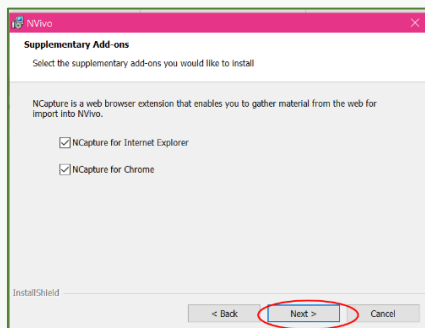
8. Please read the license agreement, click “I accept the terms in the license agreement”, then click “Next”.



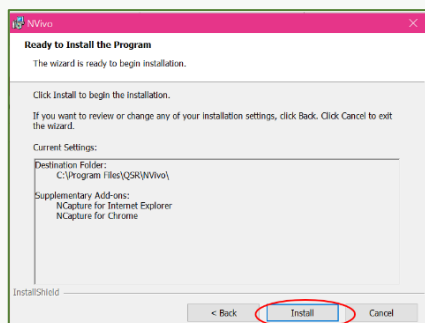
9. A dialogue box will appear showing the folder where the software files will be stored. Click “Next”.



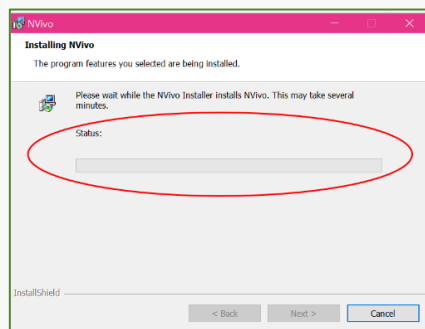
10. Another dialogue box will ask you which NCapture browser extension add-ons you wish to install. NCapture will be useful for downloading big data from websites, the Google search engine, Yahoo, etc. Check NCapture and click “Next”.



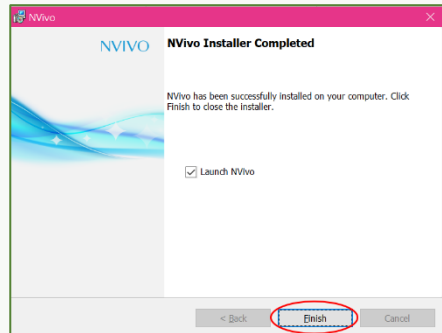
11. After that, a dialogue box will tell you the program is ready for installation. Click “Install”.



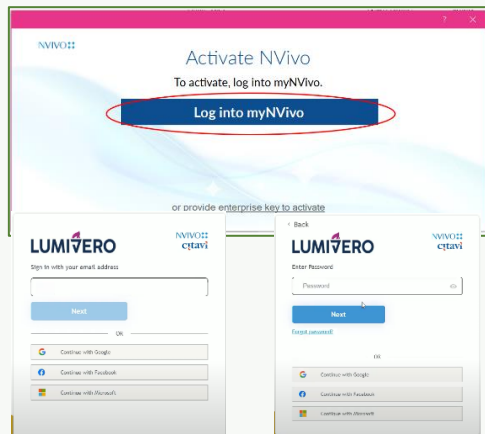
12. Another dialogue box will show you the status of the installation process. Please wait until the process is complete. This will usually take around 5–10 minutes.



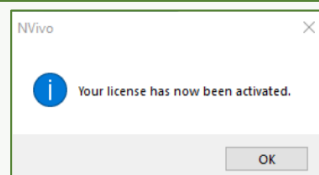
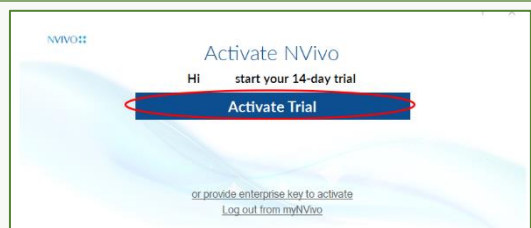
13. Once the process is complete, check “Launch NVivo” and click “Finish”. Please wait until NVivo opens.



14. When NVivo opens for the first time, click “Log into myNVivo”. Enter your myNVivo account email and password, then click “Log in”.

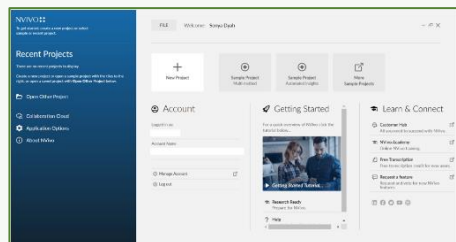


15. After successfully logging in, you will be asked to activate your trial license. Click “Activate Trial”. A dialogue box will tell you your trial license is active. Click “OK”.



16. You will be asked to fill in your user profile. Fill in your name and initials, and select the language for the user interface (English recommended). Check “Participate in the Customer Experience Improvement Program” if you are willing to participate in NVivo customer surveys. Doing so is not obligatory. Click “OK”.

17. Your NVivo trial version is now ready to use for the next 14 days.



2. Qualitative data analysis workflow

Qualitative research is an iterative process of exploring and analysing data (Figure 1). This process starts with importing data, then exploring the data to observe whether it has any emerging or recurring patterns. This process is followed by “coding”, or labelling and organizing data to identify themes and relationships. The coding process can be deductive or inductive. A deductive process involves building a codebook or coding guide before the analysis begins (Table 1). For exploratory research, codebooks can be created based on data. This is known as an inductive process (Yi 2018). The next step involves reflecting on the data and coding results, and then visualizing the data.

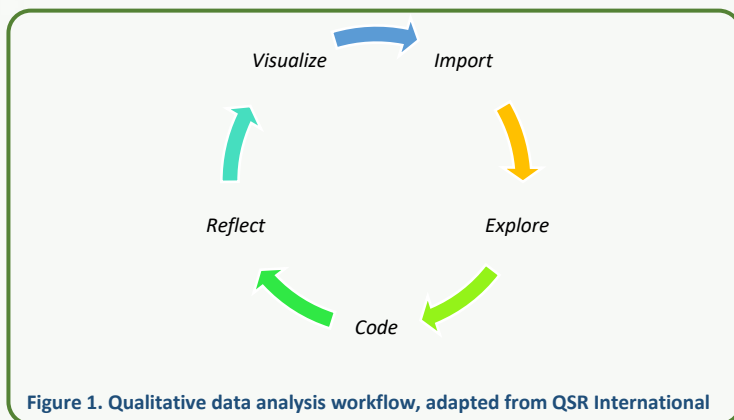


Table 1. Example of a codebook

Code	Description	Example
Fill in the code type	Fill in the description to explain the <i>code</i> in the first column.	Fill in the sample data that shows why it falls into the <i>code</i> category (first column).
Example: “definition”	Example: Respondents or texts refer to how the concept of peatland restoration is interpreted or conceptualized. This definition can include both social and ecological aspects of restoration, such as hydrological and vegetation conditions.	Example: Restoration is restoring the ecosystem to its pre-damaged condition. We know we’ll never get there, but at least we’ve tried.

3. NVivo at a glance

NVivo is a paid software package for analysing qualitative data. It allows teams (up to five people) to work together to analyse data through the [Collaboration Cloud](https://lumivero.com/products/collaboration-cloud/)² feature. The software allows researchers and practitioners to analyse data effectively and efficiently. Data and analysis results can be visualized in word clouds, tree maps, and other forms. NVivo licenses can be purchased individually or collectively through institutions. The NVivo learning centre can be accessed [here](https://lumivero.com/resources/academy/).³

² <https://lumivero.com/products/collaboration-cloud/>

³ <https://lumivero.com/resources/academy/>

4. Preparing data⁴

Prepare the data you want to analyse in one folder. Data that NVivo can process can include:

- **Documents and memos**

Documents and memos can be in the form of interview transcriptions, field notes, journal articles, reports and other documents in Microsoft Word (.doc, .docx), Rich Text File (.rtf), Text File (.txt), or Portable Document Format (PDF) formats.

- **Datasets**

Datasets are structured data organized by rows and columns. They can be survey data in the form of spreadsheets (.xls, .xlsx) or metadata from social media data collected through NCapture.⁵

- **Multimedia**

NVivo can also be used to import multimedia, such as audio, video and image files obtained from focus group discussions (FGDs), observations, etc. Formats compatible with NVivo are: MOV, MP4, AVI, M4A, MP3, WAV, .gif, .jpeg, .png, and .tiff.

- **Bibliographies**

If you have done a literature review using EndNote, you can import data in the form of EndNote (XML) files into NVivo.

⁴ <https://help-nv.qsrinternational.com/20/mac/Content/files/files.htm>

⁵ NCapture is an NVivo browser extension add-on available for Google Chrome and Internet Explorer web browsers. It is used to extract data from social media

5. Getting started with NVivo

5.1. Creating a new project or opening a recent project

When you open NVivo, select **New Project** to create a new project, or **Recent Projects** to open one you have recently been working on (Figure 2). This page also provides access to the learning centre and support resources.

When you select **New Project**, NVivo will redirect you to a new page for you to give your project a name (Figure 3). You will also be prompted to choose a location for saving the file. Select **Next** then **Create Project**.

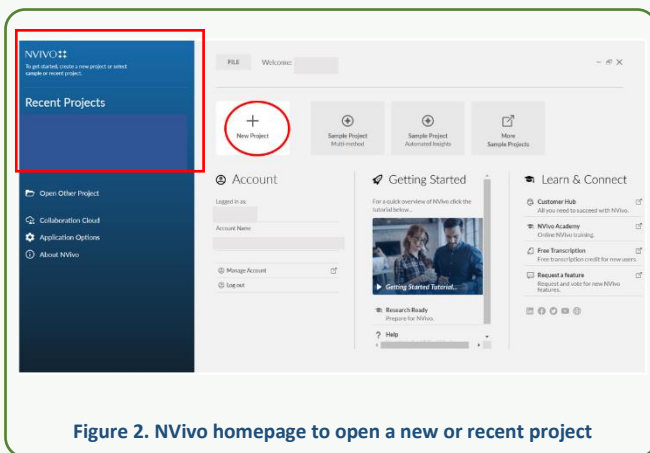


Figure 2. NVivo homepage to open a new or recent project

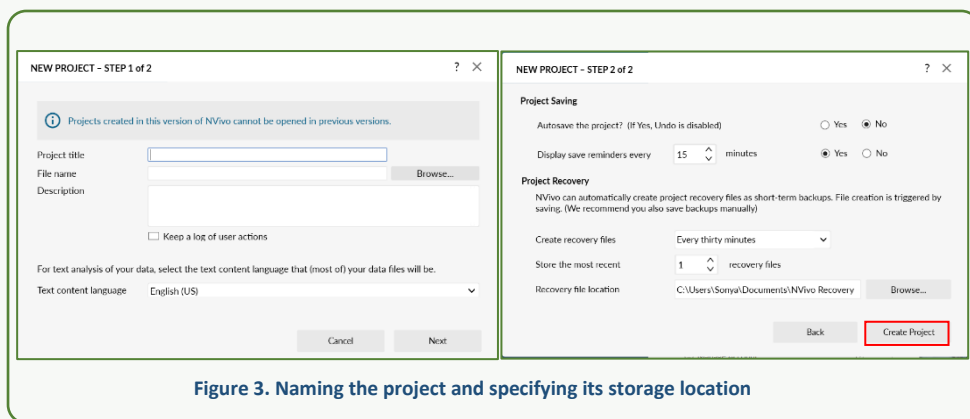
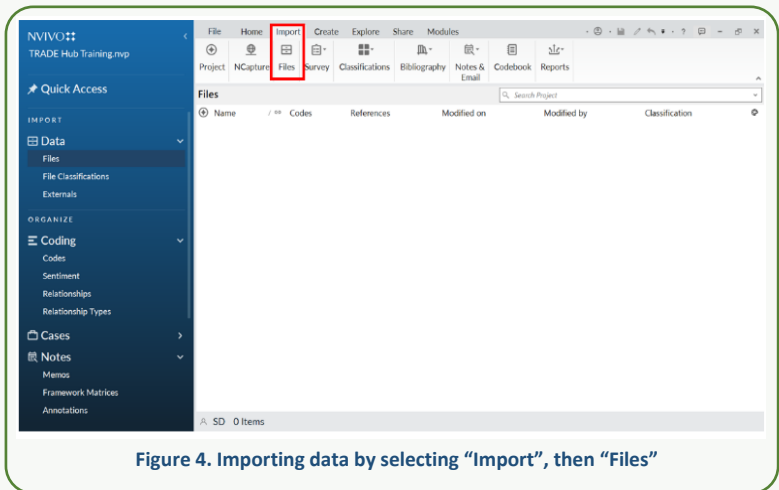


Figure 3. Naming the project and specifying its storage location

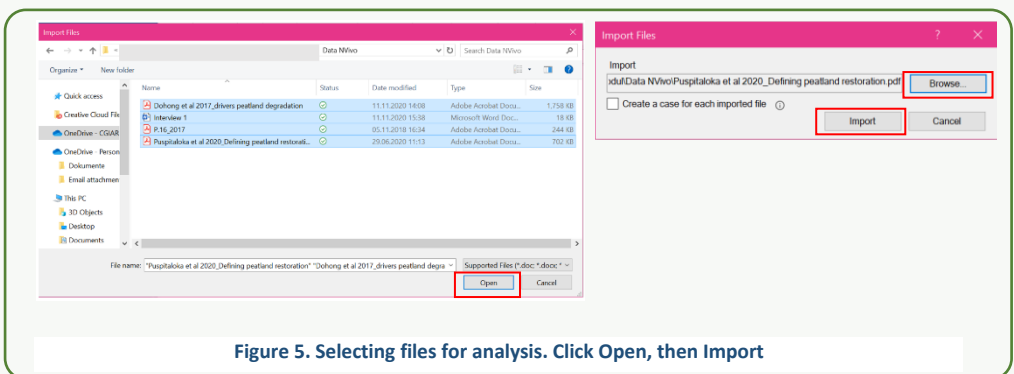
If you want to open a previously saved NVivo file (.nvp or .nvp), double-click on it and NVivo will open it automatically (Figure 4).

5.2. Importing data

Once you have created a new project, you will be redirected to the NVivo main page. To start importing data, select **Import** (Figure 4), and the file explorer dialogue box will pop up.



Select the desired file(s), then click **Open**. In the next dialogue box click **Import** (Figure 5). In this section we will study interview data (in .doc format) and literature (in PDF format). These documents can be downloaded from this [link](https://ipb.link/tradehub-nvivo).⁶



⁶ <https://ipb.link/tradehub-nvivo>

5.3. Organizing data

Imported data can be organized by **Case Classification** or **File Classification**. These features can be found in the **Home** menu (Figure 6). The ‘case’ represents a unit of observation. For example, a research project may contain cases for people, locations, organizations or entities.

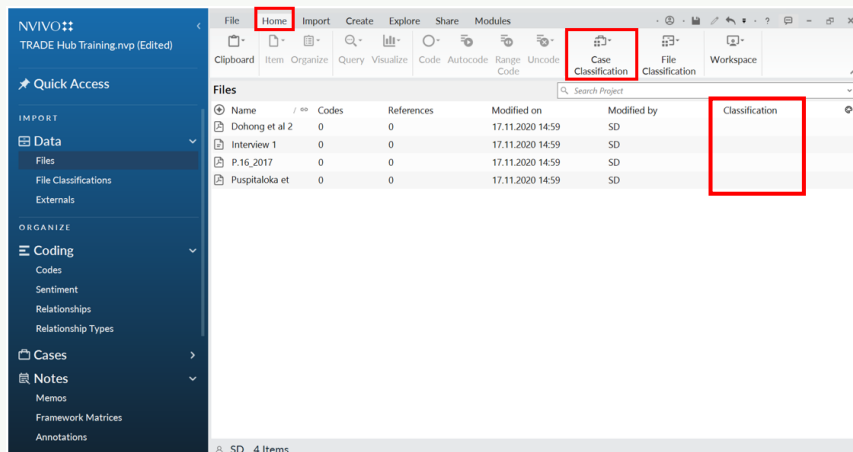
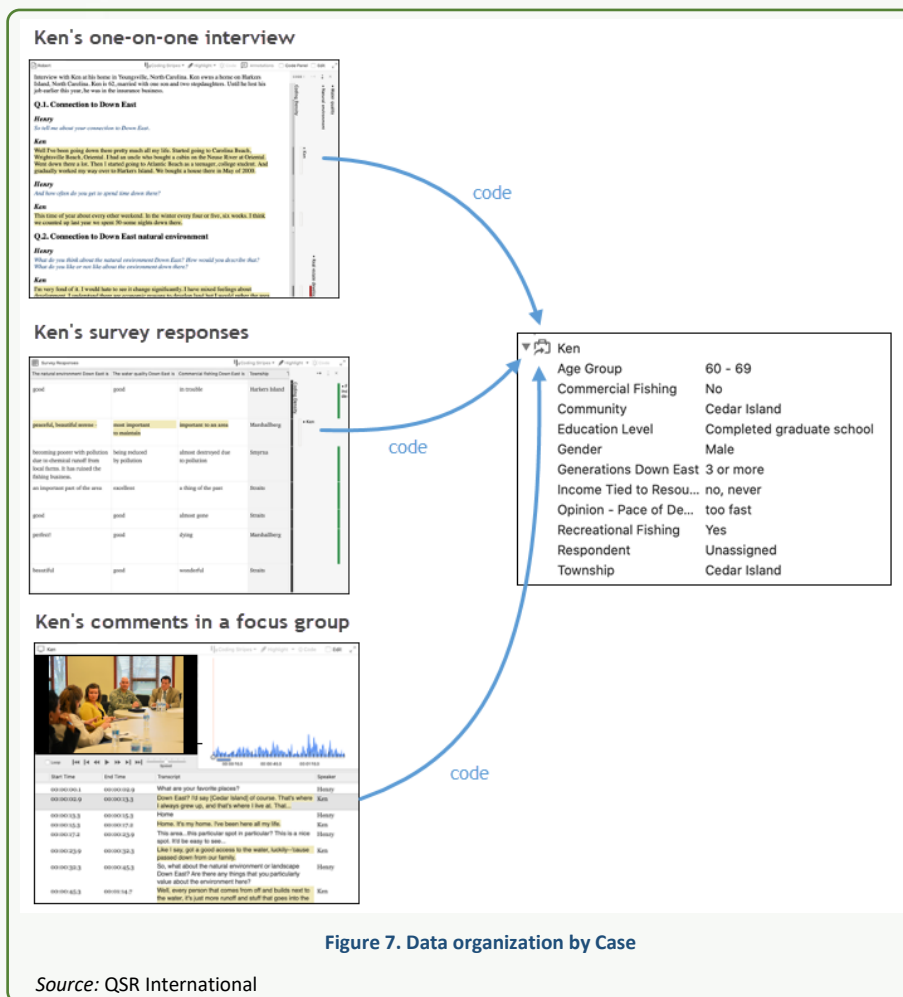


Figure 6. Data organization options - by case (Case Classification) or file (File Classification)

An example of data organization by **Case** is shown in Figure 7, where a respondent named Ken had been involved in interviews, surveys and group discussions. In this example a dedicated Case has been created and assigned the name “Ken”.



Organizing data through the **File Classification** option is to group documents by file extension type. For interviews and literature, for instance, select **File Classification** on the **Home** menu, then click **New File Classification**. Next, complete the information in the dialogue box by naming the desired classification class, then click **OK**. Repeat this step when you create a new classification class. In the following example where two classification classes – “interview” and “literature” – are created, this step is repeated (Figure 8).

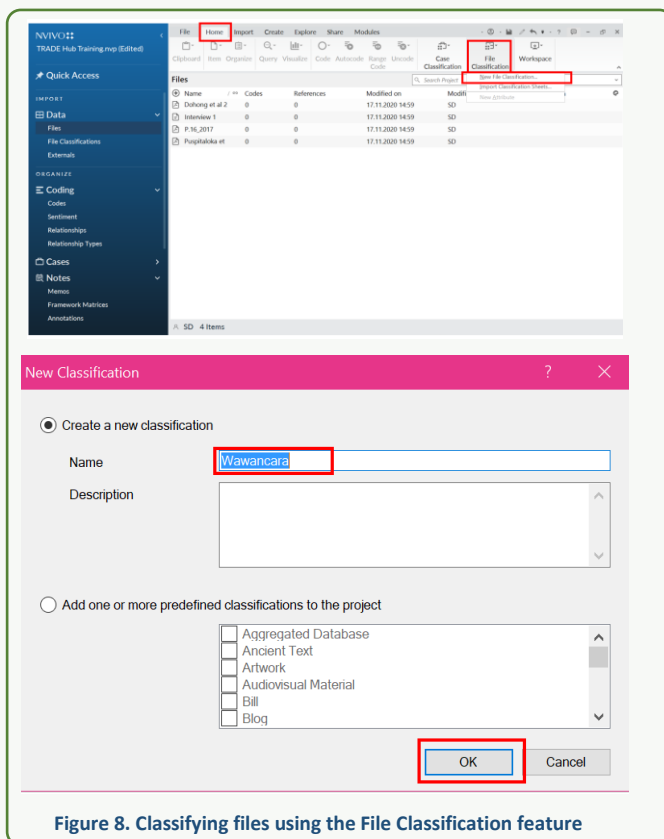


Figure 8. Classifying files using the File Classification feature

Next, go back to **Files** from the left of the screen to begin categorizing files. Right-click on a file and select **Classification**, then select “interview” or “literature” (Figure 9). Colour options are available with a right-click and selecting **Color**. The results of created classification classes are then available in the **File Classifications** menu on the left side of the screen (Figure 10).

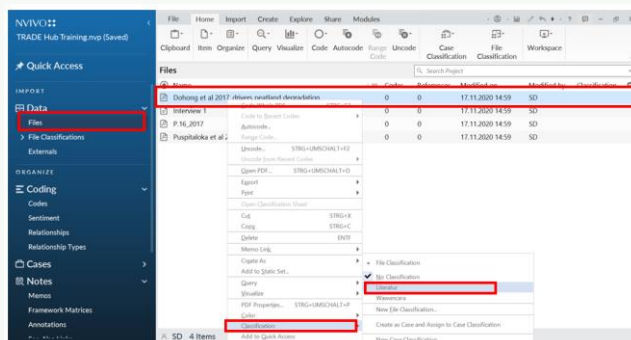


Figure 9. Classifications of files in created categories

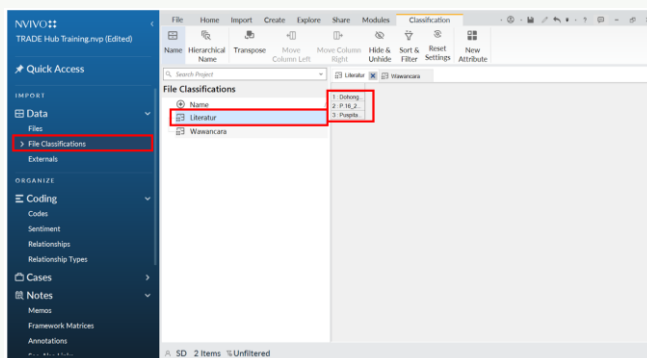


Figure 4 File classification results - Under File Classifications, click classification class and a list of files in that category will appear

5.4. Coding

5.4.1. Creating codes

Through the **Files** tab, open a file that has been classified under “interview”, click on it and read it thoroughly. After that, determine what codes will be created from the data. To create new code, highlight the part of the text you want to code. Then right-click and select the **Code Selection** option. A dialogue box will appear for you to create a new code. Click **Create New Top-Level Code**, and name the new code. Next, click **Code** then **Selection to New Code** (Figure 11). You can also select the **Code** option from the menu bar at the top of the screen to make it faster. Click **Code Selection**.

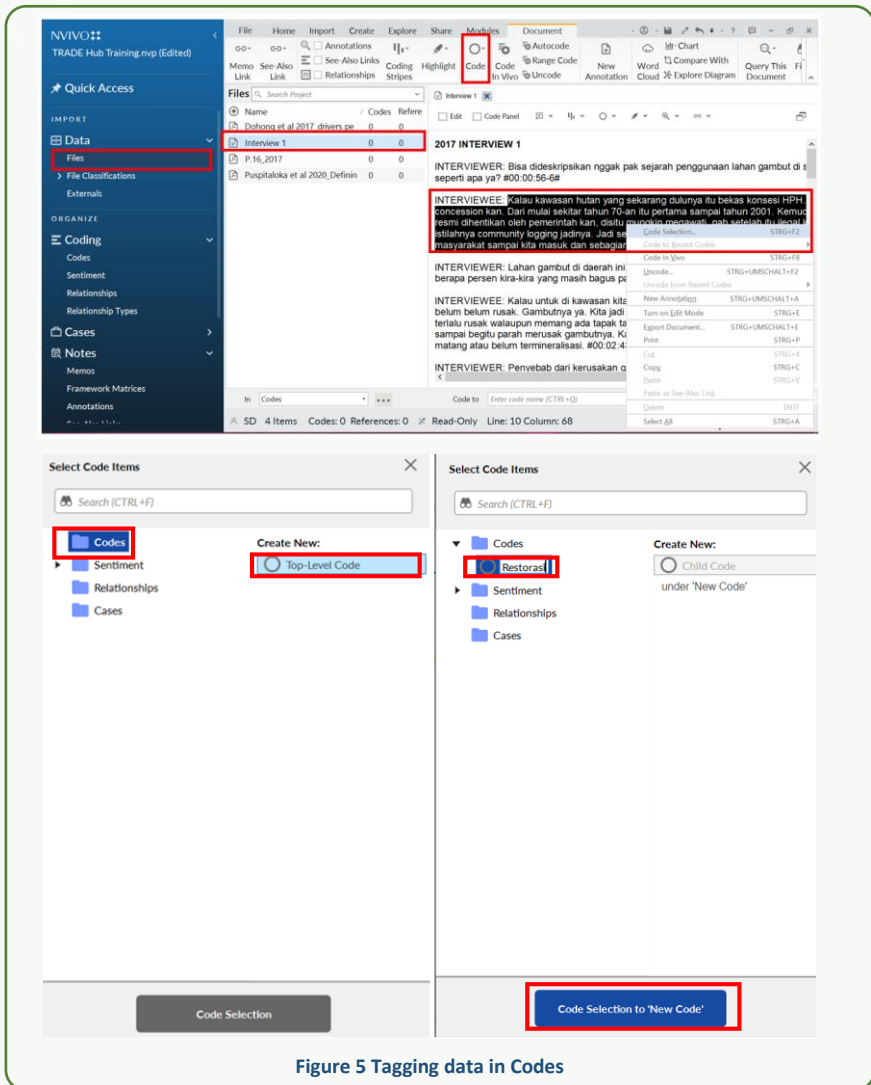


Figure 5 Tagging data in Codes

After creating a new code, you can fill in the **Code Properties**, which include name, description and colour specifications. Click **Codes** in the menu on the left of the screen. Right-click on the code that has been created then click **Code Properties**. A dialogue box will appear where you can add a description and colour the code (Figure 12).

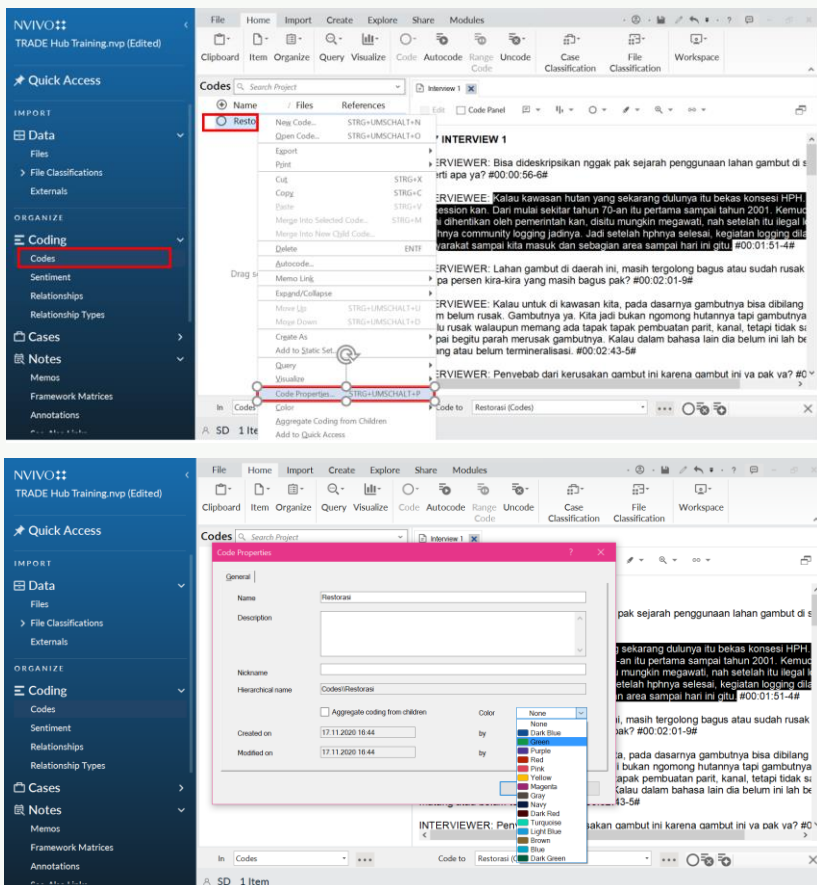


Figure 6. The Code Properties setting

5.4.2. Parent and child codes

You can also create ‘**child codes**’, which are more specific classifications under their more general ‘parent codes’. An example being:

Restoration

- Revegetation
- Rewetting
- Revitalization

à *Parent code*

à *Child code*

à *Child code*

à *Child code*

To create a child code, click on the **Codes** tab and select an already created parent code. Right-click on the parent code and select **New Codes**. A dialogue box will pop up for you to name, complete details of, and colour the child code.

You can check the code hierarchy by looking at the “Hierarchical name” box, which will show the parent code first before the child code. When ready, click “OK” to complete (Figure 13).

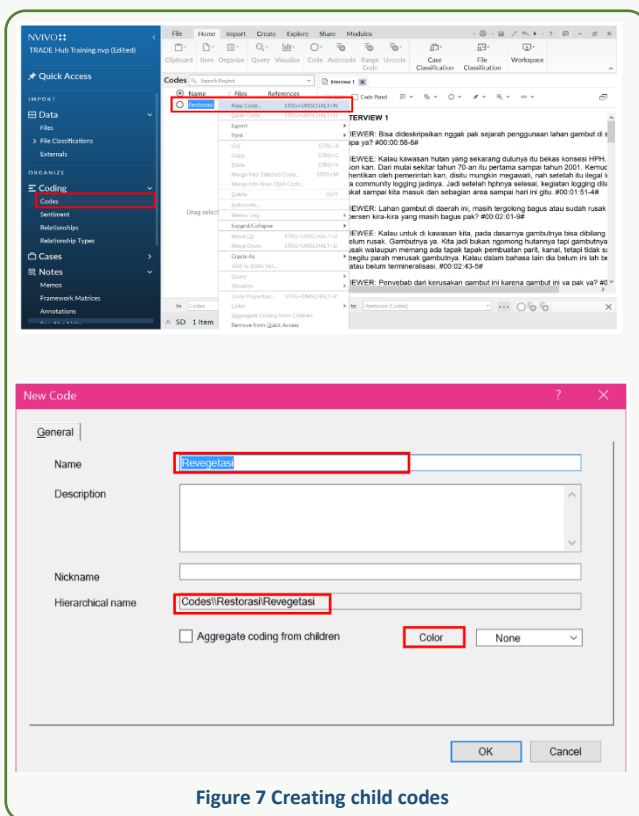


Figure 7 Creating child codes

5.4.3. Highlighting pre-coded data

To show which parts of an interview have been coded, you can select the **Highlight** and/or **Coding Stripes** feature. The **Highlight** feature will highlight text that has already been coded, while the **Coding Stripes** feature will show the code type (Figure 14). To facilitate the analysis process, activate these two features by selecting **Highlight** then **All Coding**, and **Coding Stripes** then **All**.

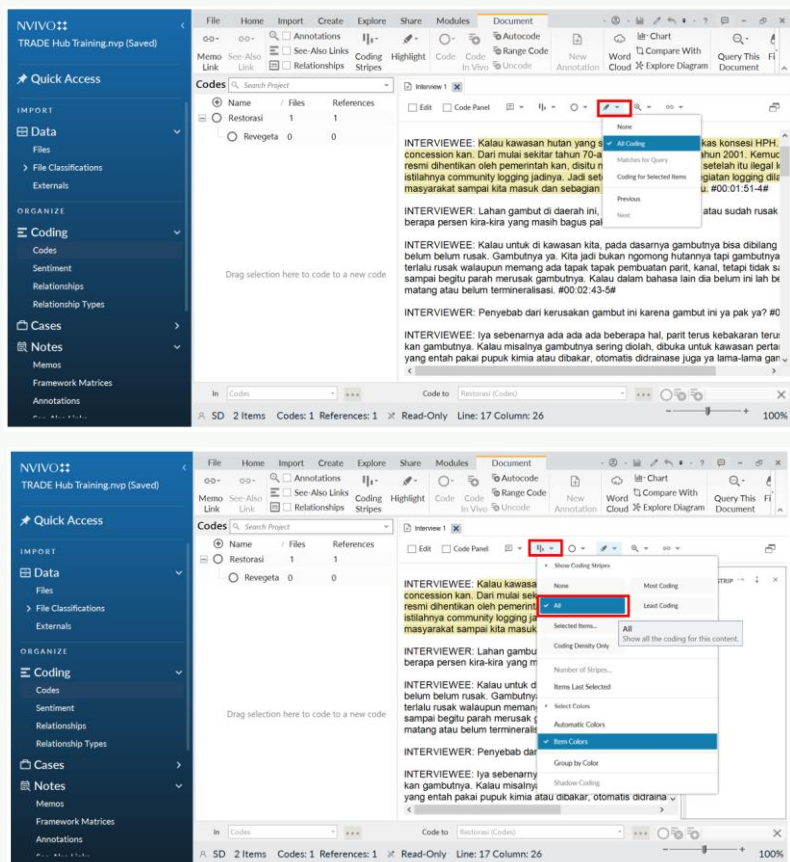


Figure 8 Displaying highlighted text with the Highlight and Coding Stripes features

5.4.4. 'Uncoding'

The **Coding Stripes** feature also allows you to 'uncode' or remove codes from parts of the text. To do this, right-click on the code, then select **Uncode** (Figure 15).

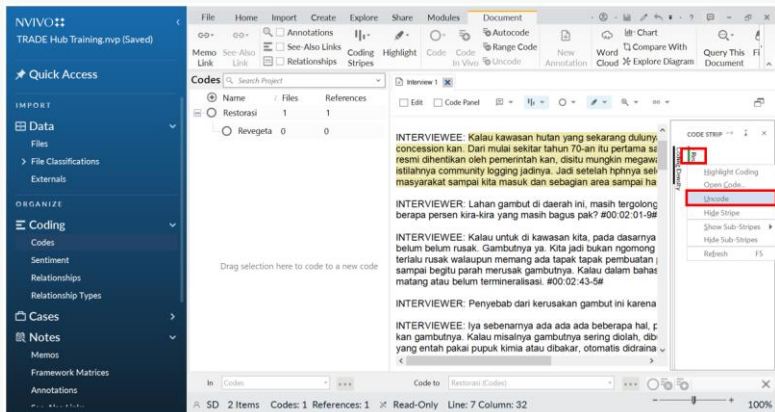


Figure 9 Using the "Coding Stripes" feature to uncode

5.4.5. Exporting codebooks from coding results

Codes that have been created using NVivo can be converted and exported into codebooks (.docx). This process can be done by selecting the **Share** tab then selecting the **Export** and **Export Codebook** options (Figure 16).

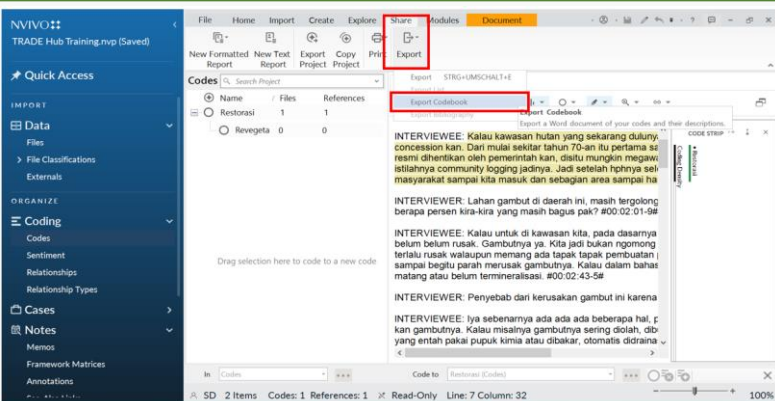


Figure 10 Exporting codebooks from coding results in NVivo

NVivo will generate a new file in Microsoft Word format (.docx) containing code names, descriptions, files and references (Figure 17).

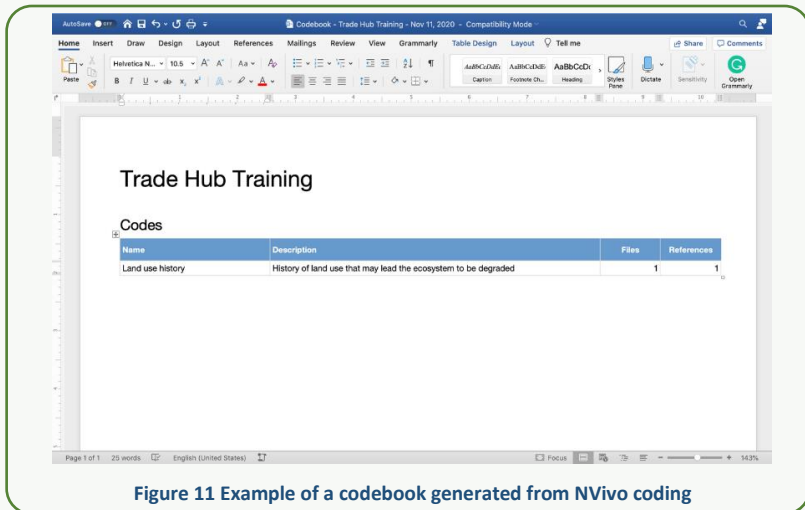


Figure 11 Example of a codebook generated from NVivo coding

5.5. Visualizing data

Data visualization in NVivo can help you identify emerging and recurring themes in the early stages of analysis. It also helps in reflection and presentation processes. A wide variety of visualizations can be created in NVivo, either automatically or manually (e.g., drawing concept maps). This section covers visualizations generated automatically from NVivo. Please close the previous files and open the Visualisasi Windows.nvp file, which can also be downloaded from this [link](#), to learn about visualization features (Figure 18).

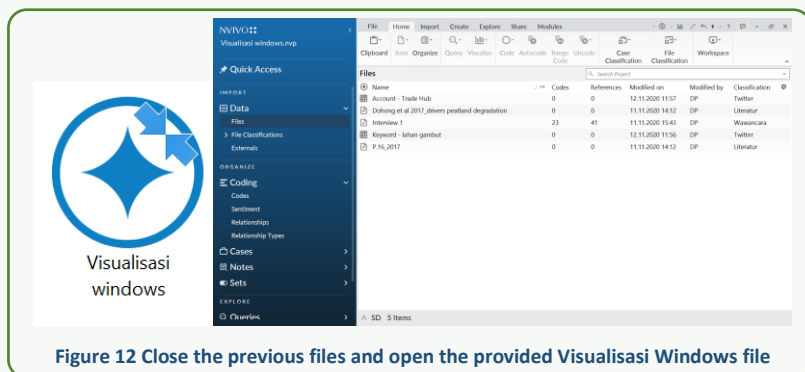


Figure 12 Close the previous files and open the provided Visualisasi Windows file

5.5.1. Hierarchy charts

Hierarchy charts visualize code groupings and are used to view proportions of themes relating to each other in the data. Select **Explore** then **Hierarchy Chart**. A dialogue box will appear. Click “**Amount of coding for – codes**” then “**Next**”. Then check **Compare – All codes** and **Coded to – All files, Externals & Memos**, and click **Finish** (Figure 19).

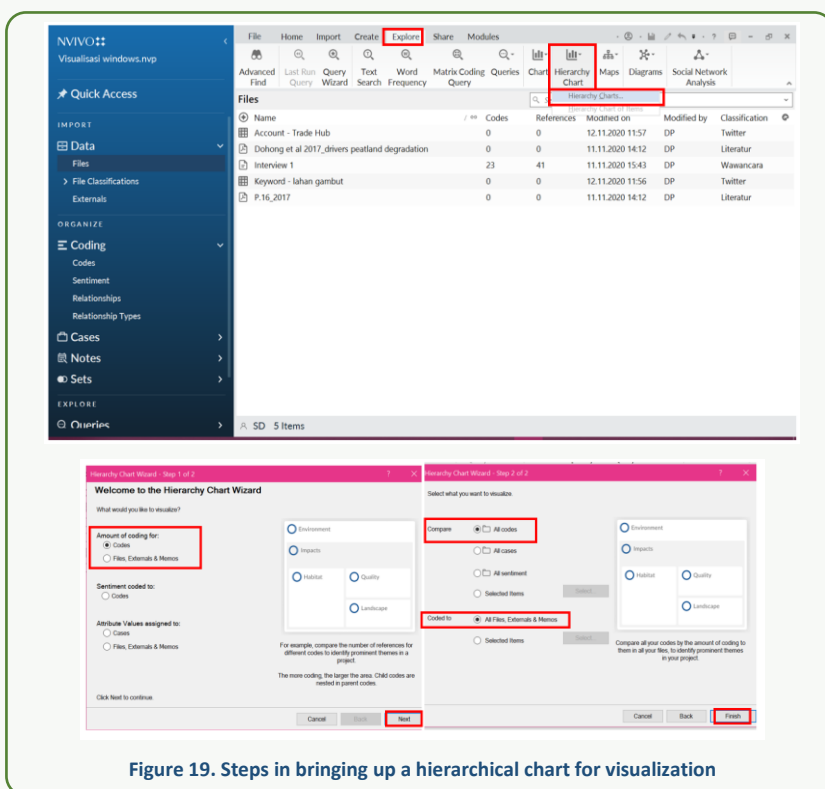


Figure 19. Steps in bringing up a hierarchical chart for visualization

Once the chart is displayed you can choose either a **tree map** (Figure 20) or **Sunburst** (Figure 21) visualization.

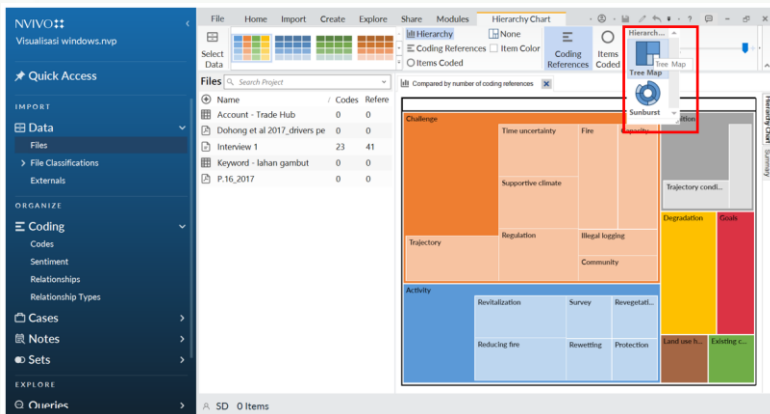


Figure 13 A hierarchy chart in the form of a tree map

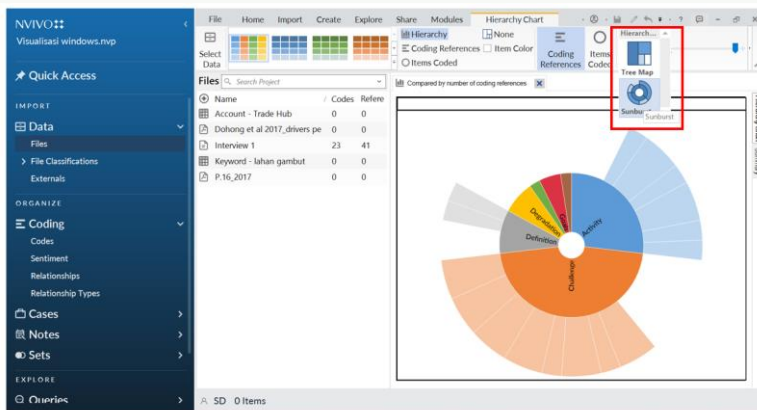


Figure 14. A hierarchy chart in the form of a sunburst

5.5.2. Word frequency

‘Word clouds’ visualize words appearing most frequently in codes, files and cases. They are ideal for the early stages of research, particularly exploratory research, for quickly seeing emerging or repeating patterns. Under the **Explore** tab (Figure 22), select **Word Frequency**. Then select the number of display words and minimum length desired. Next, under the **Grouping** tab select **With stemmed words**. To create a word cloud from the coding results, click **Selected Items** for a dialogue box to appear.

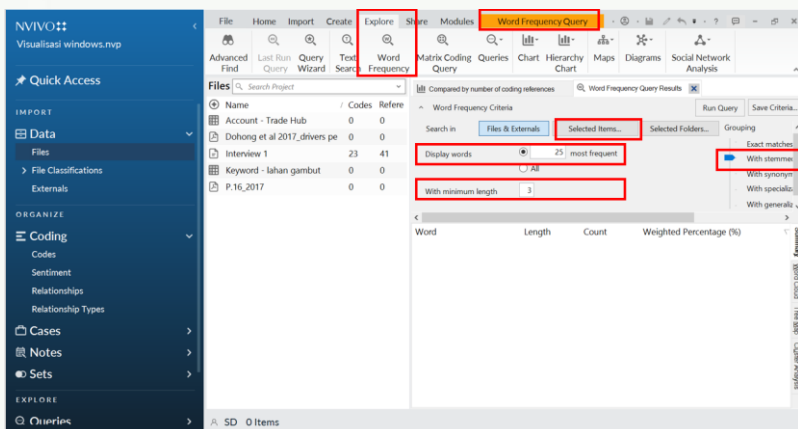


Figure 15 Word cloud visualization – Step 1

In the dialogue box (Figure 23), check **Automatically select subfolders** and **Automatically select descendant codes**. Then check the codes to choose which ones you want to display. After that click **OK**.

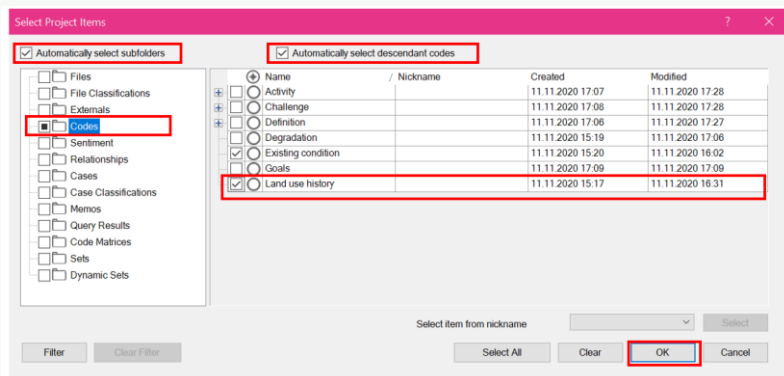
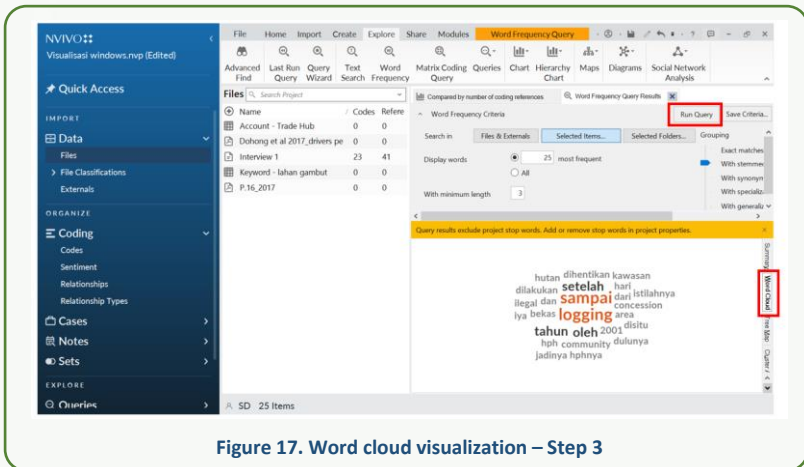
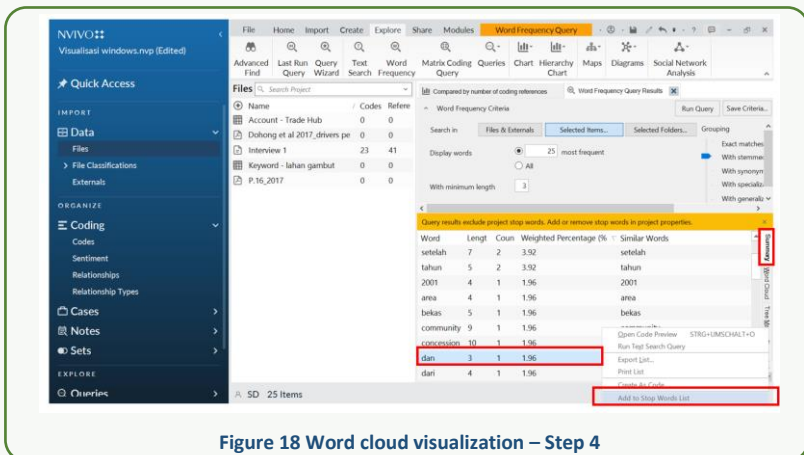


Figure 16 Word cloud visualization – Step 2

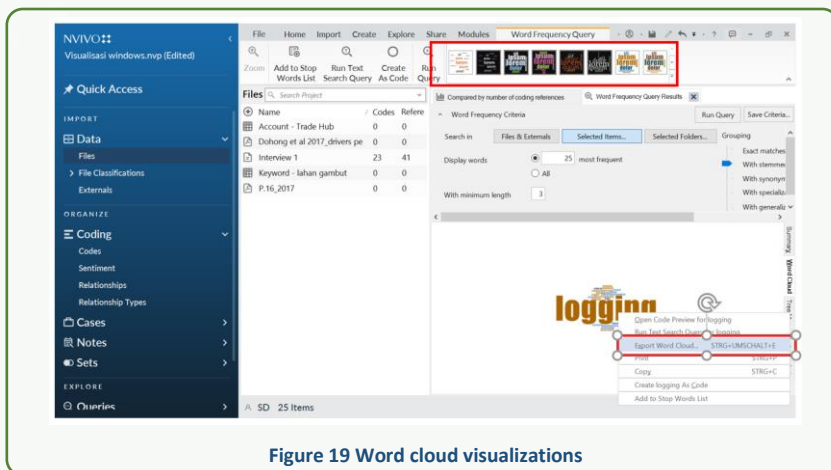
When you return to the NVivo main page, click **Run Query** and NVivo will display a summary together with a word cloud (Figure 24).



If unimportant words like “which”, “this” or “that” enter your word cloud, click **Summary**, right-click on the unwanted word and select **Add to Stop Word List** so NVivo will no longer include it in the word cloud and top word list. After that, click **Run Query** again to display the final word cloud (Figure 25).

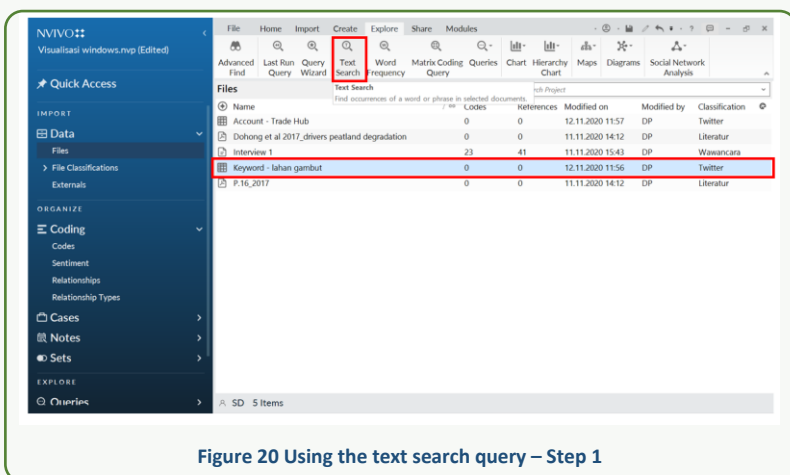


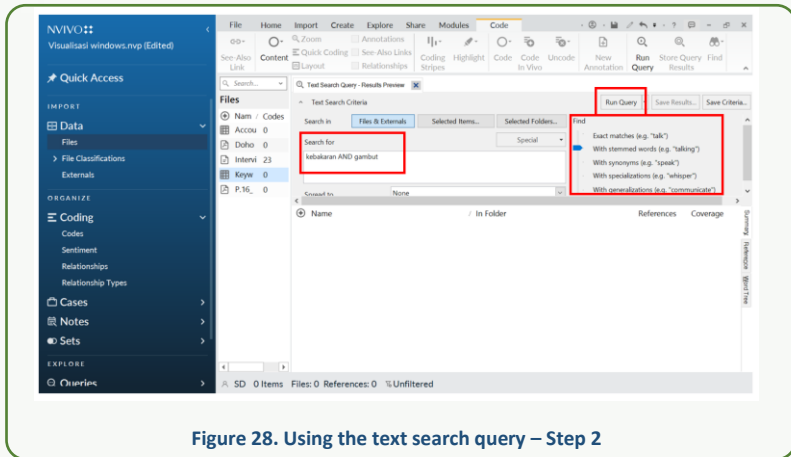
You can change the appearance of the word cloud by selecting the settings from the top of the screen below the **Word Frequency Query** menu (Figure 26).



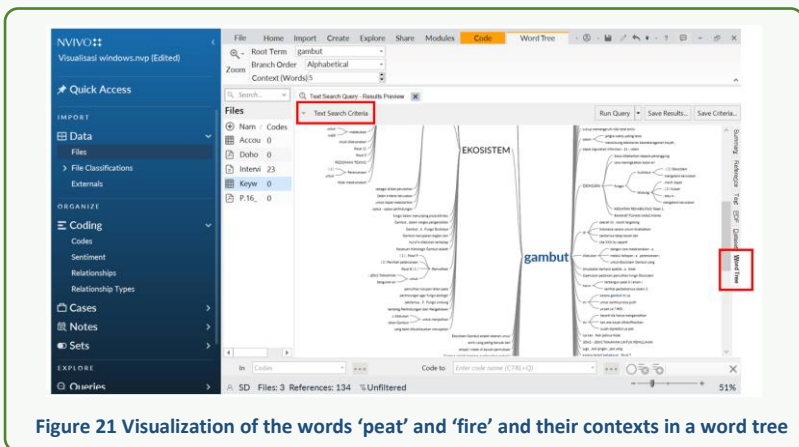
5.5.3. Searching text

Text search visualizations are depicted through word trees. This type of visualization shows specified or selected words and the contexts in which they are used in interviews or literature. For this visualization, select **Text Search** then click **Selected Items** to specify whether you want to see context in codes, files or cases. Then enter the word “fire” and select **Special** on the right. Then, select **AND** and enter the word “peat”. After that select **Include Stemmed Words** then **Run Query** (Figures 27 and 28).





To bring up the word tree, close the **Text Search Criteria** tab, then click the **Word Tree** tab at the right of the screen (Figure 29).



5.5.4. Diagrams

Diagrams visualize comparisons between codes, files and cases. Under the **Explore** tab select **Diagrams**, click **Compare Codes** and select the codes to be compared – for example, “activity” and “challenge” – then select **OK** (Figure 30).

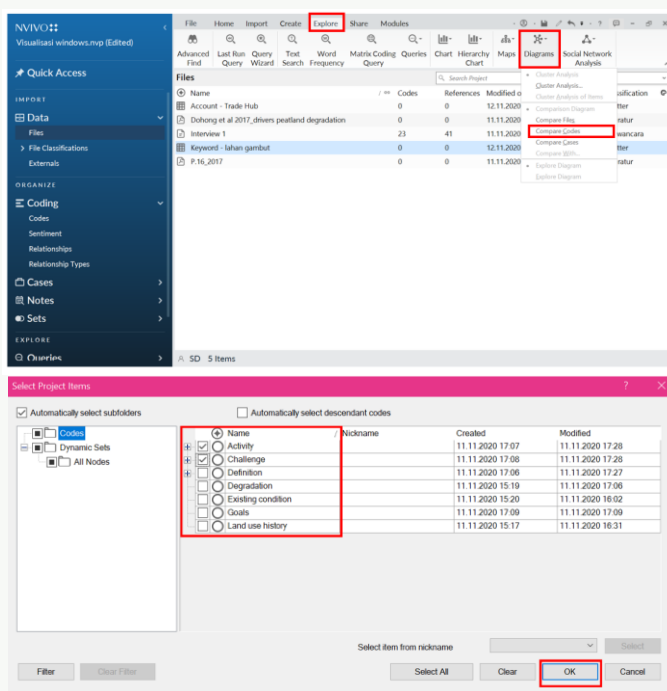


Figure 22 Bringing up a comparison diagram

To bring up a comparison diagram, check **Children** in menu under the **Comparison Diagram** tab (Figure 31).

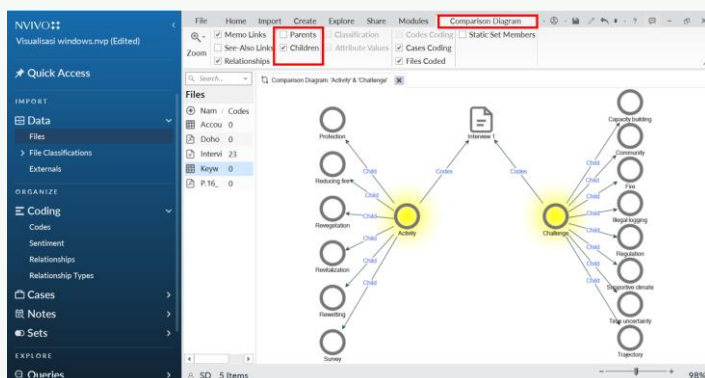


Figure 31. A comparison diagram comparing codes

6. NCapture

NCapture is a free web browser extension for Chrome that allows you to collect web content for import into NVivo. Support for NCapture for Internet Explorer was discontinued in 2020, but you can still install the latest version if needed. Most web pages can be captured as PDFs. You can also capture multiple pages from Facebook, Twitter and YouTube as datasets, videos and figures. An NCapture file (.nvcx) contains the content you retrieved as well as the URL, capture time, and any additional information such as description, memo and encoding you specified at the time of retrieval. Some captures from social media sites generate a lot of files after being imported into NVivo. For example, Facebook content can contain NVivo and Figure datasets.

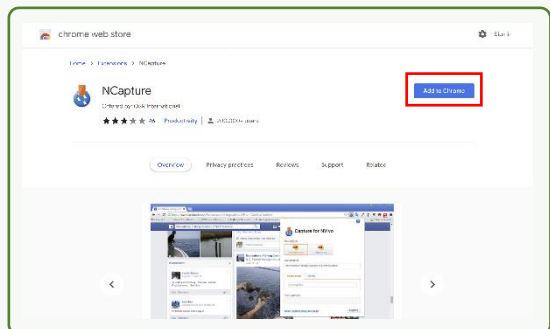
Viewing social media data - You must authorize NCapture when retrieving from Facebook or Twitter for the first time.

NCapture authorization - Depending on your version of NVivo, some types of captured content cannot be imported into your project.

6.1. Installing NCapture in Chrome

If you have installed NVivo, NCapture may have been installed on your computer as part of the NVivo installation. Otherwise, you can install it manually. You will need Chrome 44 (or later) to use NCapture for Chrome.

1. Open **NCapture for Chrome** in the Chrome Web Store.
2. Click the **Add to Chrome** button and confirm in the dialogue box. NCapture will then be added to Chrome, with an icon in the toolbar.

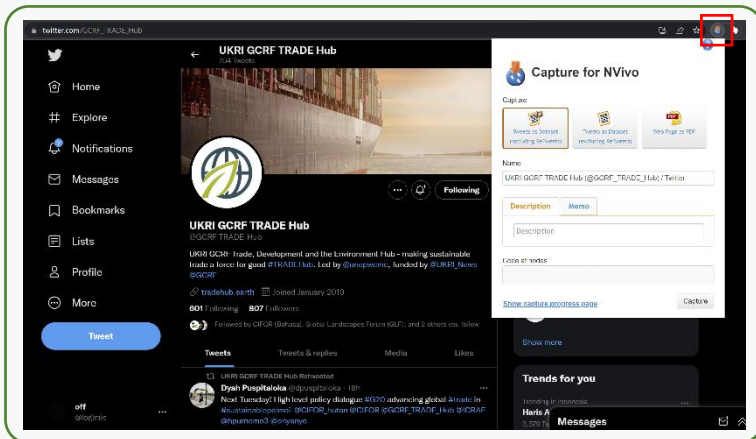


You do not need to install NVivo to use NCapture. For example, you can still ask a research assistant who does not have NVivo to install NCapture and collect Tweets. They can then send NCapture (.nvcx) files to you to import into your NVivo project.

6.2. Capturing content with NCapture

You can import social media content from Facebook, Twitter and YouTube that you have collected with NCapture.

1. In your browser, open the content you want to capture.
2. Click the **NCapture** button at the top of your browser.



3. Select the document result type. Depending on the type of content you are viewing, you may see different capture options.
4. Review and rename files.
5. You can enter a short description or memo:
 - a. Description becomes one of the file properties in NVivo.
 - b. Memos you enter become linked memos when files are imported.
6. Optionally, enter one or more codes (“nodes” in previous versions of NVivo) to encode the contents. When you import content into NVivo, the entire file is encoded into this.
 - a. If you enter a code that does not exist in your project – or mistype its name – a new code is generated.
 - b. If coding into an existing code, enter a hierarchical code name – for example, “trade”\“palm”.
7. Click **Capture**. The retrieved content is saved as an NCapture (.nvcx) file that you can import into your NVivo project.

6.3. Social media account authorization (Twitter)

A dataset is created containing Tweets you have captured. Any hyperlinks in the Tweet will be noted. If the Tweet includes a link to a media file, the media file is not imported into your project, but you can access it from the hyperlink.

If the Tweet is a search result on Twitter, you can click the link in the **Search Terms** column in the dataset to perform a new search on Twitter.

By default, user information such as gender or location will be imported along with Tweets. If this is not relevant to your research, you can change this behaviour in the project properties.

Before obtaining data, the account must first be authorized.



7. Further reading

Yi E. 2018. Themes don't just emerge – Coding the qualitative data.

<https://medium.com/@projectux/themes-dont-just-emerge-coding-the-qualitative-data-95aff874fdce> (11 November 2020)

QSR International. NVivo for Mac – Getting started guide.

<http://download.qsrinternational.com/Document/NVivo11forMac/11.1.0/NVivo-for-Mac-Getting-Started-Guide.pdf> (11 November 2020)

Jackson K and Bazeley P. 2019. *Qualitative data analysis with NVivo*. Sage.

Table of contents

1.	KUMU ACCOUNT REGISTRATION TUTORIAL	36
1.1.	KUMU REGISTRATION	36
2.	INTERPRETING BASIC DATA AND PREPARING FOR SOCIAL NETWORK ANALYSIS WITH KUMU	40
3.	FILLING IN ELEMENTS SHEETS	41
4.	FILLING IN CONNECTIONS SHEETS.....	42
5.	ANALYSING SOCIAL NETWORK DATA WITH KUMU (VIA EXCEL FILE IMPORTS)	46
5.1.	LOGGING IN TO YOUR KUMU ACCOUNT.....	46
5.2.	CREATING NEW PROJECTS ON KUMU	47
6.	IMPORTING DATA FROM EXCEL DOCUMENTS TO KUMU, AND BASIC VISUALIZATION SETTINGS...53	
7.	CENTRALITY ANALYSES	57
8.	SETTING VISUALIZATIONS OF CENTRALITY ANALYSIS RESULTS TO AID INTERPRETATION ...59	
9.	EXAMPLES OF VISUALIZATION AND INTERPRETATION OF SOCIAL NETWORK ANALYSIS RESULTS USING KUMU	62

Training materials

ipb.link/tradehub-kumu



1. Kumu account registration tutorial

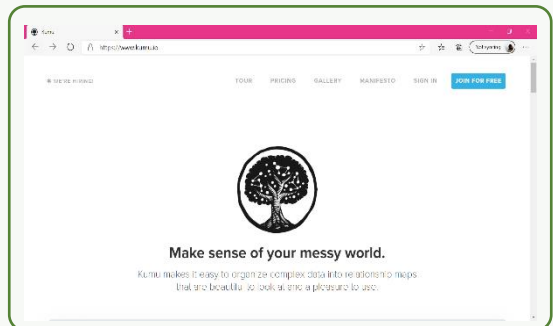
Kumu (<https://www.kumu.io/>) is a website-based software package created by Jeff and Ryan Mohr in the United States in 2011. It can be used for visualization of stakeholder mapping, systems mapping, social network mapping, community asset mapping and concept mapping. Kumu offers advantages in enabling users to provide attractive visualizations for complex data, and to create visual databases. Kumu also has several automated analysis features, for example, for metric calculations in social network analysis, community detection and clustering. In addition, Kumu has a feature to create online presentations that make it easy for you to share the results of your research. Basically, Kumu is a free platform, but your data will be publicly available. If you want to make your data available personally, you can choose a paid service.

Here are the steps to register a Kumu account:

1.1. Kumu registration

1. Open the Kumu website through your browser
<https://www.kumu.io/>

2. Enter the **JOIN FOR FREE** menu in the upper right hand corner.



3. Fill in the data needed for registration. This registration page can also be accessed directly at the following link <https://www.kumu.io/register>



First and last name

Email address

Choose a username

Only a-z, 0-9, and dashes allowed

Choose a password

Minimum 8 characters

☐ Yes, I'd like to receive Kumu's monthly newsletter

We do not share your email and you can unsubscribe at any time. Unsure? [Take a peek at a past newsletter.](#)

☐ I'm not a robot



Create your free account

By signing up, you agree to Kumu's [terms of service](#) and [privacy policy](#).

© 2011 - 2020 Kumu Inc.

Did you know?

A free, personal workspace will automatically be created for you when you sign up. Within your account you have the option to create additional workspaces to keep your projects organized (such as a client or company specific workspace).

Already have an account? [Sign in](#)

First and last name

First name and last name, example: Miftah Rahman

Email address

Your email address, example: miftahrahman@email.com

Choose a username

Choose the username you want to use, you can use numbers 0–9 and/or letters a–z and hyphens (-). Examples of usernames are miftahrahman, miftahr20, miftah-rahman

Choose a password

Enter the password you will use. You will need to use this password each time you log in to your account on the Kumu website.

If you want to receive a monthly newsletter from Kumu, you can check “Yes, I'd like to receive Kumu’s monthly newsletter”. You do not need to check it if you do not want to receive the newsletter.

After you have filled in all the data, click “I’m not robot” for verification and **Create your free account**.

4. Your account has been successfully created if the following **DASHBOARD** page appears.

KUMU GALLERY DOCS HELP



NEW PROJECT DASHBOARD SETTINGS

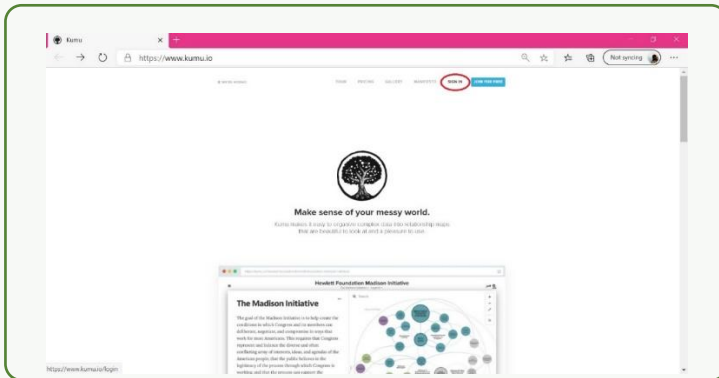


Projects Workspaces

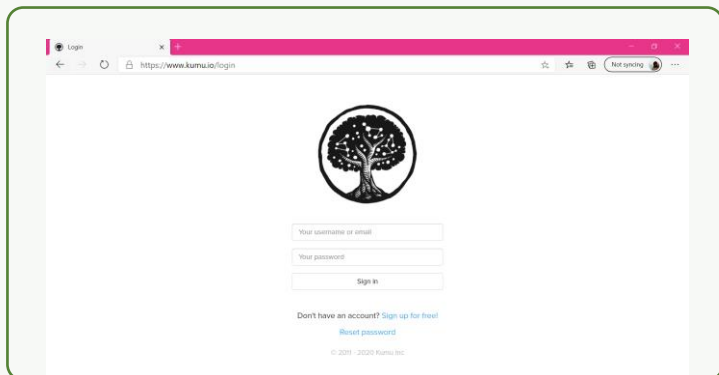
Welcome! Get started by creating your first project.

NEW PROJECT

5. You can learn more about Kumu features at **Learn the essentials** <https://docs.kumu.io/>
6. Open the Kumu website through your browser <https://www.kumu.io/> and click **SIGN IN**.



7. On the sign in page, fill in your username or email address and the password you used to register, then click **Sign in**.



8. After signing in successfully, you will be connected to the dashboard page of your Kumu account.

KUMU GALLERY DOCS HELP



NEW PROJECT DASHBOARD SETTINGS



Projects Workspaces

Welcome! Get started by creating your first project.

NEW PROJECT

Zero to Kumu in 3 simple steps:

Step 1. Explore what's possible

Find out how others have used Kumu by exploring existing public projects.

- Hewlett Foundation's [systems map](#) of the US Democracy
- Civic Canopy's [stakeholder and project network](#)
- Kumu's own data visualization of the [Celebrity Ice Bucket Challenge](#)

Step 2. Learn the essentials

At docs.kumu.io you'll find a step-by-step guide to getting started with Kumu, along with advanced guides to all the great features available within Kumu.

READ THE DOCS

Step 3. Experiment within a free, public project

The best way to learn is by getting your hands dirty. Create a sandbox project, hack away on it, and then delete it when you're done!

CREATE A SANDBOX PROJECT

Got questions?

Send an email to support@kumu.io or reach out to us on [Slack](#).

Kumu Gallery Docs Help

2. Interpreting basic data and preparing for social network analysis with Kumu

1. The TRADE Hub_7Nov20_Data KUMU_A and TRADE Hub_7Nov20_Templat KUMU Excel files can be downloaded [here](#).
2. The TRADE excel file Hub_7Nov20_Data KUMU_A contains a matrix of data from social network surveys to actors who have been identified as having a role in the governance of Commodity A. Data is in the form of an adjacency matrix.

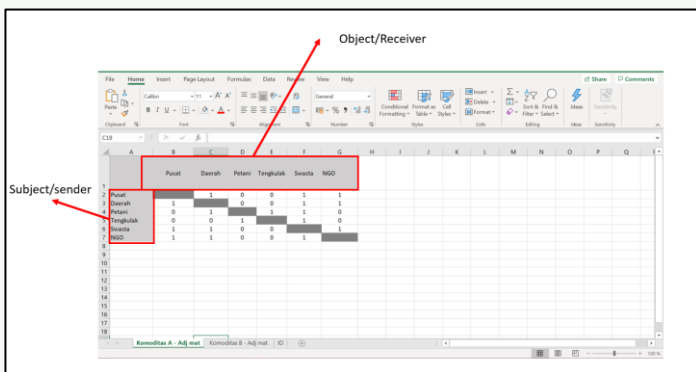


Figure 1. How to interpret survey result data (Adjacency matrix)

Column A is a list of actors as subjects/senders, and columns in row 1 list actors as objects/receivers (Figure 1). The number 1 indicates the subject/sender actor stating there is a commodity governance interaction with the object/receiver actor, whereas the number 0 means there is no interaction.

Examples: The 1 in cell C2 means the central government stated that it has direct interaction with local governments in the governance of Commodity A, while the 0 in cell D2 means the central government stated it has no direct interaction with farmers.

3. As the survey data will be analysed with Kumu, adjustments are made to the Kumu template file (TRADE Hub_7Nov20_Template KUMU). The Kumu template contains two sheets; the first for entering data elements (Figure 2) and the second for data connections (Figure 3).

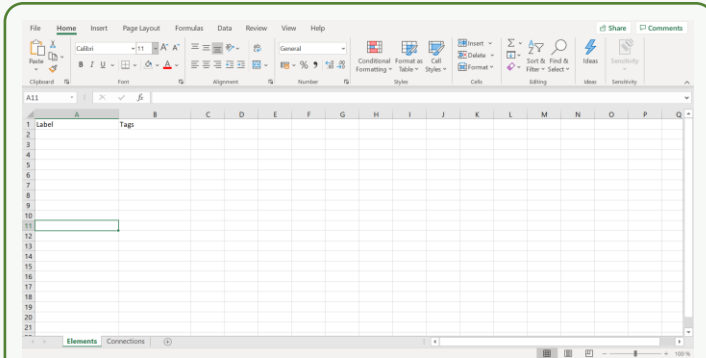


Figure 2. The first sheet of the Kumu template (elements data)

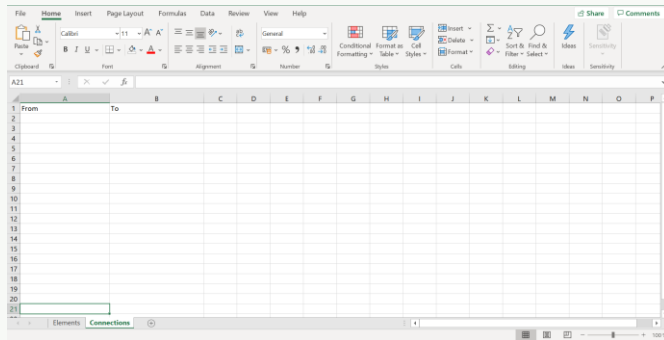


Figure 3. The second sheet of the Kumu template (connections data)

3. Filling in elements sheets

Elements in Kumu are actors/stakeholders that constitute the focus of analysis, and can be individuals or organizations. The elements sheets contain lists of actors/stakeholders constituting the basic data. If needed, to enrich the analysis or visualization of an element, detailed data – such as name, type, description, tag, organization, etc. can be added in subsequent columns. In Kumu, element attributes are called fields.

Fill in the element sheets containing lists of actors according to the data. The example in Figure 4 below is for Commodity A. To shorten names, IDs can also be used.

The element label is the name of the actor/stakeholder that will be displayed in the visualization. This can be shortened by using an ID. The label is the basic information for Kumu, and must be filled in.

Examples of additional information needed to enrich the analysis or visualization

Label	Full name	Type
1. Aceh	Pemerintah Aceh	Pemerintah
2. Daerah	Pemerintah Daerah	Pemerintah
3. Perasi	Perasi	Supply chain
4. Tengkulak	Tengkulak	Supply chain
5. Swasta	Perusahaan Swasta	Supply chain
6. NGO	Organisasi non pemerintah	Non pemerintah

Figure 4. Filling in elements sheets in the Kumu templates

Tip Box 1. Important notes in filling in elements sheets

- Labels are basic information for analysis with Kumu. They must always be filled in and located in the first column (column A in Excel). The label is the name of the actor/stakeholder that will be displayed on the Kumu visualization map.
- Fields such as label, type etc. should always be present in the first row.
- There should be no column breaks or empty rows.

4. Filling in connections sheets

Connections in Kumu are interaction relationships between actors/stakeholders that constitute the focus of analysis. The connections sheets contain social network data in the form of an *edgelist matrix*. As survey data takes the form of an *adjacency matrix*, it needs to be converted to an *edgelist matrix*. Please refer to Tip Box 2 for how to convert matrices using a web-based matrix expander.

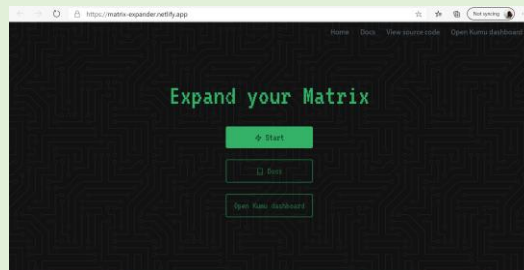
Tip Box 2. Two quick ways to convert an *adjacency matrix* to an *edgelist matrix*:

1. Through the website <https://matrix-expander.netlify.app/>

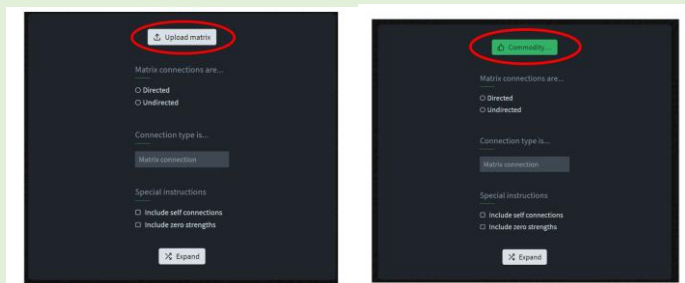
- a) Set up an *adjacency matrix* in an Excel file as shown below. Actor/stakeholder/element/label names should not contain spaces, and make sure the data position starts in the top row and the first column.

	Pusat	Daerah	Petani	Tengkulak	Sekeloa	NGO
Pusat		1	1	1	1	1
Daerah			1	1	1	1
Petani				1	1	1
Tengkulak					1	1
Sekeloa						1
NGO						

- b) Go to the website <https://matrix-expander.netlify.app/>



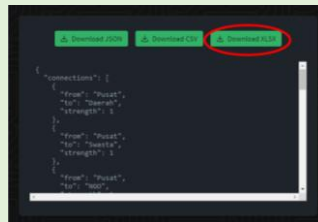
- c) Click start or drag the cursor down, then upload the Excel file by clicking **Upload matrix**. The *upload box* will turn green once your file has been uploaded successfully.



- d) Check **Directed** for matrix connections.

- e) Click **Expand**.

- f) Scroll down and download the result file, in Excel xlsx format, for example.



- g) Copy the sheet containing the converted matrix to the connections sheet in Excel for Kumu.

	A	B	C
1	From	To	Strength
2	Pusat	Daerah	1
3	Pusat	Sewasta	1
4	Pusat	NGO	1
5	Daerah	Pusat	1
6	Daerah	Sewasta	1
7	Daerah	NGO	1
8	Petani	Daerah	1
9	Petani	Tenghulak	1
10	Petani	Sewasta	1
11	Tenghulak	Petani	1
12	Tenghulak	Sewasta	1
13	Sewasta	Pusat	1
14	Sewasta	Daerah	1
15	Sewasta	NGO	1
16	NGO	Pusat	1
17	NGO	Daerah	1
18	NGO	Sewasta	1
19			
20			

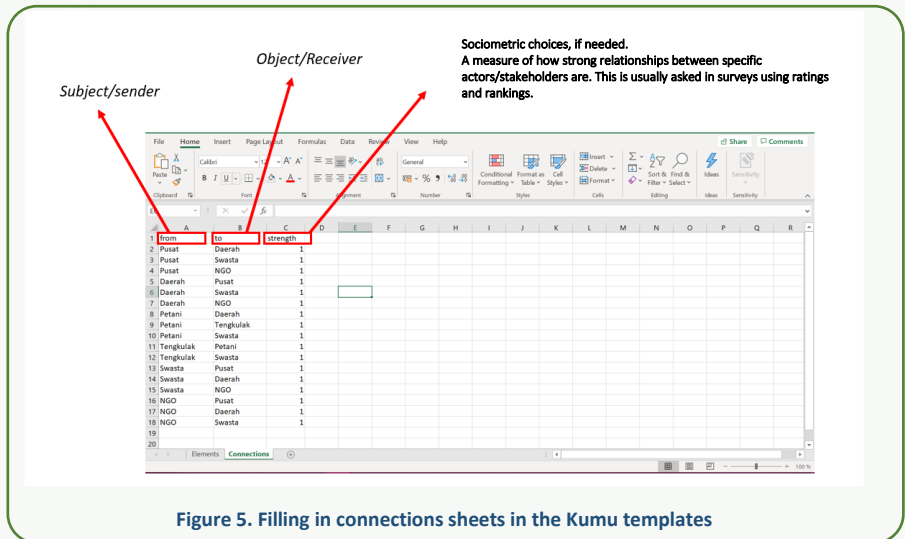


Figure 5 shows an example of filling in a connections sheet for a Kumu template. The sheet lists all data on relationships/interactions between actors/stakeholders. Data in column A under the heading **from** is the subject/sender, while data in column B under the heading **to** is the object/receiver. Strength is usually the value of sociometric choices, which usually indicates a measure of how specific the relationship between an actor/stakeholder is. Sociometric choices data are usually obtained at the time of surveys through rating or ranking questions. If needed, to enrich the analysis or visualization of an element, detailed data – such as name, type, description, tag, organization, etc. can be added in subsequent columns. Connection attributes are called fields in Kumu.

5. Analysing social network data with Kumu (via Excel file imports)

5.1. Logging in to your Kumu account

1. Open the Kumu website at <https://www.kumu.io/> through your browser and click the **SIGN IN** menu.

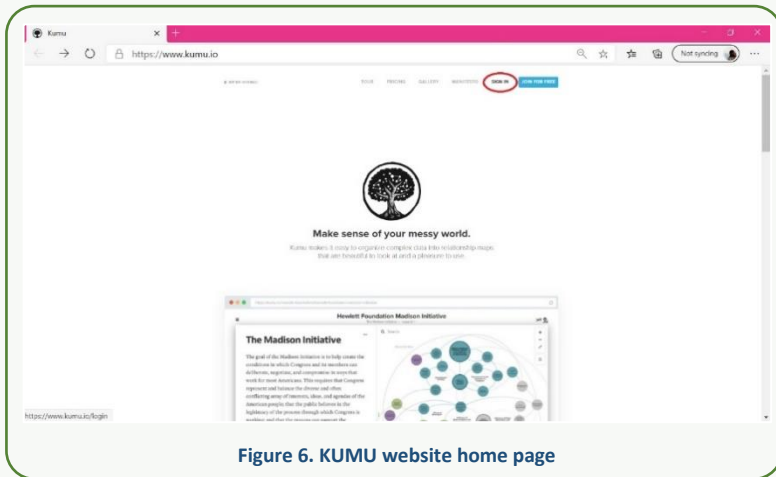


Figure 6. KUMU website home page

2. On this page, fill in your username or email address and the password you used to register, then click **Sign in**.

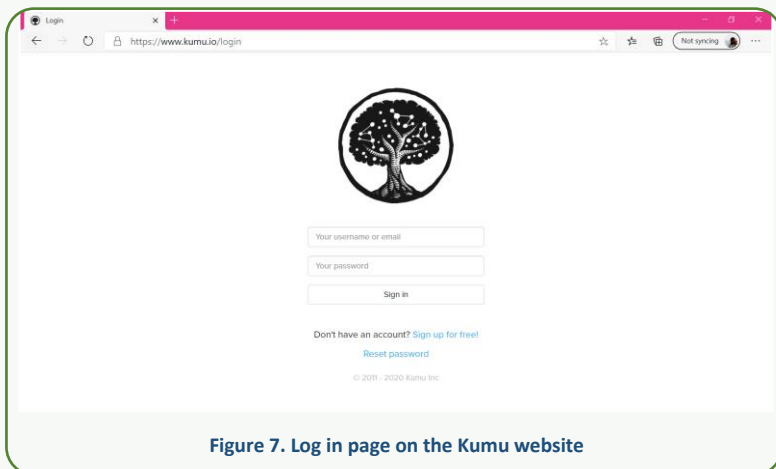


Figure 7. Log in page on the Kumu website

5.2. Creating new projects on Kumu

1. After signing in you will be connected to the **Dashboard** page of your Kumu account. Click **New Project**.

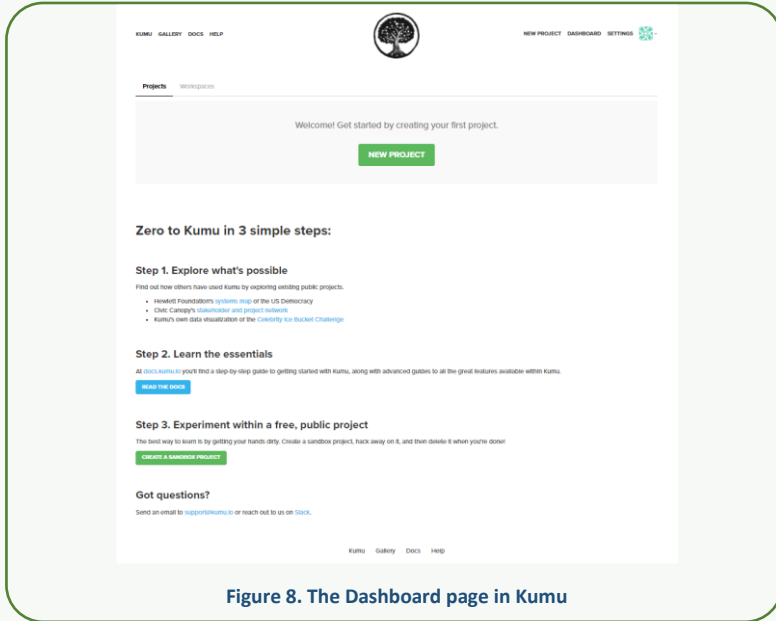


Figure 8. The Dashboard page in Kumu

2. Fill in project information in the **Project name** and **Project description** fields. Check **Public** in the pricing plan selection.

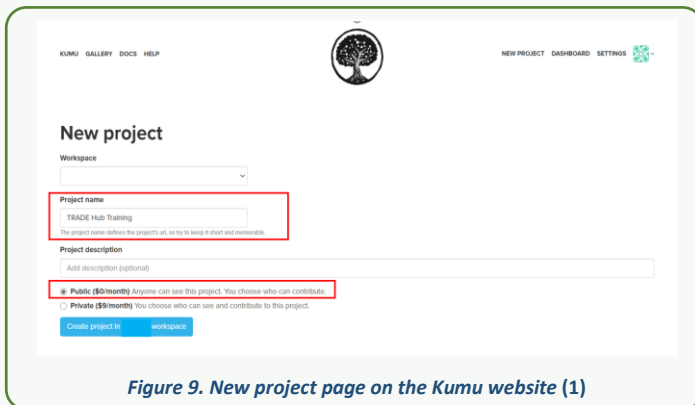
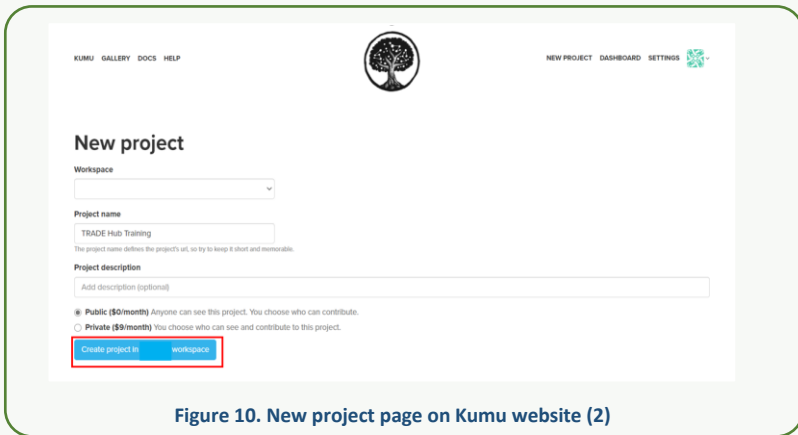
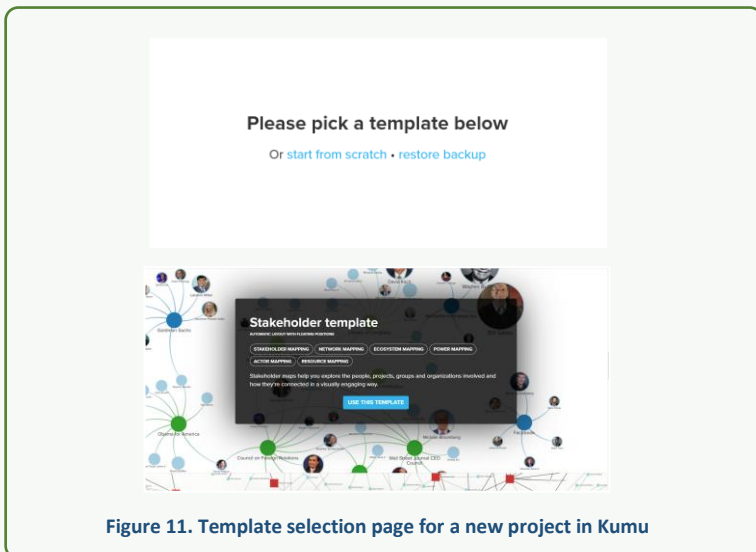


Figure 9. New project page on the Kumu website (1)

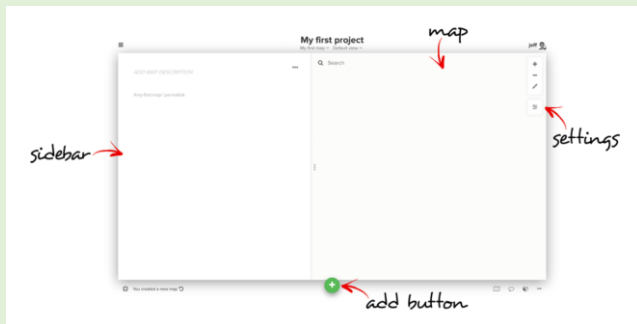
3. Click **Create project in workspace** to open a worksheet.



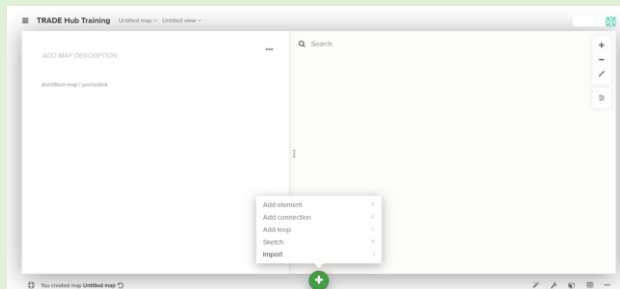
4. On the **pick a template** page, slide the cursor down and select a stakeholder template by clicking on it, then click **USE THIS TEMPLATE** to go to the Kumu worksheet. Please refer to Tip Box 3 for features in Kumu worksheets.



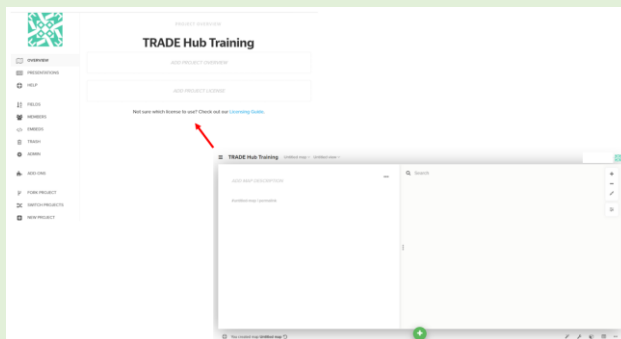
Tip Box 3. Features of a Kumu worksheet



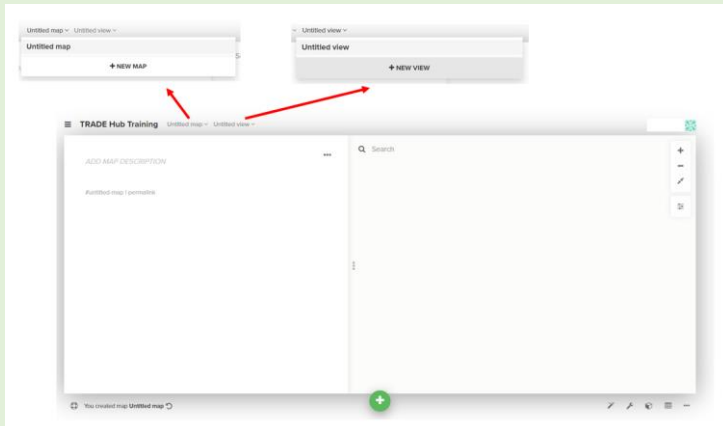
The **Add button**: For adding data to the map (element, connection, loop, sketch, import)



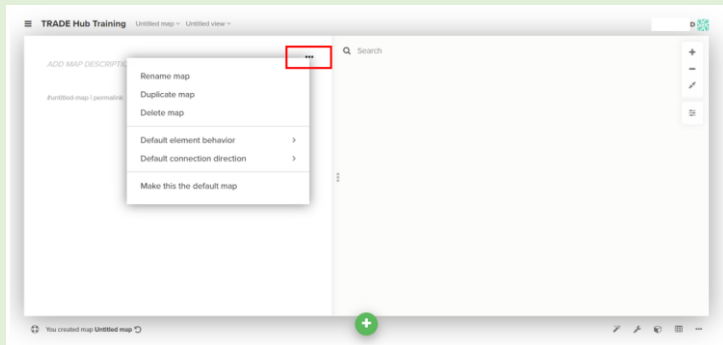
The **menu in the upper left corner**: Shows the main settings



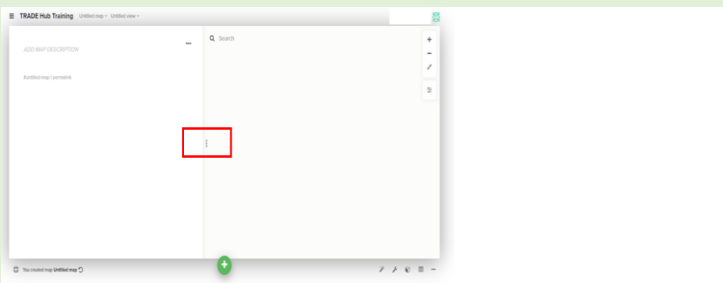
Map settings and map view in the upper left corner: For selecting map and preset visualization settings, and creating new maps or presets in the same worksheet



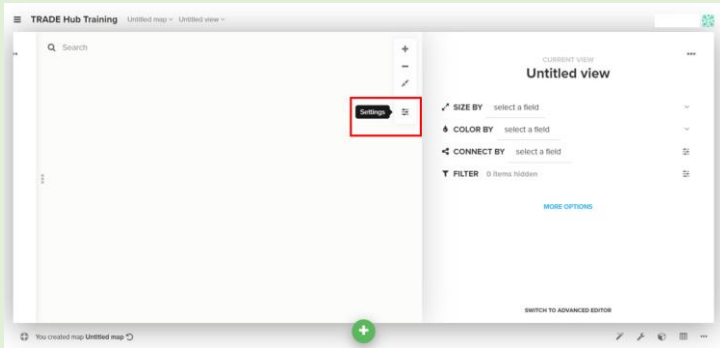
Sidebar menu: Quick options to go to map settings



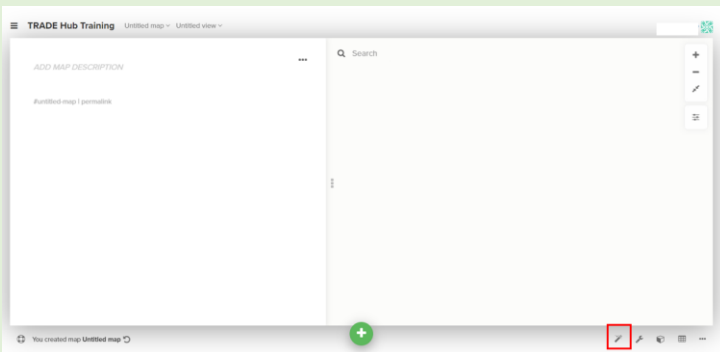
Menu in the middle of the file: For hiding the sidebar so only the map is shown



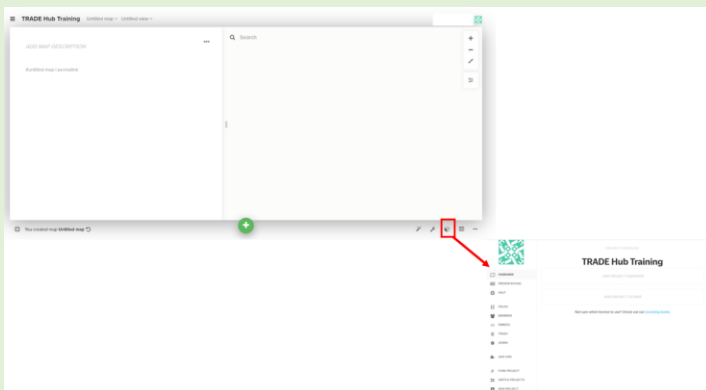
Map menu: For displaying map visualization settings



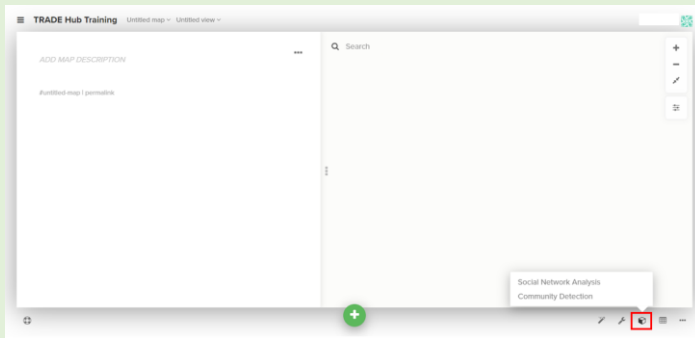
Wizard menu: Serves as a *help* menu, displaying guides and answers to FAQs



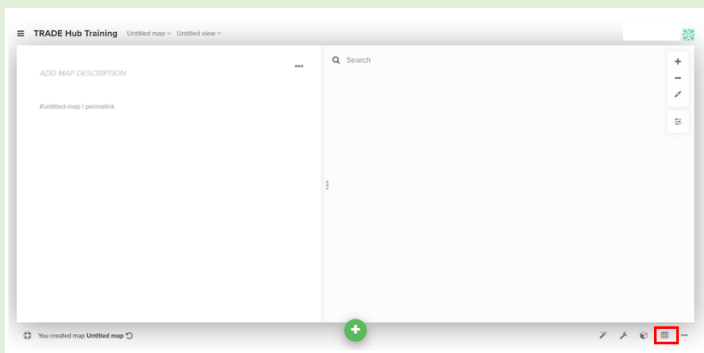
Settings menu in the lower left corner: Displays general settings



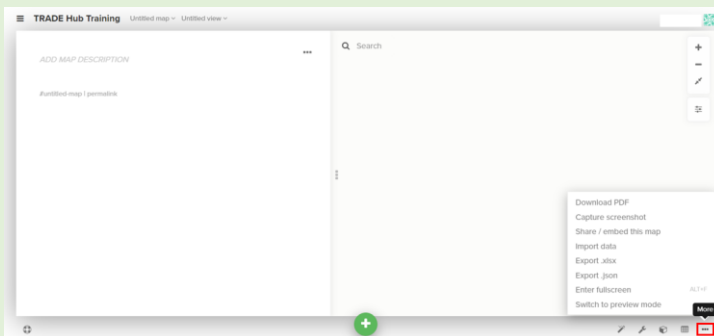
Cube icon menu: For displaying the Social Network Analysis and Community Detection menus



Tables menu: For displaying data in table/matrix form



More menu: Displays menu for exporting or importing data, fullscreen view, preview mode, etc.



6. Importing data from Excel documents to Kumu, and basic visualization settings

1. You can import data from a pre-prepared Excel file by clicking the **Add button** then **Import**.

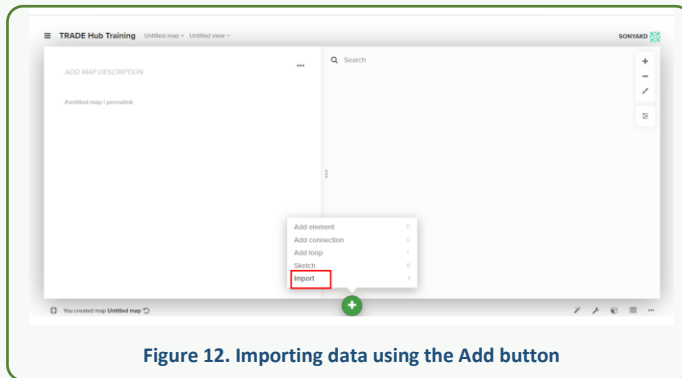


Figure 12. Importing data using the Add button

2. To import a file to Kumu, under the **Import** menu, click **Choose File**, select a file, then click **Import spreadsheet** to upload the file.

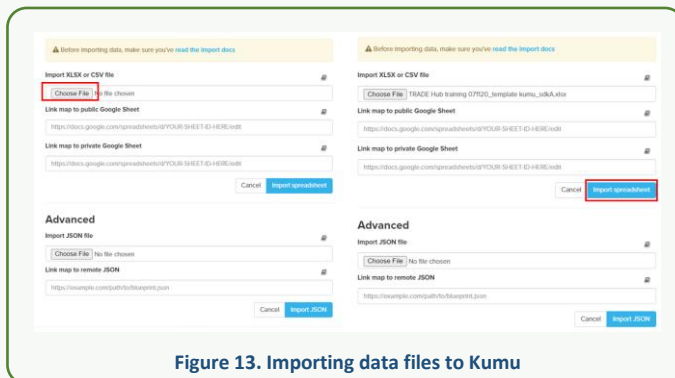


Figure 13. Importing data files to Kumu

- During the import process, Kumu will automatically review the data for errors. If no errors are found, continue the data import by clicking **Save Import**.

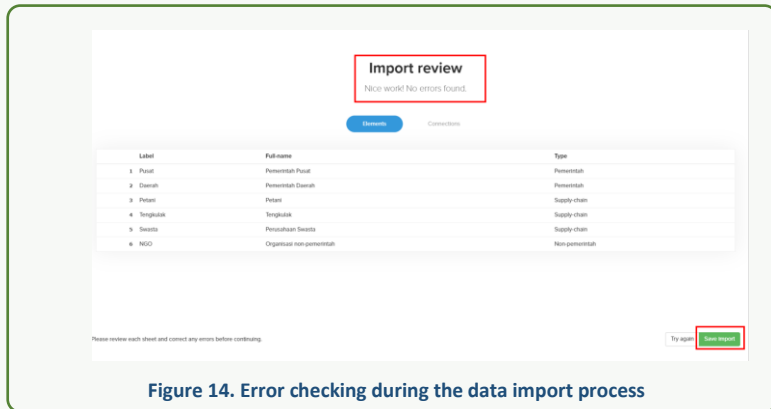


Figure 14. Error checking during the data import process

- Once the data import is complete, Kumu will automatically display a map of the social network. Click the menu on the sidebar to rename the map, then click **Submit**.

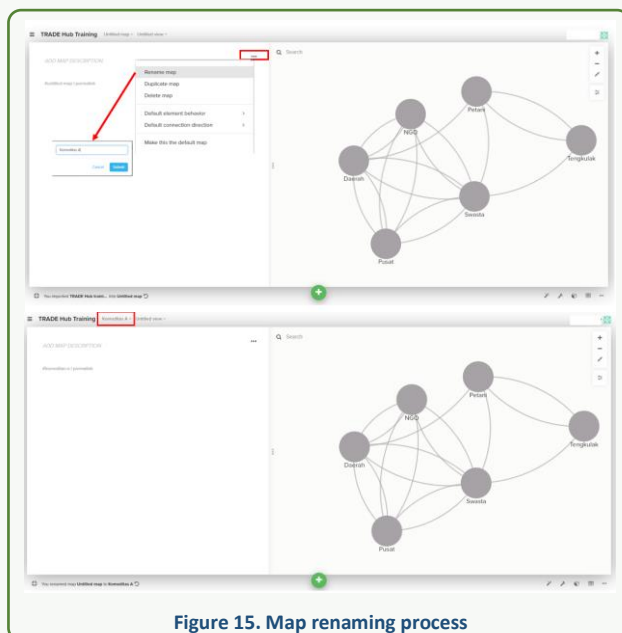
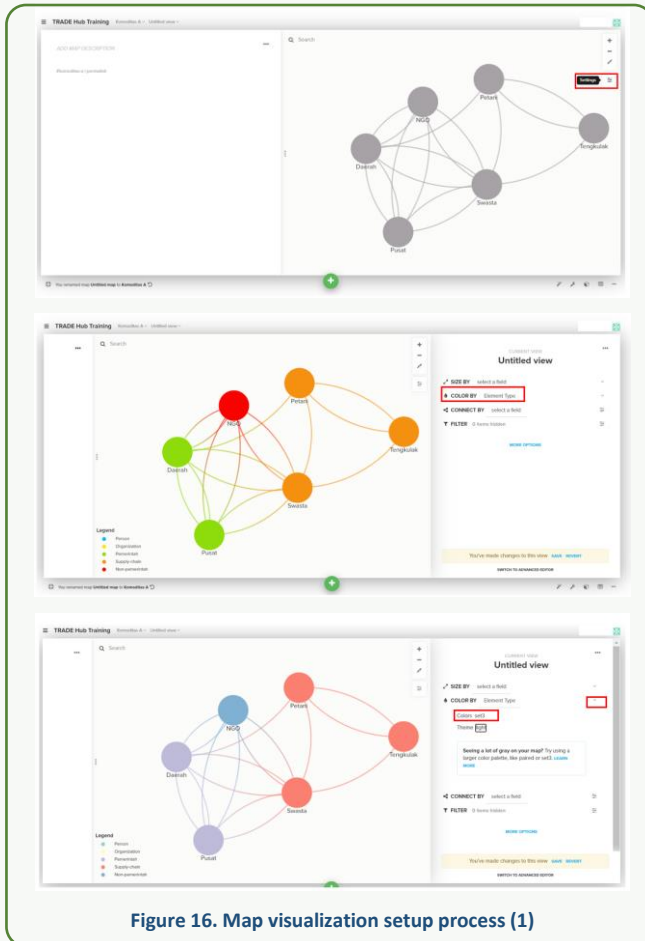


Figure 15. Map renaming process

- You can adjust the map's visualization settings by clicking the **Settings**, then **COLOR BY** and selecting **Element Type**. Click the expand selection toggle on the far right of the **COLOR BY** row and select the desired colour set. Change **Theme** to **dark** to provide better contrast, then click **SAVE** to save the settings.



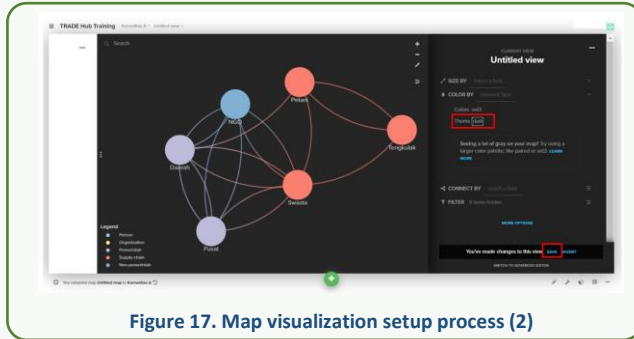


Figure 17. Map visualization setup process (2)

6. Save the map visualization as the default preset view and rename it “Default” by clicking the settings menu in the upper right corner of the screen, selecting **Rename view**, and clicking **Submit**.

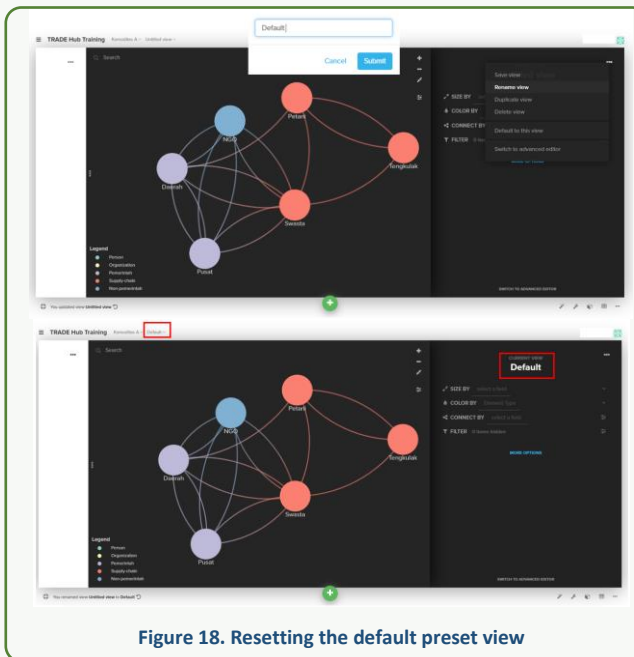


Figure 18. Resetting the default preset view

7. Centrality analyses

1. You can perform a centrality analysis by clicking the **Cube** icon in the lower right corner, selecting **Social Network Analysis** and moving your cursor to the sidebar.

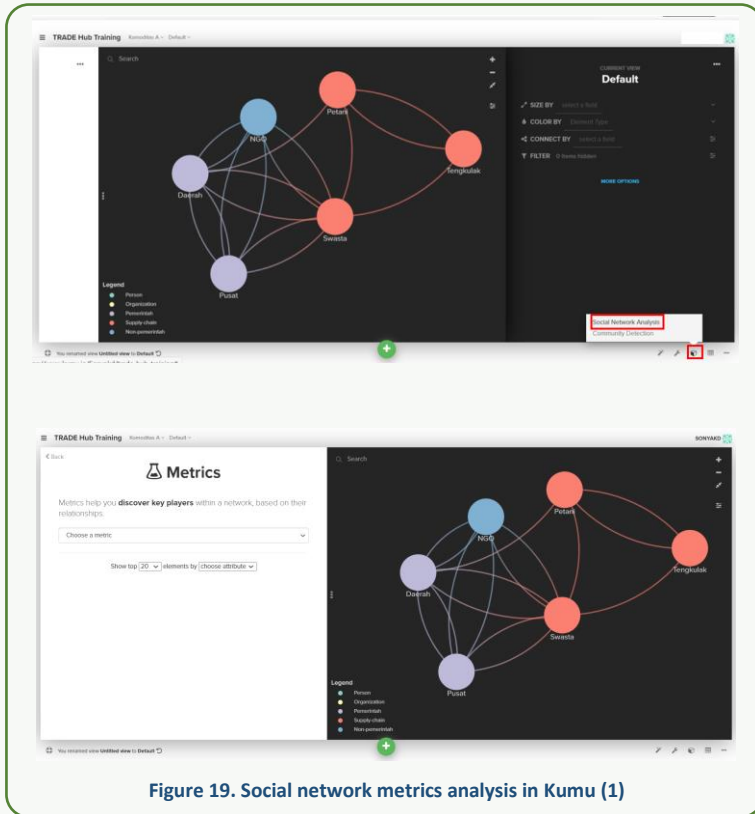


Figure 19. Social network metrics analysis in Kumu (1)

- Click **Choose a metric**, for example, **Degree**, then click “**Discover the connectors / hubs**” to run automatic calculations. Then copy the resulting degree centrality calculation table to another document.

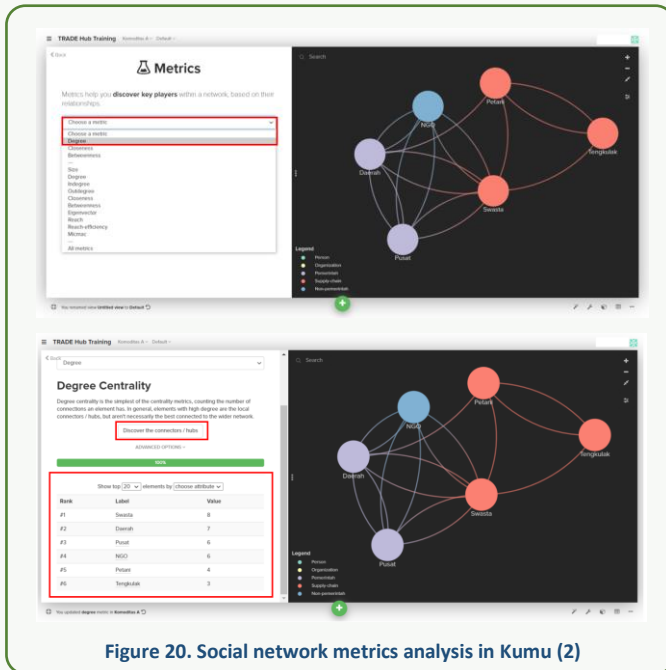


Figure 20. Social network metrics analysis in Kumu (2)

- Repeat steps 1 and 2 to calculate the other metrics, namely closeness and betweenness centrality.

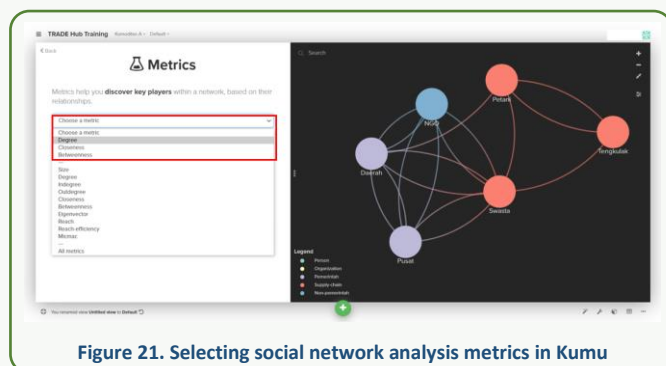


Figure 21. Selecting social network analysis metrics in Kumu

8. Setting visualizations of centrality analysis results to aid interpretation

1. After the three centralities have been analysed, click **Settings** then the left corner menu under **Settings**, and select **Duplicate view** to create different views with the same basic settings. Change the name to “Degree centrality” and click **Submit**.

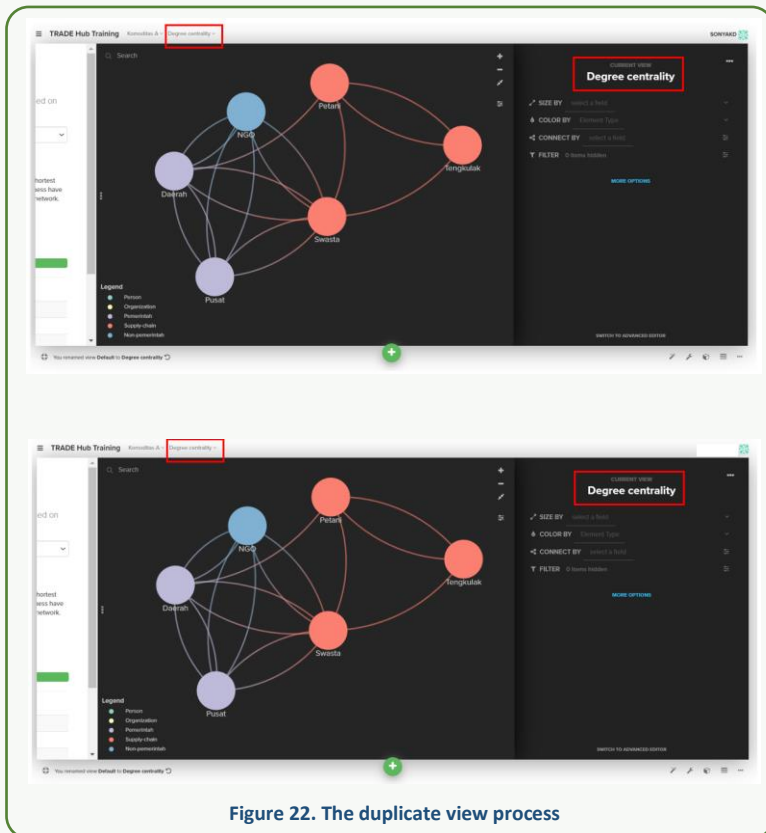
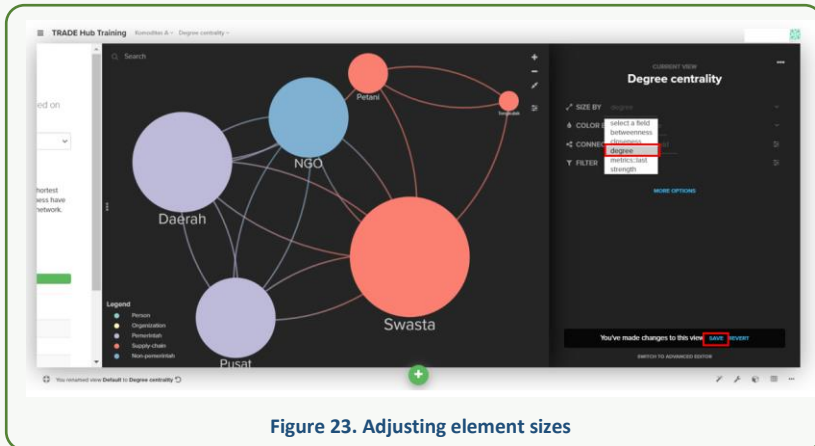


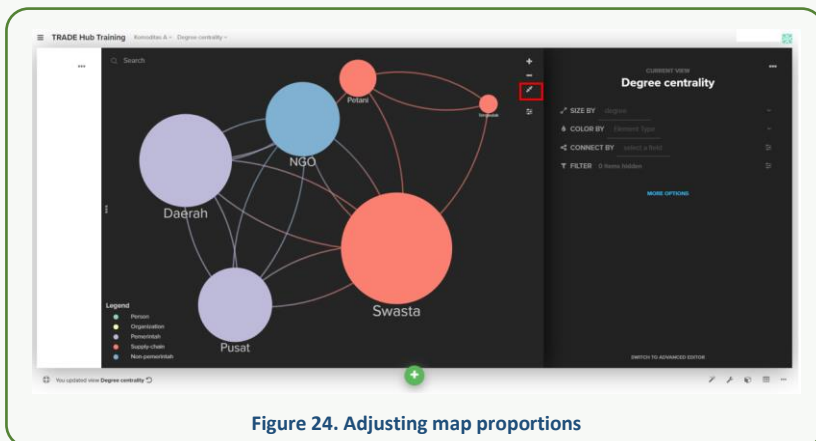
Figure 22. The duplicate view process

- Once the view is saved with a new name, click **SIZE BY** in the settings and select **degree**. This will adjust the size of elements on the map to accord with their degree centrality values. Click **SAVE**.

This visualization makes element size representative of degree centrality value.

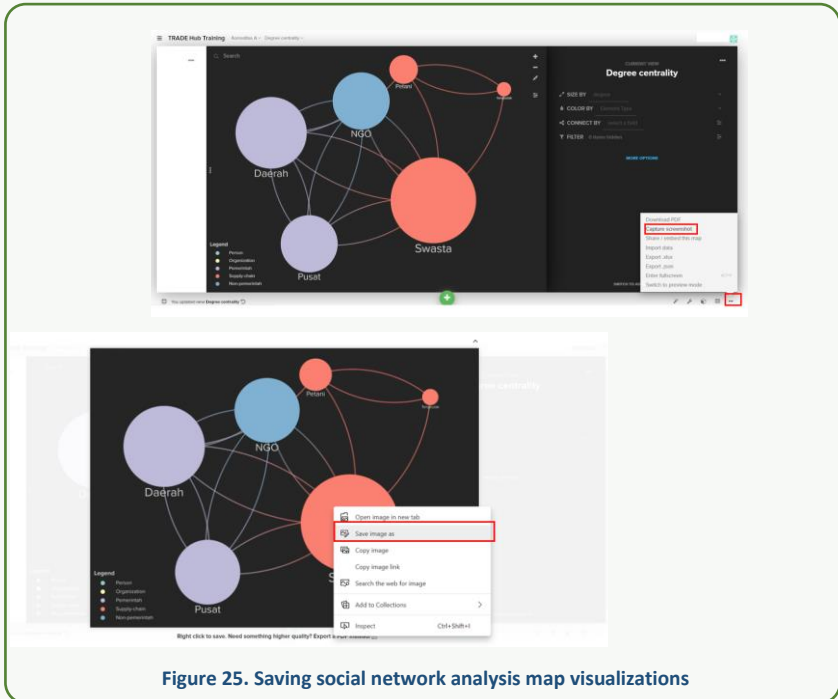


- Click **Zoom to fit** to ensure appropriate proportions for the map view.



4. To save the map view as a Figure file, click the **More** menu in the lower right corner, select **Capture screenshot**, then right-click and click **Save image as**.

You can also save the map view as a .pdf file by clicking the **More** menu and selecting **Download PDF**.



5. Repeat steps 1–4 for closeness and betweenness centrality results.

9. Examples of visualization and interpretation of social network analysis results using Kumu

Examples of social network analysis visualizations for actors involved in the governance of Commodity A are shown below.

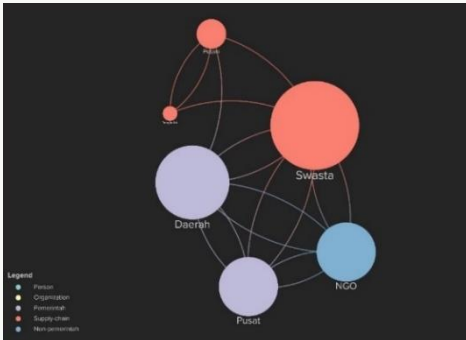


Figure 26. Social network analysis visualization map depicting degree centrality

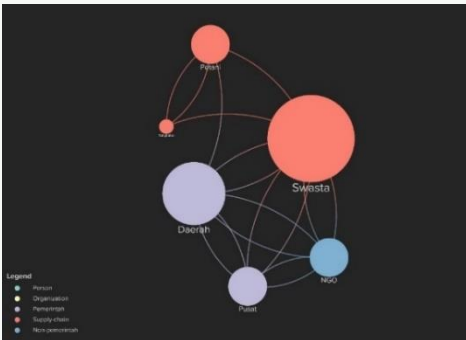


Figure 27. Social network analysis visualization map depicting closeness centrality

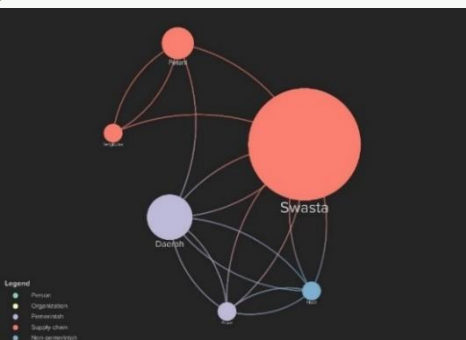


Figure 28. Social network analysis visualization map depicting betweenness centrality

Table 1. Degree, closeness and betweenness centrality calculation results

Degree centrality			Closeness centrality			Betweenness centrality		
Rank	Label	Value	Rank	Label	Value	Rank	Label	Value
#1	Swasta	8	#1	Swasta	1	#1	Swasta	0.350
#2	Daerah	7	#2	Daerah	0.900	#2	Daerah	0.100
#3	Pusat	6	#3	Pusat	0.800	#3	Petani	0.050
#4	NGO	6	#4	Petani	0.800	#4	Pusat	0
#5	Petani	4	#5	NGO	0.800	#5	Tengkulak	0
#6	Tengkulak	3	#6	Tengkulak	0.700	#6	NGO	0

The social network analysis results examples identify private companies as highly important actors in the network as they act as local connectors, spreaders/sensors, and brokers/bottlenecks. All actors in the network have good connectivity, except farmers and brokers. All actors have sufficient proximity in the dissemination of information within the network. Private companies, local governments and farmers are key actors in the successful flow of information in the network.

Tip Box 4: Guide to interpreting degree, closeness and betweenness centrality values

Metric	Interpretation
Degree centrality	Identify the local connector/hub Shows the number of relationships that an element has. In general, elements with high degree scores are well connected within the network, but are not necessarily the highest in the wider network.
Closeness centrality	Identify the spreader/sensor Shows the distance of one element to another. Indicates the proximity of an element to other elements in the network. In general, elements with a high closeness value can spread information into the network more easily and have a high tendency to be able to know what is happening in the network.
Betweenness centrality	Identify brokers/bottlenecks Measures the number of times an element is between relationships between two other elements. In general, elements with a high betweenness value have more control over the flow of information and act as key links in the network. A high betweenness value also indicates that the element can be a point that supports the failure of information flow in the network.

Further information on setting up visualizations and other features in Kumu can be accessed via the following link: <https://docs.kumu.io/>.

UCINET and NetDraw

TABLE OF CONTENTS

1. UCINET AND NETDRAW INSTALLATION TUTORIAL	65
2. FEATURES AND TOOLS IN UCINET AND NETDRAW	68
2.1. UCINET WORKSHEETS	68
2.2. NETDRAW WORKSHEETS	69
3. INPUTTING RELATIONSHIP DATA	71
3.1. FULL MATRIX	71
3.1.1. Nodelist	72
3.2. EDGELIST	72
3.2.1. Entering actor attribute data	74
3.2.2. Data transformation	75
4. WHOLE NETWORK ANALYSES	76
4.1. NETWORK DENSITY	76
4.2. CLIQUES	78
4.3. DEGREE CENTRALITY	80
4.4. BETWEENNESS CENTRALITY	81
4.5. EIGENVECTOR CENTRALITY	82
5. EGO NETWORK ANALYSES	84
5.1. BROKERAGE	84
6. CREATING SOCIOGRAMS USING NETDRAW	86
6.1. WHOLE NETWORK VISUALIZATIONS	86
6.2. EGO NETWORK VISUALIZATIONS	87
6.3. CHANGING THE APPEARANCE OF LINES/EDGES/LINKS THAT CHARACTERIZE RELATIONSHIPS	88
6.4. CHANGING THE APPEARANCE OF NODES (ACTORS) ..	89

Training materials

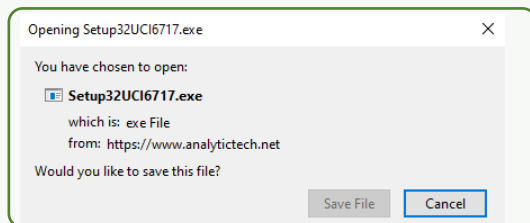
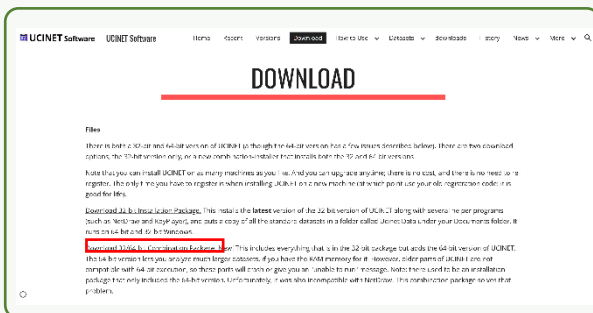
ipb.link/tradehub-ucinet

1. UCINET and NetDraw installation tutorial

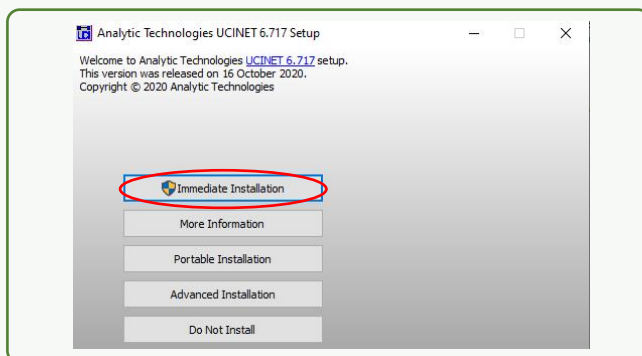
UCINET is a social network data processing program created by United States-based software company Analytic Technologies. The program was developed by Lin Freeman, Martin Everett and Steve Borgatti, and was first released as UCINET version 4.0 in 1992. At the

time of writing, the most recent iteration of UCINET is version 6.742. UCINET can be downloaded for free from a page provided by Analytic Technologies at <https://sites.google.com/site/ucinetsoftware/download>. The page also provides tutorials on using this software.

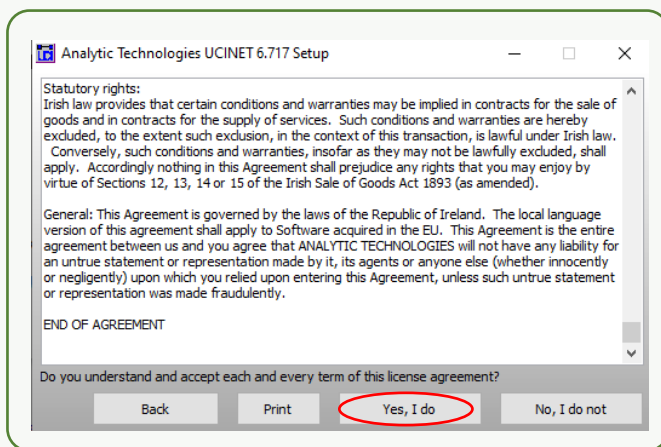
Select the latest version of the UCINET program from the **Versions** bar at the top of the page, and click **Download**. When the setup dialogue box appears, click **Save File** to download the UCINET execution file.



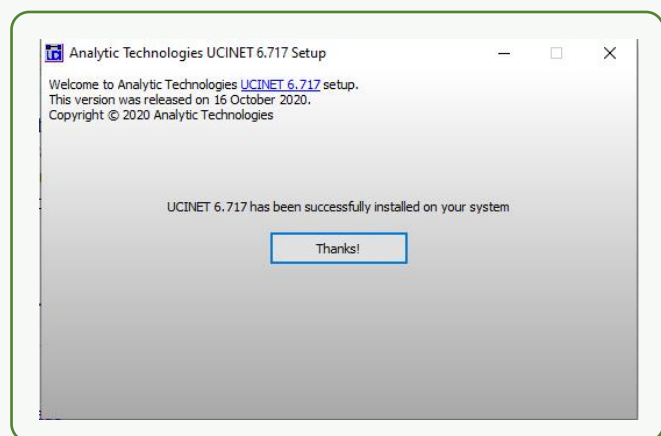
Once the download is complete, click the UCINET document to perform the installation. Click the **Immediate Installation** button. When the next dialogue box appears, select **Yes**.



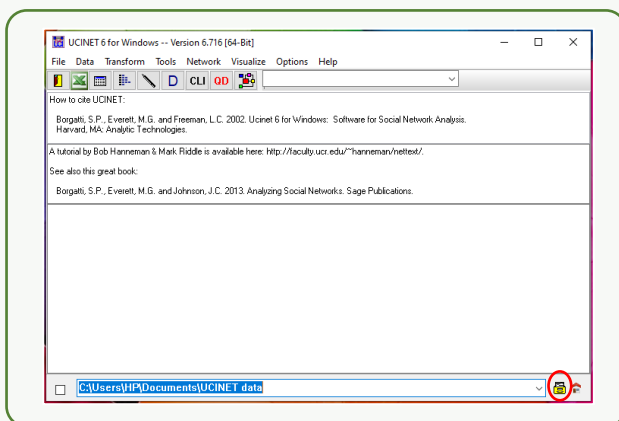
The Setup dialogue box will pop up as below. Please read the terms and conditions, if you agree to the installation process, select **Yes, I do**. The installation process will take a few minutes to complete.



Once installation process is complete, the following notification will appear. Click **Thanks!**.



To manage the storage of documents generated by the UCINET program, select **Set Default Folder** from the menu that appears when you click the storage icon in the lower right corner. Select your desired storage folder to ensure all UCINET analysis result documents are stored in the same folder.



The free UCINET download is a 60-day trial version with no registration number. Paid versions with registration numbers are also available for purchase. For information on prices and available versions, click on the **Purchasing** bar at the top of the page. The only difference between the trial and paid versions of UCINET is their period of validity.

As NetDraw has become an integral part of the UCINET program, it does not require a separate installation.

2. Features and tools in UCINET and NetDraw

2.1. UCINET worksheets

UCINET is an easy-to-use social network data processing program. Once you have successfully installed the program, you can click the UCINET icon to bring up the display shown below.

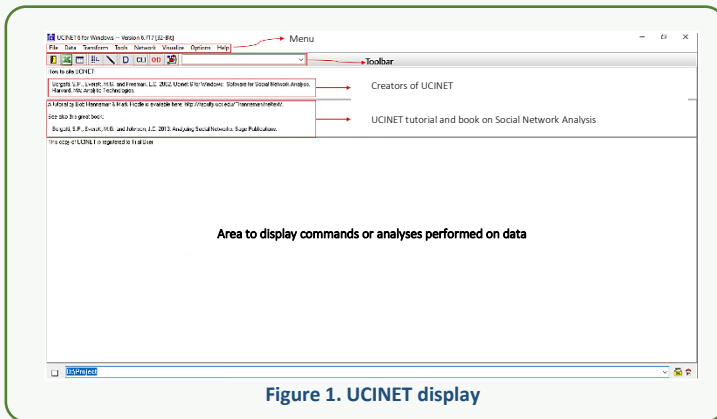


Figure 1. UCINET display

The most commonly used menu in conducting network analyses is the **Network** menu, which allows analyses of whole and ego networks. The UCINET worksheet **toolbar** shown below makes it easier for users to input and process data.

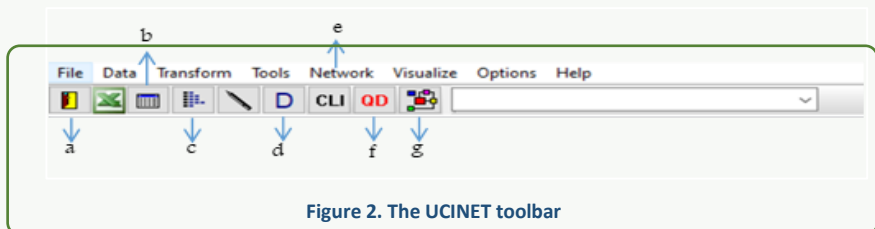



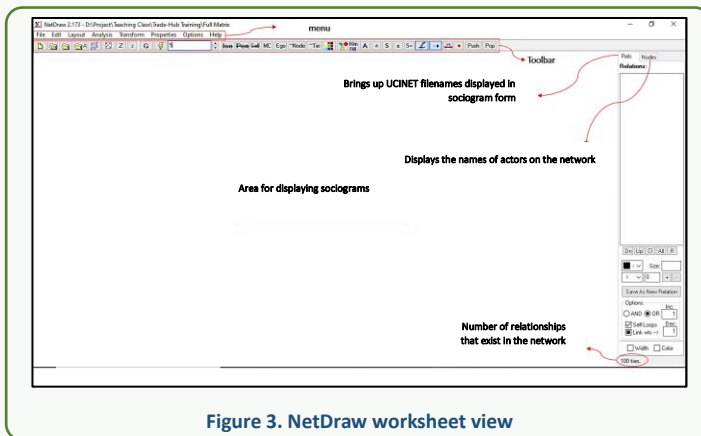
Figure 2. The UCINET toolbar

- a. **Exit:** To exit UCINET
- b. **Matrix editor:** For inputting data on attributes for each actor in a network
- c. **DL editor:** For inputting data on relationships between actors produced by researchers. Data inputting can be done directly in the DL editor box, or copied and pasted from Microsoft Excel.

- d. **Open datasets:** For opening files saved in dataset format.
- e. **Network:** For displaying different social network analyses
- f. **Quickstart:** For opening dataset files and displaying them in the form of sociograms
- g. **NetDraw:** For displaying NetDraw software spreadsheets

2.2. NetDraw worksheets

NetDraw is a program for displaying social network data analysis results in the form of sociograms. Developed by Borgatti, NetDraw is integrated with the UCINET program. You can open a NetDraw worksheet by clicking the  icon in UCINET.



The most frequently used menus in NetDraw are the **File**, **Analysis** and **Properties** menus. The use of these menus is explained in sub-chapters below.

NetDraw provides a toolbar that allows users to modify the appearance of sociograms.

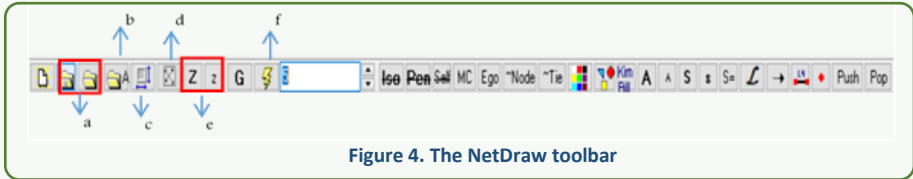


Figure 4. The NetDraw toolbar

Icons on the NetDraw toolbar function to:

- a. **Open UCINET network dataset:** For opening relationship files saved in UCINET dataset format
- b. **Open UCINET attribute dataset:** For opening actor attribute files saved in UCINET dataset format
- c. **Resize to fill area:** For adjusting the size of sociograms to the size of the NetDraw page
- d. **Move all points:** Provides a menu for rotating a figure, zooming in and out, adjusting the position of a figure to the NetDraw page, and changing the network view
- e. **Zoom in – Zoom out:** For zooming in and out of a sociogram figure
- f. **Kawai:** Functions to display different forms of figures.

3. Inputting relationship data

UCINET use is generally divided into three types: Data entry (inputting); network data analysis; and creating sociometric figures using NetDraw. At this stage the data obtained is entered in numerical form (usually in nominal or ordinal measurement scales). Data entry can be done through facilities in UCINET, or using other software such as Microsoft Excel and copying into UCINET. Files analysed by this software will be saved as datasets. An important consideration when inputting data into UCINET is the data format used. The three most widely used formats are Full Matrix, Nodelist, and Edgelist. The direction of data must also be considered in the data entry process, as in relationships there are actors who act as subjects (active) and others who act as objects (passive).

3.1. Full Matrix

This format is created in the form of a rectangular matrix in which actors are positioned in rows and columns. Actors are paired with others based on their relationships. The number 0 indicates no relationship, while the number 1 indicates the existence of a relationship. Actors acting as subjects are positioned in rows, while those acting as objects are placed in columns. This binary format for relationship data is widely used to perform various network analyses in UCINET.

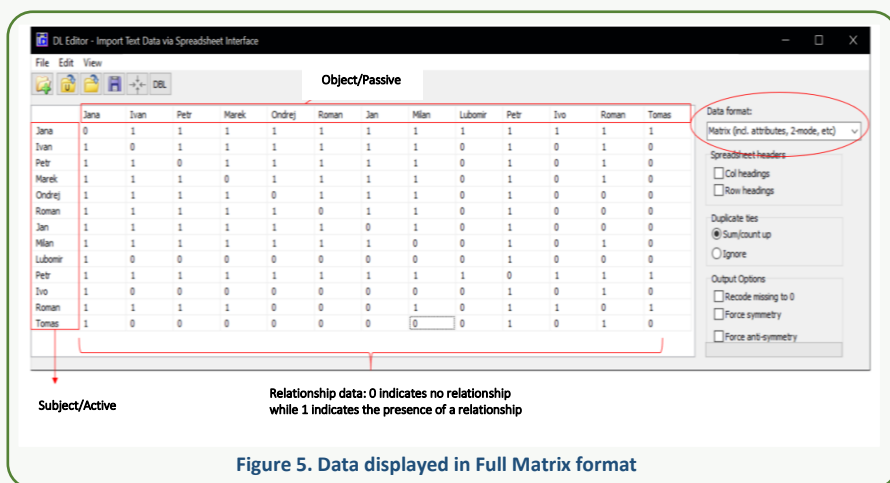


Figure 5. Data displayed in Full Matrix format

3.1.1. Nodelist

This format is created by creating a list of actors (nodes) and their relationships. The names of actors and their relationships with other actors are written horizontally. The advantage of using this format is that the possibility of actors being left out or overlooked during data entry can be avoided. Consequently, this format is often used if there are large numbers of actors. The downside to this format is that it cannot display values for relationships.

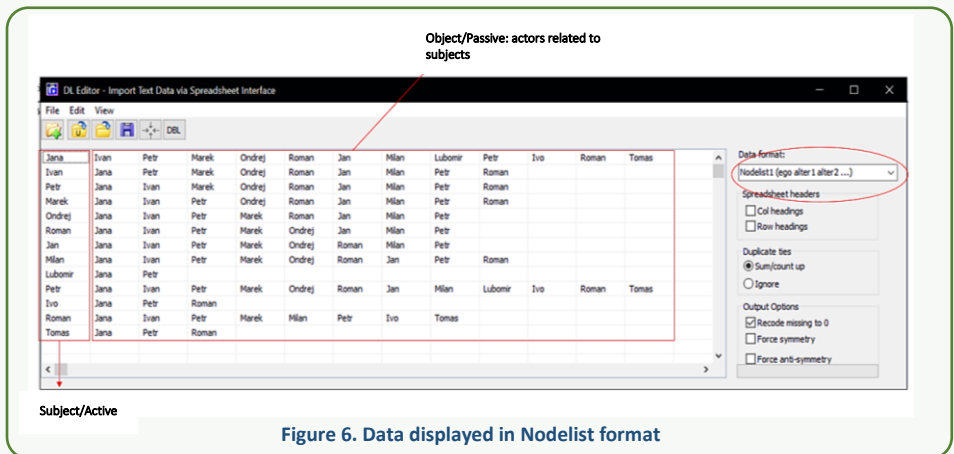


Figure 6. Data displayed in Nodelist format

Actors playing roles as subjects are placed in the first column, while those playing roles as objects are placed in the second and subsequent columns. The disadvantage of this format is that values of relationships between actors cannot be displayed.

3.2. Edgelist

This format is similar to Nodelist, the difference being that actors' names and relationships with other individuals are written vertically (one per row). The advantage of using this format is that we can list large numbers of actors and display relationship values. Actors playing roles as subjects are listed in the first column, while those playing roles as objects are listed in the second column. This format only lists related actors, so if data is in nominal scale form, only the number 1 will be displayed. Numbers with ordinal scales, like those in Figure 7, show the strength of relationships between actors.

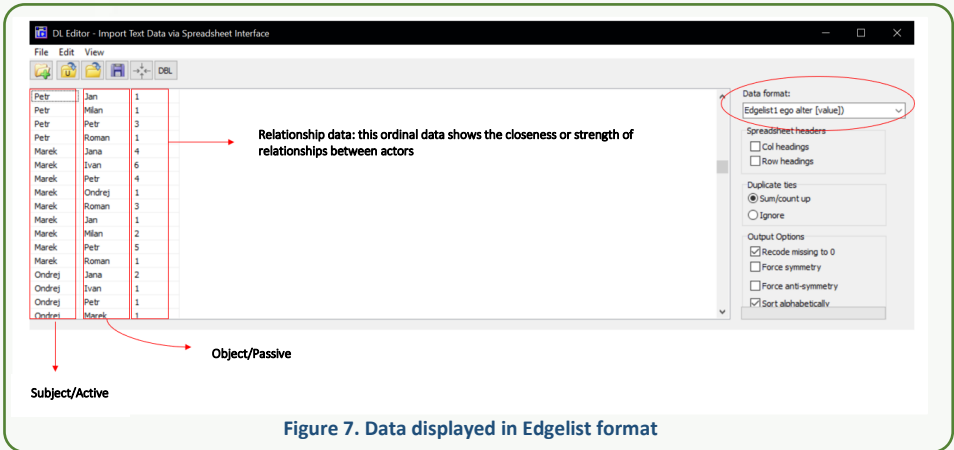


Figure 7. Data displayed in Edgelist format

Once familiar with the formats used in UCINET, you can choose the one most applicable to your needs for the data entry process. Inputting data in UCINET starts by clicking the **DL Editor** (DL) icon on the toolbar, after which the DL Editor spreadsheet will appear (Figure 8). The data entry process can be carried out either by copying data from Excel using Ctrl + C in the Excel file and Ctrl + V in the DL Editor spreadsheet, or clicking **Paste** under the **Edit** menu. Select the appropriate data format in the **Data Format** field on the right side of the spreadsheet. If the data being entered is in matrix form, you should select the matrix data format in the same field.

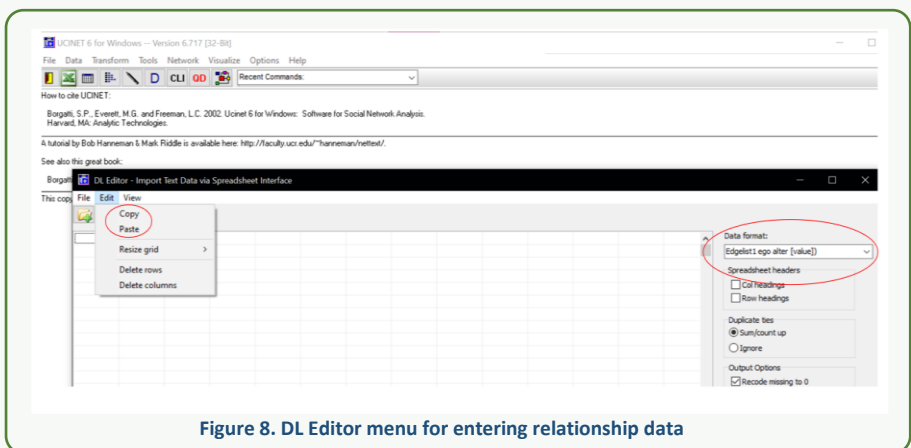





Figure 8. DL Editor menu for entering relationship data

Once all data has been entered, click the  icon to finalize data entry. Save the entered data by clicking the **File** menu and selecting **Save UCINET Dataset**, or by clicking the  icon and selecting the desired storage folder. To check the data entered is correct and the UCINET format it has been saved in, select the **Open Dataset** () icon to display the data in text form (Figure 9).

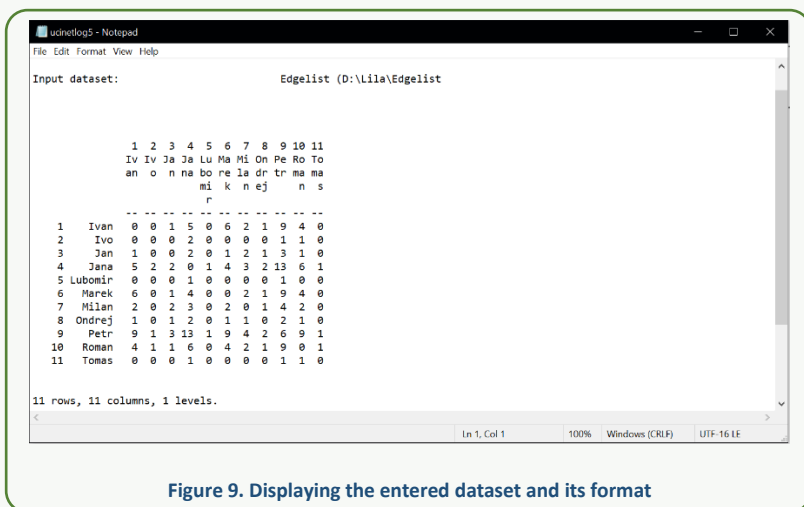



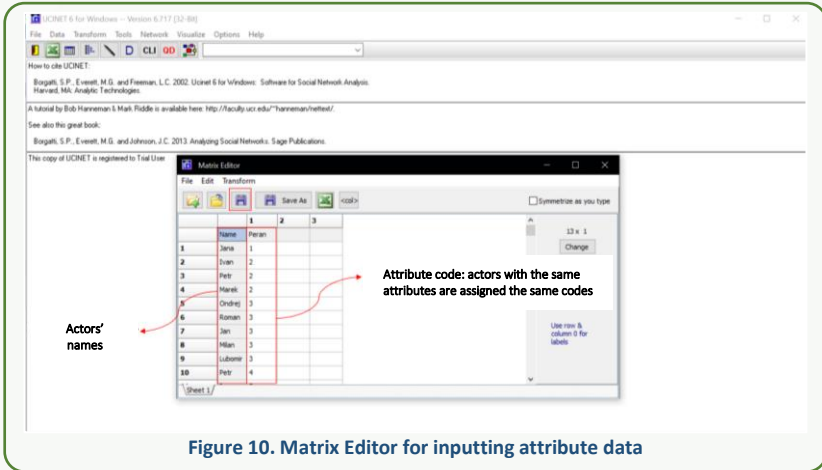


Figure 9. Displaying the entered dataset and its format

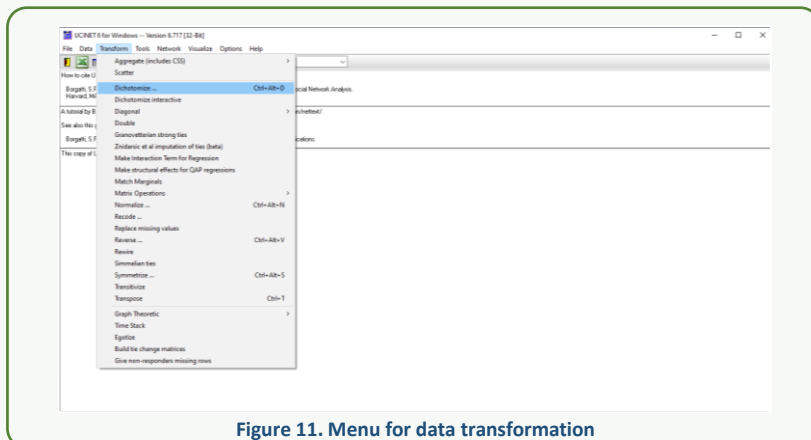
3.2.1. Entering actor attribute data

UCINET can also be used to analyse relationships between actors by attribute, such as age, gender, position, regional origin, etc. Attribute data entry begins by typing actors' names in the first column and their attributes in the next column. Each attribute must be coded as UCINET can only process data in numeric form. To enter actor attributes, click the **Matrix Editor** () icon, and enter the attribute data into the available fields. Actor attributes can either be typed directly in the **Matrix Editor**, or copied and pasted from Excel. If the data comes from an Excel file, click the  icon and find the file to analyse. Data copied from the Excel file can be entered by clicking the **Edit** menu and selecting **Paste**, or by using Ctrl + C and Ctrl + V commands. Once data entry is complete, click the  icon to save the file.



3.2.2. Data transformation

A number of network analysis calculations require certain data requirements. For example, the calculation of network density requires dichotomous/binary data. If the data we have is ordinal/ranking data, a process is necessary to transform the data to match conditions required by the calculation. UCINET provides a menu to transform valued (ranking) data into binary data.



Under the **Transform** menu, select **Dichotomize** for a dialogue box to appear (Figure 12). Next, enter data values in the **Input dataset (X)** field and select the storage location in the **Output dataset (Y)** field.

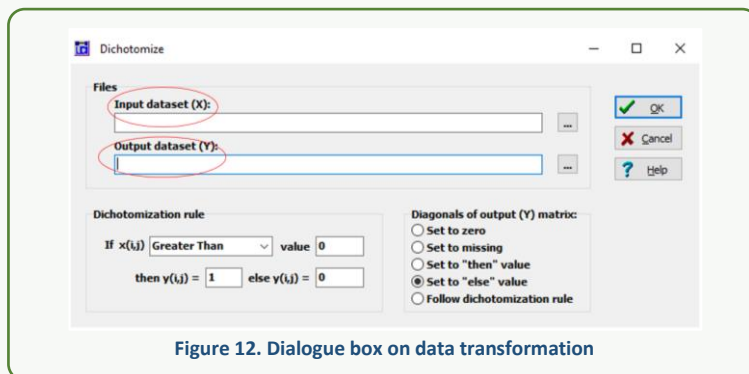


Figure 12. Dialogue box on data transformation

4. Whole network analyses

Whole network analyses discussed in this section are structural analyses of network density, centrality (the positions of actors in relation to others), and cliques.

4.1. Network density

Network density is the ratio between the number of bonds present (actual) and the number of bonds that arise when all actors in the network relate to each other (potential). For such analyses, data must be binary (0 and 1) showing the presence or absence of relationships between actors. We can perform a network density analysis by clicking the **Network** menu and selecting **Whole network & cohesion, Density and Density Overall** (Figure 13).

When the dialogue box appears, enter the file for analysis in the **Network Dataset:** field and select a storage folder for analysis results in the **Output densities:** field (Figure 14).

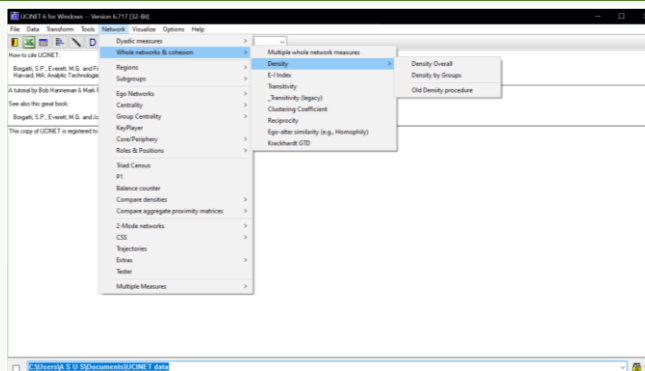


Figure 13. Menu for analysing network density

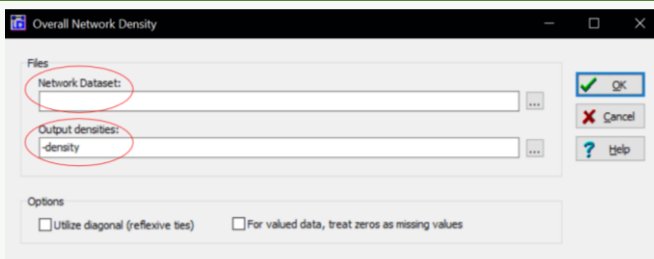


Figure 14. Network density analysis dialogue box

Figure 15 shows the results of a network density analysis in UCINET. The data shows an average network density of 0.641, or 64.1%, indicating the network having a relatively low density where many actors or members of the network have no relationships or are even unfamiliar to each other.

DENSITY / AVERAGE MATRIX VALUE

Input dataset: Matrix (D:\Lila\Matrix)
Output dataset: Matrix-density (D:\Lila\Matrix-density)

	1	2	3	4	5
	Density	No. of	Std Dev	Avg Deg	Alpha
		Ties		ree	
1 Matrix	0.641	100	0.480	7.692	0.959

1 rows, 5 columns, 1 levels.

Figure 15. Network density analysis results

4.2. Cliques

A clique is a grouping of actors in a network where all actors in the group interact with each other. To identify cliques in a network, click the **Network** menu and select **Subgroups**, then **Cliques**.

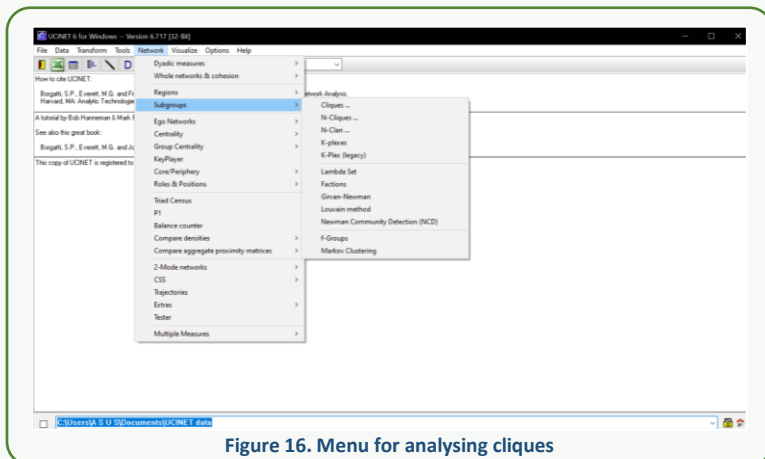


Figure 16. Menu for analysing cliques

When the dialogue box (Figure 17) appears, enter the file to be analysed in the **Input dataset:** field. In the second field, enter the minimum number of members per clique. If we choose three, then only cliques with three or more actors will be displayed. The next step is to select a storage location folder for each output.

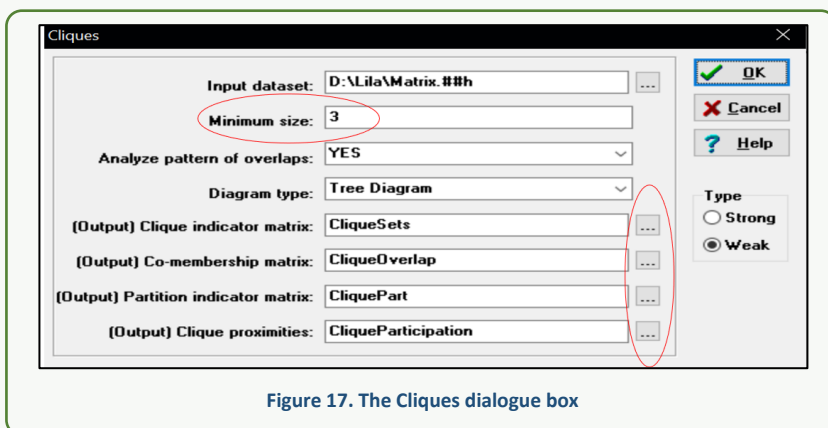


Figure 17. The Cliques dialogue box

Analysis results in Figure 18 show five cliques comprising at least three actors existing in the network. Actors can be members of more than one clique. This analysis identifies Jana and Petr_Ne as actors having strong relationships with various actors since they are members of all five cliques. They also have potential to be liaisons between actors from different cliques.

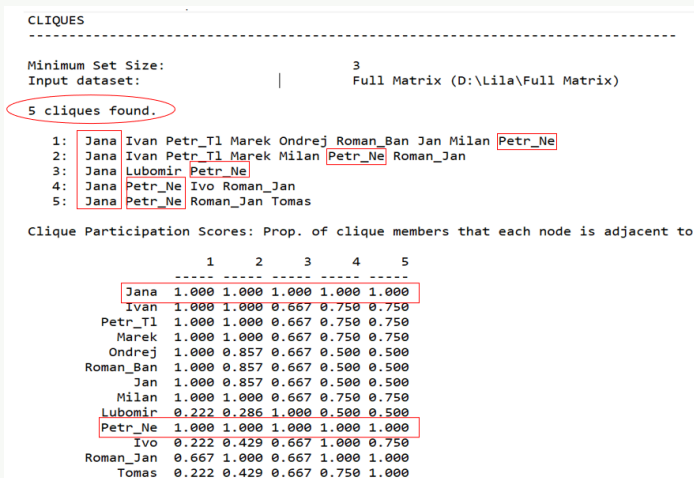


Figure 18. Analysis results showing numbers and members of cliques in the network

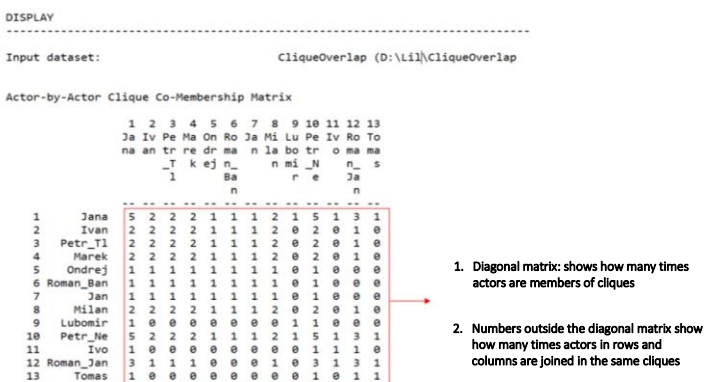


Figure 19. Clique analysis results by actor

4.3. Degree centrality

The results of this analysis show the number of relationships between ‘out degree’ and ‘in degree’ actors. Actors with the highest degrees of centrality are popular actors in social networks as they have the highest numbers of relationships with other actors. To perform a degree centrality analysis in UCINET, click the **Network** menu, and select **Centrality**, then **Degree**.

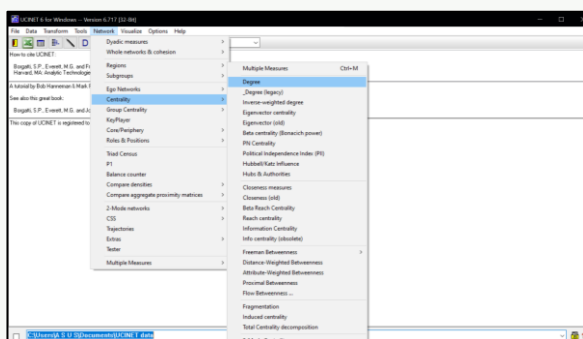


Figure 20. Menu for analysing degree centrality

The command will bring up a dialogue box like the one in Figure 21. Next, enter the file to be analysed in the **Input Network:** field and select the output storage location in the desired folder.

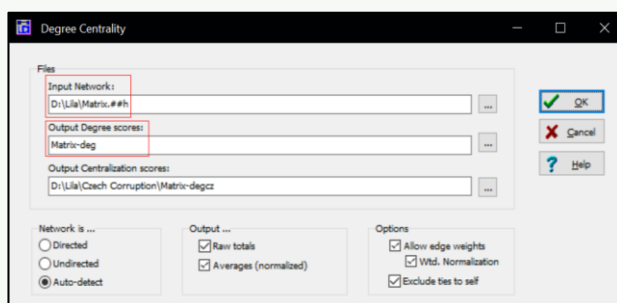


Figure 21. Degree centrality analysis dialogue box

Analysis results in Figure 22 below show Jana and Petr_Ne having relationship values of 12 and degree centrality degree values of one, meaning both actors have relationships with all actors in the network. Therefore, Jana and Petr_Ne are central actors with potential to accelerate the dissemination of information or resources to other actors in the network.

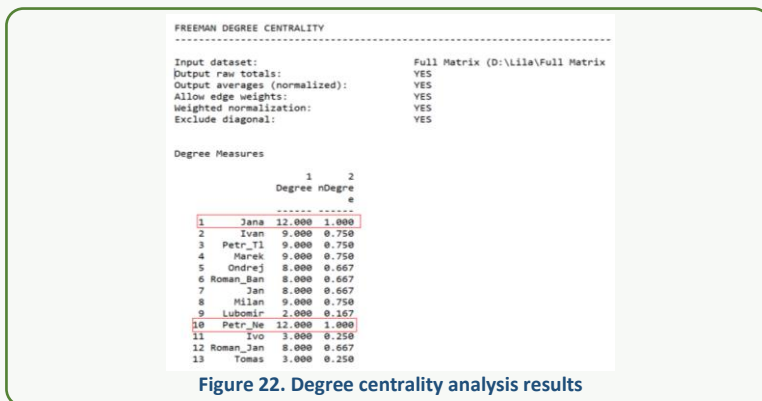


Figure 22. Degree centrality analysis results

4.4. Betweenness centrality

Betweenness centrality analyses show actors' positions as intermediaries in relationships between other actors in a network. Actors who act as intermediaries are important members of a network as certain actors cannot connect with others without an intermediary. Analysis of betweenness centrality is important because it deals with the control and manipulation of information by actors who act as intermediaries. To perform a betweenness centrality analysis in UCINET, under the **Network** menu, select **Centrality**, then **Freeman Betweenness**, and **Node Betweenness**.

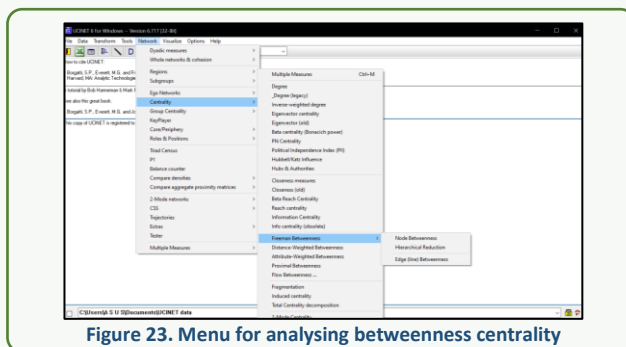


Figure 23. Menu for analysing betweenness centrality

Again, the next steps are selecting files for analysis and choosing the desired storage folder. Analysis results in Figure 24 below show seven actors having roles as intermediaries, with Jana and Petr_Ne being the most dominant. This means Jana and Petr_Ne are central actors with potential to control the network and manipulate information as communication to actors in the network must pass through both of them.

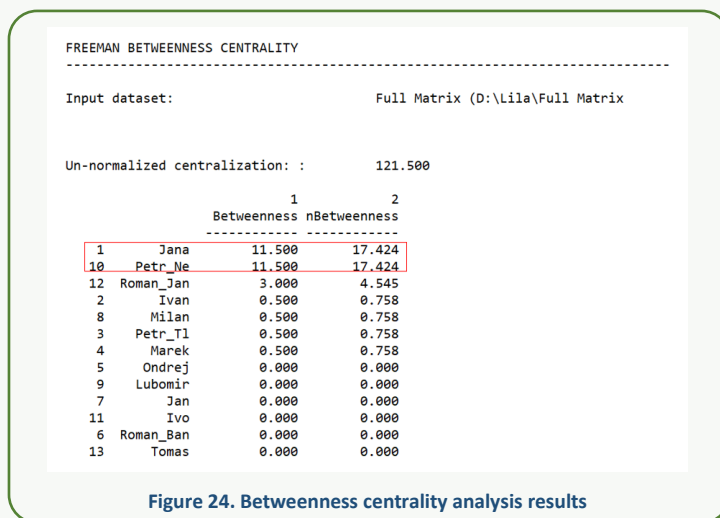


Figure 24. Betweenness centrality analysis results

4.5. Eigenvector centrality

Eigenvector calculations determine how important other persons associated with actors are, as defined by the numbers of relationships they have. Unlike degree centrality, which counts how many actors (nodes) are associated with others, Eigenvector focuses on how popular nodes are networked with actors. To perform an Eigenvector centrality analysis in UCINET, click the **Network** menu and select **Centrality**, then **Eigenvector centrality**.

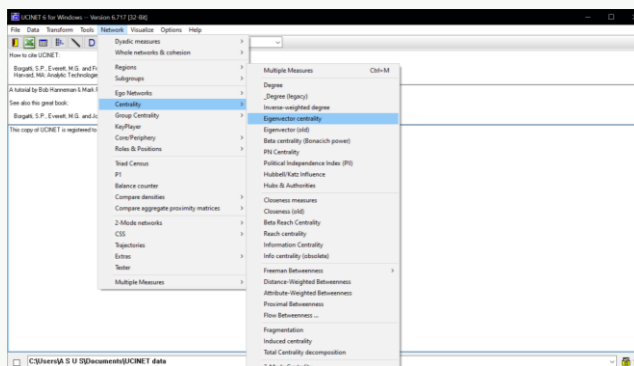


Figure 25. Menu for analysing Eigenvector centrality

Analysis results show Jana and Petr_Ne having higher Eigenvector values than other actors, meaning they have relationships with important people in the network. Based on all the centrality analyses, Jana and Petr_Ne are central actors as they both have many relationships, relate to important people in the network, and act as intermediaries.

```
EIGENVECTOR CENTRALITY
-----
Input dataset:                Full Matrix (D:\Lila\Full Matrix)

Eigenvectors of Full Matrix

      1
      Eigen
      vecto
      r
      ---
1  Jana 0.349
2  Ivan 0.319
3  Petr_Tl 0.319
4  Marek 0.319
5  Ondrej 0.293
6  Roman_Ban 0.293
7  Jan 0.293
8  Milan 0.319
9  Lubomir 0.080
10 Petr_Ne 0.349
11 Ivo 0.109
12 Roman_Jan 0.251
13 Tomas 0.109

13 rows, 1 columns, 1 levels.
```

Figure 26. Eigenvector centrality analysis results

5. Ego network analyses

Ego network analyses focus on the positions of actors (egos) in relation to others (alters). The type of ego network analysis discussed in this section is a brokerage analysis.

5.1. Brokerage

Brokerage analyses are intended to identify which egos play roles as intermediaries (brokers) between alters, and the type of intermediary function those egos play. To perform a brokerage analysis, click the **Network** menu and select **Ego Networks**, then **G&F Brokerage roles**.

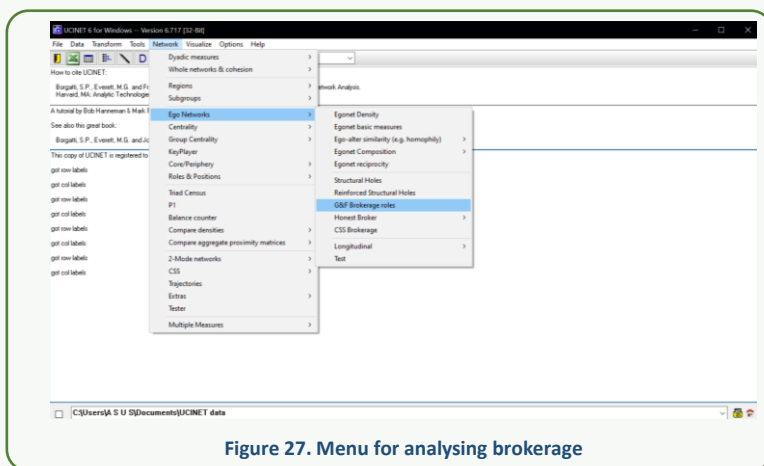


Figure 27. Menu for analysing brokerage

A dialogue box will appear like the one in Figure 28. In the **Network dataset:** field, select files containing relationship information between actors (used in previous analyses). In the **Attribute data set:** field, select the actor attribute file saved in UCINET dataset format. In the three **Output** fields, select the desired folder(s) for saving the analysis results.

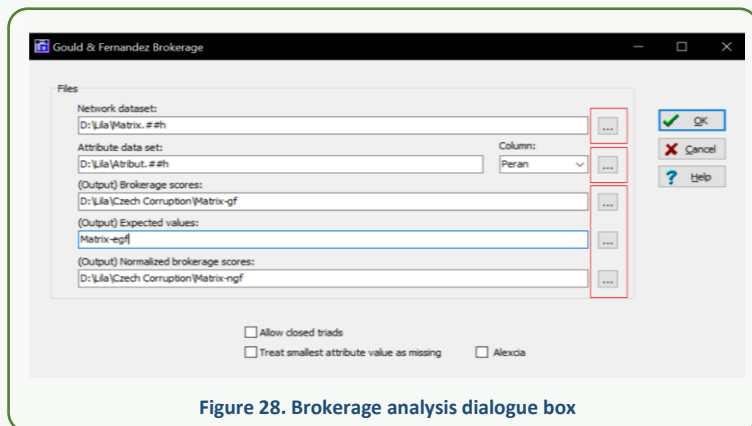


Figure 28. Brokerage analysis dialogue box

Brokerage analysis results in Figure 29 based on the attributes of each actor show the network being divided into five groups separated by dotted lines. The first group comprises only Jana, who is a former prime minister. The second group consists of Ivan, Petr_Tl and Marek, who are party deputies. The third group comprises Ondrej, Roman_Ban, Jan, Milan and Lubomir who are intelligence agents. The fourth group is Petr_Ne, who is a government official, while the fifth group comprises Ivo, Roman_Jan and Tomas, who are godfathers.

Jana and Petr_Ne have the most connections with other actors, with both serving as consultants and liaisons. Consultants, namely Jana and Petr_Ne, are liaisons between nodes belonging to the same group. Jana, for example, is a liaison between Milan and Lubomir, both of whom are intelligence agents. Liaisons, namely Jana and Petr_Ne, are connectors between nodes belonging to different groups. Petr_Ne, for example, is a liaison between Ivo, who is a godfather and Marek, who is a party deputy.

GOULD & FERNANDEZ BROKERAGE MEASURES


Input dataset: Full Matrix (D:\Lila\Full Matrix
Partition vector: "D:\Lila\Atribut.##" column 1
Method: UNWEIGHTED
Raw Brokerage: Full Matrix-gf (D:\Lila\Czech Corruption\Full Matrix-gf

		1	2	3	4	5	6
		Coordinat	Gatekeepe	Represent	Consultan	Liaison	Total
1	Jana	0	0	0	10	46	56
2	Ivan	0	0	0	0	6	6
3	Petr_Tl	0	0	0	0	6	6
4	Marek	0	0	0	0	6	6
5	Ondrej	0	0	0	0	0	0
6	Roman_Ban	0	0	0	0	0	0
7	Jan	0	0	0	0	0	0
8	Milan	0	3	3	0	0	6
9	Lubomir	0	0	0	0	0	0
10	Petr_Ne	0	0	0	10	46	56
11	Ivo	0	0	0	0	0	0
12	Roman_Jan	2	8	0	0	0	18
13	Tomas	0	0	0	0	0	0




Legend: (given flow 1-->2-->3, where 2 is the broker)
Coordinator: A-->A-->A (all nodes belong to same group)
Gatekeeper: B-->A-->A (source belongs to different group)
Representative: A-->A-->B (recipient belongs to different group)
Consultant: B-->A-->B (broker belongs to different group)
Liaison: B-->A-->C (all nodes belong to different groups)

Figure 29. Brokerage analysis results

6. Creating sociograms using NetDraw

Results of network analyses in UCINET can be visualized very easily in the form of sociograms showing relationships between actors in the network by using NetDraw. Click the  icon in the UCINET toolbar to open the NetDraw page.

6.1. Whole network visualizations

Documents stored in UCINET datasets can be opened in NetDraw in different ways. Firstly, by clicking the **File** menu, and selecting **Open, Ucinet dataset**, then **Network**. Attribute data can also be opened under the **File** menu by selecting **Open**, then **Attribute data**, as long as relationship data (network) is opened beforehand. This attribute data will not be displayed in the NetDraw worksheet, but is used to adjust sociogram visualizations of analyses that use actor attributes. Another, easier option for opening relationship files is to click the  or  icons, while attribute files can be opened by clicking the  icon.

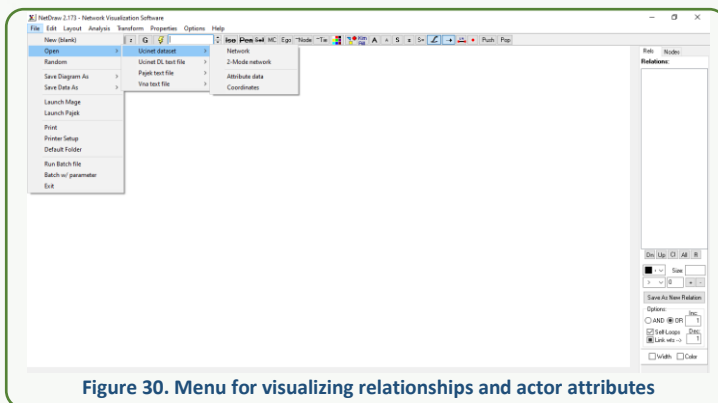


Figure 30. Menu for visualizing relationships and actor attributes

Once a sociogram appears in a worksheet, it can be saved in Metfile, Bitmap, jpeg, or PNG format. To save a sociogram, under the **File** menu, select **Save Diagram As** and choose the desired image file format.

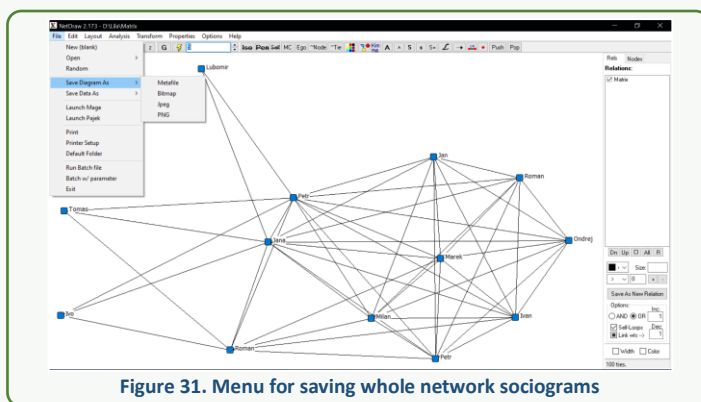


Figure 31. Menu for saving whole network sociograms

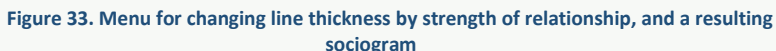
6.2. Ego network visualizations

NetDraw can also display networks showing relationships between specified actors (egos) and other actors (alters). To display an ego network, click the **Ego** icon on the toolbar. A dialogue box will appear showing the names of actors in the network (Figure 32). If we want to select one of the actors in the network, check the box next to their name. NetDraw will only show all relations and actors related to that actor. The example sociogram shows the actor named Roman having eight alters.



6.3. Changing the appearance of lines/edges/links that characterize relationships

The appearance of lines showing relationships between actors in sociograms can be altered for aesthetic purposes as well as to highlight certain aspects of the network. We can change the colour, size, style, directional shape and labelling of lines. Measures and labels are usually used to indicate the strength of ties between actors. For example, if we want to change the size/thickness of a line based on the strength of the relationship between actors, under the **Properties** menu, select **Lines**, **Size**, and then **Tie strength**. NetDraw will display networks with different line thicknesses according to the strengths of relationships between actor, as depicted in Figure 33.



6.4. Changing the appearance of nodes (actors)

NetDraw can also change nodes according to user needs. For example, if we want the actor with the highest degree of centrality to be indicated by the largest node size, under the **Analysis** menu, select **Centrality Measures**. The command will generate a dialogue box like the one shown in Figure 34. In the **Set Node Sizes by:** field, select **Degree**, and click **OK**.

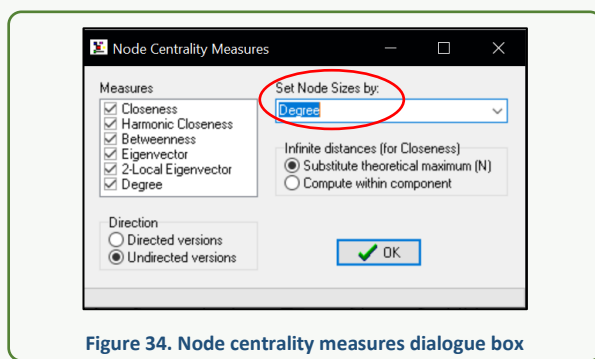


Figure 34. Node centrality measures dialogue box

The analysis will generate node sizes according to the degree centrality values for each actor. In addition to being assigned the largest size, the central actor node can also be assigned a different colour to the other actors in the network. To do this, right-click on the *Jana* node, for example, click **Color**, select the desired colour, then click **OK**. The same can be done for the *Petr_Ne* node. Modifications to nodes based on degree centrality analyses will generate a network like the one in Figure 36.

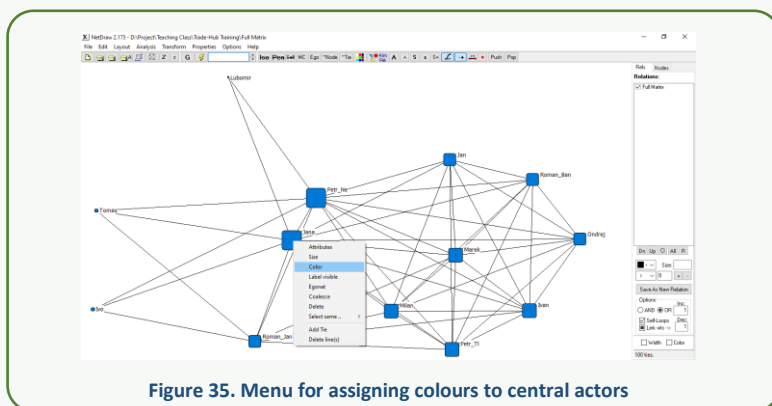


Figure 35. Menu for assigning colours to central actors

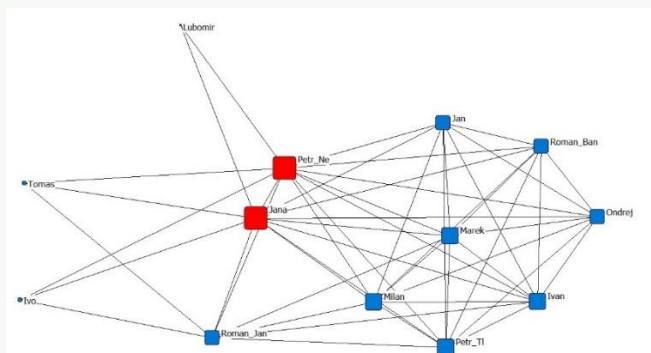


Figure 36. Sociogram based on a degree centrality analysis



Center for International Forestry Research (CIFOR)

CIFOR advances human well-being, equity and environmental integrity by conducting innovative research, developing partners' capacity, and actively engaging in dialogue with all stakeholders to inform policies and practices that affect forests and people. CIFOR is a CGIAR Research Center. Our headquarters are in Bogor, Indonesia, with offices in Nairobi, Kenya; Yaounde, Cameroon; Lima, Peru; and Bonn, Germany.

