Point-and-Click Programming Using SAS® Enterprise Guide®

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Abstract

SAS® Enterprise Guide® empowers organizations exploiting the power of SAS by offering programmers, business analysts, statisticians and end-users with powerful built-in wizards to perform a multitude of reporting and analytical tasks, access multi-platform enterprise data sources, deliver data and results to a variety of mediums and outlets, perform important data manipulations without the need to learn complex coding constructs, and support data management and documentation requirements quickly and easily. Attendees learn how to use the graphical user interface (GUI) to access tab-delimited and Excel input files; subset, group, and summarize data; join two or more tables together; flexibly export results to HTML, PDF and Excel; and visually manage projects using flowcharts and diagrams.

Introduction

SAS® Enterprise Guide® (EG) provides a powerful programming platform to accomplish many tasks previously only possible using more traditional techniques found in the DATA and PROC steps. EG provides access to multi-platform enterprise data sources including SAS data sets, tab-delimited data, and Microsoft Excel files; satisfies "custom" reporting as well as complex analytical tasks; delivers data and results to a variety of mediums and outlets including HTML and Microsoft Excel; performs data manipulations without the need to learn complex coding constructs; and supports data management and documentation requirements including flowcharts and diagrams quickly and easily using the power of the built-in wizards.

Data Used In Examples

The data used in all the examples in this paper consist of a selection of movie classics, along with an actors table. The Movies tab-delimited file, SAS data set, and Microsoft Excel file consists of six columns: title, length, category, year, studio, and rating. Title, category, studio, and rating are defined as character columns with length and year being defined as numeric columns. The Movies data is illustrated below.

Tab-delimited MOVIES File

MOVIES Data Set

	Title	Length	Category	Year	Studio	Rating
1	Brave Heart	177	Action Adventure	1995	Paramount Pictures	R
2	Casablanca	103	Drama	1942	MGM / UA	PG
3	Christmas Vacation	97	Comedy	1989	Warner Brothers	PG-13
4	Coming to America	116	Comedy	1988	Paramount Pictures	R
5	Dracula	130	Horror	1993	Columbia TriStar	R
6	Dressed to Kill	105	Drama Mysteries	1980	Filmways Pictures	R
7	Forrest Gump	142	Drama	1994	Paramount Pictures	PG-13
8	Ghost	127	Drama Romance	1990	Paramount Pictures	PG-13
9	Jaws	125	Action Adventure	1975	Universal Studios	PG
10	Jurassic Park	127	Action	1993	Universal Pictures	PG-13
11	Lethal Weapon	110	Action Cops & Robber	1987	Warner Brothers	R
12	Michael	106	Drama	1997	Warner Brothers	PG-13
13	National Lampoon's Vacation	98	Comedy	1983	Warner Brothers	PG-13
14	Poltergeist	115	Horror	1982	MGM / UA	PG
15	Rocky	120	Action Adventure	1976	MGM / UA	PG
16	Scarface	170	Action Cops & Robber	1983	Universal Studios	R
17	Silence of the Lambs	118	Drama Suspense	1991	Orion	R
18	Star Wars	124	Action Sci-Fi	1977	Lucas Film Ltd	PG
19	The Hunt for Red October	135	Action Adventure	1989	Paramount Pictures	PG
20	The Terminator	108	Action Sci-Fi	1984	Live Entertainment	R
21	The Wizard of Oz	101	Adventure	1939	MGM / UA	G
22	Titanic	194	Drama Romance	1997	Paramount Pictures	PG-13

MOVIES Microsoft Excel File

	A	B	C	D	E	F
1	Title	Length	Category	Year	Studio	Rating
2	Brave Heart	177	Action Adventure	1995	Paramount Pictures	R
3	Casablanca	103	Drama	1942	MGM / UA	PG
4	Christmas Vacation	97	Comedy	1989	Warner Brothers	PG-13
5	Coming to America	116	Comedy	1988	Paramount Pictures	R
6	Dracula	130	Horror	1993	Columbia TriStar	R
7	Dressed to Kill	105	Drama Mysteries	1980	Filmways Pictures	R
8	Forrest Gump	142	Drama	1994	Paramount Pictures	PG-13
9	Ghost	127	Drama Romance	1990	Paramount Pictures	PG-13
10	Jaws	125	Action Adventure	1975	Universal Studios	PG
11	Jurassic Park	127	Action	1993	Universal Pictures	PG-13
12	Lethal Weapon	110	Action Cops & Robber	1987	Warner Brothers	R
13	Michael	106	Drama	1997	Warner Brothers	PG-13
14	National Lampoon's Vacation	98	Comedy	1983	Warner Brothers	PG-13
15	Poltergeist	115	Horror	1982	MGM / UA	PG
16	Rocky	120	Action Adventure	1976	MGM / UA	PG
17	Scarface	170	Action Cops & Robber	1983	Universal Studios	R
18	Silence of the Lambs	118	Drama Suspense	1991	Orion	R
19	Star Wars	124	Action Sci-Fi	1977	Lucas Film Ltd	PG
20	The Hunt for Red October	135	Action Adventure	1989	Paramount Pictures	PG
21	The Terminator	108	Action Sci-Fi	1984	Live Entertainment	R
22	The Wizard of Oz	101	Adventure	1939	MGM / UA	G
23	Titanic	194	Drama Romance	1997	Paramount Pictures	PG-13

The data stored in the ACTORS table is illustrated below.

ACTORS Data Set

	Title	Actor_Leading	Actor_Supporting
1	Brave Heart	Mel Gibson	Sophie Marceau
2	Christmas Vacation	Chevy Chase	Beverly D'Angelo
3	Coming to America	Eddie Murphy	Arsenio Hall
4	Forrest Gump	Tom Hanks	Sally Field
5	Ghost	Patrick Swayze	Demi Moore
6	Lethal Weapon	Mel Gibson	Danny Glover
7	Michael	John Travolta	Andie MacDowell
8	National Lampoon's Vacation	Chevy Chase	Beverly D'Angelo
9	Rocky	Sylvester Stallone	Talia Shire
10	Silence of the Lambs	Anthony Hopkins	Jodie Foster
11	The Hunt for Red October	Sean Connery	Alec Baldwin
12	The Terminator	Arnold Schwarzenegge	Michael Biehn
13	Titanic	Leonardo DiCaprio	Kate Winslet

Exploring Enterprise Guide

Enterprise Guide (EG) provides users with a graphical user interface (GUI) to make programming tasks easier. Once EG is started you'll see the 'Welcome to SAS Enterprise Guide' dialog. Users can select an existing project from the list of available projects displayed under the 'Open a project' heading; New Project, New SAS Program and New Data under the 'New' heading; or request assistance under the 'Assistance' heading, as illustrated in Figure 1.

Figure 1. Welcome to SAS Enterprise Guide dialog

We'll begin exploring EG's many capabilities by selecting '**New Project**'. Once a new project is initiated, EG's three main windows appear: Project Explorer, Project Designer, and Task Status, as illustrated in Figure 2.

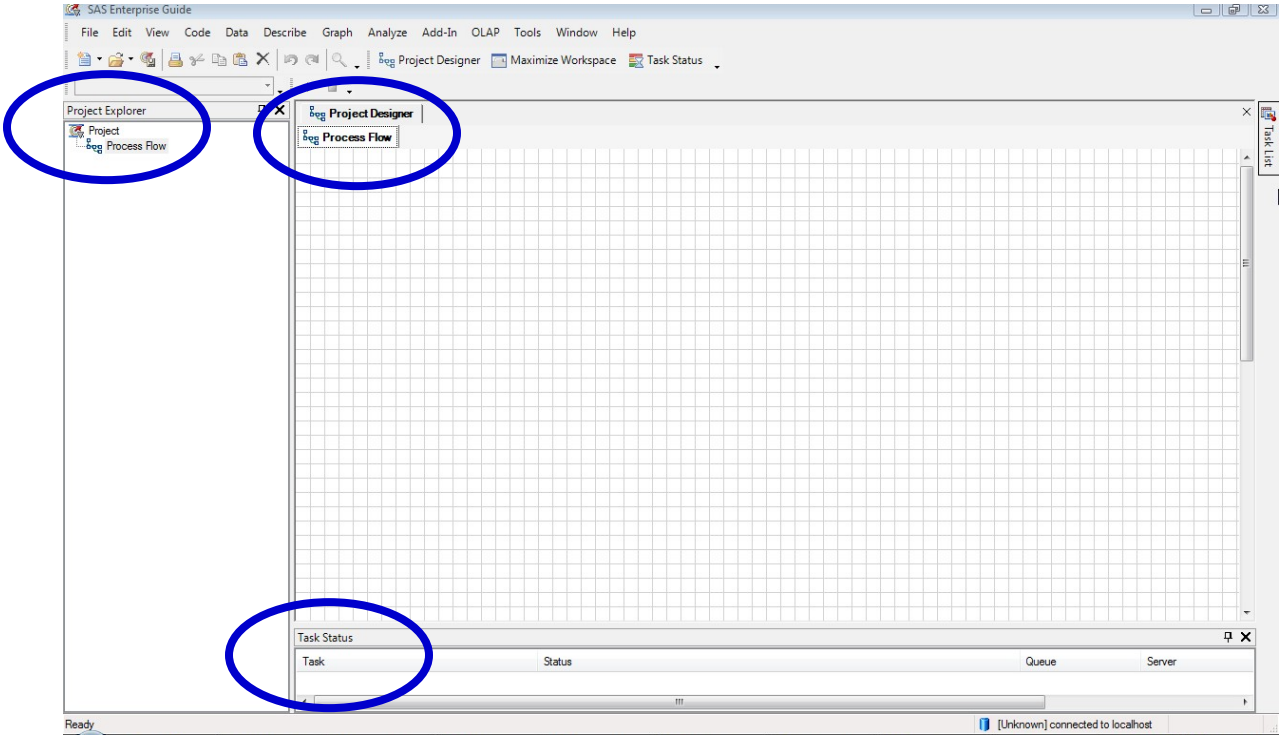


Figure 2. Enterprise Guide Main Windows

Additional windows can be opened using the point-and-click capabilities found in EG. Once open, a tab displays at the top of the screen to enable navigation to other windows. For example, a list of available tasks can be displayed by clicking the "Task List" button located at the right of the EG main windows, as Figure 3 illustrates.

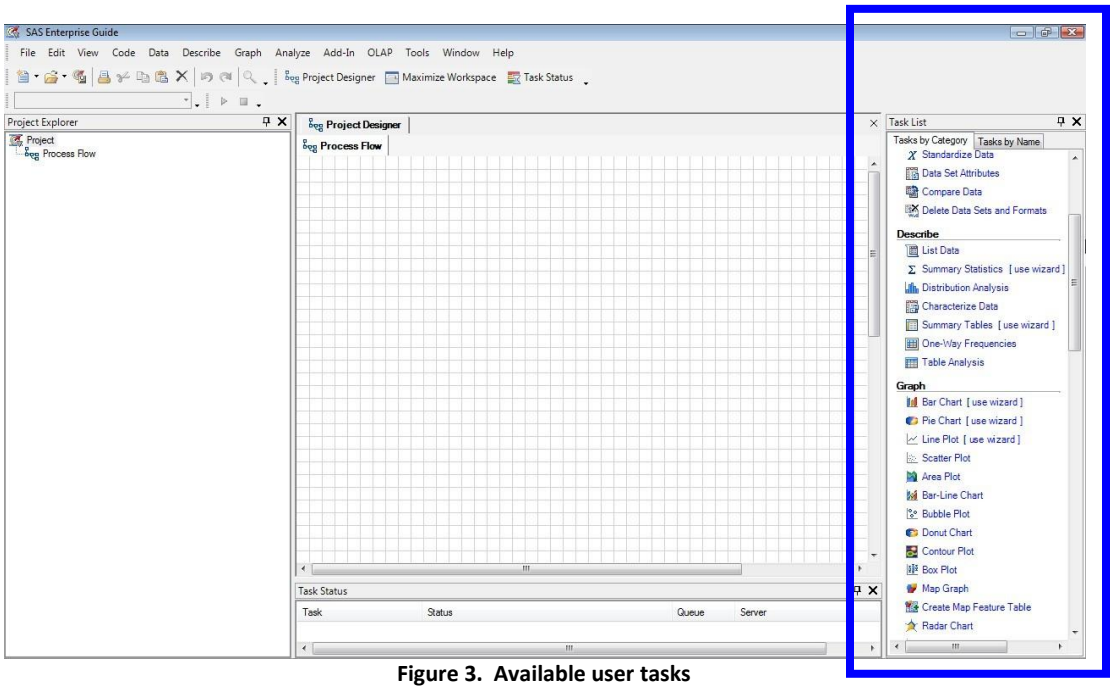


Figure 3. Available user tasks

Tasks under the '**Tasks by Category**' tab are displayed within the following functional categories: Data, Describe, Graph, ANOVA, Regression, Multivariate, Survival Analysis, Capability, Control Charts, Pareto, Time Series, Model Scoring, and Tools, as illustrated in Figure 4. Tasks under the '**Tasks by Name**' tab are displayed in alphabetical task name order along with each task associated SAS Procedure, as illustrated in Figure 5.

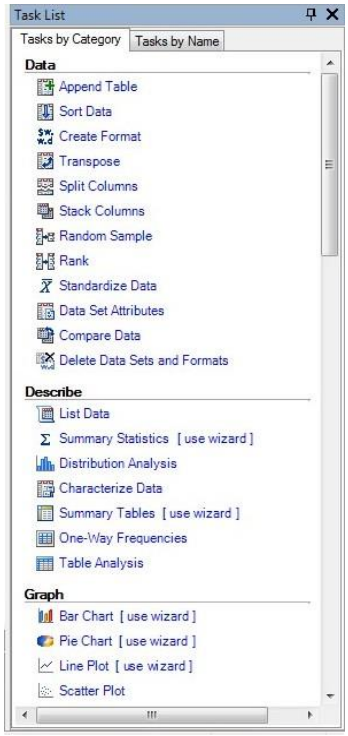


Figure 4. Task List by Category

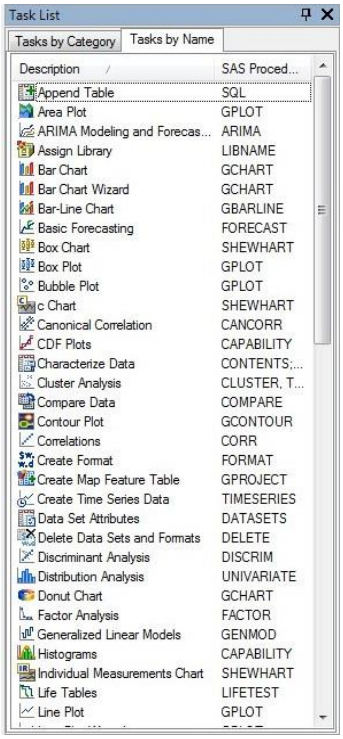


Figure 5. Task List by Name

Accessing Multiple Data Sources

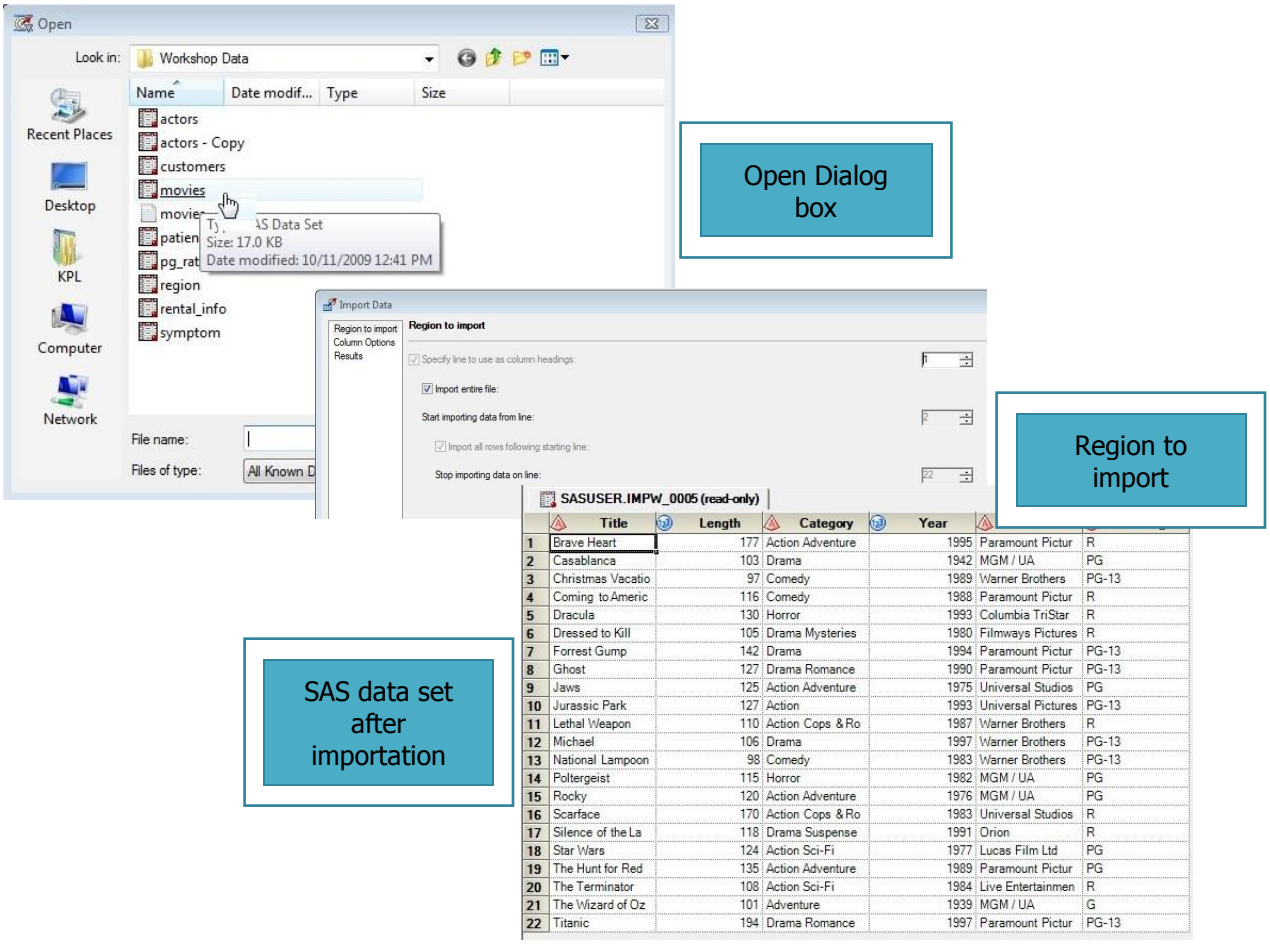
SAS EG has the ability to access a variety of remote servers, including Windows, Unix, and IBM mainframe operating systems, containing data from many types of input data sources. From text files to SAS data sets; Windows data sources including Microsoft Excel, Microsoft Access, Lotus, Paradox, and HTML; relational database tables including Oracle, DB2, SQL-Server, MySQL, among others; and ODBC, Microsoft Exchange folders, and OLE DB, EG is capable of adding data files to a project using **View** … **Server List** and/or **File** and **Import Data**… .

Importing SAS Data

To illustrate the process of importing a SAS data set located on the authors' local computer, the '**Local Computer**' icon is clicked on the **Open Data** dialog as illustrated in Figure 6.

Figure 6. Open Data dialog

The data importation process illustrated in Figure 7 demonstrates the selection of the Movies data set for import purposes, the entire data set (all rows and columns) imported and made available to EG as a SAS data set in 'read-only' mode, and finally after the successful completion of the requested task the data set is created and opened in 'read-only' mode.



	Title	Length	Category	Year		
1	Brave Heart	177	Action Adventure	1995	Paramount Pictur	R
2	Casablanca	103	Drama	1942	MGM / UA	PG
3	Christmas Vacatio	97	Comedy	1989	Warner Brothers	PG-13
4	Coming to Americ	116	Comedy	1988	Paramount Pictur	R
5	Dracula	130	Horror	1993	Columbia TriStar	R
6	Dressed to Kill	105	Drama Mysteries	1980	Filmways Pictures	R
7	Forrest Gump	142	Drama	1994	Paramount Pictur	PG-13
8	Ghost	127	Drama Romance	1990	Paramount Pictur	PG-13
9	Jaws	125	Action Adventure	1975	Universal Studios	PG
10	Jurassic Park	127	Action	1993	Universal Pictures	PG-13
11	Lethal Weapon	110	Action Cops & Ro	1987	Warner Brothers	R
12	Michael	106	Drama	1997	Warner Brothers	PG-13
13	National Lampoon	98	Comedy	1983	Warner Brothers	PG-13
14	Poltergeist	115	Horror	1982	MGM / UA	PG
15	Rocky	120	Action Adventure	1976	MGM / UA	PG
16	Scarface	170	Action Cops & Ro	1983	Universal Studios	R
17	Silence of the La	118	Drama Suspense	1991	Orion	R
18	Star Wars	124	Action Sci-Fi	1977	Lucas Film Ltd	PG
19	The Hunt for Red	135	Action Adventure	1989	Paramount Pictur	PG
20	The Terminator	108	Action Sci-Fi	1984	Live Entertainmen	R
21	The Wizard of Oz	101	Adventure	1939	MGM / UA	G
22	Titanic	194	Drama Romance	1997	Paramount Pictur	PG-13

Figure 7. SAS Data Set Importation process

As an added bonus, EG provides users with a convenient way to view any, and all, SAS Log messages and task-specific EG-generated SAS code following the completion of the requested importation task. Figure 8 and Figure 9 illustrate the available log messages and task-generated SAS code from the specific data set importation task respectively.

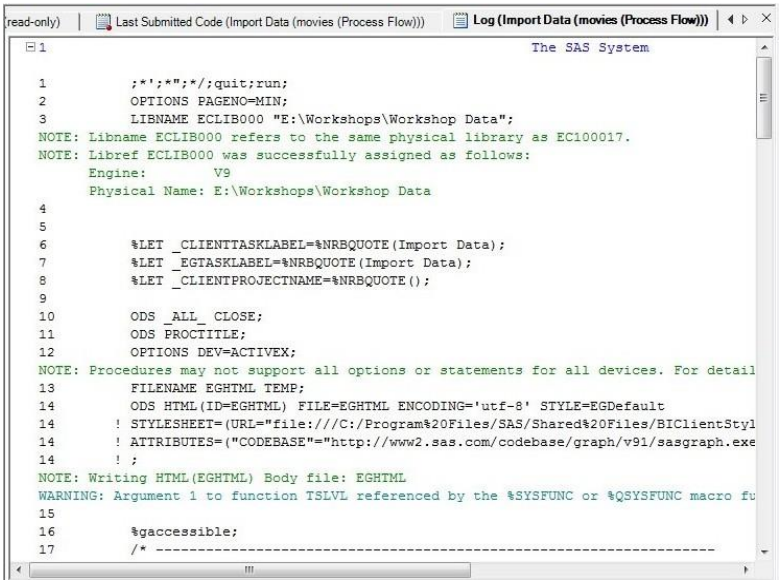


Figure 8. SAS Log results

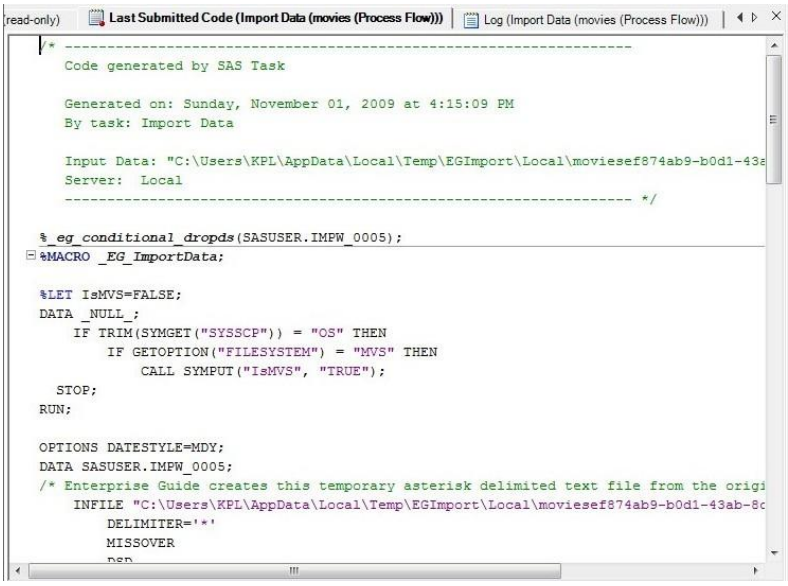


Figure 9. SAS generated code

Importing Tab-delimited Files

To further illustrate the data importation process we'll look at the process of importing a tab-delimited file. As before, the specific text file is located on the authors' local computer, so the 'Local Computer' icon is clicked on the **Open Data** dialog, the Movies (with tabs) file is selected, with the entire file (all rows and columns) selected for import, and converted and opened as a SAS data set in 'read-only' mode, as illustrated in Figure 10.

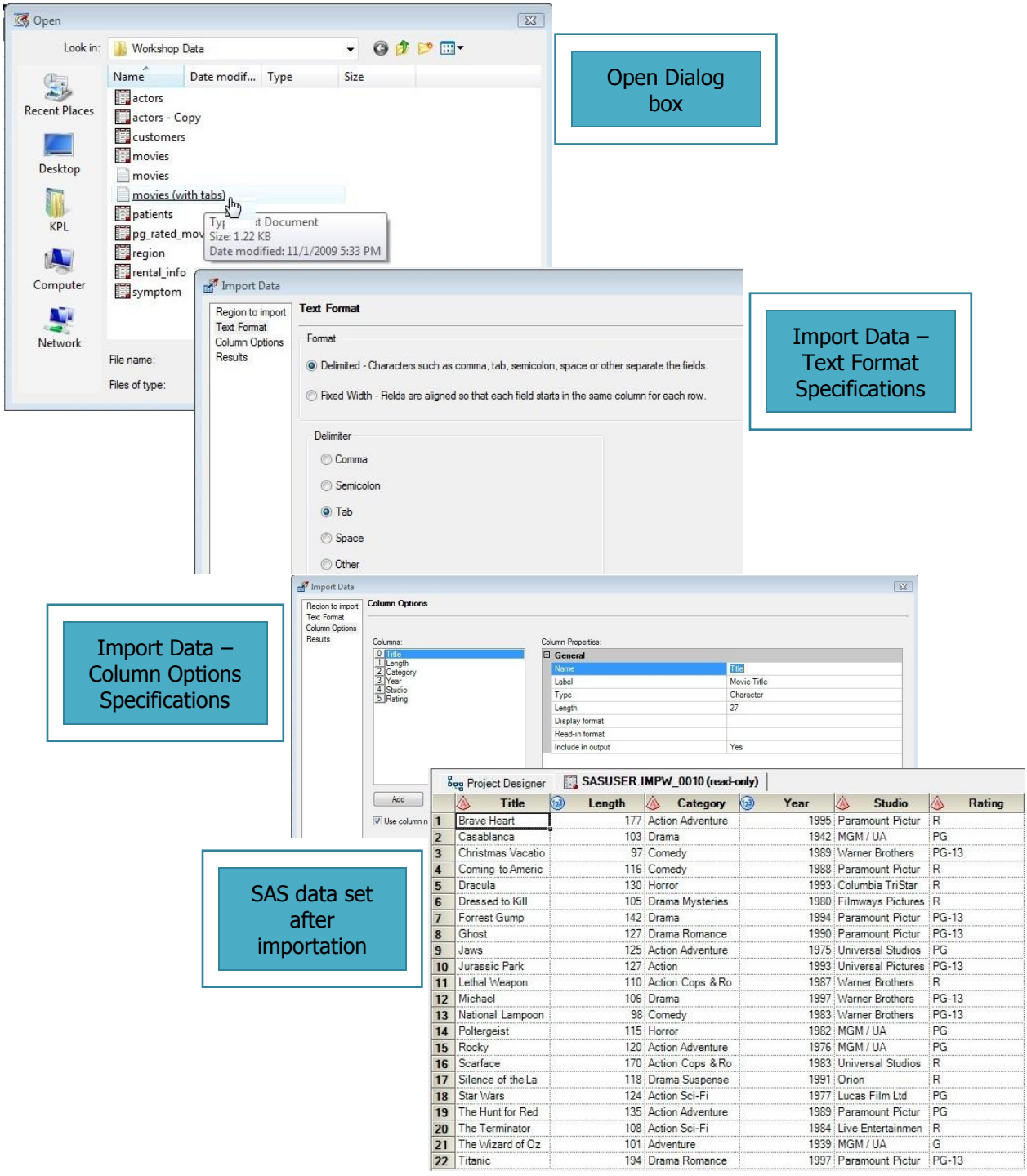


Figure 10. Tab-delimited File Importation process

Importing Microsoft Excel Files

Finally, to illustrate the flexibility and power of the data importation process, we'll look at the process of importing a Microsoft Excel file. As with the previous data importation examples, the specific Excel file is located on the authors' local computer. The Excel file, Movies, is selected; the entire file (all rows and columns) selected for import; and converted and opened as a data set in 'read-only' mode, as illustrated in Figure 11.

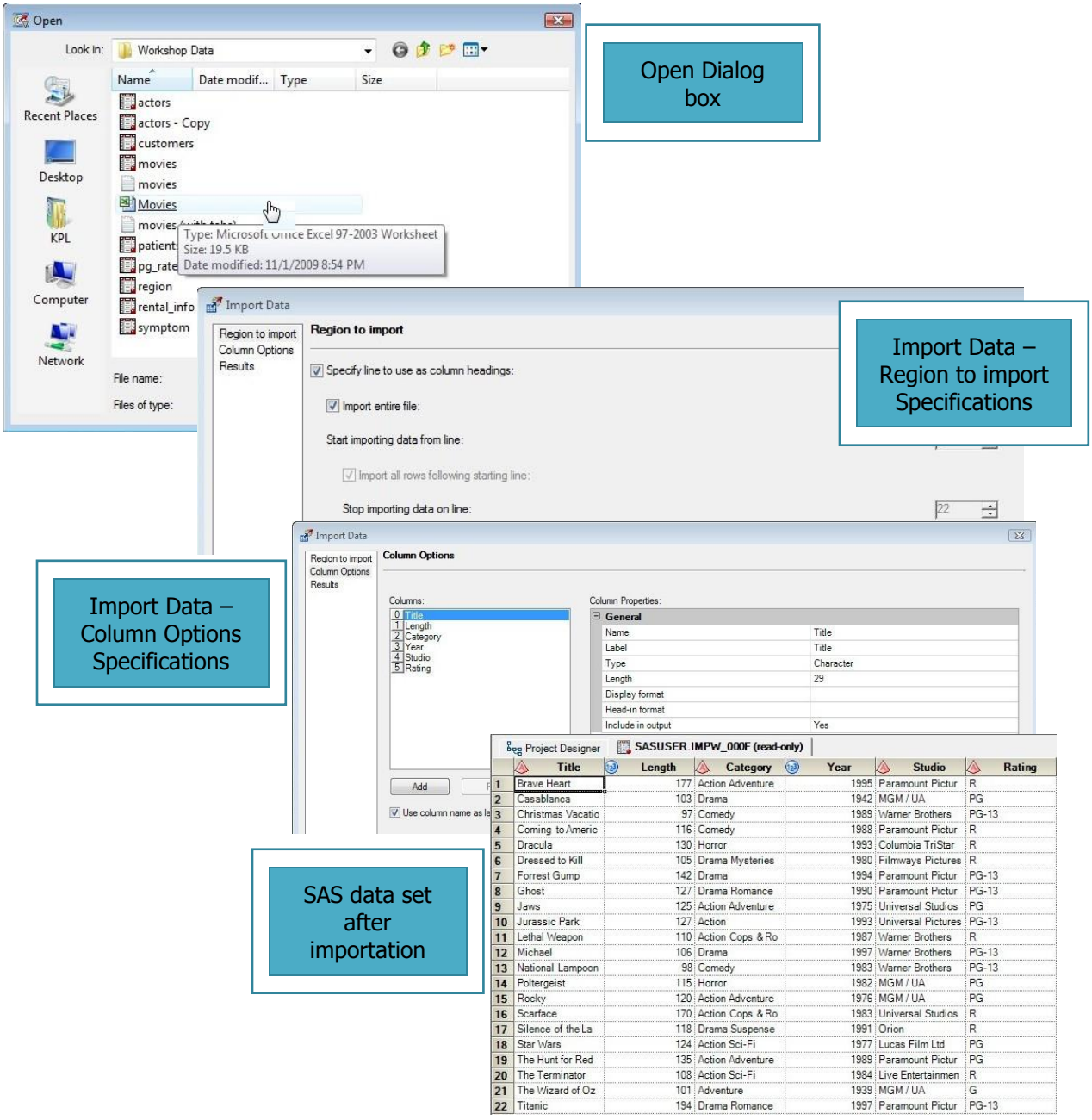


Figure 11. Excel File Importation process

Manipulating Data – No Programming Required

EG provides users with powerful point-and-click data summarization and manipulation capabilities without the need to learn formal programming language techniques. Supported features include recoding data values, sorting or rearranging the data order, producing descriptive statistics, merging (or joining) tables of data, transposing data, data concatenation, and comparing data. Due to size restrictions of this paper we'll confine our attention to illustrating the production of descriptive statistics and a match merge (or join) operation on the Movies and Actors data sets.

Producing "Quick and Dirty" Descriptive Statistics

In order to perform most types of analyses, it is necessary to fully understand your data. In addition to cleaning and organizing the data, the first stage should always include using descriptive statistics to obtain some basic measures for each variable. All of these tasks can be performed within EG by using Wizards without the use of complex programming. SAS EG Wizards provide the ability to produce "quick and dirty" descriptive statistics. The Wizard allows the user to select a task by category or name, select/verify the data source, assign variables to roles, select the desired statistics and result types, customize the output and create the report.

In the first set of steps, the Wizard guides the user through the task selection process, verifying the data source and assigning variables to roles. The Wizard guides users by providing a list of variables to assign as categorical and continuous, as illustrated in Figure 12.

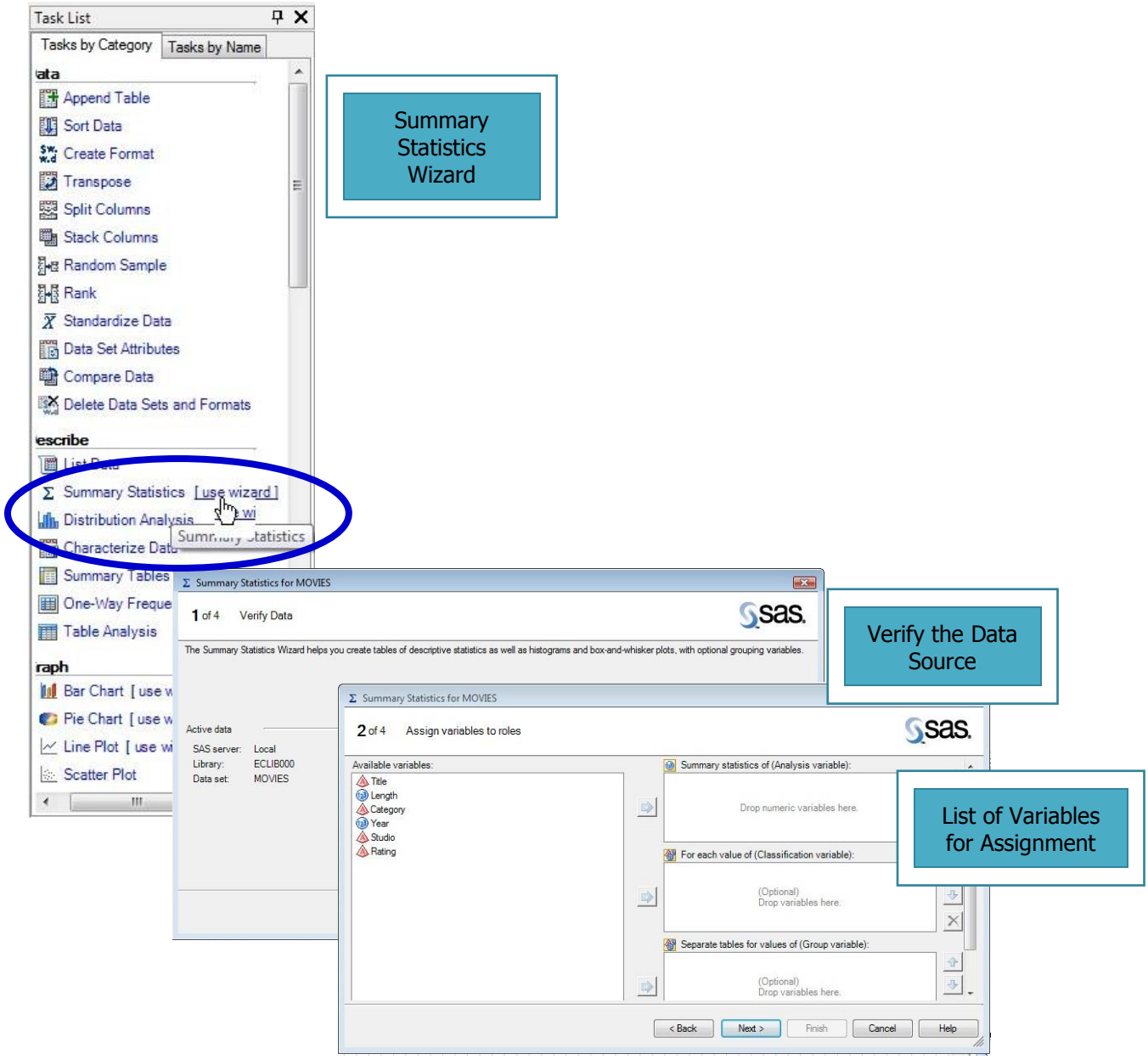


Figure 12. Process of producing "Quick and Dirty" Statistics (Part 1)

After specifying the variables and their roles, the Wizard guides the user through the selection of statistics and results. Titles and footnotes for the final report can be easily specified using the Wizard, as illustrated in Figure 13.

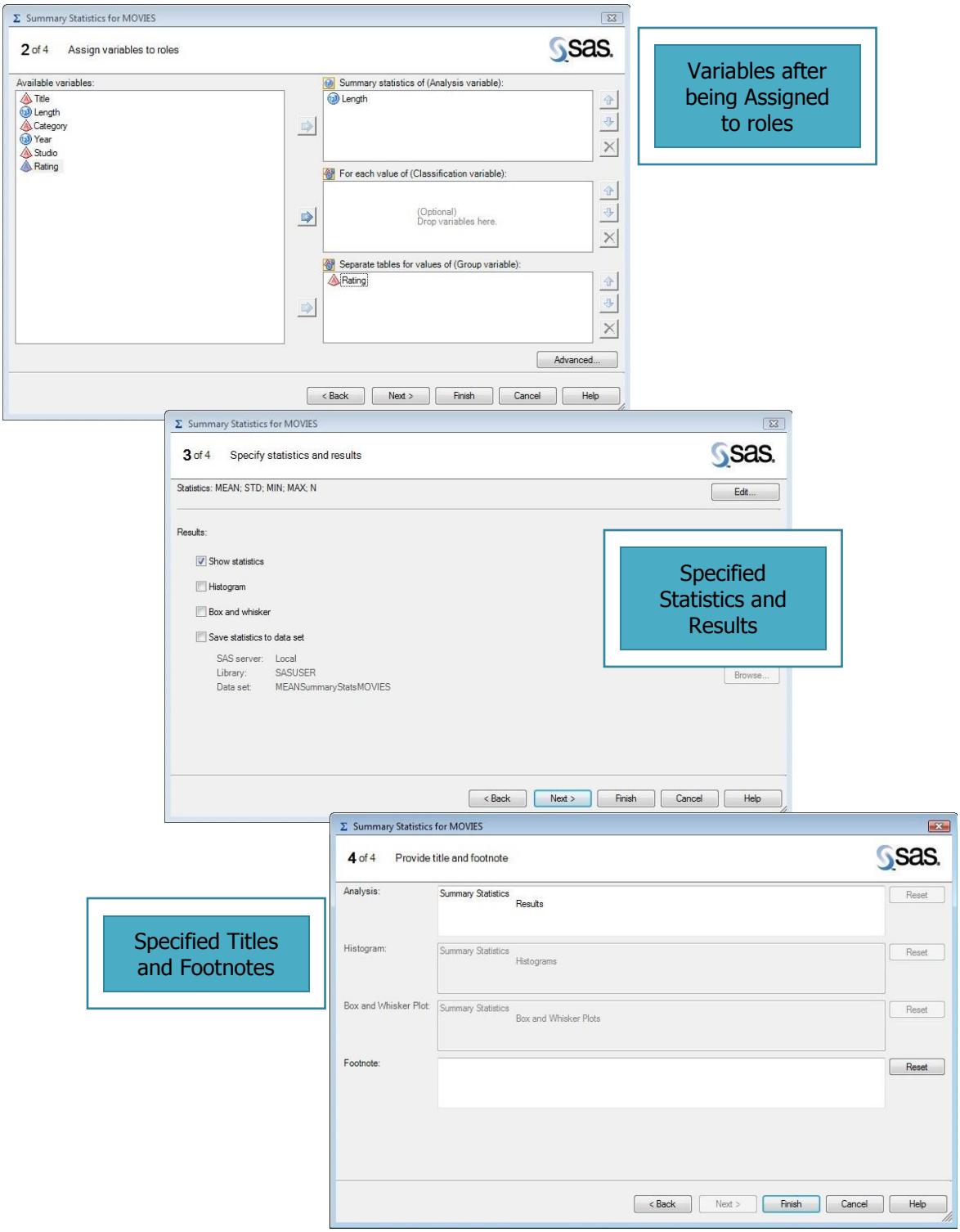
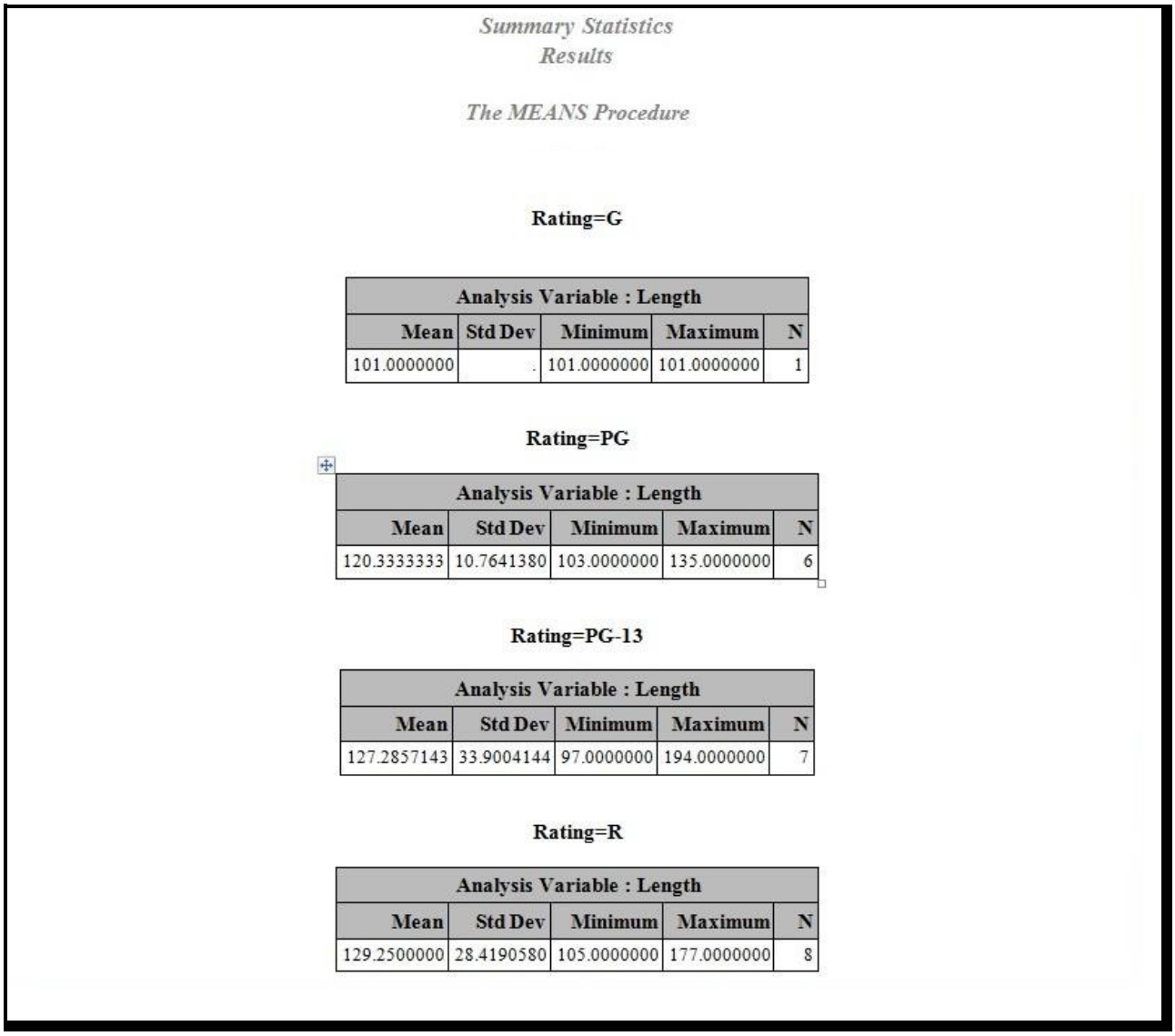


Figure 13. Process of producing "Quick and Dirty" Statistics (Part 2)

Finally, the Wizard runs the report with the selected options and displays the results. As with other reports and summaries created in EG, numerous options are available for embellishing and exporting results. Additional options for descriptive measures and options for complex statistical analysis are available through EG. In this example the mean, minimum, maximum and standard deviation were calculated, as illustrated in Figure 14.



Summary Statistics
Results

The MEANS Procedure

Rating=G

Analysis Variable : Length				
Mean	Std Dev	Minimum	Maximum	N
101.0000000	.	101.0000000	101.0000000	1

Rating=PG

Analysis Variable : Length				
Mean	Std Dev	Minimum	Maximum	N
120.3333333	10.7641380	103.0000000	135.0000000	6

Rating=PG-13

Analysis Variable : Length				
Mean	Std Dev	Minimum	Maximum	N
127.2857143	33.9004144	97.0000000	194.0000000	7

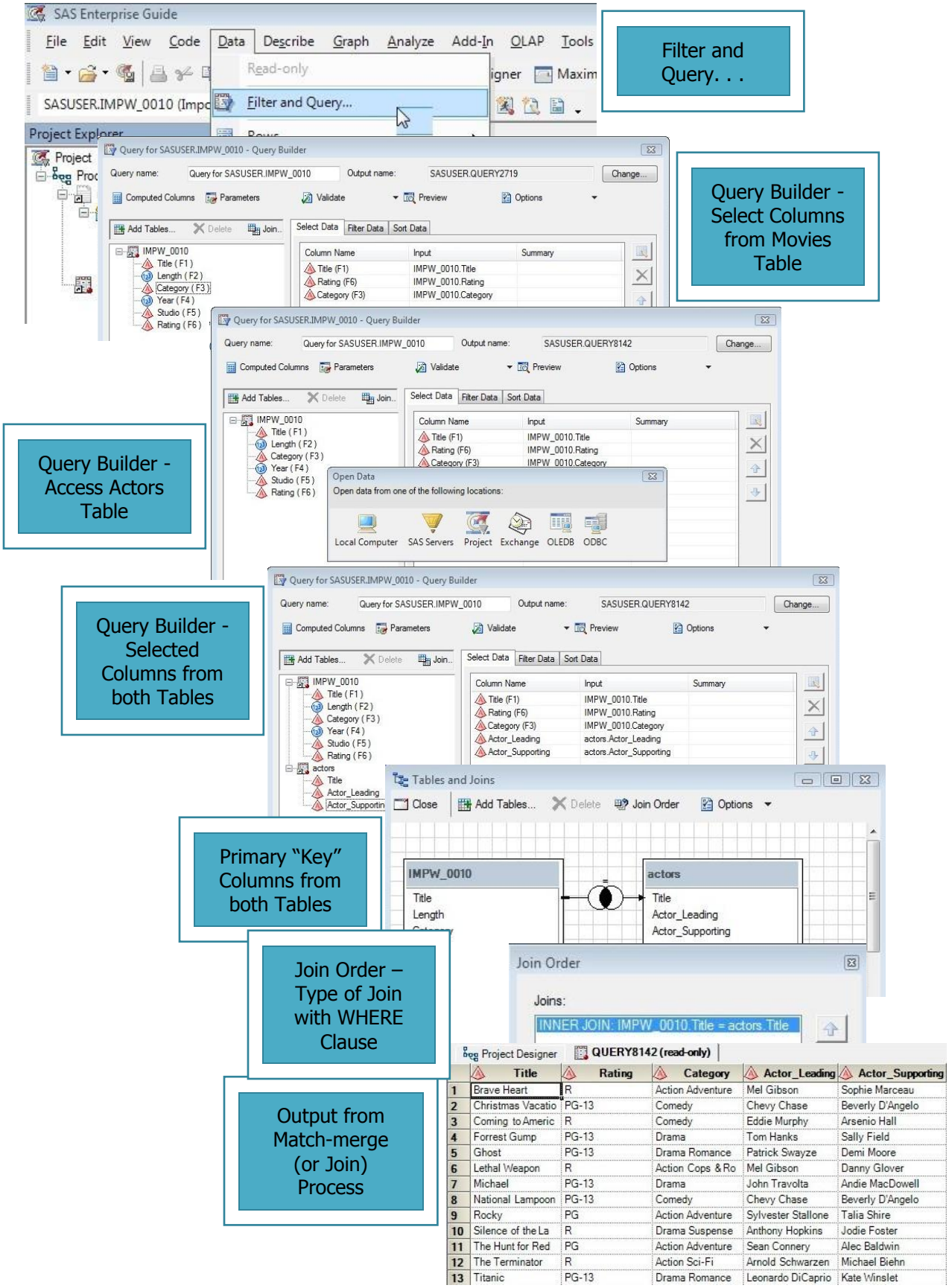
Rating=R

Analysis Variable : Length				
Mean	Std Dev	Minimum	Maximum	N
129.2500000	28.4190580	105.0000000	177.0000000	8

Figure 14. "Quick and Dirty" Statistics Output

Manipulating Data with Merges (or Joins)

A merge (or join) of two or more tables provides a way to bring data together horizontally. The process requires a minimum of two tables, where a column from each table is used for the purpose of connecting the tables. Connecting columns should have ***"like"*** values and is most successful when the joining columns have the same datatype attributes. The following task applies a match-merge process using the TITLE value in both tables as the matching column, as illustrated in Figure 15.



	Title	Rating	Category	Actor_Leading	Actor_Supporting
1	Brave Heart	R	Action Adventure	Mel Gibson	Sophie Marceau
2	Christmas Vacatio	PG-13	Comedy	Chevy Chase	Beverly D'Angelo
3	Coming to Americ	R	Comedy	Eddie Murphy	Arsenio Hall
4	Forrest Gump	PG-13	Drama	Tom Hanks	Sally Field
5	Ghost	PG-13	Drama Romance	Patrick Swayze	Demi Moore
6	Lethal Weapon	R	Action Cops & Ro	Mel Gibson	Danny Glover
7	Michael	PG-13	Drama	John Travolta	Andie MacDowell
8	National Lampoon	PG-13	Comedy	Chevy Chase	Beverly D'Angelo
9	Rocky	PG	Action Adventure	Sylvester Stallone	Talia Shire
10	Silence of the La	R	Drama Suspense	Anthony Hopkins	Jodie Foster
11	The Hunt for Red	PG	Action Adventure	Sean Connery	Alec Baldwin
12	The Terminator	R	Action Sci-Fi	Arnold Schwarzen	Michael Biehn
13	Titanic	PG-13	Drama Romance	Leonardo DiCaprio	Kate Winslet

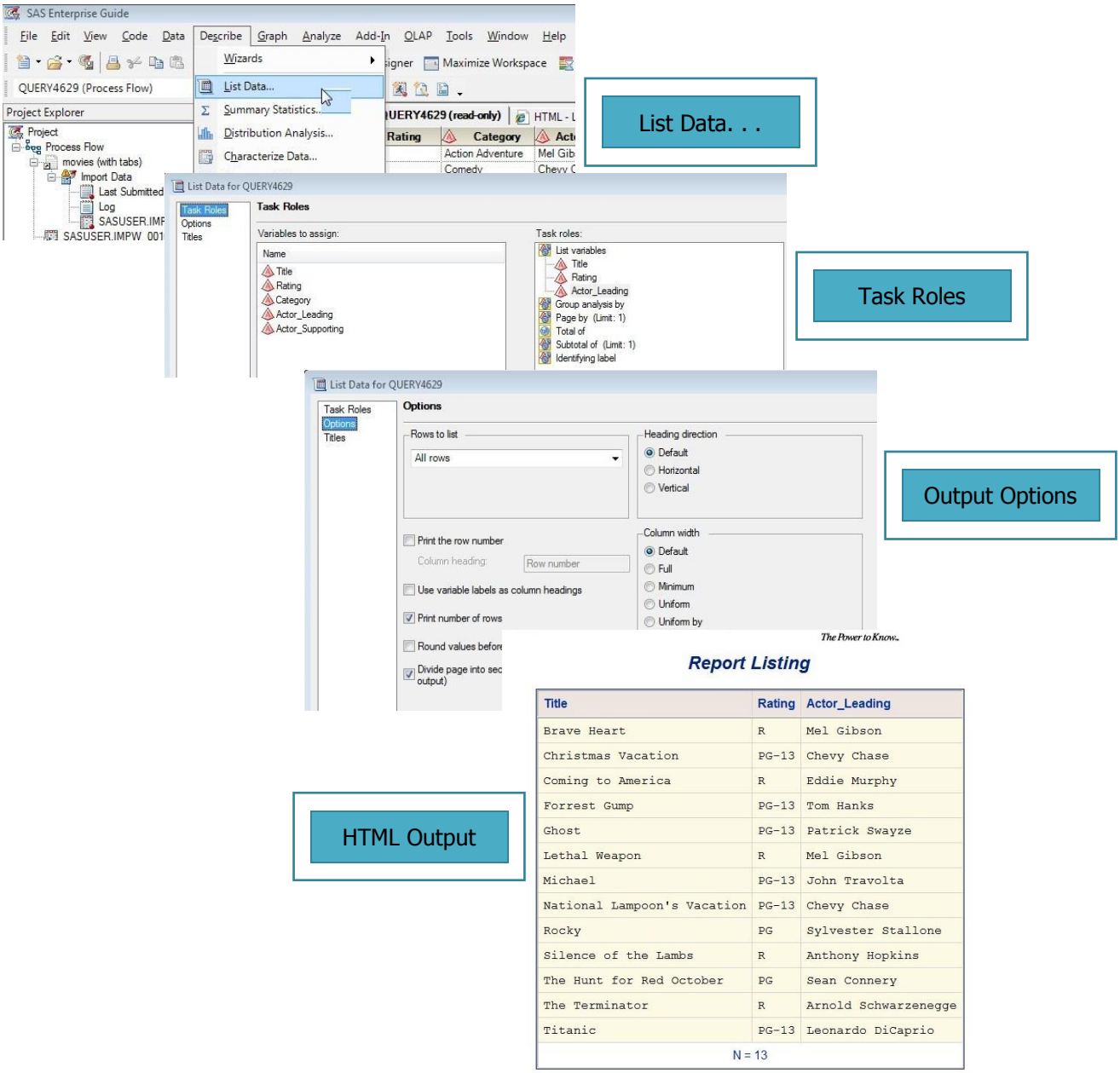
Figure 15. Match-merge process

Show Me the Results – Creating "Custom" Reports

SAS EG provides numerous point-and-click features designed for reporting and presentation. The GUI front-end is designed to be simple to use, and is what differentiates SAS from other software products. EG and its built-in capabilities offer users a unique ability to generate quick results – requiring little, if any, programming skills. In the following examples we'll see how EG can be used to export results to HTML and Microsoft Excel.

Exporting Results to HTML

With the widespread use of the Internet, EG and Output Delivery System (ODS) combine to turn tired-looking monospace output into great looking information using Hyper-text Markup Language (HTML). EG and ODS take the pain out of creating and deploying selected pieces of SAS output in HTML format by providing a level of control without the need to learn complicated coding techniques, illustrated in Figure 16. The HTML-generated output can be deployed to a server (e.g., the Web, Intranet, and Extranet), or a stand-alone workstation for easy access using a Web browser such as Internet Explorer, Firefox, or Netscape Navigator. As you explore the power of EG and ODS, you'll begin to appreciate the relative ease in delivering SAS output and data to HTML.



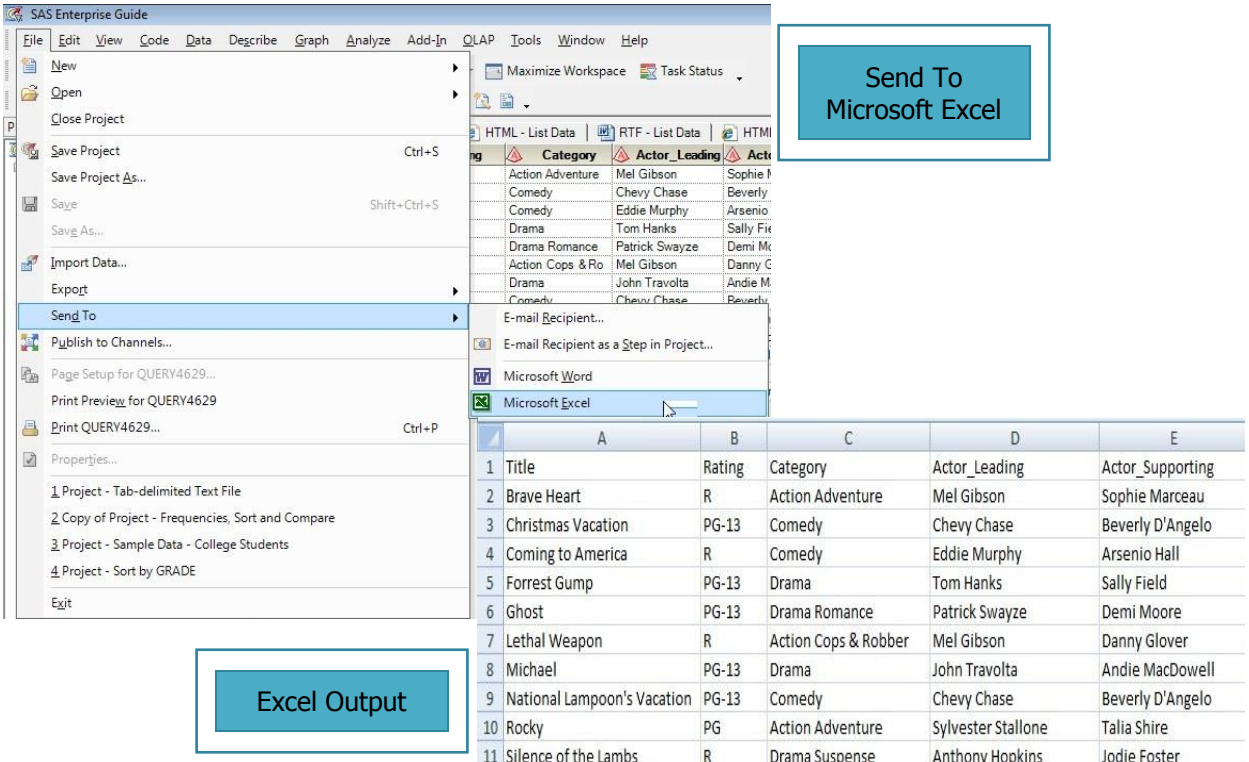
Report Listing

Title	Rating	Actor_Leading
Brave Heart	R	Mel Gibson
Christmas Vacation	PG-13	Chevy Chase
Coming to America	R	Eddie Murphy
Forrest Gump	PG-13	Tom Hanks
Ghost	PG-13	Patrick Swayze
Lethal Weapon	R	Mel Gibson
Michael	PG-13	John Travolta
National Lampoon's Vacation	PG-13	Chevy Chase
Rocky	PG	Sylvester Stallone
Silence of the Lambs	R	Anthony Hopkins
The Hunt for Red October	PG	Sean Connery
The Terminator	R	Arnold Schwarzenegge
Titanic	PG-13	Leonardo DiCaprio
N = 13		

Figure 16. Exporting results to HTML

Exporting Results to Microsoft Excel

Microsoft Excel is not only one of the most widely used software products in the world; it is without a doubt an essential component in an organization's inventory of mission-critical software tools. Figure 17 illustrates the process of using EG to deliver data and results to Microsoft Excel. EG makes creating Microsoft Excel output from data and/or selected pieces of SAS output as easy as 1-2-3.



	A	B	C	D	E
1	Title	Rating	Category	Actor_Leading	Actor_Supporting
2	Brave Heart	R	Action Adventure	Mel Gibson	Sophie Marceau
3	Christmas Vacation	PG-13	Comedy	Chevy Chase	Beverly D'Angelo
4	Coming to America	R	Comedy	Eddie Murphy	Arsenio Hall
5	Forrest Gump	PG-13	Drama	Tom Hanks	Sally Field
6	Ghost	PG-13	Drama Romance	Patrick Swayze	Demi Moore
7	Lethal Weapon	R	Action Cops & Robber	Mel Gibson	Danny Glover
8	Michael	PG-13	Drama	John Travolta	Andie MacDowell
9	National Lampoon's Vacation	PG-13	Comedy	Chevy Chase	Beverly D'Angelo
10	Rocky	PG	Action Adventure	Sylvester Stallone	Talia Shire
11	Silence of the Lambs	R	Drama Suspense	Anthony Hopkins	Jodie Foster
12	The Hunt for Red October	PG	Action Adventure	Sean Connery	Alec Baldwin
13	The Terminator	R	Action Sci-Fi	Arnold Schwarzenegge	Michael Biehn
14	Titanic	PG-13	Drama Romance	Leonardo DiCaprio	Kate Winslet
15					

Figure 17. Exporting results to Microsoft Excel

Accessing Flow Diagrams and Generated Code

EG provides users with application-generated flow diagrams for visually organizing, viewing, and managing projects. These process and flow diagrams are important system and application documentation components. As illustrated in Figure 18 and 19, input and output data sources, along with "key" processes are readily available with a saved project.

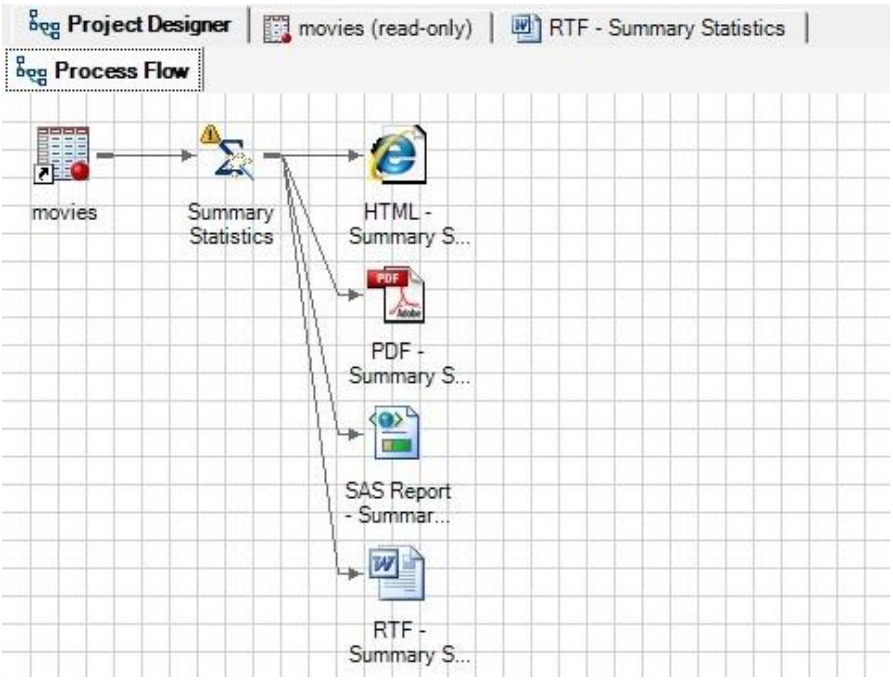


Figure 18. Project Designer – "Quick and Dirty" Statistics Process Flow diagram

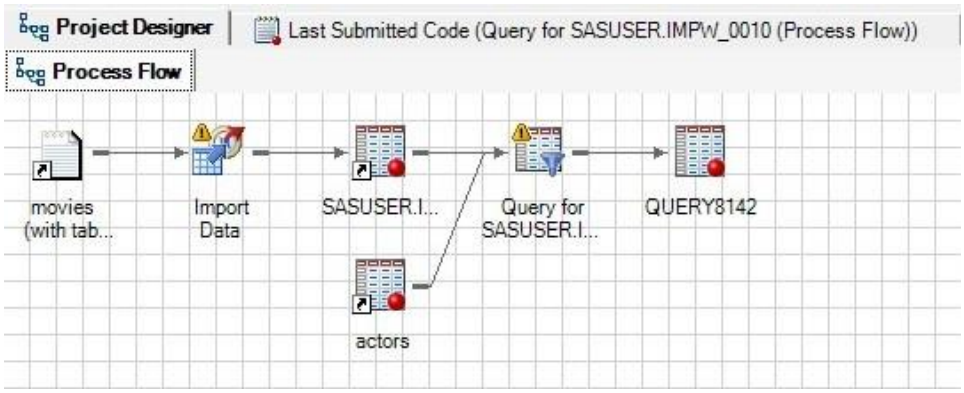


Figure 19. Project Designer – Merge (or Join) Process Flow diagram

Another wonderful feature built into EG is its ability to provide users with application-generated syntactically-correct SAS code. As Figures 20 and 21 illustrate, EG's point-and-click steps along with all user selected options for producing "quick and dirty" descriptive statistics and the match-merging (or joining) process presented earlier generated an assortment of SAS programming code including SORT, SQL, and MEANS procedure code. EG provides users with working code to help learn the many programming techniques available in the SAS System, the ability to execute the generated code without having to revisit the numerous steps provided through the GUI, as well as the actual source code for system documentation purposes.

```
%macro _SASTASK_DROPDS(dsname);
	%IF %SYSFUNC(EXIST(&dsname)) %THEN %DO;
		DROP TABLE &dsname;
	%END;
	%IF %SYSFUNC(EXIST(&dsname, VIEW)) %THEN %DO;
		DROP VIEW &dsname;
	%END;
%mend _SASTASK_DROPDS;

%LET _EGCHARTWIDTH=0;
%LET _EGCHARTHEIGHT=0;
/* ---------------------------------------------------------------
  Code generated by SAS Task

  Generated on: Sunday, November 01, 2009 at 6:34:59 PM
  By task: Summary Statistics

  Input Data: ECLIB000.MOVIES
  Server:  Local
  --------------------------------------------------------------- */

PROC SQL;
%_SASTASK_DROPDS(WORK.SORTTempTableSorted);
QUIT;

/* ---------------------------------------------------------------
  Sort data set ECLIB000.MOVIES
  --------------------------------------------------------------- */
PROC SORT
	DATA=ECLIB000.MOVIES(KEEP=Length Rating)
	OUT=WORK.SORTTempTableSorted
	;
	BY Rating;
RUN;
/* ---------------------------------------------------------------
  Run the Means Procedure
  --------------------------------------------------------------- */
TITLE;
TITLE1 "Summary Statistics";
TITLE2 "Results";
FOOTNOTE;
PROC MEANS DATA=WORK.SORTTempTableSorted
	FW=12
	PRINTALLTYPES
	CHARTYPE
	VARDEF=DF

		MEAN
		STD
		MIN
		MAX
		N		;
	VAR Length;
	BY Rating;

RUN;
/* ---------------------------------------------------------------
  End of task code.
  --------------------------------------------------------------- */
RUN; QUIT;
PROC SQL;
%_SASTASK_DROPDS(WORK.SORTTempTableSorted);
QUIT;

TITLE; FOOTNOTE;
```

Figure 20. Project Explorer – Generated Code for "Quick and Dirty" Statistics Process

Project Designer | QUERY8142 (read-only) | Last Submitted Code (Query for SASUSER.IMPW_0010 (Process Flow))

```
%_eg_conditional_dropds(SASUSER.QUERY8142);

PROC SQL;
  CREATE TABLE SASUSER.QUERY8142 AS SELECT IMPW_0010.Title,
      IMPW_0010.Rating,
      IMPW_0010.Category,
      actors.Actor_Leading,
      actors.Actor_Supporting
  FROM SASUSER.IMPW_0010 AS IMPW_0010
       INNER JOIN EC100017.ACTORS AS actors ON (IMPW_0010.Title = actors.Title);
QUIT;
```

Figure 21. Project Explorer – Generated SQL Code for Merge (or Join) Process

Conclusion

SAS® Enterprise Guide® (EG) empowers an organization's end-users with a powerful graphical user interface (GUI) environment for exploiting a multitude of data, analytical, and reporting tasks. EG provides access to multi-platform enterprise data sources including SAS data sets, tab-delimited data, and Microsoft Excel files; create "custom" report generation; deliver data and results to a variety of mediums and outlets including HTML and Microsoft Excel; produce "quick and dirty" descriptive statistics; perform data manipulations without the need to learn complex coding constructs; while supporting data management and documentation requirements by producing system flowcharts and diagrams quickly and easily using the built-in wizards.

References

Delwiche, Lora D. and Susan J. Slaughter (2006), "*Producing Summary Tables in SAS® Enterprise Guide®*," Proceedings of the 2006 NorthEast SAS Users Group (NESUG) Conference.

Fecht, Marje and Rupinder Dhillon (2013), "*SAS® Enterprise Guide®: A Powerful Environment for Programmers, Too!*," Proceedings of the 2013 SAS Global Forum (SGF) Conference.

Hemedinger, Chris (2005), "*Boost Your Programming Productivity with SAS® Enterprise Guide®*," Proceedings of the Thirtieth SAS Users Group International (SUGI) Conference, SAS Institute Inc., Cary, NC, USA.

Hettinger, Patricia (2009), "*Tips for Moving SAS® Enterprise Guide® on Unix*," Proceedings of the 2009 SouthEast SAS Users Group (SESUG) Conference.

Lafler, Kirk Paul and Mira Shapiro (2013), "*Point-and-Click Programming Using SAS® Enterprise Guide®*," Proceedings of the 2013 NorthEast SAS Users Group (NESUG) Conference.

Lafler, Kirk Paul and Mira Shapiro (2013), "*Point-and-Click Programming Using SAS® Enterprise Guide®*," Proceedings of the 2013 Michigan SAS Users Group (MISUG) One-day Conference.

Lafler, Kirk Paul and Mira Shapiro (2012), "*Point-and-Click Programming Using SAS® Enterprise Guide®*," Proceedings of the 2013 Kansas City Area SAS Users Group (KCASUG) Meeting.

Lafler, Kirk Paul (2004), "*Creating HTML Output with Output Delivery System*," Proceedings of the 2004 Western Users of SAS Software (WUSS) Conference, Software Intelligence Corporation, Spring Valley, CA, USA.

SAS® Software Essentials Using SAS Enterprise Guide® Course Notes, First Edition (2009). Software Intelligence Corporation, Spring Valley, CA, USA.

Shapiro, Mira and Kirk Paul Lafler (2011), "*Point-and-Click Programming Using SAS® Enterprise Guide®*," Proceedings of the 2011 SAS Global Forum (SGF) Conference.

Shapiro, Mira and Kirk Paul Lafler (2010), "*Point-and-Click Programming Using SAS® Enterprise Guide®*," Proceedings of the 2010 MidWest SAS Users Group (MWSUG) Conference.

Shapiro, Mira and Kirk Paul Lafler (2010), "*Point-and-Click Programming Using SAS® Enterprise Guide®*," Proceedings of the 2010 Western Users of SAS Software (WUSS) Conference.

Shapiro, Mira and Kirk Paul Lafler (2010), "Point-and-Click Programming Using *SAS® Enterprise Guide®*," Proceedings of the 2010 South East SAS Users Group (SESUG) Conference.

Todd, Michael (2008), "*Transitioning to SAS® Enterprise Guide®*," Proceedings of the 2008 NorthEast SAS Users Group (NESUG) Conference.

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Trademark Citations

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