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DOCUMENTATION FOR "THE SOCIAL CONSTRUCTION OF INDUSTRY:ELECTRICITY IN THE UNITED STATES, 1880-1925" DATA SETS

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SUMMARY

These data sets are designed to enable the analysis of many different aspects of the Electricity Industry in the United States from 1880-1925. In an effort to understand more about the social construction of an industrial sector like Electricity, Mark Granovetter and Patrick McGuire found a number of detailed sources of data. As the result, a number of data sets have been put into machine-readable form in order to promote their analysis. These data sets probably provide the most complete account of the origins and evolution of a major industry in the United States, with information about most substantial organizations and individuals.

DATA SOURCES

- The *American Electrical Directory* published every year or two in the 1880s and early 1890s by the Star Iron Tower Company of Fort Wayne, IN. These volumes are based on comprehensive national surveys, and give for each company its capacity, its equipment inventory and suppliers, its directors and officers, and its level of capitalization. It provides information for stations in the US, Canada and Mexico (early versions also include information for other countries).
- The *Powers' Central Station Directory*, published quarterly after 1894, gives a complete list of stations in the US, Canada and Mexico. Powers continues with the work started by the American Electrical Directory.
- The *Rand, McNally and Co's Bankers' Directory* published in 1891 and 1887. These directories provide a rigorous list of the directors of national and state banks located in 120 principal cities in the United States. It gives information about location, officers, capital, profit, and correspondents of every bank in the United States.
- *Annual and semi-annual proceedings* of both major trade associations of the time (i.e., the *National Electric Light Association*, and the *Association of Edison Electric Illuminating Companies*. These proceedings from 1885 to 1910 include complete lists of those who attended with their company affiliations, lists of all the committees and their members, titles of all papers delivered, with the text of many, and transcripts of discussions following delivery of all major papers.
- The Edison Pioneer biographical material on some two hundred early participants in the electricity industry which Francis Jehl's collected. The notes and biographies are now available at the Henry ford Museum, Dearborn, Michigan. These materials contain information about career histories and personal connections among people who mentioned working directly with Edison. This biographical material is supplemented with information from various public and private archives and other more standard biographical collections such as the *National Cyclopedia of American Biography*.

DATA AVAILABLE

This codebook documents the different data sets collected for the NSF Project "The Social Construction of Industry: Electricity in the United States, 1880-1925". Microsoft Access97 was primarily used to store most of the data sets, as well as to perform preliminary analysis. The data are stored in multiple tables which can be linked to one another to facilitate the parsimonious organization of data. Through the use of forms, data can be entered into multiple tables simultaneously, and through the use of queries and reports, data can be arranged from those multiple tables into singular presentations for the purpose of

error checking, preliminary analysis, and the packaging of selective data for use in more specialized data analysis packages.

Following are the the types of data available for analysis:

1. Electricity Producers
    1.1. Electric Central Stations
    1.2. Electric Isolated Stations
2. Banks
3. Electrical Equipment Manufacturers
4. Electric Railroad Companies
5. Cities
6. Trade Associations
    6.1. National Electric Light Association (NELA)
    6.2. Association of Edison Illuminating Companies (AEIC)
7. Biographies

DESCRIPTION OF DATA FILES

Following is a brief summary and description of each of the different data sets available:

1. Electric Producers

From the American Electrical Directory (called the Powers' Directory after 1894), detailed information has been coded for all central stations firms in the United States in 1886, 1891, 1895, 1899, and 1903, public and private.[1] Data have also been entered regarding selected isolated generators selling excess current to nearby customers.

1.1 Electric Central Stations

The major data set includes information about each company's capacity, its equipment inventory and suppliers, its directors and officers, its level of capitalization, and other financial information. The complete data set containing all the years together is in the file **aed86-03.mdb**. which is located on both the desktop and laptop computers associated with the project in the directory */data/stations*. This is an Access file and contains two basic tables of information (financial/technical information and personal information) which are listed in the

[1] A central station is a company whose principal purpose is to sell electricity to households or companies. An isolated plants refer to those stations which generate electricity for their own purposes.

Database window when the *Tables* tab is highlighted (1) 1886-03CSFin and (2) 1886-03CS-Personal.[2]

A. Financial and technical information

The table *1886-03CSFin* includes cross-sectional data, repeated across five years, for electricity-generating companies operating at the time. These data were collected by survey of the whole population of central stations each year (as published by the American Electrical Directory and the Powers' Directory). Since these cross-section data are repeated over time with a high level of consistency between questions, sequences of measures can be created in discrete time and its is possible to incorporate a time trend into the analysis.

The data matrix consists of 10788 companies (0.2% of which come from the 1886 directory, 16.9% from the 1891 Directory, 20.5% from the 1895, and 24.6% from the 1899 Directory, and 35% from the 1903 Directory).

The following table includes the names and a brief description of the variables included in the data set:

Variable name	**Type**	**Coding Description**
State	Text	State in which the electric firm is located
Town	Text	Town in which the firm is located
Central station ID	Number	Central Station Identification number
Firm Name	Text	Formal name of the firm in the Directory
Year of Data	Number	Year of the Directory from which the information is collected
Population	Number	Population of the city where the electric firm is located
Year established	Number	If listed in the Directory, year when the firm was established
Number of Stations	Number	Number of stations owned by the firm (if stated in the Directory)
City Contract	Yes/No	Dummy variable indicating whether the firm has a city contract (0=no, -1=yes)
Authorized Capital	Currency	Amount of authorized capital
Paid In Capital	Currency	Amount of paid capital (entered only if it is a category distinct from authorized capital)
Value/Share	Currency	Value per share of stock

[2] We are still in the process of coding the personal data for 1903.

Bonds	Currency	Value per share of bond (if stated in the electrical Directory) authorized and/or issued (if "authorized" and "issued" are listed separately, the amount of bonds "authorized" was recorded)
Subordination to Another Firm	Text	Dummy variable indicating whether the firm is owned or controlled by another company
Name of Dominant Firm	Text	If the firm is owned by another firm, this variable records the name of the owning firm
1st Sockets' Provider	Text	Name of the first sockets' provider
2nd Sockets' Provider	Text	Name of the second sockets' provider
# of Sockets	Number	Total number of sockets
1st Arc System	Text	Type of arc system as identified by the name of the manufacturing company
1st Arc #	Number	Number of first type arc systems
2nd Arc System	Text	Second arc system as identified by the name of the manufacturing firm
2nd Arc #	Number	Number of second type arc systems
Arcs AC/DC/B or NI	Text	Type of the "arc" system(s). There are four possible categories: AC, DC, Both (B), or Not Indicated (NI)
ArcAC	Number	Total number of AC arc lights of various manufacturers (if the number is greater than 1)
ArcDC	Number	Total number of DC arc lights of various manufacturers (if the number is greater than 1)
Total # of Arc Lights	Number	Total number of all AC plus all DC arc lights of various manufacturers
1st AC/DC System Provider	Text	Name of the first AC or DC system provider.
1st AC/DC/Both	Text	Type of system (AC or DC) appearing right before the name of AC/DC system provider
1st AC/DC #	Number	Number of AC/DC systems of the first provider
2nd AC/DC System Provider	Text	Name of the second system provider
2nd AC/DC/Both	Text	Type of system (AC or DC) appearing before the name of the AC/DC system provider
2nd AC/DC #	Number	Number of AC/DC systems of the second provider
1st Incandescent System	Text	Name of the first incandescent system
1st Inc #	Number	Number of the first incandescent systems
2nd Incandescent System	Text	Name of the second incandescent system
2nd Inc #	Number	Number of the second incandescent systems
Inc AC/DC/B or NI	Text	Variable indicating whether the incandescent system(s) are AC, DC, Both or Not Indicated
IncAC	Number	Total number of AC inc. bulbs
IncDC	Number	Total number of DC inc. bulbs
Total # of Incandescent Lights	Number	Total number of inc. bulbs
Voltage	Text	Voltage. It can be a set of 2 or 3 numbers

		with hyphens between them (indicates multiple voltages) or a combination of single numbers with a set of multiple numbers
Schedule	Text	Schedule of the electric firm. The following are the possible values: day cir, moonlt, all nt., mdnt., nt., moonlt 12 PM. *All* schedules designated in the description were entered.
1st Engine Provider	Text	Name of the first engine provider
2nd Engine Provider	Text	Name of the second engine provider
3rd Engine Provider	Text	Name of the third engine provider
Total # of Engines	Number	Total number of engines
Total Horsepower	Number	Total horsepower
Water Power System	Text	Name of the water power system manufacturing firm. Leffel, Pelton, Knight, Jones, and American are all common names
Water Power System Size	Text	Size of the water power system
DataEntry	Text	Initials of the coder

B. Personal information

The table *1886-03CS-Personal* includes cross-sectional data, repeated across five years (i.e., 1886, 1891, 1895, and 1899) for the same and different officers and directors in charge of the electricity-generating companies operating at the time.[3] This information is about the relevant actors of the electricity industry and was collected by surveys of the whole population of central stations each year. Therefore each record of the table is an individual.

The data matrix consists of 22093 individuals: 69.4% were only officers, 16.8% were only directors (and therefore, 13.8% were officers and directors) according to the surveys.

The following table describes the variables included in the data set and a brief description of each of the variables:

Variable name	**Type**	**Coding Description**
Name	Text	Full name of the actor
Year	Number	Year of data
Central station ID	Text	Central Station Identification number (which is consistent with the one in the FinTech table)
Director	Text	A “D” means that the actor is a director of the station
Director Title	Text	Director title. For very few cases, we have directors entitled “managing director”
Officer	Text	An “O” means that the actor is an officer of the station
Officer Title	Text	Officer position is specified in this variable.
Dir Occ	Text	For some actors, their occupation information is recorded
Dir Res	Text	For some actors, their state and city of location is recorded (which might be different from the station locality)

1.2 Electric Isolated Plants

This data set on isolated plants is in the process of being coded from the Directories.

[3] The year 1903 is in the process of being completed.

2. Banks

From the The *Rand, McNally and Co's Bankers' Directory* published in 1891, 400 pages have been coded including information about banks and bankers in 1891 These directories provide a list of the directors of national and state banks located in 120 principal cities in the United States. It gives information about location, officers, capital, profit, and correspondents of every bank in the United States. Data have been entered for those.

There is one Access file called **Banks91.mdb** for the 1891 information about banks which is located on both the desktop and laptop computers associated with the project in the directory */data/banks*. This data set includes banks located in cities which have one or more central stations —it is estimated that this data set of banks covers 65-70 percent of the whole population in 1891. The Banks91.mdb contains the following two major tables:

A. Financial and technical information

The table *1891BK-Fina* includes cross-sectional data for 5288 banks in 1891. The following table describes the variables included in the data set and a brief description of each of the variables:

Variable name	**Data Type**	**Coding Description**
State	Text	State in which the bank is located
City	Text	City in which the bank is located
Bank Name	Text	Name of the bank
Bank Id	Number	Bank identification number (this number was assigned by the coder)
Year Chartered	Number	Year in which the bank is chartered
Year Established	Number	Year in which the bank is established
Bank Category	Text	Bank category. There are 15 different types of banks as identified by coders B (Broker); L&T (Loan and Trust Company); N (National Bank); P (Private Bank); S (State Bank); S&L (Saving and Loan Bank); SA (Saving Bank); SLT (Saving, Loan, and Trust Company); T (Trust Company); T&S (Trust and Saving Company); I (Investment Company); M (Mortgage Company); MT (Mortgage and Trust Company); C (Clearing House Association); SA, L&T (Saving Bank and Loan and Trust Company) These categories are also listed in the "Bank

		Category Coding” Table
Total Resource (assets)	Number	Total assets of the bank
Capital	Number	Capital of the bank
Profit	Number	Profit of the bank

B. Personal information

The file called *1891BK-Personal* includes cross-sectional data for directors and officers (with 20 possible positions) in charge of the banks in 1891. The data matrix consists of 23929 individuals.

The following table describes the variables included in the data set and a brief description of each of the variables:

Variable name	**Data Type**	**Coding Description**
State	Text	State in which the bank is located
City	Text	City in which the bank is located
Bank Name	Text	Name of the bank
Bank Id	Number	Bank identification number (this number was assigned by the coder)
Fname	Text	First name of the actor
Mname	Text	Middle name of the actor
Lname	Text	Last name of the actor
Director	Text	A “D” means that the actor is a director in the bank
Officer	Text	Officer position. 20 officer positions are identified by coders and are listed in the “Officer Position Coding” table
FnameNew	Text	Revised first name of the actor
MnameNew	Text	Revised middle name of the actor
LnameNew	Text	Revised last name of the actor

3. Electrical Equipment Manufacturers

The electrical equipment manufacturers data set contains personal information from electrical equipment manufacturers listed in the *AED* for 1886 and 1891 and including data from Edison General Electric, Westinghouse, and others. The name of the Access file is **Rr&Mfg1.mdb** and is located in */Data/Rr&ma*.

A. Financial Information

The table *MergedMA-Fina* lists the manufacturing companies, incorporated location, amount of capital and number and value of stock. There are only 44 manufacturers listed in this table.

Variable name	Type	Coding Description
Name	Text	Last name, first name
Firm ID	Text	Firm identification number
Year	Text	Firm name
Town	Text	Town where headquarters is located
State	Text	State where headquarters is located
Total Capital	Text	Total company capital
Number of Shares	Text	Total number of shares
Share Value	Text	Price per share

B. Personal information

The file called *MergedMA-Personal* includes cross-sectional data for directors and officers in charge of the manufacturing companies in 1886 and 1891. The data matrix consists of 371 entries.

The following table describes the variables included in the data set and a brief description of each of the variables:

Variable name	Type	Coding Description
Name	Text	Last name, first name
Firm ID	Text	Firm identification number
Year	Text	Firm name
Town	Text	Town where headquarters is located
State	Text	State where headquarters is located
Director	Text	A “D” means that the actor is a director in the bank
Director Title	Text	Director title
Officer	Text	An “O” means that the actor is an officer in the bank
Officer Title	Text	Officer Title
Property Rel	Text	Property relations
Dir Occ	Text	Director's occupation
Dir Res	Text	Director's residential location
TA/CL-Aff	Text	Trade Association or Club Affiliation
TA/CL-Loc	Text	Trade Association or Club Location
TA/CL-St	Text	State where Trade Association or Club is located
TA/CL-Title	Text	Trade Association or Club Title

4. Electric Railroads

The electric railroad data set contains both financial/technical and personal information about electric railroad companies listed in the *American Electrical Directory* in 1891. Electric railroads were among the largest electrical equipment consumers and electricity producers in the early 1890's. The railroads data set is located in the same database with the electrical equipment manufacturers database; the Access file is **Rr&Mfg1.mdb** and is located in */Data/Rr&ma*.

A. Financial/Technical Information

The file *1891RC-Finatech* includes financial and technical information about the electric railroads such as miles of track, type of system used, and size of engines. 312 electric railroads are described.

Variable name	**Type**	**Coding Description**
RR Company ID	Text	Firm identification number
Firm Name	Text	Name of the company
State	Text	State in which firm is located
Town	Text	Town in which firm is located
Year of Data	Number	1891
Year Established	Number	Year when firm is established
Authorized Capital	Currency	Amount of authorized capital
Paid in Capital	Currency	Amount of paid capital (only if it is different from authorized capital)
Value per Share	Currency	Value per share of stock
Consolidated?		"Yes" if the firm is consolidated
Name of Firm Consolidated	Yes/No	Name of the firm consolidated
Primary Type of System	Text	Primary Type of System
Secondary Type of System	Text	Secondary Type of System
Miles of Track	Number	Miles of Track
Largest Engine Type	Text	Largest Engine Type
Horsepower1	Number	First Horsepower
Second largest Engine	Text	Second largest Engine
Horsepower2	Number	Second Horsepower
Water Power	Number	Water Power
Rent/lease/sell	Text	Rent/lease/sell

B. Personal information

The file called *MergedMA-Personal* includes cross-sectional data for directors and officers in charge of the electric railroads in 1891. The data set includes of 1159 railroad personal.

Variable name	Type	Coding Description
Name	Text	Name of individual
RRCompanyID	Text	Electric Railroad Identification number
RRCompany	Text	Name of each company
State-Served	Text	State in which firm is located
Town-Served	Text	Town in which firm is located
Year	Number	Year
Director	Text	A “D” means that the actor is a director in the bank
Director Title	Text	Director title
Officer	Text	An “O” means that the actor is an officer in the bank
Officer Title	Text	Officer Title
Property Rel	Text	Property relations
Dir Occ	Text	Director's occupation
Dir Res	Text	Director's residential location
TA/CL-Aff	Text	Trade Association or Club Affiliation
TA/CL-Loc	Text	Trade Association or Club Location
TA/CL-St	Text	State where Trade Association or Club is located
TA/CL-Title	Text	Trade Association or Club Title

5. Cities

The Access file **City.mdb** includes population data for 2797 cities in 1890, 1900 and 1910 found in the United States Census of those years. The data set is located in the following directory */Data/City*.

The following table describes some of the variables included in the table.

Variable name	Type	Coding Description
State	Text	Name of the state
City	Text	Name of the city
Pop1910	Number	Population of the city in 1910
Pop1900	Number	Population of the city in 1900
Pop1890	Number	Population of the city in 1890

6. Trade Associations

The National Electric Light Association (NELA) and the Association of Edison Illuminating Companies (AEIC) were two trade associations closely associated with the early electricity industry. Both associations were formed in 1885, and had both individual and corporate (utility company) members. Both of these associations had officers and committees, and both held conferences in which papers were presented and printed in the proceedings of those conferences. We have two separate databases, one for each association, which contain various data associated with them.

6.1 NELA

The file **Neladata.mdb** is the complete data set containing data culled from the NELA directories and conference proceedings from the formation of the association in 1885 through 1910. This data set contains the names and company affiliations of the officers, committees, and committee members of the associations, and both contain the authors and titles of all of the papers presented at association conferences. It also contains complete company membership information and the names of honorary members, famous figures in science or the electricity industry who were honored at its meetings. The data file is located on both the desktop and laptop computers associated with the project in the directory */data/associations*.

A. NELA NAMExYEAR (mem, off, pos, comp)

This table contains company and position data on NELA officers, honorary members, and committee members by year. Between 1885 and 1891 the annual meetings were held semiannually and are designated with the suffix a or b (e.g., 1886a, 1886b).

B. NELA NAMExYRxCOMM

This table contains the committees that members were involved in each year and is separate from the *AEIC NamexYR* table because many members were involved in more than one committee each year.

C. NELA NAMExYRxCOMP

This table contains the companies that members were involved in each year. The companies that members were involved in are also listed in the *NELA NamexYR* table because most members are involved in only one company each year. However, there are a few people who were

simultaneously involved in many companies at the same time, and this table was created to accommodate them.

D. NELA NAMExYRxPAPER

This table contains the authors and titles of papers presented each year at the annual NELA conference. It also contains the abbreviation of an evaluative category which is indexed in the *Category* table.

E. COMMITTEES

This table indexes the committees abbreviated in the *NamexYrxComm* and lists their full title and years of operation.

F. CATEGORIES

This table indexes a list of thematic categories with their abbreviations which are used in various other tables. These categories are used to identify the papers and committees.

6.2 AEIC

The file **Aeicdata.mdb** is the complete data set containing data culled from the NELA directories and conference proceedings from the formation of the association in 1885 through 1910. This data set contains the names and company affiliations of the officers, committees, and committee members of the associations, and both contain the authors and titles of all of the papers presented at association conferences. It also contains complete company membership information and the names of all individual members who attended the yearly meeting. The data file is located on both the desktop and laptop computers associated with the project in the directory */data/associations*. As is easily noticed, many of the files are similar if not identical to the format of corresponding NELA tables.

A. AEIC NAMExYEAR (mem, off, pos, comp)

This table contains company and position data on AEIC officers, committee members, and individuals who attended the annual meetings by year. Between 1885 and 1891 the meetings were held semiannually and are designated with the suffix a or b (e.g., 1886a, 1886b).

E. AEIC NAMExYRxCOMM

This table contains the committees that members were involved in each year and is separate from the *AEIC NamexYR* table because many members were involved in more than one committee each year.

F. AEIC NAMExYRxCOMP

This table contains the companies that members were involved in each year. The companies that members were involved in are also listed in the *AEIC NamexYR* table because most members are involved in only one company each year. However, there are a few people who were simultaneously involved in many companies at the same time, and this table was created to accomodate them.

G. NELA NAMExYRxPAPER

This table contains the authors and titles of papers presented each year at the annual AEIC conference. It also contains the abbreviation of an evaluative category which is indexed in the *Category* table.

E. COMMITTEES

This table indexes the committees abbreviated in the *NamexYrxComm* and lists their full title and years of operation.

F. CATEGORIES

This table indexes a list of thematic categories with their abbreviations which are used in various other tables. These categories are used to identify the papers and committees.

7. Biographies

The Electricity Biography database was assembled for the comparative analysis of the career histories or biographies of persons associated with the electricity industry. For certain individuals in the industry, we are interested in more specific biographical detail than that provided by the other data sets. To store this more detailed information, and to prepare it for systematic analysis with the other data sets, we have created a biographical database. Individual biographies draw from data primarily in four social domains: (1) the organization of the electrical central station companies; (2) the governance of these electrical companies; (3) the banking relationships associated with the financing of these electrical companies; (4) the local, state, and federal political relationships associated with the protection and support of these companies, and (5) the professional associations of the electrical industry. Some additional data may be collected in other areas such as educational institutions attended or taught at and the institutions associated with pre-work youth.

The Electricity Biography database, entitled Electricity Biography, is located on both the desktop and laptop computers associated with the project in the directory */data/biography*. The data is organized into 2 basic tables which are listed in the *Database* window when the *Tables* tab is highlighted: 1) the Index table and 2) the Event table.

A. The Index Table

The Index table is organized with each row corresponding to a unique individual, as identified by a unique ID number and the first and last name. Other fields in the table contain time-invariant data relating to that individual, such as birthplace, demographic information, parental information, etc.

Following is a table containing the names and descriptions of the fields in the Index table.

VARIABLE NAME	**Data type**	**Coding Description**
ID	Number	An unique number indicating the individual under consideration
Last Name	Text	Individual's last name
First Name	Text	Individual's first name
Middle Name	Text	Individual's middle name or initial
Title	Text	Individual's title (e.g., Mr., Dr., Lord, etc.)
Family history	Text	Historical detail of family, esp. parents, siblings, wife, and children
Connections*	Text	Ties to Edison
Position*	Text	First Edison position

Year left Edison*	Text	Year left formal Edison association
New Location*	Text	First new location after Edison
New Company*	Text	First company after Edison
New Position*	Text	First position after Edison
Reason for Leaving*	Text	Reason for leaving Edison employ
Menlo Park*	Number	Dummy Variable indicating presence at Menlo Park
Pre Menlo Park*	Number	Dummy Variable indicating Edison association prior to Menlo Park
Post Menlo Park*	Number	Dummy Variable indicating Edison association after Menlo Park
Financial Organizers*	Number	Dummy Variable indicating role as financier or organizer
Data Notes	Text	Additional Data Notes
Jehl V1 Pages†	Text	Source pages in Jehl, volume 1
Jehl V2 Pages†	Text	Source pages in Jehl, volume 2
Jehl V3 Pages†	Text	Source pages in Jehl, volume 3
Source Notes	Text	Notes on the source of data

*The data from these fields will eventually be incorporated into the Event table and removed from the Index Table.
†The data from these fields will eventually be merged into the Source Notes.

B. The Event Table

The Event table is organized by individual by year and contains all of the career information relating to each individual mentioned in the Index table over time.

Following is a table containing the names and descriptions of the fields in the Event table.

VARIABLE NAME	**Data type**	**Coding Description**
ID	Number	A number indicating the individual under consideration
Event	Number	A unique number associated with a single year in the career of the specified individual
Year	Number	The actual year in the life of the specified individual
Date Info J1	Text	Specific date information on the job held that year
Location J1	Text	Location of the job held that year
Company J1	Text	Company in which the job was held that year
Position J1	Text	Title of the position or job held that year
Date Info J2	Text	Specific date information on a concurrent job held that year
...		(information for 2nd and 3rd concurrent jobs held that year)
Date Info B1	Text	Specific date information on the board position held that year

Company B1	Text	Board of Directors membership held that year
Date Info B2	Text	Specific date info. on concurrent board membership held that year
...		(information for 2nd and 3rd concurrent board memberships held that year)
NELA membership	Number	Dummy variable indicating membership in NELA that year
NELA leadership	Text	Leadership position in NELA held that year
NELA papers	Text	Papers presented at NELA conference that year
AIEC membership	Number	Dummy variable indicating membership in AIEC that year
AIEC leadership	Text	Leadership position in AIEC held that year
AIEE membership	Number	Dummy variable indicating membership in AIEE that year
AIEE leadership	Text	Leadership position in AIEE held that year
AIEE papers	Text	Papers presented at AIEE conference that year
Financial Events	Text	Data on financial events (e.g., loans, mortgages) and ties
Political Events	Text	Data on political events, offices, and ties
Family Events	Text	Data on family events
Change Position	Number	Dummy variable indicating a change in position title this year
Change Company	Number	Dummy variable indicating a change in job company this year
Change Location	Number	Dummy variable indicating a change in job location this year
Change Board	Number	Dummy variable indicating a change in board membership this year
Notes	Text	Additional Data Notes
Source Notes	Text	Notes on Data Sources

Data are organized using Access. Access is a relational database tool which allows us to link together the previously described data. This means that an individual who is listed as an officer of NELA may be linked or associated with the tables in which he is also listed as a director of a central station and the officer of an electric railroad company. This linking makes it possible to store essential data in only one location which eliminates redundancy and makes it possible to update data in only one place. Uniquely stored data from many tables can then be brought together by a query which recognizes the links between individuals, companies, or cities located in many places throughout the electricity databases.

As an example, I will guide a tour through the linked relationship between the *Index* and *Event* tables in the Biography database. The linkage between these two tables can be seen in Access by entering the **ebio.mdb** database, clicking on the *Tools* menu, and then on the *Relationships* menu item. The linkage means that records in the Index Table are linked or related to records in the Event table. A dark arrow connects the ID field in the Index table with the ID field

in the Event table indicating a one-to-many relationship (1—∞). This means that while each row or record in the Index Table refers to a single individual, there may be multiple rows for that same individual in the Event Table. While the Index table has a single row for each individual containing time-invariant data, the Event table has multiple rows for the same individual containing time-varying data, one row for each year in which there is recorded information about that person. Each record in the Event Table has a unique Event number corresponding to a year in the life a certain individual whose ID number is the same as that of the corresponding entry in the Index Table.

Each of the data sets described earlier contain three index tables, one for individuals, another for firms, and a third for cities. Each of these index tables link to corresponding data in the substantive tables of that database—the *NAME* table links to all the tables with individuals in the database, the *FIRM* table links to all the tables with firms, and the *CITY* table links to all tables with cities. These *NAME*, *FIRM*, and *CITY* index tables within each database are then linked to three corresponding tables, *NAME*, *FIRM*, and *CITY*, in an Index database, **Index.mbd**. These links can be seen in the Index database table window, where the *NAME*, *FIRM*, and *CITY* tables from each database are denoted by a name and icon with a darkened arrow to the left of the icon. In the relationships window the linkages between the name, firm, and city fields in the respective tables are depicted graphically with darkened lines indicating a one to one (1—1) relationship.

BIBLIOGRAPHIES AND OTHER REFERENCES

An extensive bibliography of 1335 printed sources is contained in the database **Biblio96.mdb**. This contains two tables, *0896Bib-For Access Format* and *0896Bib-For Endnote Format*, each of which contain all of the sources, but in the more simplified Access Format and the more detailed Endnote format.

Other unpublished archival materials, and data which have been gathered from archival and printed materials is also indexed in the Bibliography data base in the table.[4]

[4] This table needs to be created.

APPENDICES

A. Glossary
B. Sample of Tables
C. Related Articles
D. Introduction to Programs for Network Analysis
E. Some tips for Network Analysis

A. Glossary

Following there are some definitions of technical terms included in the codebook (in alphabetical order):

Arc system
Horse power
Incandescent system
Socket
System provider
Voltage
Water power system

B. Sample of Tables

C. Related Articles

Chung, Chi-nien 1997. “Networks and Governance in Trade Associations: AEIC and NELA in the Development of the American Electricity Industry 1885-1910” in *International Journal of Sociology and Social Policy*, 17 (7/8):52-10, 1997.

Chung, Chi-nien and Mark Granovetter 1998. “Trade Associations as an Organizational Form: NELA and the Development of the Early American Electricity Industry, 1885-1910.” Working paper.

Granovetter, Mark and Patrick McGuire 199?. “Electricity—the social construction of an industry” Unfinished manuscript.

Yakubovich, Valery, Mark Granovetter, and Patrick McGuire 1998. “Electric Charges: The Social Construction of Rate Systems.” Working Paper.

D. Introduction to Programs for Network Analysis

There are several programs for network analysis for certain purposes. Without describing all programs released, this documentation introduces some of the most popular programs in social sciences. For information on various computer programs for social network analysis, refer to
http://www.heinz.cmu.edu/project/INSNA/soft_inf.html

UCINET

UCINET is a program designed to facilitate NETWORK analysis. It provides various techniques to analyze actor by actor matrices without programming. The latest version of the program, UCINET IV, incorporates a diverse collection of network analysis techniques. The X-version of UCINET IV extends the maximum number of cases to 180. UCINET is a program that runs under the DOS operating system. For more information, go to the UCINET web site at:
http://eclectic.ss.uci.edu/~lin/ucinet.html

STRUCTURE

Structure, by Ronald S. Burt, is a network analysis program which has procedures for various network technique such as structural equivalence, cohesive subgroups, centrality, and autonomy. The program runs under the DOS operating system. For detailed information, check a web site for Structure,
http://www.columbia.edu/cu/css/download.htm

SAS
SAS is a statistical program that is widely used for quantitative analysis in social science. With regard to network analysis, SAS program contains IML package that allows for matrix programming. SAS also enables the easy merging and splitting of files other matrix manipulation.

SPSS
SPSS is a statistical software package which allows the user to draw plots reflecting characteristics of matrices. SPSS also enables the analysis and plotting of matrices.

MATLAB

Matlab is a program that is widely used in Engineering departments. Like SAS IML, it enables to construct a matrix and play with it for various purposes.

E. Some tips for Network Analysis

1. When creating a matrix
Access is a useful program to create a matrix form of data sets without programming. First, go to *Database* you created in Access and open 'New' on the right side after marking the file you want. Then, click on *Crosstab Query Wizard*. Choose one of files from which you want to create a matrix. Insert each variable for rows and columns. For example, if you have two variables, one is for rows and the other is for columns. Name your query whatever you like to call. Clicking on *finis*h leads you to see your result (a matrix).

2. When converting two-mode matrix into one-mode one.
Many programs provide some functions to convert a matrix: for example, SAS, MATLAB, SPSS, UCINET and so on. For example, in UCINET, after converting ASCII file into UCINET file, go to *Networks* and then *Transform*. Open *Affiliations*. With three functions in there, you should be able to create a matrix.