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THESIS

DATABASE DESIGN AND IMPLEMENTATION FOR
USMC MANPOWER RETENTION SURVEY

by

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September 1999

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DATABASE DESIGN AND IMPLEMENTATION FOR USMC MANPOWER RETENTION SURVEY

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ABSTRACT

MCERC is a database design and implementation to support the survey instruments for the USMC Exit and Retention Censuses, which are administered over the Internet. The Retention Census is a longitudinal survey administered annually to all Marines. A review of commercially available survey software revealed a lack of support for longitudinal surveys. A semantic object model for survey instruments is developed that relates them to the response data they collect. The resultant database schema facilitates version management of survey instruments over their lifecycle. The design supports the longitudinal aspect of the USMC Censuses by allowing the tracking of the instruments and response data over time. A relational model of the database design is prepared and implemented in Access™. A user interface is designed using Visual Basic, which integrates Cognos Powerplay™ into the system for analysis of the data. The interface includes the capability to convert raw data into a matrix for analysis. Issues of database administration are discussed as they relate to scaling the system from a stand-alone to a multiple-user environment.

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I. INTRODUCTION

Retention of "corporate knowledge" is vital to any large organization. The United States Marine Corps (USMC), as well as all other military services in the United States, constantly faces the loss of critical skills and leadership as top quality Marines choose to leave the service for a variety of reasons. Policymakers must decide what actions are possible and necessary to keep well-trained Marines motivated to stay in the service. Toward this end, the USMC has initiated the USMC Exit and Retention Censuses to be implemented beginning in Fiscal Year 1999 and continuing indefinitely on an annual basis. The initiative takes advantage of contemporary technology, by placing the survey instrument on the Internet as the vehicle for data collection. This thesis produces a database design and implementation to facilitate understanding, analysis, and administration of the collected data as well as management of the census questionnaires throughout the lifecycle of the censuses.

A. BACKGROUND

The USMC Exit and Retention Censuses (or surveys) will ask over 200 questions of as many Marines as possible every year. The intention as stated by the program sponsor, Manpower and Reserve Affairs (M&RA), Headquarters USMC (HQMC), is to have 100 percent participation, less general officers, officer candidates, and recruits. Marines exiting the service must complete the Exit Census prior to being fully discharged. All others are to complete the Retention Census on an annual basis. Both are conducted via the Marine OnLine (MOL) website on the World Wide Web. The effort is intended to harness contemporary information technology to make the surveys easily accessible and thorough. The result will be a very large repository of survey information, with many thousands of Marines responding to many questions every year. For the Retention Survey, the database will have response data for many of the same Marines across multiple

years. Therefore, one of the results of the Retention Census will be a longitudinal study, where the same individuals will be polled for their responses across numerous timeframes.

Given the vast amounts of data that will be collected over the years, a wealth of potential analyses can be drawn from the data. However, there is a challenge inherent to a longitudinal study initiative in that the survey instrument itself will very likely be refined many times during the lifecycle of the study. To ensure the data is consistently understandable, these refinements to the survey instrument must be assiduously tracked. While it is important to field the best possible survey instrument at the beginning of the study, it is also essential to be able to modify existing questions on the instrument and add new questions as well as analyze the response data relative to these survey instrument modifications. Ultimately, the data collected over the years will be used for hypothesis testing in order to predict the outcome of policy options. Preliminary analysis of the data will be accomplished using software for crosstabulations to display and examine distributions. As data is collected over the long term, erratic data for certain variables may be explained by the questions asked on the survey instrument at the time. [Cooper and Emory] Thus, the capability to track changes to the survey instrument is an essential feature of any longitudinal study.

At some future state of the Exit and Retention Census initiative, the data collected in prior years may potentially be rendered unusable because the changes to the survey instrument become impossible to track. This thesis provides a conceptual data schema that results in the capability to manage changes to the survey instrument to avoid this situation. In addition to the data schema, a system is implemented which demonstrates the capabilities for managing the survey instrument and analyzing the collected data for the USMC Exit and Retention Censuses.

B. PURPOSE

The purpose of this study is to design an effective database schema to support a longitudinal survey which will accommodate inquiries over time as the same respondents

answer the survey from year to year, and which will itself change over the years. The resulting schema can be used to support the administration of the USMC surveys. In addition an interface to the database is provided to enable the extraction of subsets of the database for analysis in support of the manpower decisionmaking process. To implement the system, meaningful user interface requirements for the survey developer and analyst are identified and analyzed in relation to the database schema.

To motivate identification of the database requirements, an overview of existing, Web-based survey software packages is conducted. This will illuminate what features and functionality are desirable for our database system. In particular, the time semantics, or version management, dimension of this database is critical to a successful implementation.

Extensions of the basic concepts developed by this study are discussed to provide input for improving and maintaining the longitudinal survey system. Ultimately, the goal of the system is to build a uniform environment for survey development, administration, and analysis. Recommendations are included for enhancing the system developed in this thesis.

C.   SCOPE AND METHODOLOGY

The scope of the thesis includes the following:

1. An overview of survey software packages available with integrated analysis capabilities. Additionally, statistical analysis software available for analyzing the data regardless of the software for administration of the survey instrument is reviewed.

2. The development of a data model/schema for the capture of data from the survey and for the capture and tracking of changes to the surveys and questions. This supports the longitudinal aspect of the survey.

3. Implementation of the database in Microsoft Access, including the user interface between Access and an analytical software package.

3

4. Design and development of a user interface in Visual Basic to enable the integration of the database with analytical software packages. This provides the capability to obtain certain pre-formatted reports and data extracts.

The following methodology is used to conduct this research:

1. Conduct a literature and World Wide Web search for information on analytical software for surveys. Analyze the relative capabilities and functionality of the programs found.

2. Develop a conceptual data model for the longitudinal surveys using SALSA™, which could theoretically be applied to any longitudinal study. Analyze and determine the necessary entities and relationships to facilitate the longitudinal nature of the study.

3. Convert the conceptual model to a relational database model and implement the model in Microsoft Access.

4. Design interface forms in Access as the user interface to the survey instrument database.

5. Design preformatted standard reports and data extracts.

6. Develop a user interface in Visual Basic to allow the system administrator to manage the survey instrument, and manipulate and analyze data through a single system interface. The interface facilitates the use of Cognos Powerplay™ for viewing the data.

7. Populate the database with the first version of the Exit and Retention survey instruments, and develop procedures for maintaining the instruments for future versions.

8. Implement the database by downloading a subset of respondent information entered by Marines via the World Wide Web. Produce reports and various data extracts using the data.

9. Document the process of design and development, conclusions, lessons learned, and recommendations for follow-on study.

10. Prepare a user's manual for the managers, and a procedures guide for the project officers who will be maintaining the system throughout its lifetime.

D.   THESIS STRUCTURE

This introductory chapter has provided the background, scope and methodology for the thesis. Chapter II is a discussion of the various software components needed for the thesis and an overview of commercial software available. In Chapter III, the problem areas of the thesis are discussed and requirements of the system are specified. Chapter IV presents the conceptual design for building the database, including the data models, database schema, constraints, and database administration. Chapter V describes building the User Interface, including the development of process models, design and creation of menus, screens and reports, generation of application code, and development of a user's manual. In addition to conclusions, recommendations for future enhancements are included in Chapter VI.

II. SURVEY SOFTWARE OVERVIEW

The USMC Exit and Retention Census initiative, with its web-based survey instrument, is intended to leverage contemporary technology to fulfill its objectives. It is important to understand the basic processes and components inherent to a complete survey system, and to find appropriate technology to support those processes. Toward this goal, we start with a review of web-based survey systems, keeping in mind the particular requirements to support the longitudinal study being undertaken by the USMC. This chapter provides a conceptual overview of the system and reviews several software packages, documenting their relative capabilities.

A. WEB-BASED SURVEY SYSTEMS

Software to support the USMC's web-based surveys requires features above and beyond basic database functionality which provides permanent response storage capabilities as well as web-authoring tools for the survey instrument. The first component is the application that contains the actual survey questionnaire and facilitates its deployment to the web. This software assists the survey administrator in survey instrument development and maintenance. It may include a web-authoring capability to facilitate placing the instrument on the web in which case the web-based instrument then facilitates the transmission of responses into a data file for permanent storage. Once response data is collected, another software package (if not an integrated part of the survey software) facilitates analysis of selected subsets of the data. Software for the development of a user interface between the database and the data analysis program will also be necessary unless the components are already integrated.

Figure 1 shows a schematic of a web-based survey system with the basic hardware components and their interaction with applications, data, and software components.
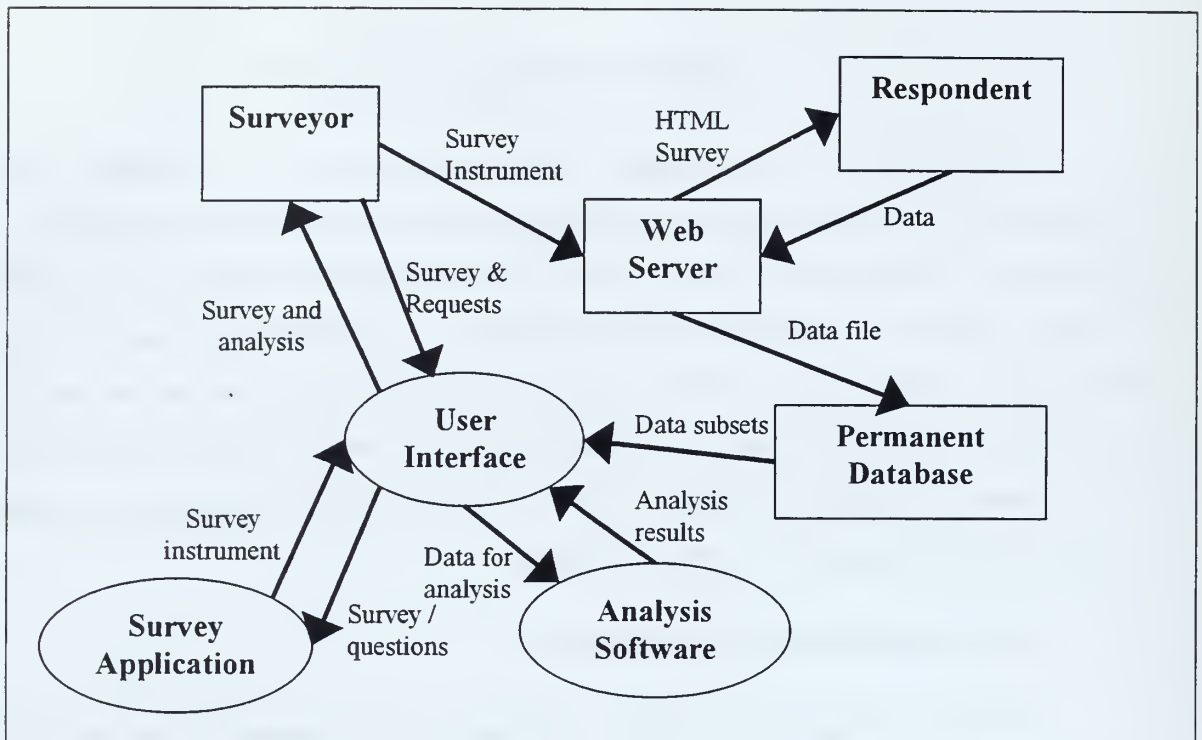
Figure 1. System Schematic of Longitudinal Web-Based Survey

The Surveyor's goal is to have information about Respondents. The large number of Respondents requires that a robust mechanism be in place for them to deliver that information, rather than a direct link between the Surveyor and the Respondents. Therefore the survey instrument is delivered to the Respondents as an HTML survey from a web server. Respondents then enter data which the web server collects and sends to the Permanent Database. The Respondents only interact with the web server in their role of providing the data to the system.

The Surveyor's role as depicted in Figure 1 is clearly more involved than the Respondent. The Surveyor must develop and deploy the Survey instrument on the Web Server. Prior to placing it on the web, it must be designed, documented and stored for future reference using the Survey Application. Figure 1 shows the Surveyor employing a User Interface to place information about surveys in the Survey Application. The survey instrument is then permanently maintained in the Survey Application. The Surveyor also

sends requests via the user interface to the Analysis Software for analysis of response data and to the Survey Application for the survey instruments and related reports. When the Surveyor sends request to the Analysis Software, the response data is passed from the Permanent Database to the Analysis Software either directly or via the User Interface.

Given this general overview of the system components, the software required to support the USMC Surveys must include:

1. Survey software to develop Survey Instruments and maintain them in a database for the lifecycle of the USMC Surveys;

2. Analysis software to provide analytical capabilities for research on response data collected;

3. Graphical User Interface (GUI) software such as Visual Basic to provide an integrated system environment for the user.

The still growing popularity of the Internet has generated a vast supply of flexible web-based development tools. These tools are evolving rapidly, with a wide variance in the approaches software development companies are taking. As a result, there are numerous tools of varying quality that can be used for the development of an HTML survey instrument. There is a number of software development companies with specialized survey development packages. Since these tools are designed specifically for survey development, most of them have an internal analysis capability, as well as the ability to format the data for transfer to a robust statistical analysis tool. A powerful alternative to purchasing a specialized survey development tool is to use web-authoring software for survey creation, and to choose a robust statistical analysis package to examine the results. Increased availability of web-authoring software fulfills this need. Accordingly, various web-authoring tools for surveys and their associated capabilities and limitations are examined in the next section. In the subsequent section, statistical analysis software capable of providing a broad range of statistics on complex data subsets is examined. A survey of these two components of the survey system will give the

contemporary surveyor a good sense of the current state of software for collecting and understanding large volumes of data.

Software to support the other component of the longitudinal survey system, the GUI interface, is more widely understood and will not be reviewed here. The software for developing the GUI interface component should be a flexible programming language such as Visual Basic.

B.   SURVEY SOFTWARE.

There are numerous quality development tools for the creation of web-based surveys. Many come with their own data administration modules, as well as analysis packages. For the USMC Retention and Exit Survey, as with most web-based surveys, the survey software chosen requires certain capabilities. It must:

1. allow lengthy surveys (of at least 280 questions);

2. allow many respondents;

3. allow branching in the survey so that respondents need only respond to appropriate questions;

4. automatically populate the database;

5. provide security of respondent's private information;

6. provide entry validation;

7. provide a user friendly interface for administrators and the respondents;

8. allow a wide range of item and response types.

Because this is a longitudinal survey system, the responses will be stored in a permanent database external to the web survey package, so there is no requirement for this component to have an analysis or data management capability. However, these

capabilities are imperative for the system as a whole, so the analytical and data management components, if any, of packages will be considered.

This examination of web survey development packages concentrates on those showing promise to support extensive, long-term surveys. There are numerous packages available which are designed to support web surveys on a smaller scale and for one-time surveys, such as specific marketing studies. This examination should not be considered as a comprehensive list, but an evaluation of only a few of the means of getting a survey instrument on the web.

The survey development tools in Table 1 can be used for implementing a survey on the web. Most include analysis capabilities in addition to merely deploying a survey instrument. Although not a tailored survey software application, Lotus Domino is included as a development tool that can be used to design a proprietary survey application.

Capabilities		Does Large Surveys	Longitudinal Studies	Works With Other Software	Entry Validation	Analysis Capability	Security
Products	Cost						
Survey Select Saja Software, Inc.	$595 to $1285	Yes	No	Yes	Yes	Limited	Yes
SurveySolutions Perseus Development Corp.	$179	Yes	No	Yes	Yes	Limited statistics	Unknown
Domino Lotus Development Corp.	$495	Yes	N/A	Yes	Yes	N/A	Yes
Inquisite Catapult Systems Corp.	Call for price	Yes	No	Yes	Yes	Limited	Unknown
Surveys with Confidence SPSS, Inc.	$999	Yes	No	Yes	Yes	Complete	Unknown
SurveyTracker National Computer Systems, Inc.	Call for price	Yes	No	unknown	Yes	Complete	Unknown

Table 1. Summary of Survey Software Packages/Options Reviewed

In order to support large surveys, an application must support branching, large numbers of respondents, and many questions. To support longitudinal surveys, a package must also have the capability to manage versions of surveys and questions.

The survey software should allow importing and exporting in commonly used formats to be compatible with other applications that might be used in conjunction with it. For instance the survey instruments might be desired for publication to the web in HTML or a report might be desired from it for downloading in a particular desktop administrative tool. Additionally, the data collected should easily be made available for analysis in a program of the user's choice. Some survey software comes with built-in analysis tools, but the capabilities are usually limited.

For Entry Validation, the software should provide a way to define validation rules when respondents provide answers. This capability includes the support for multiple data types, and helps ensure that the data being received is indeed the data desired for analysis. Entry validation also provides data integrity, since data of undesired format is prevented from polluting the database.

Security provides control over data access, another aspect of data integrity. A good survey software package should provide some level of security for the database, as well as the response data. It should also ensure that any private information of respondents is protected. From the perspective of respondents, a security feature that maintains their anonymity also encourages them to provide candid responses. From a database administration perspective, the feature is necessary to protect confidential information.

Some survey software packages have variable price ranges, depending on the desired functionality. Additional modules may be needed to give the survey software a web-based, e-mail or network capability.

No survey software reviewed mentioned the administration of longitudinal surveys. Those that have the complete analysis capabilities could certainly handle the analysis of longitudinal data, but the problem of tracking a survey instrument over time is not

explicitly considered by any of them. The impetus for these commercially available survey tools is largely marketing and customer satisfaction surveys. Longitudinal studies require a long-term commitment and dedicated administrative overhead to manage the overall process. The lack of a short-term payoff makes this type of study unattractive to the business world, which constitutes most of the market for the software vendors.

Longitudinal studies are more in the realm of government, research and academic organizations. As such, they are centralized and serve the broad purposes of a large community with long term goals. Software applications designed to support such an effort would be proprietary by nature. This observation gives insight into the apparent lack of support for longitudinal surveys in conjunction with commercially available survey software.

The USMC Survey Instrument was designed for the web using Lotus Development Corporation's Domino software. The first iterations of both the Exit and Retention Censuses were designed and implemented without a database schema to support tracking multiple survey instruments over time. This thesis provides a design and implementation of a Microsoft Access relational database to manage a longitudinal survey. Because the Survey Instrument has already been built and placed on the Internet, the requirement for this study is to store the details of the Survey Instrument in an appropriate database application. The main goal of the system is to provide survey instrument lifecycle management for both longitudinal and static surveys. Links to analytical capabilities will be provided in two ways: a text file can be generated which can subsequently be imported into statistical analysis software packages such as SAS™ or SPSS™, and a direct connection will be provided to the Cognos Powerplay™ tool which can do multidimensional crosstabs displays and reports.

Now that we understand the components that should be in a generic, longitudinal survey system, we can apply this insight to the USMC Surveys to generate specific requirements as discussed in the next chapter.

III.   PROBLEM BACKGROUND AND REQUIREMENTS SPECIFICATION

The Marine Corps Exit and Retention Censuses are the impetus for the development of a data model and schema that reflects their particular requirements. The Marine Corps' initiative is to conduct two surveys primarily for the purpose of statistical analysis. All Marines who are exiting active duty will be required to take the Exit survey. On an annual basis, all Marines will be required to take the Retention survey. An overall objective is to capture data about four classes of people: those who say they are leaving and leave; those who say they are leaving and stay; those who say they are staying and stay; and those who say they are staying and leave. General officers, officer candidates, and recruits will not be required to take the surveys.[CMC, 1999] While there are questions asked on the Exit survey that are only appropriate for a Marine who is leaving the service, and questions on the Retention that are only asked of Marines staying in, there are also many questions common to both surveys. It is necessary to analyze the data elements of these surveys that will be captured in the database in order to understand these requirements. For clarity and brevity, we adopt the unofficial acronym MCERC (Marine Corps Exit and Retention Censuses) for the system being developed to support the USMC surveys in this thesis.

A.   USMC SURVEY REQUIREMENTS

The survey instrument provides the necessary information to gain a basic understanding of the survey system requirements. By studying the questions and response alternatives, the type of data that will be held in the database can be determined. The data collected as well as the questions themselves must be kept in the database in a logical schema so the data can be related back to the questions asked. Information about the survey instruments and each question on them should be maintained for the survey management aspect of the system. This information is typically referred to as a codebook

for the survey. Another aspect is that of data analysis, for which response information must be kept, including data about the responses and the respondents themselves.

A representative sample of questions from the Exit and Retention surveys is given in Figure 2. Both surveys are lengthy, with a broad spectrum of questions. The Exit survey has over 150 questions, and the Retention survey has over 250 questions. Many questions are repeated between the two surveys. The questions from the Retention survey can be found in Appendix A.

Spoucareer   To what extent have your spouse's career opportunities been limited by frequency of relocation?
    1.   Not at all
    2.   Somewhat
    3.   A great deal

spouloca   To what extent have your spouse's career opportunities been limited by frequency of relocation?
    1.   Not at all
    2.   Somewhat
    3.   A great deal

daycare How satisfied are yu with the availability of daycare in your area?
    4.   Very satisfied
    3.   Somewhat satisfied
    2.   Somewhat dissatisfied
    1.   Very dissatisfied
    0.   n/a

marital What is your current marital status?
    1.   Single and never married
    2.   Single and divorced
    3.   Legally separated
    4.   Married (first marriage)
    5.   Married (previously divorced or widowed)
    6.   Widowed

milhousing   Do you live in military housing?
    1.   Yes
    2.   No

trainready   I have received the training needed to make my contribution to unit readiness.
    4.   Strongly agree
    3.   Somewhat agree
    2.   Somewhat disagree
    1.   Strongly disagree

Figure 2. Questions and Choice Alternatives for USMC Surveys

Although there are various formats for survey questions, the concept is straightforward. A survey question is presented and a respondent provides a response to it. MCERC must be flexible enough to accommodate different formats for responses. Since there will be different types of data based on the responses, it must also be rigid enough to maintain integrity of responses in spite of the variance in their formats.

The requirements for the basic survey system can be divided into two main categories: providing a relational database structure, and making the data available for analysis and reports.

Because the USMC intends this to be a longitudinal study, the factor of time must be accommodated in the schema. Where many surveys are conducted only to gather a one-time data sample, the USMC surveys will presumably be conducted over many years. The Exit survey will be a requirement for every Marine to take before leaving active duty service. With the Retention survey, the same respondents may be responding multiple times, and the intention is that there be mandatory annual participation. Thus the Retention survey is truly longitudinal in that the same respondents will be providing responses to the same questions as well as new and revised questions over time. Therefore, there is a requirement to structure the data in a manner that captures this longitudinal aspect.

The intention to field the surveys for many years dictates that inevitable changes to the survey instrument must also be accommodated. The high likelihood that questions will be added, subtracted, or modified creates the need to track these types of changes as they occur over the lifetime of the survey system. Analysts of the data need to know when their time-series data is based on more than one version of a question.

Requirements to provide survey management as well as data analysis have been identified. These, combined with the requirement to accommodate them within a single system, drive the design of a user interface. This interface should allow the user to easily enter questions into the MCERC database and associate them with appropriate survey

versions. It should allow for modification of existing questions, and addition of questions without compromising the data collected prior to the change. The interface will also allow users to generate output files that can be accessed by statistical analysis software which can manipulate and analyze the responses.

B.   ANALYSIS REQUIREMENTS

There are many possibilities for analysis of the data that will result from these surveys. Of primary interest is how variance in responses fluctuates among different demographic factors. For instance, there may be interest in how responses to questions relating to leadership style vary by Military Occupation Specialty (MOS). Responses to certain questions by female Marines may be compared to the responses of males. Certain communities within the Marine Corps reflect a high investment and are difficult to retain. Any analysis that may give insight into these communities may help shape policy to retain their critical skills. As an example, the aviation community may respond quite differently to questions about military benefits than other communities. These kinds of analyses can potentially provide the type of insight decision-makers need to craft policy. For MCERC, the data analysis capability must give views of the data that show the relative numbers of responses against desired variables.

For the USMC Surveys, the reporting and analytical software in use by the survey sponsor, Manpower and Reserve Affairs (M&RA), Headquarters, U. S. Marine Corps (HQMC), is PowerPlay™ by Cognos, Inc. Powerplay™ provides the user with crosstabulations capability. It comes with a component, Transformer™, which allows data modeling for multidimensional analysis. Powerplay™ is a leading Online Analytical Processing (OLAP) tool with extensive drill-down, slice and dice capability. MCERC must provide a way via the user interface for the analysts to access the capabilities of PowerPlay™.

A summary of requirements for the MCERC system requirements is given in Table 2.

Summary of Requirements	
Category	**Requirement**
Survey Management	Database schema for management of Surveys and Questions
	Must accommodate changes in survey instrument (questions and surveys)
Data Analysis	Response data must be related to Surveys and Questions in the schema.
	Data schema must support longitudinal analysis of responses
	Interface must integrate survey database and PowerPlay™ analysis software
	Must be able to generate Survey Codebooks

Table 2. Summary of Requirements for MCERC to Support the USMC Surveys

With these requirements specified, the data model for MCERC can be developed and implemented, then integrated with the analysis software via a user interface to provide all required capabilities of the system.

IV.   BUILDING THE DATABASE

One of the key milestones for the implementation of the longitudinal survey system is the development of an appropriate data model and corresponding database schema. The model must correctly portray the various entities that exist in the survey application as well as the relationships between them.   Similarly, the database schema must implement these entities and relationships in a physical database that serves as the engine of the overall system.   Data models and a database schema for MCERC are developed with system requirements in mind as the basis for deeper analysis.

A.   DEVELOPING THE CONCEPTUAL DATA MODEL

A successful database implementation should be preceded by the development of thoroughly analyzed data models. To obtain an appropriate data model for a system, the methodology used should take the requirements of the system as the basis for developing and documenting the model. Two methodologies for accomplishing this are the Entity-Relationship (E-R) Model and the Semantic Object Model (SOM). The E-R approach identifies each entity and all of its associated relationships with other entities. The SOM approach also identifies entities (called semantic objects) as well as their attributes, although, unlike the E-R approach, SOM represents relationships between objects in a less explicit manner. Objects are embedded within other objects to reflect a relationship. SOM also gives all the attributes and associates them directly with the objects. The nature of the relationships between objects and with attributes can also be described in SOM by showing cardinalities. The SOM approach is used in this thesis to derive a data model for MCERC.

1.   Primary Objects

The first issue is to determine what the actual objects should be in the survey system. David M. Kroenke defines an object as "a named collection of attributes that

sufficiently describes a distinct entity." [Kroenke, 1995]   Based on an analysis of the system requirements, the following objects have been identified as integral to the system: Surveys, Questions, Respondents, and Responses.

The Semantic Objects relating to these four objects are presented in Figure 3. As can be seen, a semantic object has its attributes associated directly with it by simply listing them within the object. Key attributes (identifying attributes) are designated with asterisks in the figure, using two asterisks for unique keys and one for non-unique keys.   To establish a relationship between objects, the objects are embedded in each other.   This serves to directly relate the key attributes. Cardinalities can be shown for each attribute, meaning the minimum and maximum occurrences of the attribute as it relates to a single instance of the object. The cardinalities are designated to the right of each attribute by the two values separated by a hyphen.   The minimum cardinality is the left value, the maximum the right.
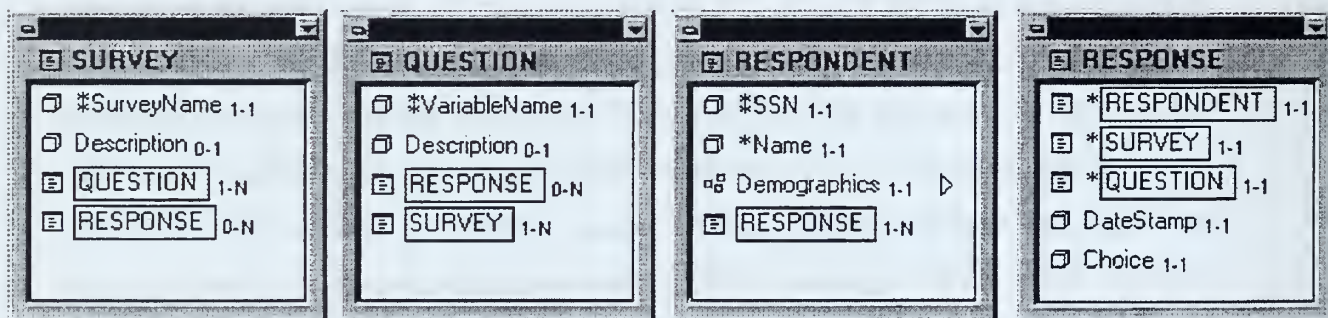
Figure 3. Primary Objects of MCER C Model

Figure 3 depicts a Semantic Object Model with only the four objects of a simple survey system that allows for management of multiple surveys and respondents. These primary objects, while modeling the basic ideas of a simple survey system, are insufficient to handle all the problems associated with the USMC Census database.   Other objects must be added to the model to handle issues surrounding the management of a large,

longitudinal survey. These additional objects will be described below. The following is a description of the basic objects, their associated relationships, and their key attributes.

The SURVEY object models the survey instrument. The *SurveyName* field is the uniquely identifying key for a SURVEY, and will be either the Exit survey or Retention survey for the USMC Census database. A SURVEY consists of many QUESTIONs, and many RESPONDENTs can take a particular SURVEY. This is not modeled directly, however, rather the RESPONSE object is used to capture the relationship between RESPONDENT and SURVEY. While one SURVEY can have many QUESTIONs, the business rules pertaining to survey questions will determine whether QUESTIONs can pertain to one or many SURVEYs. In order to reuse QUESTIONs, they must be associated with many SURVEYs in this model.

QUESTION is a separate object from SURVEY because questions can take many forms, and each survey can take many forms with varying numbers and types of questions. This relationship is necessary to provide the flexibility to manage multiple surveys. If questions were only a field within a survey, then each question developed could only be used for one survey. With the separation of the objects, questions can be reused. The *VariableName* field uniquely identifies a QUESTION and is therefore the key for this primary object.

RESPONDENT is a separate object that captures the notion there will be individuals taking the survey and providing responses which we want to measure in this application. For the purposes of this database, certain attributes of respondent information require protection under the Privacy Act of 1974; treating RESPONDENT as a separate object facilitates the protection of this stored data. Certain demographic and personal information obtained for this object in the MCERC database is extracted from the USMC master file rather than entered directly by the respondent. The primary key of the RESPONDENT object is the SSN field (Social Security Number), with the Name of the respondent being a secondary identifier. Only the last four digits of the SSN are used to establish relationships with other entities.

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RESPONSE is a separate object, and represents the key data elements of interest for analysis in this database. Determining the best way to handle this object depends on the choice of business rules for this system. One approach, in which questions for each version of SURVEY are viewed as relating only to that particular survey, is to treat each response as one RESPONSE object for each RESPONDENT for each SURVEY. This would appear as a sequential list of answers. Another view, which is adopted here, allows each particular QUESTION to be used on many surveys, in varying sequence, and in various versions. In this case, the RESPONSE object appears one time for each QUESTION for each RESPONDENT for each SURVEY answered. This requires significantly more computing and storage overhead as a tradeoff against more usability and flexibility in the system. Each RESPONSE is uniquely identified by a combination of the key fields of SURVEY, QUESTION, and RESPONDENT. The key for RESPONSE is therefore a combination of the keys of these three objects.
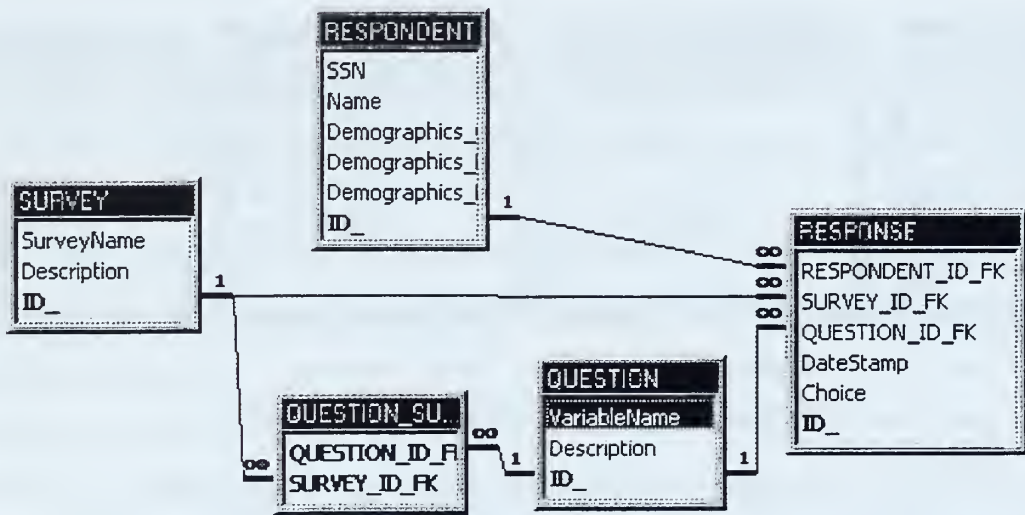
Figure 4. Entity-Relationship Schematic of Simple Survey System

The next step we take is to convert the basic semantic object model shown in Figure 3 into a database schema, in this case a Microsoft Access database. This gives an explicit representation of the relationships between the entities that result from the SOM.

Figure 4 shows the resulting tables and relationships between the tables. In this model, the SURVEY table has a one-to-many relationship with RESPONSE, meaning a single SURVEY can have many RESPONSEs and a single RESPONSE pertains to one and only one SURVEY.

SURVEY is also joined via a junction table to QUESTION, reflecting a many-to-many relationship. A single SURVEY will have at least one, but may have many QUESTIONs. Likewise, a single QUESTION will pertain to at least one, but may be asked on many SURVEYs.

Another many-to-many relationship exists between SURVEY and RESPONDENT, with RESPONSE serving as a junction table in this case. In the model, we could have created a direct relationship between RESPONDENT and SURVEY, but this would have been redundant, since the relationship is already captured via the RESPONSE table. A single SURVEY can have many RESPONDENTs, and a single RESPONDENT can respond to many different SURVEYs.

The QUESTION table has a similar redundant relationship at first glance. The many-to-many relationship between QUESTION and SURVEY has already been discussed. The RESPONSE table also relates these two objects in a many-to-many relationship. However, for a RESPONSE to exist, there also has to be a RESPONDENT. QUESTIONs and SURVEYs will exist before there are any RESPONDENTs. The redundancy here is necessary to manage surveys and questions prior to having any responses by respondents. The survey designer must create a SURVEY and associated QUESTIONs first in order to later obtain RESPONSE and RESPONDENT information.

A single instance of a QUESTION can have from zero-to-many RESPONDENTs. Likewise a single RESPONDENT will answer one-to-many QUESTIONs. This creates a many-to-many relationship between QUESTION and RESPONDENT, which are joined via the RESPONSE table. A single instance of QUESTION can have many RESPONSEs, but a single RESPONSE pertains to one and only one QUESTION. A RESPONSE is defined as one respondent's answer to one QUESTION of one SURVEY. Although

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RESPONSE serves as a junction table for the above-mentioned many-to-many relationships, a single instance of RESPONSE can pertain to one and only one QUESTION, SURVEY, and RESPONDENT. Therefore each RESPONSE is uniquely identified by the combination of the keys of the other three objects. The RESPONSE object represents the ultimate target of the survey system, which is to gather many unique responses for analysis.

2. Refinement of the Data Model for Longitudinal Surveys

The foregoing SOM and resulting diagram of its resultant relationships provide the basis for a simple survey system, yet will not suffice for a large, longitudinal survey system like the USMC Longitudinal Censuses for Exit and Retention (MCERC). There are complex issues which complicate the implementation of the system, and which require decisions about how to manage the complexity. Additional objects will have to be added to the model, requiring more tables in the database, and further analysis of the relationships.

There are at least three complicating issues caused by the size and the longitudinal nature of the system. First among them is *version management* due to the longitudinal nature of the survey and the necessity to facilitate change. Secondly, *conditional branching* results from the requirement that various subsets of the targeted respondents need answer only those questions pertinent to their demographics, or questions that are only applicable contingent upon answers to previous questions. Related to this is the third issue of *sequencing the questions* between different versions of surveys and the different subsets of respondents who will see them.

The longitudinal nature of MCERC creates the requirement for version management. Changes to surveys that span many years are inevitable. Responses to certain questions are very likely to prove too erratic for insightful analysis, and such questions will be refined, rewritten, or even eliminated. This entails management of various versions of what is essentially the same question, and management of a new

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version of the actual survey every time a change is made to the survey in any meaningful way. Even without any changes in the actual survey involving its appearance, wording, sequence, etc., over the years of implementation, it may still be desirable to have each time period represent a different version of the survey. For instance, the USMC Retention census will be taken annually by most Marines between May and September. Each year could be considered a different version for ease of management, although the dating of survey responses renders this unnecessary.

Conditional branching occurs in MCERC based either on demographics of respondents, or their responses to conditional questions. For example, some questions are to be answered by officers only, and some by enlisted only. If the information on the respondent indicates he or she is an officer, then the enlisted only questions will not be presented to him or her. This is an example of conditional branching based on demographics. A question about family housing support will not be asked a Marine who first answers that she lives in the bachelor barracks. This is an example of conditional branching based on a previous response.

The problem of sequencing questions in a complex and changing survey system like MCERC is a result of changing sequence as new versions are fielded, and maintaining a desired sequence between respondent subsets related to branching. A good survey system should keep questions in the same sequence to manage variance in responses. This simplifies the problem a great deal, since all demographic groups within the overall respondent population are answering essentially the same survey. If the general sequence is changed for a subset of respondents, this essentially creates a different survey.

3. Business Rules

Given the simple survey system described previously and the complicating issues discussed above, a set of business rules needs to be defined for MCERC. Once the business rules are initially identified, the data model and relational database schema can be

revisited for solutions to the problems. Table 3 displays the relevant business rules for MCERC.

1.	A RESPONDENT can take multiple SURVEYs, including both Retention and Exit surveys.
2.	A RESPONDENT answers any given version of a SURVEY one time only.
3.	When a RESPONDENT takes a SURVEY, he or she only answers QUESTIONs related to that particular SURVEY.
4.	A QUESTION can appear on multiple SURVEYs.
5.	A QUESTION can be modified, but only one version of it will appear on one version of a SURVEY.
6.	Once a QUESTION is modified and placed on a SURVEY, there is a different SURVEY version as well as a different QUESTION version.
7.	Every QUESTION in the database must be associated with a SURVEY. (No excess, unused questions will be kept in the system).
8.	Merely changing the sequence of a QUESTION without changing the wording does not create a new QUESTION version, but does create a new SURVEY version.
9.	QUESTIONs may have varying numbers of choices and may come in a variety of formats.
10.	RESPONDENT's personal, private information will be protected from uncontrolled access.
11.	RESPONSE data will be accessible for longitudinal analysis.

Table 3. Business Rules for MCERC

Clearly, if a Marine is taking a Retention survey, he or she is expected to be in the service for the opportunity to take another survey of either type. The expectation that a Marine can take multiple Exit surveys is justified by the possibility of "broken time", where a Marine exits the service and later returns, eventually to exit again. There is also the possibility the Exit survey will be completed, and circumstances will subsequently change before the Marine actually exits. Such circumstances as a full-scale deployment for a combat situation, unexpected promotions or billet opportunities, or simple changes of attitude due to personal circumstances have the potential to keep a Marine in the

service after completing an exit survey. Although this is a rare situation, the capability to support it must be available in the survey system.

4. Conceptual Data Model for Longitudinal Survey System

Now that the basic model and relationships have been described, the basic model can be modified to accommodate the business rules complexities of a longitudinal survey system. With respect to version management, both SURVEYs and QUESTIONs are highly likely to encounter changes in a survey project spanning an indefinite period of time, presumably many years. The Archetype/Version object provides the solution to version management of SURVEYs and survey QUESTIONs. [Kroenke, 1995] The archetype object is represented with the common attributes the object will have, and the version portion has the changing attributes, such as a version number. Thus it is a composite object with the primary object having from one-to-many version objects associated with it. Figure 5 shows the Semantic Object Model for MCERC including this technique.

Also included in Figure 5 is a new CHOICESET object. The business rules allow for multiple formats for QUESTIONs, meaning they may be multiple choice, true or false, free text entry, numerical entry, etc. CHOICESET is related to the QUESTION object via the new QUESTIONVERS object, where QUESTIONVERS is the version portion of the archetype/version object for questions. As the model shows, a CHOICESET can be used on one-to-many QUESTIONVERS objects, and a QUESTIONVERS will have one and only one CHOICESET object associated with it. The unique identifier for the CHOICESET is the key attribute *ChoiceSetID*. Note that there is a *Choice* attribute in the RESPONSE object, yet there is no relationship between RESPONSE and CHOICESET. CHOICESET is a part of the QUESTION/QUESTIONVERS object, and only provides a mechanism for the Respondent to make her choice. A value for *Choice* is independently entered for each RESPONSE. It could have just as easily been called "Response", "Answer", or "Reply."
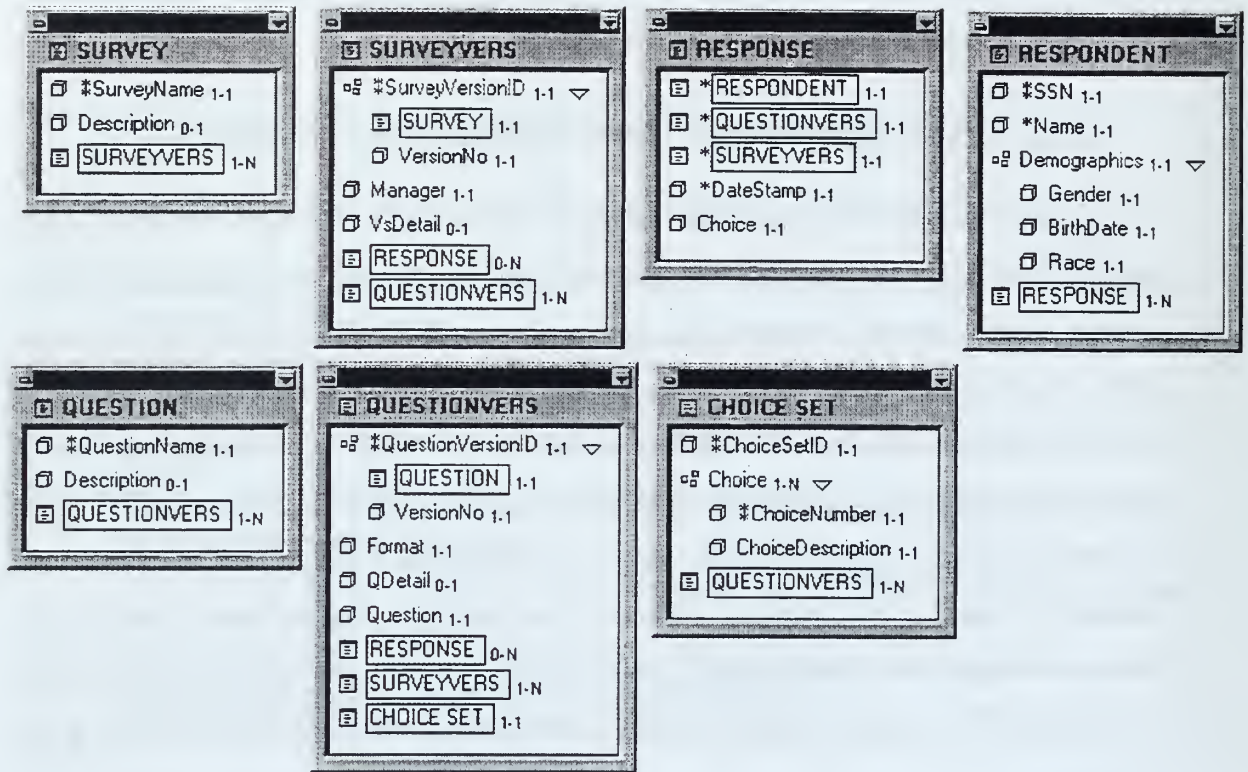
Figure 5. MCERC Model with Archetype/Version Objects

Figure 5 further illustrates the object for surveys is now broken into two objects, SURVEY and SURVEYVERS. The SURVEY object describes only the basic idea behind a survey with a particular name, but as can be seen, it can have many SURVEYVERS objects associated with each instance of it. Each SURVEYVERS has a unique identifier composed of the identifier of the archetype object and a version number. The relationships of SURVEYs with other objects are now via the SURVEYVERS object. The archetype SURVEY object is only related to the version SURVEYVERS object.

Similarly, the object for questions is also broken into two objects, QUESTION and QUESTIONVERS. If a QUESTION is re-worded or otherwise altered without changing the essence or intent of the question, the archetype/version object allows it to retain the

same basic identifier. The QUESTIONVERS object will also retain the basic identifier of the QUESTION object, but will require a new, unique version number. Relationships between questions and other objects of the system are now via QUESTIONVERS, the version portion of the QUESTION/QUESTIONVERS Archetype/Version object.
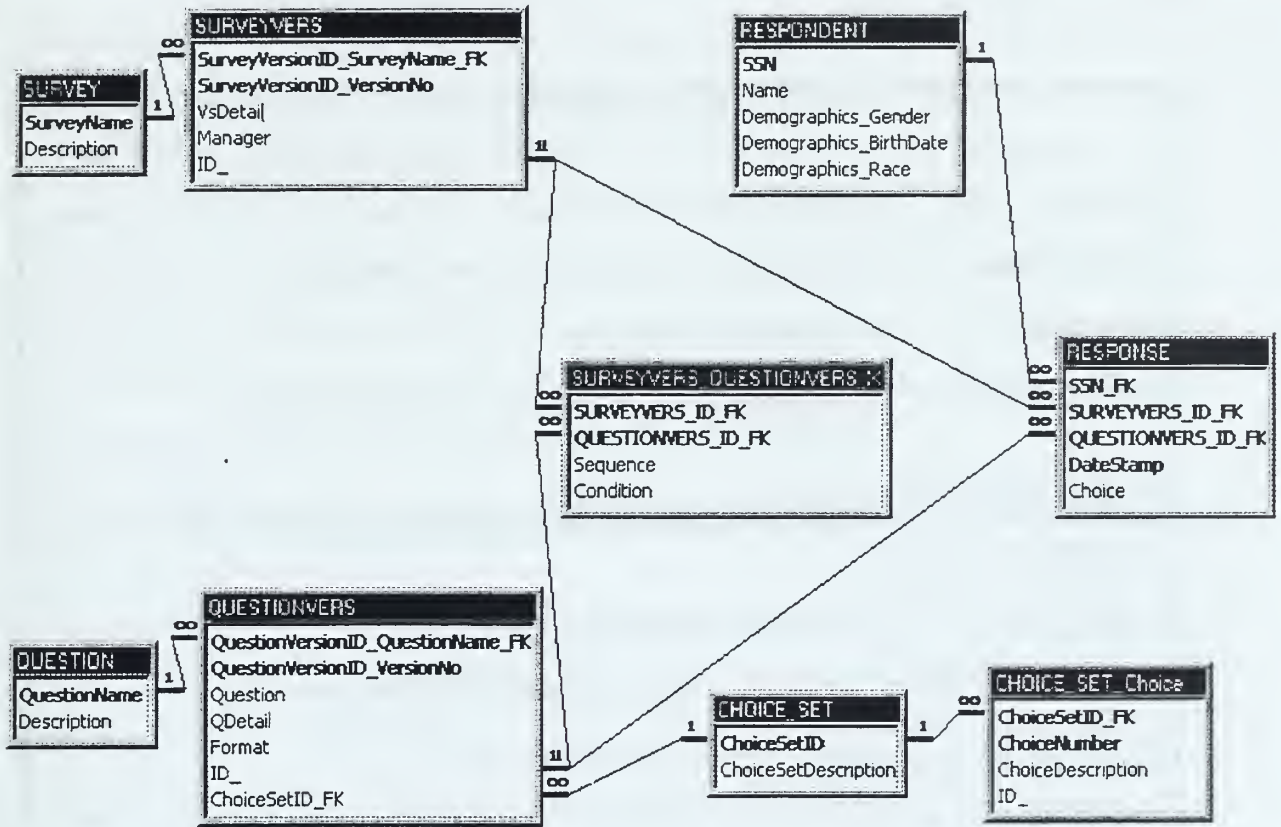
Figure 6. Entity-Relationship Schematic of Longitudinal Survey System

The entity-relationship schematic resulting from the full model with Archetype/Version objects is depicted in Figure 6. As can be seen, the SURVEY and QUESTION archetype objects have a simple one-to-many relationship with their respective version objects, SURVEYVERS and QUESTIONVERS.

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B.   RELATIONAL DATA MODEL

Data modeling can also be accomplished for the system using the relational model. This technique corresponds directly to the relations that will appear in a relational database, unlike the SOM, which models the objects as they are perceived in reality, separate from the database.

MCERC Relational Model

SURVEY   (SurveyName, Description)

SURVEYVERS   (SurveyName_FK,   VersionNo, VsDetail, Manager, ID_)

QUESTION   (VariableName, Description)

QUESTIONVERS   (VariableName_FK,   VersionNo, Format, Question, Qdetail,
                          ChoiceSetID_FK, ID_)

SURVEYVERS_QUESTIONVERS_X
                          (SURVEYVERS_ID_FK, QUESTIONVERS_ID_FK, Sequence,
Condition)

CHOICE_SET   (ChoiceSetID, ChoiceSetDescription)

CHOICE_SET_Choice (ChoiceSetID_FK, ChoiceNumber, ChoiceDescription, ID_)

RESPONDENT   (SSN, Name, Gender, Birthdate, Race)

RESPONSE   (SSN_FK, SURVEYERS_ID_FK, QUESTIONVERS_ID_FK, Datestamp,
                          Choice, ID_)

Figure 7. MCERC Relational Model

The relational model in Figure 7 depicts each relation with the attributes or combinations of attributes (keys) which uniquely identify it underlined.   Those relations having the "ID_" attribute need it for indexing, because they are associated with another relation with a composite key.   The relations of this model correspond to the tables

represented in Figure 6, which shows the relationships between the tables more graphically.

C.   INTER-RELATIONAL CONSTRAINTS

The foregoing models describe objects or entities and the relationships between them. However, they do not illustrate the inter-relational constraints. In one-to-many relationships, a row in a "parent" table can have many associated "child" rows in a child table. These relationships can be constrained as to whether or not a parent must have at least one child, or whether or not a child must be associated with a parent. Thus there are 4 classifications of the inter-relational constraints: Mandatory to Mandatory, Mandatory to Optional, Optional to Mandatory, and Optional to Optional. These inter-relational constraints must be enforced to maintain data integrity. Table 4 gives these inter-relational constraints for the MCERC system.

Parent	Child	Constraint
SURVEY	SURVEYVERS	Mandatory to Mandatory
SURVEYVERS	RESPONSE	Mandatory to Optional
SURVEYVERS	SURVEYVERS_QUESTIONVERS_X	Mandatory to Mandatory
QUESTION	QUESTIONVERS	Mandatory to Mandatory
QUESTIONVERS	RESPONSE	Mandatory to Optional
QUESTIONVERS	SURVEYVERS_QUESTIONVERS_X	Mandatory to Mandatory
CHOICE_SET	QUESTIONVERS	Mandatory to Mandatory
CHOICE_SET	CHOICE_SET_Choice	Mandatory to Mandatory
RESPONDENT	RESPONSE	Mandatory to Mandatory

Table 4. Inter-Relational Constraints in MCERC

For the Archetype/Version objects composed of SURVEY/SURVEYVERS and QUESTION/QUESTIONVERS, there are Mandatory to Mandatory inter-relational constraints. A version object must have an archetype and in MCERC, there will be at least one version required for each archetype; thus the inter-relational constraints exist to enforce this.

Whenever a survey is created, there must be at least one question associated with it. Likewise, whenever a question is added to the database, it must be associated with a survey. Therefore, junction table SURVEYVERS_QUESTIONVERS_X that associates QUESTIONVERS and SURVEYVERS has Mandatory to Mandatory inter-relational constraints with both of these relations.

Whenever a question is placed in the database, it must have a set of choices associated with it. The CHOICE_SET relation is required to have at least one related QUESTIONVERS to avoid having unused sets of choices in the database. The inter-relational constraint is again Mandatory to Mandatory.

Because CHOICE_SETs may have varying numbers and types of choices, the CHOICE_SET_Choice relation defines all the choices that can be associated with a set of choices. This is also defined as a Mandatory to Mandatory inter-relational constraint.

The RESPONSE and RESPONDENT relations represent another aspect of MCERC, the data being gathered after development of the actual survey instrument. The inter-relational constraint between these two relations is clearly Mandatory to Mandatory. A RESPONSE must have a RESPONDENT, and a RESPONDENT cannot be possibly defined until he/she has provided a RESPONSE.

The other two relations associated with RESPONSE are SURVEYVERS and QUESTIONVERS. Because surveys and questions must be written and made available to potential respondents before responses can be gathered, there cannot be a response initially. However, a response is clearly related to a question, which is required to be on a survey. Thus, the inter-relational constraint between SURVEYVERS and RESPONSE is Mandatory to Optional. Likewise, the constraint between QUESTIONVERS and RESPONSE is Mandatory to Optional.

The constraints defined in the data model and schema maintain the appropriate data integrity of the underlying survey management database. At the same time, the model is flexible enough to accommodate the complex problems of a longitudinal survey.

D. MICROSOFT ACCESS DESIGN/DATA DICTIONARY

The design of the Access database results from the relational model defined in this chapter. Building the Access database first required the analysis of entities and relationships as discussed previously, and the creation of a data model. The data model was then implemented in the SALSA for the Desktop software from Wall Data, Inc., a Computer Aided Software Engineering (CASE) tool for creating database applications, either in SALSA database or other well-known applications such as FoxPro or Access. To create the application, the user develops objects with attributes in SALSA. The model simply describes the data. From this model, SALSA for the Desktop will generate the basic tables and relationships of a database application for the user. Once this was accomplished for MCERC, the database application development required alterations of fields in the tables to ensure appropriate keys, indexes, and data types existed. Enforcing some inter-relational constraints required designing forms to restrict data entry for certain fields, particularly where the constraints were designated to prevent unused records from existing in the database.

When SALSA is used to generated the Access database for MCERC, the unique identifiers of the SALSA model are not translated into the key fields of the Access database schema. Instead, each table is automatically given a numeric field named "ID_." Although it is possible to use these as the key fields, it is desirable to designate meaningful key fields with an actual attribute that uniquely identifies the table. Therefore, the key attributes designated in the original model are re-designated as the key fields in the Access schema. Further definition of fields is required to ensure proper constraints are enforced by Access. In particular, the key fields must be defined as indexes and specified as to whether or not duplicates are allowed. Data integrity constraints such as these must be defined for all fields.

Data integrity constraints must be identified and enforced in the model for successful implementation. The data dictionary in Appendix B is provided to identify the data types of each attribute and give any pertinent constraints on the database fields. In

addition to data types, the length of each field must be defined. In most cases, the length is given by a numerical figure, but in the case of fields defined as "Number" data types, it can be given as "integer, long integer, byte, single, or double."

Once all key fields of the tables are defined properly, other fields are also reviewed to ensure the data types, field lengths, "required" flags, or other desired field properties are set correctly. For MCERC, the design view in which this is accomplished for the "QuestionVersionID_VersionNo" field of the QUESTIONVERS table is shown in Figure 8. (Note the triangular selector preceding the Field Name, designating the active field.)
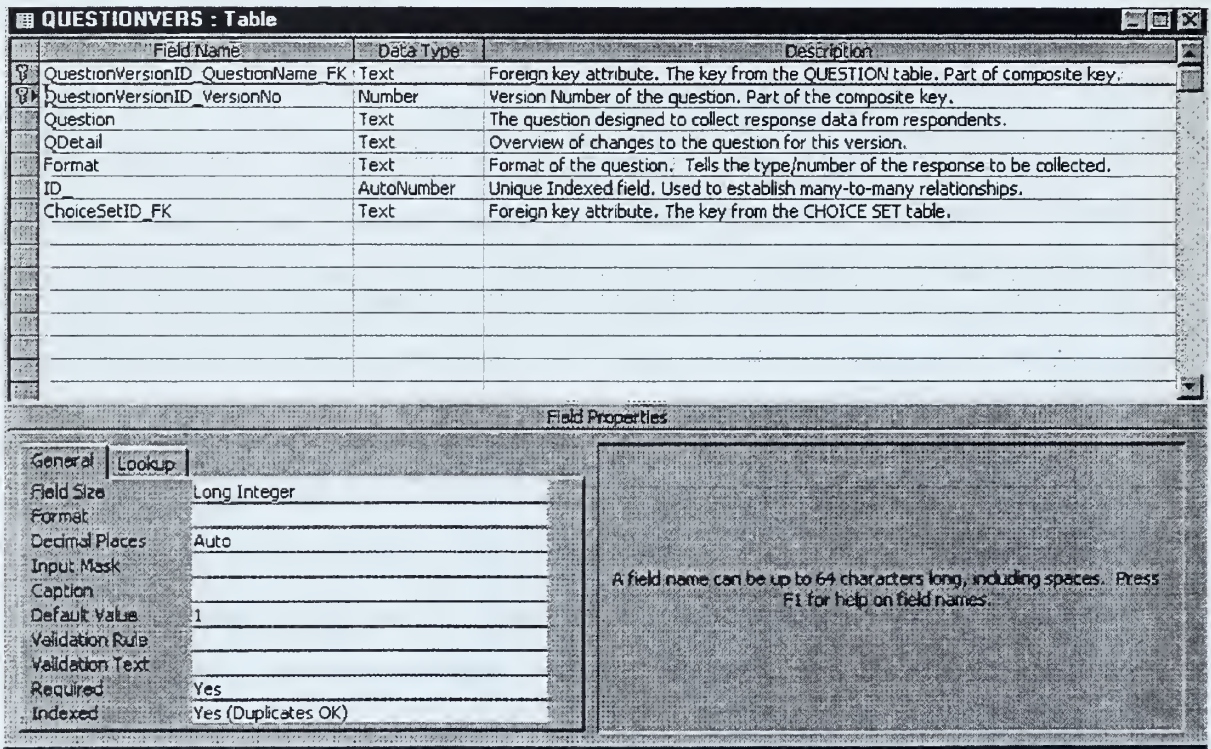
Figure 8. Design View/Table Definition of Table QUESTIONVERS of MCERC

The SALSA model generated the fields in the table, although the key fields had to be re-designated, because SALSA generated the "ID_" field for Access as the key. In the SALSA model, the composite key "QuestionVersionID" in the QUESTIONVERS object of the model was the unique identifier of the object. The QUESTIONVERS table in the database schema is generated with the two fields "QuestionVersionID_

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QuestionName_FK" and "QuestionVersionID_VersionNo" corresponding to the two fields of the composite key from the SALSA model. This key prevents having records in this table with the same combinations of "QuestionVersionID_QuestionName _FK" and "QuestionVersionID_VersionNo." The "ID_" field is retained as a unique index for the table, although it is not a key field. It is used to establish the many-to-many relationship between the QUESTIONVERS and SURVEYVERS tables.

Duplicate values of the "QuestionVersionID_VersionNo" field must be allowed so that all questions may have a version 1, version 2, etc. In Figure 8, this field is selected so the "Field Properties" at the bottom of the screen apply to the version number field of a question in the QUESTIONVERS table. Screens defining all field properties are displayed in Appendix B. Using these screens, all fields are given appropriate definitions to correctly implement MCERC.

One difficulty involves the "VersionNo" fields of the QUESTIONVERS and SURVEYVERS tables, which must be incremented by one for a new "QuestionName" or "SurveyName". Although the AutoNumber data type increments by one every time an entry is made in the field, it increments regardless of the associated name. Therefore, the AutoNumber data type does not provide the solution. To correctly implement the requirement, the database application must not allow a user to enter a value in the "VersionNo" field other than the next consecutive number relative to the selected primary identifier. For MCERC, this simply means that the application must require a Version 2 when there is only a Version 1 of either the Exit or Retention survey, or of a given question.

E.   POPULATING THE TABLES WITH DATA

Once the database schema has been designed as described, populating it with data constitutes the actual building of the database. For MCERC, this entails two basic procedures; entry of the survey instrument, and entry of response data. First the survey instrument data must be entered using Access forms to input the surveys and questions,

associating all questions with a survey. The first such entry necessarily entails all fields of the Access schema except for those specific to the RESPONDENT and RESPONSE tables. This is due to the inter-relational constraints defined previously. Therefore, the first entry will have Version 1 of a Survey, with entries in all fields of the SURVEY and SURVEYVERS tables. It will have Version 1 of the first question to be entered, along with entries for all fields of the QUESTION, QUESTIONVERS, CHOICE_SET, and CHOICE_SET_Choice tables. This entails entry of the first set of choices, which must be done in order to have a question defined. The junction table, SURVEYVERS_QUESTIONVERS_X, representing the many-to-many relationship between questions and surveys will have the key fields for the relationship automatically populated and entries made for all required fields. This initial data entry requires a complicated set of inter-related forms and linked forms to be designed as part of the interface (see Chapter V).

The primary form designed to accommodate this initial data entry is displayed in Figure 9. The user enters the name of the first survey, which is Version 1 by default. A description of the general purpose of the survey is then entered, as is the name of the surveyor or "Manager." Because this is the first entry, there are no questions displayed in the field designed for the selection of existing questions. Of the two buttons at the bottom of the form, the "Create a New Question" button should be chosen. This button takes the user to a form to accomplish this entry, which has a similar button to create a new set of choices to associate with the question. The development of the User Interface will be fully explained in Chapter V, which will clarify the method for populating the database with all elements of the survey instruments.

Questions will be entered via forms that require their association with a specific survey version. When the second survey is developed, all questions will be available on the form in Figure 9 to choose from as the first question associated with the survey, or the user may create a new question, or version of an existing question, using the same form. A similar form allows subsequent versions of existing surveys to be entered.

Figure 9. Data Entry Form for the First Version of a Survey

The other aspect of populating the database involves the procedures for getting the response data into MCERC. As the USMC Surveys are currently implemented, the responses are appended to a response database as respondents provide them. M&RA maintains this database separately from other data about the surveys. There is a file for responses to the first version of both the Exit and Retention surveys. Data from these files must be obtained in the format of the RESPONSE relation for establishing relationships between the data and the survey instrument in MCERC. However, for analysis, it must be converted into a matrix with each row representing a respondent's set of answers for an entire survey.

Data is currently received for MCERC in the format shown in Table 5. This is an Access table, so it can be related directly to the tables in the database to implement the

schema. It simply needs to be imported into the database first, then have the appropriate relationship established. It can then be queried along with other tables to relate responses back to questions and surveys. In this initial implementation of MCERC, the user of the system must know which survey and version the data file is from. A column must be added to the table and populated with this information to establish all relationships. Once the database knows which version of the survey a response record is for, it can associate the version of the question that was actually asked for that response.

QuestionName	QuestionAns	DateTaken	SSN
Spousjob	4	6/12/99 12:07:54 PM	4530
Unittype	1	6/12/99 12:07:54 PM	4530
Qtrssat	3	6/12/99 12:07:54 PM	4530
Ofambensat	3	6/12/99 12:07:54 PM	4530
Benedu	1	6/12/99 12:07:54 PM	4530
Equipwarper	2	6/12/99 12:07:54 PM	4530
Equipwarunit	2	6/12/99 12:07:54 PM	4530
Ocareersat	3	6/12/99 12:07:54 PM	4530
Unitmotiv	3	6/12/99 12:07:54 PM	4530
Leadwar	5	6/12/99 12:07:54 PM	4530
Interfere	2	6/12/99 12:07:54 PM	4530
Cohere	4	6/12/99 12:07:54 PM	4530
Ready	3	6/12/99 12:07:54 PM	4530
job0	1	6/12/99 12:07:54 PM	4530
Career20	1	6/12/99 12:07:54 PM	4530
Rankfactor1	ben41a	6/12/99 12:07:54 PM	4530
Rankfactor2	question42	6/12/99 12:07:54 PM	4530
Rankfactor3	question14	6/12/99 12:07:54 PM	4530
Rankfactor4	question4	6/12/99 12:07:54 PM	4530
Rankfactorm1	question117	6/12/99 12:07:54 PM	4530
Rankfactorm2	question116	6/12/99 12:07:54 PM	4530
Rankfactorm3	question79	6/12/99 12:07:54 PM	4530
Rankfactorm4	question80	6/12/99 12:07:54 PM	4530
Gender	m	6/12/99 12:07:54 PM	4530
Paygrade	e8	6/12/99 12:07:54 PM	4530

Table 5. Data Extract of Responses to USMC Retention Census

A sample of the actual data from Version 1 of the USMC Retention Survey is given in Table 5. This layout for the data is clearly redundant, with the SSN and DateTaken being identical for all records of one Marine's responses. More redundancy

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occurs when the column is added for the survey version, which will be the same for all responses from all respondents who take a given version of a survey. This redundancy is eliminated for the response data analysis aspect of the system.

		Advoppsat	afqt	amos	assignsat	Augment	Authorsat	bah
0130	6/11/99 8:29:45 PM	3	-9	0000	4	1	4	4
0221	6/12/99 5:45:21 AM	3	-9	0000	1	1	1	2
0253	6/12/99 12:37:33 PM	3	-9	0000	3	0	3	3
0276	6/10/99 2:25:04 PM	4	-9	0000	4	4	4	4
0380	6/10/99 2:47:06 PM	3	-9	0000	4	1	4	3
0462	6/10/99 8:01:45 PM	3	-9	0000	3	0	4	3
0559	6/11/99 6:43:29 PM	1	-9	0000	2	9	4	1
0579	6/13/99 12:49:12 PM	2	-9	0000	2	1	3	1
0902	6/11/99 4:59:34 PM	4	-9	0000	4	9	4	4
0953	6/10/99 7:15:53 PM	4	-9	0000	4	1	4	3
1029	6/11/99 7:53:26 PM	4	-9	0000	2	0	2	3
1085	6/10/99 8:34:10 PM	3	-9	0000	3	1	4	2
1186	6/11/99 8:08:41 PM	3	-9	0000	2	1	1	1
1217	6/10/99 6:35:00 AM	2	-9	0000	2	0	3	2

Table 6. Subset of Response Data after Conversion from RESPONSE Table Format

After conversion, the data is in the general format of Table 6. However, there are currently over 270 columns required to represent all questions. Each row of the table represents one respondent's submission of survey responses. The date/time in the second column, combined with the SSN (last 4 digits) in the first column, uniquely identifies a submission of responses to one survey for one respondent. A column must also be included which will contain the Survey for which all responses are submitted. Under the assumption that a survey version is only given during a particular year, the date/time and survey version might be substitutable as an identifier when combined with the SSN. Clearly, the redundancy of the previous format is eliminated here. This format is preferable for permanent storage, but the format of the RESPONSE table (similar to Table 5) must be used for relating responses to the survey instruments in the database.

F.   DATABASE ADMINISTRATION

Several issues need to be considered on a continuing basis to ensure the overall data integrity of the database, particularly the responses, which compose the critical information desired for future analysis. As the system evolves, access via the Internet with concurrent, multiple users will very likely become an issue. The general issues of security, protection and preservation of the database needs to be a primary concern of the database administrator.

1.   Security

One of the primary concerns for granting access to MCERC is security. Security is a two-sided issue regarding the survey data. Data integrity must be considered when determining how the data will be made available. If certain users are granted access directly to the database, strict guidelines must be established and followed to ensure the data is not rendered unusable by viruses or other malicious software that could potentially be unleashed during a query of the database. Privacy must also be considered, because of the information that will be maintained on individual respondents. Respondents must be assured that their responses will not be traced back to them, so they will be more likely to respond with total honesty and candor. Additionally, some may fear that certain personal information combined with their social security number will make them vulnerable to theft and misuse of the information.

a.   *Data Access*

Good data integrity is contingent upon well-controlled data access to the response database. The data access issue can be handled in at least two ways. A less expensive, but more secure way is to implement strict filtering of any queries on the database. Parties requesting MCERC information should be granted access on a limited basis. Users should be required to provide information that verifies who they are, why they need the data, and what they plan to do with it. They may then be issued a password

and account identification (username, account number, etc.). Upon entering and querying the system, each request would be scanned by virus protection software. All queries attempted would be logged into an audit file in order to trace what information is being requested and by whom.

Another method for handling the data access issue is to allow no access directly to the stored data. In this scenario, all queries would be handled by a proprietary application for processing queries against the database. Queries could be sent via a web-based front-end and pre-screened and processed to ensure no malicious software could infect the data. There would still be a need to ensure authentication of users in order to enforce privacy with additional levels of authentication required for sensitive data.

b.   *Privacy*

The issue of privacy can be handled in multiple ways. Strict authentication and limiting access as discussed relative to data integrity is one method, but those with access can still potentially compromise the information. A better solution for the privacy issue is to ensure personal information maintained as data cannot be traced to the actual person submitting it. One way to accomplish this entails generating a unique identification number for each respondent. This generated user ID (GUID) would be permanently assigned to the respondent by a linked list maintained at the website which associates specific identifying information (Social Security number) with the GUID. This table would have to be protected from access as any confidential information is, but would provide specific identification of a respondent relative to all responses submitted to the Exit and Retention Censuses without betraying the identity of the respondent.

Another possible solution is the use of cryptography when the data is retrieved. The data may be maintained with private information, but when it is retrieved, the same algorithm is run only on all "SSN" fields retrieved. Other data would not be encrypted. Since the same algorithm encrypts all instances of "SSN" retrieved, all of one

respondent's data will be recognizable as longitudinal data coming from a unique respondent.

To achieve data privacy and integrity, the basic requirements are that the system have secure communications between authenticated agents.[Cain, 1999] In the alternatives above, the authentication is handled prior to allowing access to any data. The communications interface between the querying system and the data must be inherently secure.

2. Database Backup and Recovery

As with any important information, the MCERC database must be protected from loss. The simplest way, giving the user a flexible alternative for storage locations, is to periodically copy the complete file to an external storage device. This method copies all data, table structure, forms, queries, etc. associated with the database. To recover from losing information in the working file, the user makes a copy from the external storage device back to the working drive. However, all information entered since the previous save must then be restored, so copying frequent backups to external storage during data entry is important.

Another approach to backup and recovery is to maintain a copy of the database schema on disk, and only back up the tables, since they contain the desired data. This procedure can be executed by transferring the tables to an external database file for backup. To recover when needed, the database schema can be reinstalled from disk, and the procedure for transferring the tables performed on the external file. This gives the user the structure of the database, and all the data from the external file since the last backup. This procedure is somewhat more onerous than simply restoring a backup.

There are three potential scenarios for the database administrator to consider for the survey instrument database. The first is a stand-alone system maintained locally by surveyors who design the surveys. The backup and recovery alternatives discussed above apply mainly to this scenario, since this is the logical beginning one for MCERC.

Another potential scenario is that the database would reside on a local server and be accessible by multiple users. If the database were split, with only the data tables maintained on the server, then only the data tables would need to be backed up to an external storage device. If the server is lost, then all data is still available from the last backup. Splitting the database means it is divided into two files: one that contains the tables and one that contains the queries, forms, reports, macros, and modules. By splitting the database, users who need to access MCERC can customize their own forms, reports, and other objects while maintaining a single source of data on the network. The database administrator needs to ensure that there are routine backups performed on the server to preserve the data. The normal procedure would be a daily backup to an external storage device during off-peak hours. Recovery in the event of data loss would require access to the external storage device. If transaction logs are kept for all backups from the server, and if each user has a transaction log recording their daily transactions, then users will know which of their transactions need to be re-entered into the database after the server is restored.

The third possible scenario involves replication of the database. Multiple users can have a working copy (replica) of the data files. Any changes made by users are updated when the users connect to the network with the master database, called the "Design Master" by Access. A replica can be maintained on a network computer, effectively creating an automatic backup. Whenever a user of a replica "synchronizes," the changes are updated to the Design Master, and the updates from all other replicas to the Design Master are made to the user's replica. Therefore, in the event of data loss, recovery can be done via the Design Master.

3.   Record Locking Strategy

Because of the large size of the survey instrument, it is conceivable that MCERC could be deployed in a multiuser environment. Microsoft Access can automatically prevent users from changing records before another user has finished editing them. However, it

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seems unlikely that multiple users would attempt to edit the same record, so a very restrictive record-locking strategy is not called for.

A good locking strategy for MCERC would allow users to finish making changes they have started. Since MCERC has a data field for explanatory information about versions of questions, this strategy would enhance collaboration because users can give the logic behind any editing done as a basis for discussion should other users have an interest in the edited record. The "Edited Records" option for a locking strategy locks the record being edited, so no other user can change it. If another user tries to edit a record that is locked, Access displays a locked record indicator. This strategy ensures that changes once begun can always be finished.

V.   BUILDING THE INTERFACE

A good user interface should make the complexities of the database schema as transparent as possible to the user. For MCERC, the interface must not only handle the complexities of a large, longitudinal system, but must also provide the user access to analytical tools. MCERC provides a link to Cognos Powerplay™ for crosstabulation analysis of the survey data. Therefore, the user interface must provide two main avenues for the user: development and management of the survey instruments in Access, and manipulation and analysis of collected response data. Analysis can be done within MCERC using the link to PowerPlay or by generating a text file for importation into as statistical analysis the application.

For developing and managing the survey instrument, Access provides the "Switchboard Manager" add-in which facilitates menu driven user interfaces to the forms and reports the developer designs. It is possible to use this Access feature to run macros that will open other applications. For instance, Powerplay can be opened from the Access switchboard. Users, in general, will either want to modify a survey instrument, or perform some kinds of analyses; therefore, the main interface allows the user to open Access or Powerplay as appropriate. It also provides a function to first convert data into a text file for analysis in Powerplay. This text file may be imported by other statistical analysis applications such as SAS™ or SPSS™. When Access is opened, the Switchboard is used for the menu driven portion of the interface to manage survey instruments. Visual Basic 6.0 is used to develop the main MCERC interface between Access and Powerplay, including the function to prepare the data for analysis as a response matrix in a text file.

A.   MODELING THE PROCESS

Building the Access database initially required the analysis of entities and relationships, and the creation of a data model. Similarly, the building of the user interface is preceded by the development of a process model. Once models of the process and sub-

processes are developed, the design and implementation of an interface can follow in a structured manner.

It is essential to develop a thorough understanding of the processes that must logically occur in the system. One method for gaining this understanding results is to simply think through all processes desired of the system, and determine what must take place to accomplish them, taking a step by step approach. Each step of the process is visually represented as a module beginning with the first step and linking all steps that can then be taken. The resultant process decomposition diagram is a model of the process providing an excellent visual aid for developing a user interface. It helps answer the question "What next?" and aids the developer in understanding the inputs and outputs of each module. The level of detail required in a process decomposition diagram is dependent upon the complexity of the requirements of the system being developed.

The main process for using MCERC involves two major avenues, working with survey instruments, and data analysis (Figure 10).
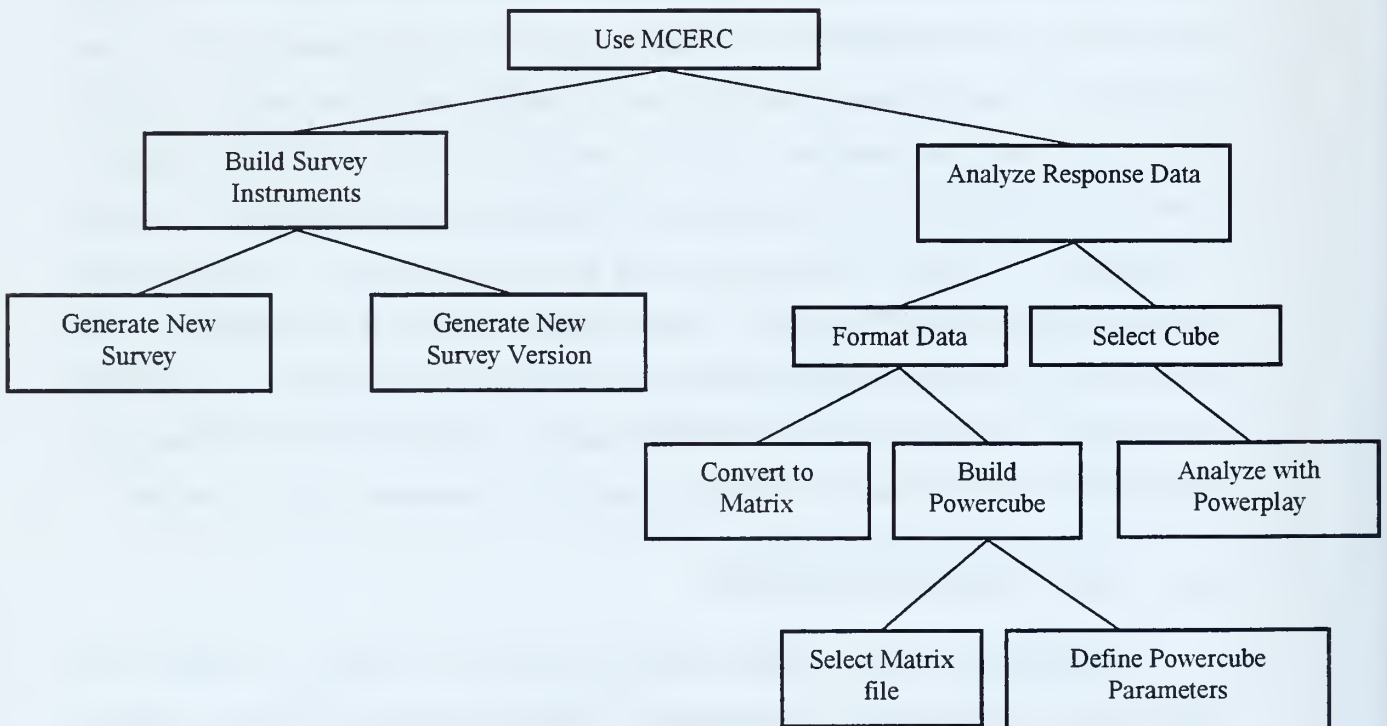
Figure 10. Main Process Decomposition Diagram for MCERC

There are clearly more levels of detail than shown in Figure 10. For the purpose of developing a user interface for MCERC, there is sufficient detail beneath the "Analyze Response Data" module since the user interface primarily entails accessing the Cognos Powerplay™ software. Once there, the subsequent functions are accomplished via the Powerplay interface, with one exception. An interface for converting data into a matrix must be developed.

There is much more detail needed beneath the "Build Survey Instruments" module, however. Understanding the database schema and the relationships that must be enforced within it helps to understand how the sub-processes beneath these modules must interact. Each of the processes beneath is broken down further in subsequent process decomposition diagrams.
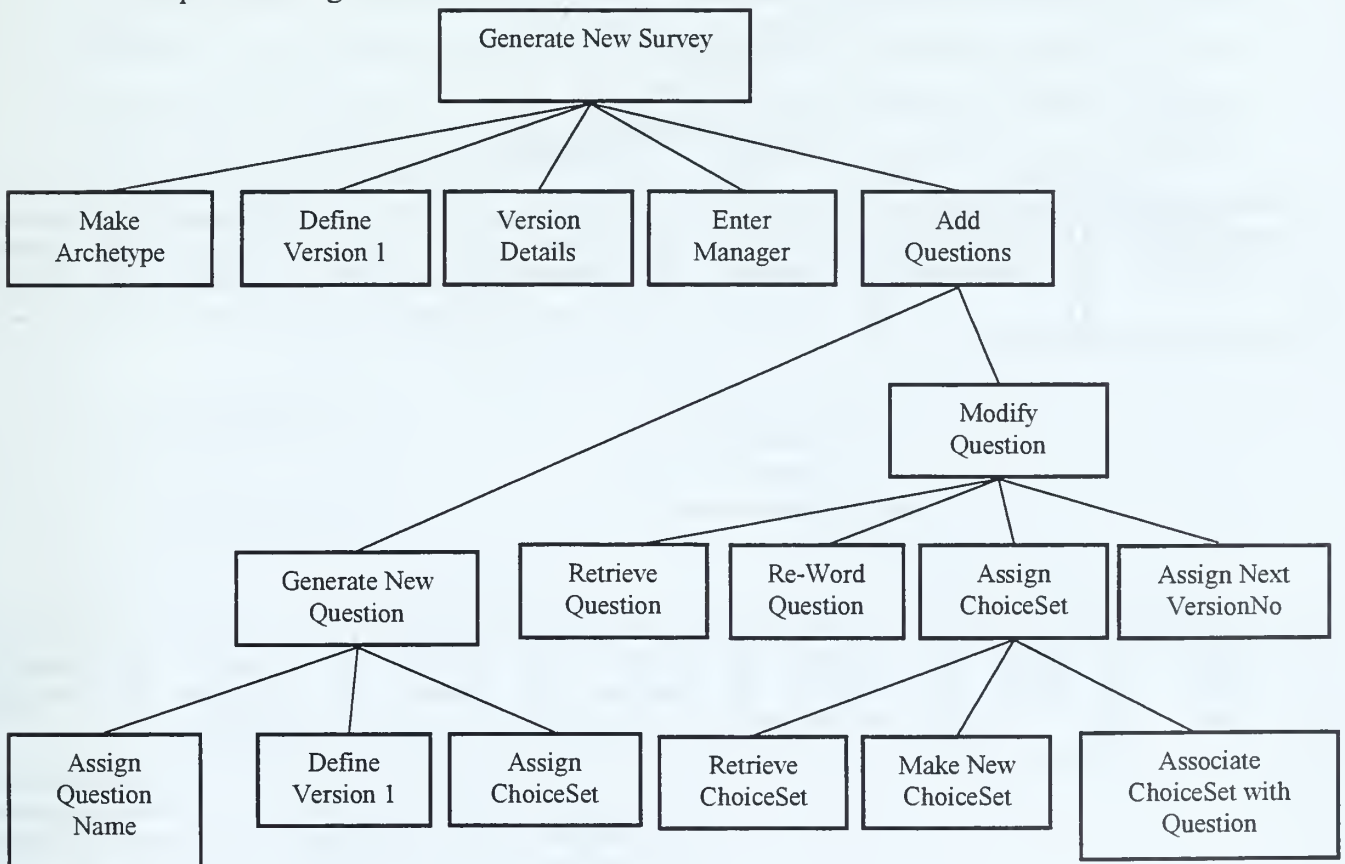
Figure 11. Process Decomposition for Generating a New Survey in MCERC

The basic information that goes in each of the database fields for surveys represents the level of detail beneath the main module in Figure 11. The complicating issue with simply defining a survey record is the constraint that a survey cannot be defined without associated questions. There are actually three options for doing this: Adding an existing question, modifying an existing one, or generating a new one. All three options result in the addition of a question to the survey. Likewise, modifying a question becomes somewhat more complex when different choice sets are assigned. An existing choice set may be assigned, or a new one defined and assigned. Another benefit of process decomposition is realized in this diagram. Note that "Assign ChoiceSet" appears twice, once beneath "Modify Question" and again beneath "Generate New Question." When designing these two processes, the same module for "Assign ChoiceSet" may be used.
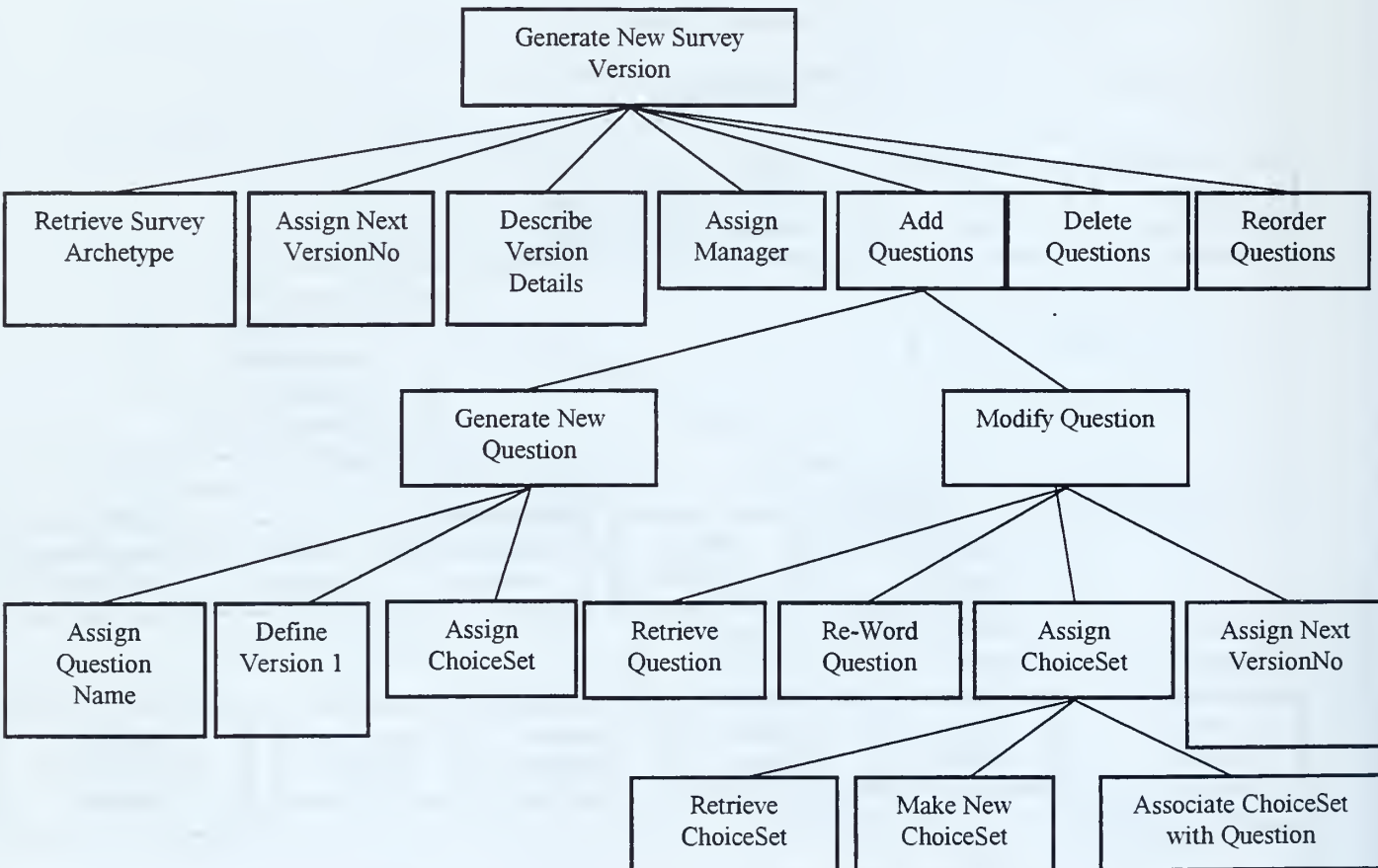
Figure 12. Process Decomposition for Generating a New Version of a Survey

As Figure 12 shows, generating a new version of a survey is similar to generating a new survey. Some of the immediate sub-processes are somewhat different, such as retrieving a survey archetype vice defining a new one, assigning the next version number, and deleting or reordering questions. However, this diagram shows that the entire process of adding questions is identical to that of the "Generate New Survey" process decomposition diagram. Therefore, that portion of the interface can be re-used to support both upper level processes for building surveys.

B.   DESIGN USER INTERFACE

As the main process decomposition diagram shows, a logical starting point in designing the user interface process is with the initial screen the user will see when using MCERC. For the survey management aspect of MCERC, the initial interface screen will provide an option for the user to manage the survey instrument database, including entering data and retrieving reports. As seen in Figure 13, this initial screen will also provide access for the user to analyze data using PowerPlay, use Transformer to build a "Powercube" for analysis, or convert data sets into the matrix format.
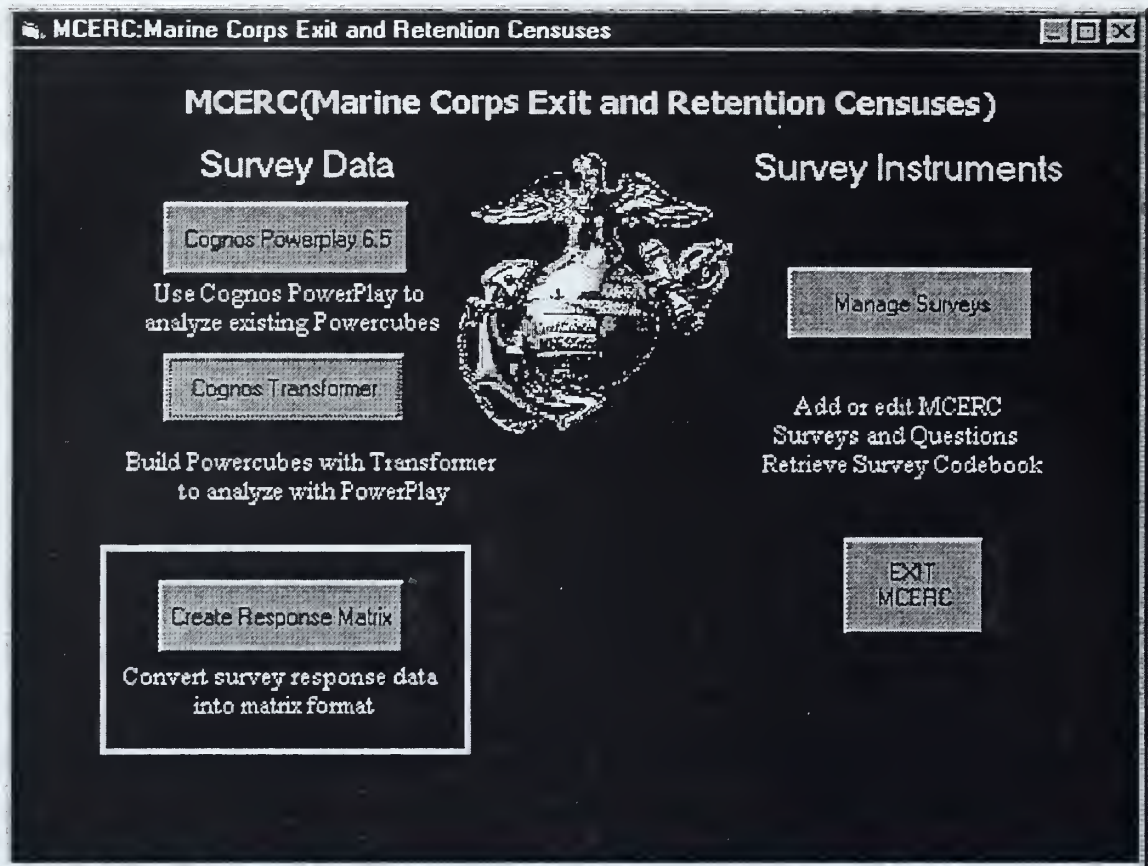
Figure 13. Visual Basic User Interface Screen for MCERC

1. Survey Management Interface

Upon selecting the "Manage Surveys" button on the main MCERC form shown in Figure 13, Access opens the survey instrument database with the menu in Figure 14 as the active screen. The user has the choice to work on surveys, analyze data, view or print survey instrument information, or exit the system. Note also the option to use Cognos Transformer™ to create a Powercube for analysis. The option to use either the survey management or data analysis aspect is available to the user via this button on the switchboards.

MCERC
(Marine Corps Exit and Retention Censuses)

What do you want to do?

☐ Make New Surveys and Versions

☐ Analyze Survey Data

☐ View/Print Survey Instrument Information

☐ Exit MCERC

Go NOW to Cognos
Transformer to
create a PowerCube

Transformer
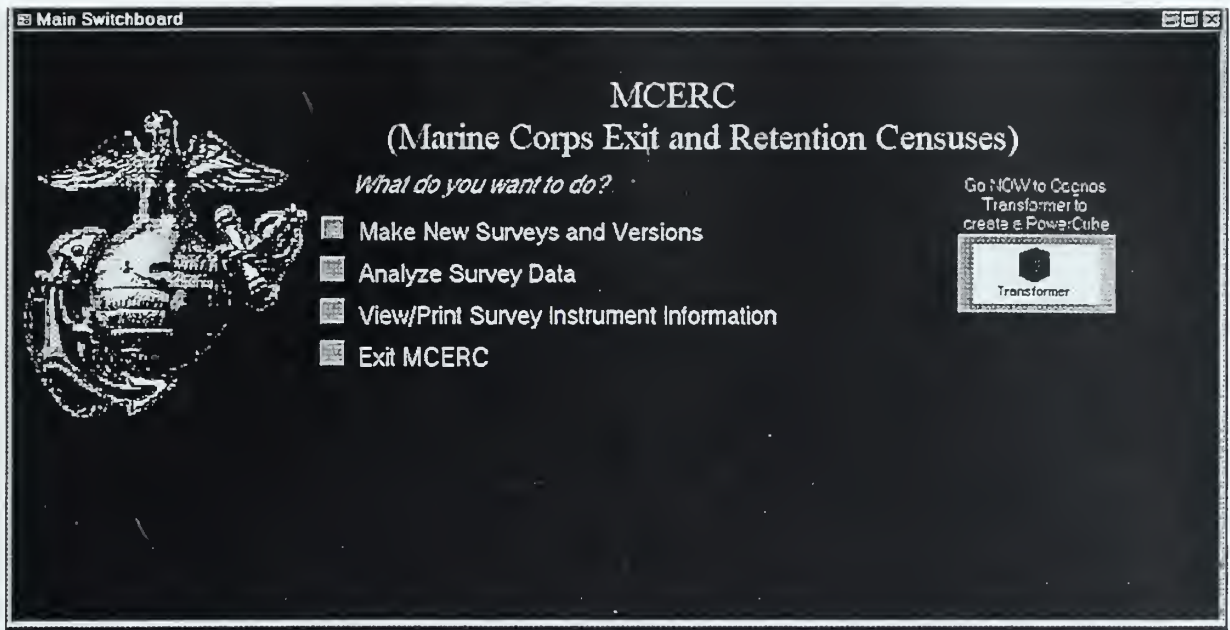
Figure 14. MCERC Menu Screen in Access

The first time MCERC is used, the logical purpose would be to generate a new survey. Figure 9 in Chapter IV displays the form for this action, which populates the database with data. A similar action, as developed in the process decomposition diagrams, is the generation of a new version of a survey. The form designed for this appears in Figure 15.

Figure 15. MCERC Form for Entry of New Version of an Existing Survey

Survey Name and Previous Version are displayed in the list box at the top of the screen. As can be seen, the Retention survey, Version 1 is selected, and the field labeled "New Vs. #" displays a "2." This field populates the VersionNo field of the SURVEYVERS table when the form updates the tables. The "Description" box displays the data from the SURVEY table describing the basic information about the type of survey. The user may now enter information about Version 2 in the "Brief Description of New Survey" field of the form. Also, the user may document the name of the person responsible for this version in the "Manager" field.

Figure 15 also illustrates that questions are associated with surveys as they are created. The user can choose an existing question from the list box, or may select one of two buttons to either modify an existing question or design a new one. Once either of these two actions is performed, the user returns to the list box and selects the new question. The default sequence of the question on the new survey is 10. By convention, the sequence numbers are given in multiples of 10, so a default value of 10 assumes this is

the first question for the survey. The user may identify a condition at this time also, meaning the presentation of this question to a respondent may depend upon other information about the respondent. An example of this for the USMC Surveys is "Enlisted Only."

This form combines information from five tables of the database schema, SURVEY, SURVEYVERS, QUESTION, QUESTIONVERS, and SURVEYVERS_ QUESTIONVERS_X, the join table. The design enforces the interrelational constraints between them, keeping the database clear of excess records. Other MCERC forms are designed to enforce these constraints as well. The use of these forms is discussed in the Maintenance and User's Manual, Appendix D.

A sub-process of generating new surveys and new survey versions is initiated when the user presses the "Create a New Question" button.

Figure 16. Form for New Questions in MCERC

Since the form in Figure 16 is for new questions, questions created with this form will always be the first version. The default 1 for the version number can be seen, as can the default "Version 1 description" statement in the "Question Version Details" field. Like the process decomposition diagram showed, a new question can have a Choice set assigned. This Choice set can be chosen from existing ones in the "Choice Set" combo box field, or a new one can be designed by using the "New Choice Set" button. A very similar form to Figure 16 is used for the making of new versions of questions.

To design Choice sets, some flexibility is needed. These sets do not necessarily contain a sequential list of Choices. Some are ordered in reverse sequence. (Figure 2 in Chapter III displayed some examples.) Some use "0" as a value. Because of this, the user must enter the values for Choice sets. The values entered are simply the Choice Set identifier, a description of the set if desired, and as many Choice Numbers with corresponding descriptions of each choice as required. Figure 17 shows the form for these entries.

Figure 17. Form for Making New Choice Sets in MCERC

Once the user has entered all information about a survey instrument into MCERC, a report, called a "Codebook," can be generated with all the questions and their associated choices for that survey instrument. From the screen displayed in Figure 14, the user may select "View/Print Survey Instrument Information." This leads to an option to either "View/Print" a survey codebook, return to the main menu, or exit MCERC. Once the option to print the codebook is selected, the user is prompted for the Survey Name and the Version Number, and MCERC generates a codebook on the screen which the user may print if desired.

2.   Data Analysis Interface

To conduct analysis on the response data, there are two main requirements; getting data into the appropriate format for analysis, and using Powerplay to perform crosstabulations analysis. Data can be obtained in its raw form, which is the format described by the RESPONSE object of the MCERC data model. One response is an answer provided by one respondent to one question on one survey on a specific date. A large dataset may be composed of many of these responses, representing many respondents' answers to all appropriate questions on multiple surveys on multiple dates. This data must be converted into a "flat file" or spreadsheet format, with one row representing all of one respondent's answers to all questions on one survey in one timeframe. This can then be imported into analytical software tools such as SAS™ and SPSS™. The Visual Basic interface must provide the ability to put the data into this format before Powerplay can be used. The Visual Basic code for the procedures to convert the data into a spreadsheet are included in Appendix C.

Powerplay is used to analyze volumes of data across multiple dimensions. The information must be placed in multi-dimensional matrices according to the variables the analyst is examining. Called "Powercubes" by Cognos, these matrices can be designed with a related application, Cognos Transformer™. Once they are designed, the matrices can be refreshed as additional data is gathered. Therefore, the Visual Basic interface must

make Transformer available for the user to create desired Powercubes from data, as well as facilitate converting the data into the "flat file" (spreadsheet) format.

To analyze response data from MCERC, the user first needs to have the data in a matrix format. This is initiated via the "Create Response Matrix" button on the main MCERC form (Figure 13). Once this process is completed, the user needs to create a Powercube with the dimensions to be analyzed and the measures desired for analyzing the dimension.

For the Retention survey, an example of a Powercube would be to analyze the MOS dimension against different measures of leadership quality from the responses provided by Marines of various MOS's as to their rating of the quality of leadership of the officers and Non-Commissioned officers. Defining certain communities of MOS skills would allow multiple levels of "drill-down" in this Powercube. MOSs could be grouped by aviation, ground combat arms, logistics, administrative, etc. Marines of all MOSs will provide responses rating the quality of leadership at several levels (NCO's, SNCO's, Warrant Officers, Junior Officers, Field Grade Officers, and General Officers). The leadership is rated from Poor to Excellent on a scale of 1 to 5. Using the MOS as the primary drill down dimension, and the 1 to 5 rating as the measure, this Powercube can provide insight into how leadership is perceived overall, by different communities, and by each MOS. An example illustrating how the results would be viewed analyzed in Powerplay is shown in Figure 18.

	Leadgen	Leadfield	Leadjr	Leadwar	Leadsnco	Leadnco	Leaderall
0100	3	3	3	5	5	2	21
0300	5	4	5	2	4	5	25
3000	4	4	2	4	3	2	19
0800	5	2	4	2	4	5	22
MOS	17	13	14	13	16	14	87

Figure 18. Example Cognos Analysis of Quality Rating of Leaders by MOS

These numbers could be further dissected by analyzing them against another dimension. For example, the Unit type dimension could be in the Powercube, and the numbers appearing in the above matrix would reflect the unit type chosen.

The MOS fields above are grouped by general MOS category. The analyst could explore further by drilling down on one MOS category to see how different MOSs in the field rated leaders. For example, the 0300 MOS category represents the infantry. Drilling down would yield each MOS within the infantry (0302, 0369, 0311, etc.). Therefore it is possible to find out exactly how all respondents having the same MOS rated each category of leaders, and to further break the result down by the type of unit of the respondent. Still more dimensions can be designed into Powercubes if needed.

C.   SYSTEM ARCHITECTURE

The process of development results in the MCERC application linking Access, Powerplay, and Visual Basic code as an interface, as well as a small data manipulation program to convert data into a matrix. The application has been described throughout this thesis in explanations of data input and user interfaces. Appendix C contains the Visual Basic code for converting the data into a matrix. Obviously, the Cognos Powerplay™ software, including Transformer, must be installed for the application to have full functionality. Installation instructions are included in the User's Manual, Appendix D.

Figure 19 shows the MCERC system with its various system architecture components and their interconnections. The Visual Basic interface component is the "glue" that connects the system as an integrated application. The Data Conversion component supports analysis by formatting the data, and is a subprogram written in Visual Basic. It receives input from an external response data file and outputs a text-based data file to a designated location. This data file can then be used by Cognos Powerplay or imported into another statistical analysis application.
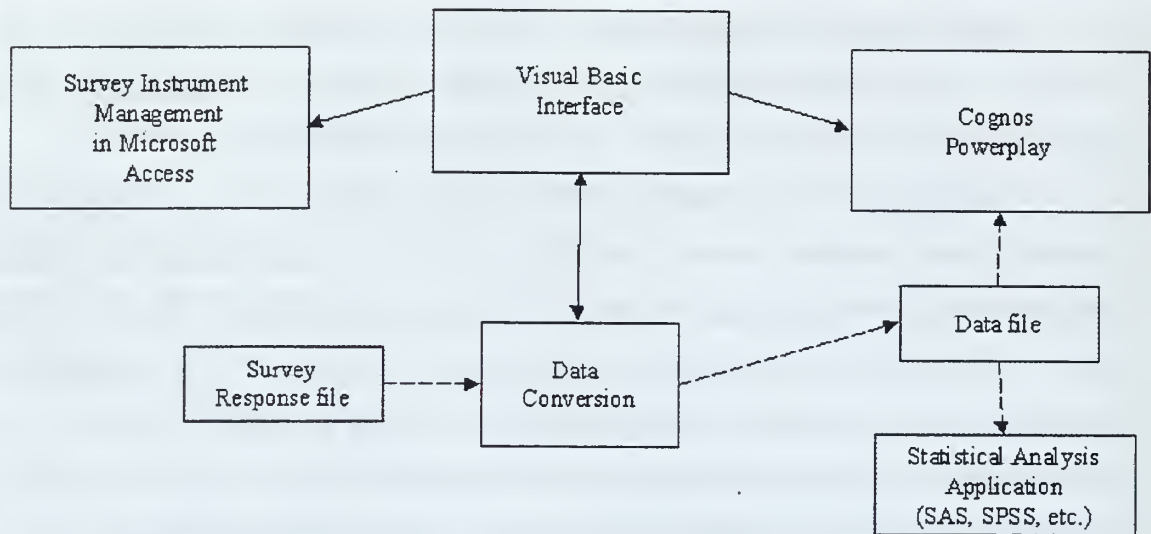
Figure 19. MCERC System Architecture

The Survey Instrument Management in Microsoft Access component is opened from the Visual Basic Interface for generating surveys, questions, codebooks, and other survey management functions.

The Cognos Powerplay component is also opened via the interface to do analysis or build a Powercube for analysis. The Data Conversion component first must be used to create a text data file in an open location for access by Powerplay (or another statisical analysis application). Then Powerplay Transformer is used to build a Powercube, after which the analysis can be done.

D.   MAINTENANCE AND USER'S MANUAL

To facilitate the administration and use of MCERC, a user's manual is included as Appendix D. Procedures for installation, backup, and recovery are included. A step by step description of the system processes is given to guide the user through all processes included on the process decomposition diagram, except those that pertain specifically to Cognos Powerplay™. A comprehensive help function is included with the Cognos software that need not be duplicated in a User's Manual.

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VI.   CONCLUSIONS AND FUTURE ENHANCEMENTS

Conducting longitudinal studies is not a common practice in the business world, so there is not a mass-marketed survey development application to support such a project. A proprietary application is necessary to ensure the concomitant complexities can be accommodated smoothly. This research designed and implemented a database system to support the longitudinal aspects of the USMC Exit and Retention Censuses.

A.   DESIGN AND IMPLEMENTATION CONCLUSIONS

The data model developed for this thesis reflects the conceptual objects involved in a longitudinal survey system. Using archetype/version objects to capture the version management aspect of the problem enhances the basic Survey and Question objects. Having a large number of questions on the surveys is made easier by re-using the choices associated with questions when possible, via the CHOICE SET object. The longitudinal aspect is captured by the RESPONSE object, which represents the elemental data for which the system is designed. With this object, one person's response can always be traced to a specific question on a specific survey in a specific timeframe.

The MCERC database schema implements a data model to support a longitudinal survey project. However, the inter-relational constraints are not all enforceable by the database engine as they were defined. This can be overcome by exercising control over data entry using validation rules, queries and coding to enforce the constraints. The database schema allows for tracking changes in the survey instruments relative to the actual responses collected by them, thereby implementing the required support of the longitudinal aspect of the survey system.

Implementation of the complete database by including actual response data proved to be challenging. Small subsets of the response data obtained by the USMC to date can be retrieved from the response database via the Internet. The format very nearly matches the RESPONSE table format, making it fairly easy to relate to the rest of the database.

The conversion process developed in Visual Basic to convert the data into a usable format for Powerplay is very slow. However, it yields a matrix that can be used to do the analysis for which the surveys were intended. The link to the Cognos Powerplay application completes the overall survey system by giving it the necessary data analysis capability.

B. RECOMMENDED FUTURE ENHANCEMENTS

The MCERC application delivers the basic capability to manage questions forsurveys as they evolve over time. The relationship the database schema implements between the respondent and the survey instrument allows the tracking of a specific respondents' answers across the years and facilitates comparison of the responses with the questions. As technology continues to evolve, this survey system can be enhanced by moving more and more of the functionality into the web environment.

1. World Wide Web Accessibility to DSS

During the initial stages of the USMC Exit and Retention Census initiative, analysis of the data will be done by a limited number of manpower analysts, most of whom are located at M&RA and Naval Postgraduate School (NPS). Over time, as the volume of data obtained increases, accessibility to the data and the survey instrument may be of interest to other analysts. The Department of Defense as well as other services facing issues similar to those of the USMC, will likely be interested in the data. Universities other than NPS may assist in the research or use the longitudinal data for academic purposes. Policy studies organizations, "think tanks," may use the data to develop and justify positions on military policy issues. Therefore an area for future consideration is integrating the web-based survey into a single environment running exclusively on the Internet.

A key concern for allowing Internet access to MCERC is security. Security was discussed in Chapter IV, but takes on added significance in a web-based environment. The issues are essentially the same, but a broader range of protections must be considered. Anti-virus software must be kept strictly up to date. The network connectivity to the system will need to be maintained for accessibility, but access must be restricted to those who have a valid requirement for access.

Another issue related to making MCERC web-accessible is the system architecture. How to obtain data extracts, i.e., whether to download data subsets and store them locally vs. building and maintaining Powercubes on the remote server, and whether to have MCERC reside on a server or on the desktop are decisions that need to be made relative to this architecture.

An attractive solution for obtaining data subsets is to access them remotely using the Cognos Powerplay software. The Powercubes can be built, maintained and refreshed on the server. For an analyst to use the data, they would merely need to know the remote locations of the Powercubes and be granted access. This would prevent proliferation of large amounts of duplicate data in various locations, and would allow for efficient transfer of the desired information. Rather than transferring all raw data, only the desired report, or aggregated data subset would be stored locally by analysts.

If multiple individuals will be using MCERC for analyzing the survey instrument against the data, or are collaborating on survey design, it may become desirable to put MCERC on a server and have it accessible via the web. Assuming these analysts are geographically separated, this would facilitate collaboration, thereby speeding the process of developing and maintaining the surveys.

b.   *Feasibility*

Rendering MCERC accessible via the web is definitely feasible.   The Access application can be converted to Hypertext Markup Language (HTML) or Extensible Markup Language (XML) using web-authoring tools as these types of tools become increasingly easy to use. Authorization could be granted to a limited number of developers to use data entry forms and collaborate on survey development if desired. Broader access could be granted for users desiring to pull reports from the database, such as listings of questions for a survey.

The data collected by the USMC Exit and Retention Surveys can certainly be made web-accessible.   Online Analytical Processing (OLAP) applications such as Powerplay Server Web Edition allow Powercubes to be deployed across the web.   There are a growing number of OLAP software solutions available which will clearly facilitate this objective. [Cognos]

As online technologies continue to proliferate, the feasibility of providing web access to MCERC will undoubtedly increase. Because the Exit and Retention Census initiative is still in its initial stages, it remains to be seen as to whether it will be practical and desirable to implement web access.   Nonetheless, courses of action should be considered in preparation for this event.

2.   Full Integration of System Components

MCERC brings the components of a web-based survey system together without fully integrating them.   A recommended future enhancement is the integration of the survey instrument database with a web-authoring capability. This enhancement would facilitate the publication of a survey to the web directly from the database, i.e., a new version of a survey would be designed with all features being recognizable in a web-based language. The generation of a report using this language would allow it to be published without having to re-enter any of the questions into the web pages and with only limited coding.

The statistical analysis aspect of the system could also be integrated with the survey instrument database. This integration would simplify the association of various versions of questions with the time-series analyses done on the variables. Co-locating the survey instrument database with the response database and relating the responses permanently to the instrument would facilitate having quick and understandable analyses of the data.

C. CONCLUSION

The Microsoft Access design and implementation of the MCERC database demonstrates the feasibility of building a system to support a complex, long term project like the USMC Exit and Retention Censuses. The database schema, with its version management capabilities, provides a way to track a dynamic, longitudinal survey instrument by relating responses to the survey instruments with the appropriate survey, and associated question versions. This combination of data and metadata in a single database with links to independent analytical software tools results in an integrated environment for supporting survey administration and analysis.

APPENDIX A. MASTER FILE DATA

NPS   USMC Retention Survey. September 14, 1999

CODEBOOK

The following variables marked by a * will be integrated from the master file; need exact variable names or file locators in the master file:

*__GENDER__
*__LOS__   Time in active duty Service (or date entered active duty service if not available)
*__DUTYSTA__   Current duty station
*__COMSOURCE__   Commissioning source (officer only)
*__PMOS__   Primary military occupational specialty
*__AMOS__   Alternate MOS
*__DUTYMOS__
*__PAYGRADE__
*__TGRADE__   Time in current grade (or date of rank if not available)
*__ENTRYAGE__   Entry Age (or date entered active duty service if not available)
*__AFQT__   (enlisted only)
* __PERFORMRTG__   "Performance measures" (These will be identified from other files)

RESPONSE FORMATS

Satisfaction Response Format:

　　　4. Very satisfied
　　　3. Somewhat satisfied
　　　2. Somewhat dissatisfied
　　　1. Very dissatisfied

Agree Response Format:

　　　4. Strongly agree
　　　3. Somewhat agree
　　　2. Somewhat disagree
　　　1. Strongly disagree

Frequency Response Format:

　　　5. Never
　　　4. Seldom
　　　3. Some of the time
　　　2. Most of the time
　　　1. All of the time

Quality Response Format:

    5. Excellent
    4. Very good
    3. Good
    2. Poor
    1. Very poor

Probability Response Format:

    1. 0% (no chance)
    2. 10% (very slight possibility)
    3. 20% (slight possibility)
    4. 30% (some possibility)
    5. 40% (fair possibility)
    6. 50% (fairly good possibility)
    7. 60% (good possibility)
    8. 70% (probable)
    9. 80% (very probable)
    10. 90% (almost sure)
    11. 100% (certain)

USMC RETENTION CENSUS

This survey will take approximately 30 minutes. The information in this census will remain confidential. It will not be used to identify individuals. The results will be used only to report trends. Your sincere responses are needed to help improve decisions affecting Marine Corps Personnel.

VARIABLE NAME (NPS)   **USMCname**

DEMOGRAPHICS

DUNITTYP   **unitype**

What is the type of unit you are currently assigned to?

1. Base/station	12. Wing/Group Squadron
2. Division/Regiment/Battalion	13. Reserve support
3. Drill instructor/Sgt. Instructor OCS	14. FSSG/Battalion/Company
4. Embassy	15. Ship's company
5. MSG	16. SRIG
6. HQMC/MCCDC	17. MEU Staff
7. Instructor (MOS)	18. Training support
8. Joint duty	19. Long term schools/
9. Marine Barracks/MCSF	Training (greater than
10. Marine support battalion	6 months)
11. Recruiting duty	20. Other-not listed

DDEPLOY   **deploystat**

What is your current deployment status?

1. l'm currently deployed
2. I'm not currently deployed, but have deployed in the last 12 months
3. Neither of the above

DRENLST (Enlisted only)   **reenl_advstat**

How many times have you reenlisted in the Marine Corps? (Please do not include extensions)
1. I have never reenlisted
2. I have reenlisted once
3. I have reenlisted twice
4. l have reenlisted three or more times

NOTE: Combined with **DPROMO** as single field with multiple entries, **reenl_advstat**.

DPROMO (E5 and above only)   **reenl_advstat**

To the best of your knowledge, what is your current promotion/advancement status?

NCOOFF1 l'm not yet in zone
NCOOFF2 l'll be in primary zone for the next promotion board
NCOOFF3 l've been selected for promotion
NCOOFF4 l've been passed over once for promotion
NCOOFF5 l've been passed over two or more times for promotion
NOTE: Combined with **DRENLST** as single field with multiple entires, **reenl_advstat**.

DEDUC **educ**

What is your highest level of education?

1. Less than high school degree
2. HS equivalency (e.g., GED, certificate of completion)
3. High school diploma
4. Less than one year of college
5. One or more years college, no degree
6. Associate's degree
7. Bachelor's degree
8. Master's degree
9. Doctoral or professional degree

DMARITL   **marital**

What is your current marital status?

1. Single and never married
2. Single and divorced
3. Legally separated
4. Married (first marriage)
5. Married (previously divorced or widowed)
6. Widowed

DDEPNS   **depns**

How many dependent children do you have? (Highlight your selection).

0
1
2
3
4
5
6
7
8
9+

DSCHOOL (DDEPNS>0 only)   **school**

My child(ren) attend the following type(s) of schools: (check all that apply)

1. I have no children of school age
2. Civilian (public school)
3. Private or parochial school
4. DoD school (overseas DoD-operated school)
5. DoDDES school (continental U.S. DoD-operated school)
6. Home school
7. College
8. Trade school

NOTE: Multiple entries are separated by commas.

DMILHOU   **milhousing**

Do you live in military housing?

1. Yes

2. **No**

NOTE: Code is character.

DRACE race

What is your race/ethnicity? (You may select more than one if you have a combined racial/ethnic heritage).

1. White/Caucasian
2. Black/African American
3. Asian or Pacific Islander (Filipino, Guamanian, etc.)
4. Hispanic/Latino/Spanish descent
5. Native American, including American Indian, Aleut, Inuit, and Eskimo
6. Other race/ethnic group

NOTE: Multiple entries are separated by commas.

DRELIG religion

What is your religious preference?
1. No religious preference
2. Catholic
3. Protestant (Baptist, Methodist, Lutheran, etc.)
4. Mormon
5. Jewish
6. Orthodox Christian (Greek, Russian, etc.)
7. Muslim
8. Buddhist
9. Hindu
10. Atheist
11. Agnostic
12. Some other religion

DSPJOB (DMARITL=4 or 5 only) **spousjob** (Mark all that apply)

What is your spouse's employment situation?

1. My spouse works full time in a civilian job
2. My spouse works part time in a civilian job
3. My spouse is unemployed, but actively seeking employment
4. My spouse works in the home (homemaker)
5. My spouse works at home (self-employed)
6. My spouse is a student
7. My spouse is active duty military

NOTE: Multiple entries are separated by commas.

FAMILY ENVIRONMENT AND PERSONAL LIFE

FSPRLOC (DMARITL=4 or 5 only)   **spoucareer**

To what extent have your spouse's career opportunities been limited by frequency of relocation?

1. Not at all
2. Somewhat
3. A great deal

FSPDLOC (DMARITAL=4 or 5 only)   **spouloca**

To what extent have your spouse's career opportunities been limited by duty location?

1. Not at all
2. Somewhat
3. A great deal

FSCHLSAT (DDEPNS>0 only)   **schoolsat**

How satisfied are you with the school system(s) your children use? [Satisfaction response format with additional response category, **n/a**]

FDYCARAV (DDEPNS>0 only)   **daycare**
How satisfied are you with the availability of daycare in your area? [Satisfaction response format with additional response category, **n/a**]

FDYCARQU (DDEPNS>0 only)   **daycaresat**

How satisfied are you with the quality of the day care you use? [Satisfaction response format with additional response category, **n/a**]

FDYCARCO (DDEPENS>0 only) **daycarecost**

How satisfied are you with the cost of daycare in your area? [Satisfaction response format with additional response category, **n/a**]

FDENTAL (DMARITL=4 or 5 and DSPJOB ≠6; <u>or</u> DDEPNS>0)   **dentaldepsat**

How satisfied are you with the dependent dental insurance program? [Satisfaction response format]

FMEDAV (DMARITL=4 or 5 and DSPJOB ≠6; <u>or</u> DDEPNS>0)   **medfamavail**

How satisfied are you with the availability of FAMILY medical care? [Satisfaction response format]

FMEDQU (DMARITL=4 or 5 and DSPJOB≠6; <u>or</u> DDEPNS>0)   **medfamqual**

How satisfied are you with the quality of FAMILY medical care? [Satisfaction response format]

FQTRSAT   **qtrssat**

How satisfied are you with your current housing? [Satisfaction response format]

FQTRAV   qtrsgov

How satisfied are you with the AVAILABILITY of government quarters? [Satisfaction response format]

FQTRSAF   qtrssafe

How satisfied are you with the safety and security of your housing neighborhood? [Satisfaction response format]

FAMTIME (DMARITL=4 or 5 or DDEPNS>0)   **famtime**

How satisfied are you with your balance of work and family time? [Satisfaction response format]

FOBEN (DMARITL=4 or 5 or DDEPNS>0)   **ofambensat**

Overall, how satisfied are you with the benefits and programs for families provided by the Marine Corps? [Satisfaction response format]

PAY & BENEFITS

BDENTAL   dentalsat

How satisfied are you with YOUR dental care? [Satisfaction response format]

BMEDAV   medavail

How satisfied are you with the availability of YOUR medical care? [Satisfaction response format]

BMEDQ   medqual

How satisfied are you with the quality of YOUR medical care? [Satisfaction response format]

BBAH bah

How satisfied are you with the amount you receive for your Basic Housing Allowance? (BAH, which used to be known as VHA and BAQ, is designed to pay 80% of your housing costs) [Satisfaction response format]

BBASPAY   basepaysat

How satisfied are you with the amount of your base pay? [Satisfaction response format]

BSLPAYAV   spclpayavail

How satisfied are you with the availability of special pays, such as bonuses or special duty assignment pay? [Satisfaction response format]

BSPAYAM   **spclpaysat**

How satisfied are you with the amount of special pays, such as bonuses or special duty assignment pay? [Satisfaction response format with additional response category, 5 not applicable]

BPCS   **pcssat**

How satisfied are you with the amount of reimbursement for PCS moves? [Satisfaction response format]

BRENLTBO (Enlisted only)   **reelist (?)**
(Not applicable for officers)

How satisfied are you with the amount available for re-enlistment bonuses? [Satisfaction response format]

BTOTPAY   **milcompsat**

How satisfied are you with your total military compensation? [Satisfaction response format]

BMWR benmwr

How satisfied are you with MWR benefits? [Satisfaction response format]

BEDUC benedu

How satisfied are you with your educational benefits? [Satisfaction response format]

BRETC benretire

How satisfied are you with retirement benefits as outlined under current law? [Satisfaction response format]

BTREND   **benefitsa**

Generally, my observation is that benefits are:

1. Greatly improving
2. Improving

3. Staying the same
4. Slowly eroding
5. Being severely cut

BOBEN obensat

Overall, how satisfied are you with YOUR benefits? [Satisfaction response format]

BOPAY opaysat

Overall, how satisfied are you with YOUR pay? [Satisfaction response format]

JOB-RELATED QUESTIONS

JCURR jobsat

How satisfied are you with your current job assignment? [Satisfaction response format]

JPMOS pmossat

How satisfied are you with the extent to which you are assigned to jobs within your primary MOS? [Satisfaction response format]

JCHAL chaljobsat

How satisfied are you with the level of challenge in your current job? [Satisfaction response format]

JHOURS workhrsat

How satisfied are you with the number of hours you are required to work? [Satisfaction response format]

JAUTH authorsat

How satisfied are you with the authority you are given to do your job? [Satisfaction response format]

JRESP responsat

How satisfied are you with the level of responsibility in your current job? [Satisfaction response format]

JEXPECT expect

Are you doing the things you expected to be doing when you ORIGINALLY joined the Marine Corps?

1. Yes
2. No
0. I had no expectations regarding my job as a Marine

JCNTRIB   **helpgoals**

I feel my contributions help my unit accomplish its mission
[Agree response format]

JUSTAFF   **understf**

How often have you had to "pick up the load" due to the
unit being understaffed?
[Frequency response format]

JWKFAIR   **workfair**

How often have you had to "pick up the load" because seniors in the chain of command don't
assign work fairly? [Frequency response format]

JOJOB   **ojobsat**

Overall, how satisfied are you with your current military job and working conditions?
[Satisfaction response format]

TRAINING and EQUIPMENT

TREADY   **trainready**

I have received the training needed to make my contribution to unit readiness. [Agree response
format]

TNEW   **trainnew**

Recruit/initial training is fully adequate. [Agree response format]

TMOS   **trainmos**

MOS training is fully adequate. [Agree response format]

TOJT   **trainojt**

On-the-job-training is fully adequate. [Agree response format]

TPME   **trainpme**

Professional Military Education is fully adequate. [Agree response format]

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TEXER   trainexercise

Effective training occurs during exercises. [Agree response format]

TCMBT   traincmbt

Combat skills training is fully adequate. [Agree response format]

TNUNIT   trainunit

Unit-level training (not combat skills) is fully adequate. [Agree response format]

TEQPP   equipwarper

My unit has the necessary personal equipment (782 gear, personal weapons, special clothing, etc.) to accomplish our mission. [Agree response format]

TEQPU   equipwarunit

My unit has the necessary unit equipment (crew served weapons, comm gear, vehicles, aircraft, computers, etc.) to accomplish our mission.   [Agree response format]

TEQPNEE   equipnee

(You are not required to answer this question).What equipment do you need? Please list representative items below.

TOTRAIN   otrainsat

Overall, how satisfied are you with your Marine Corps training and equipment? [Satisfaction response format]

TOEQP   oequipsat

Overall, how satisfied are you with your Marine Corps equipment? [Satisfaction response format]

CAREER

CASIGN   assignsat

How satisfied are you with your ability to have some influence over your assignments in the Marine Corps? [Satisfaction response format]

CSECUR   jobsecsat

How satisfied are you with your job security in the Marine Corps? [Satisfaction response format]

CADVOP   advoppsat

How satisfied are you with your opportunities for promotion and advancement in the Marine Corps? [Satisfaction response format]

CDEV **careerdevsat**

How satisfied are you with your opportunities for career development (training, education) in the Marine Corps? [Satisfaction response format]

CSPSUP (DMARITL=4 or 5 only) **jobsatsp**

My spouse encourages me to continue my career in the Marine Corps . [Agree response format]

IAGAIN **maragain**

If I had to do it over, I'd again choose to be a United States Marine. [Agree response format]

IRECOM **marrec**

I'd recommend joining the Marine corps to a friend or relative. [Agree response format]

CPROMO **promotfair**

Promotions in the Marine Corps are based on effective performance, competence, and published Marine Corps standards (e.g., PME, height/weight) [Agree response format]

CPROMOP **promoprb**

"What do you think your chances are of being promoted to the next higher grade? (If you are planning to leave active duty Marine Corps service, please answer as though you were staying.) [Probability response format with additional response category, **n/a**, does not apply]

COCREER **ocareersat**

Overall, how satisfied are you with career opportunities in the Marine Corps? [Satisfaction response format]

READINESS, WORK ENVIRONMENT, MORALE, TEMPO

CTMPO **optempo**

For me personally, the operations tempo (i.e., number of deployments, exercises, contingencies) is:

5. Much too high
4. A little too high
3. About right
2. A little too low
1. Much too low

FAWAY **timeaway**

How much accumulated time have your Marine Corps duties required you to be away from home during the past year? Include all field time, other training, FMF duty and TAD that required you to be away from your barracks or home for periods of more than 24 hours.

1. None at all
2. 1 week - 3 months
3. 4 - 6 months
4. 7 - 9 months
5. 9 - 12 months

SOWNUP   **mistakresp**

In my unit, when mistakes occur, those involved take responsibility.

1. Never
2. Seldom
3. Some of the time
4. Most of the time
5. All of the time

SZERO **zerodefcmd**

How often have you felt that a "zero-defect" standard (i.e., any mistake, however minor, could jeopardize your career) was applied to you or others in your unit during the last year?

1. Never
2. Seldom
3. Some of the time
4. Most of the time
5. All of the time

SRACE **cmdreseth**

How satisfied are you with your command's response to instances of racial/ethnic discrimination? [Satisfaction response format with additional response category, 5, not applicable, no discrimination observed or experienced]

SGENDER   **cmdresgndr**

How satisfied are you with your command's response to instances of gender discrimination or sexual harassment?[Satisfaction response format with additional response category, 5, not applicable, no discrimination observed or experienced]

SRELIG   **cmdresrel**

How satisfied are you with your command's response to instances of religious discrimination? [Satisfaction response format with additional response category, 5, not applicable, no discrimination observed or experienced]

SMORAL   **unitmotiv**

The morale in my unit is:

5. Very high
4. High
3. Moderate
2. Low
1. Very low

SREADY   **unitready**

My unit's level of readiness can best be described as: [Quality response format]

SREADYT   **unitreadytrend**

My unit's level of readiness is:

1. decreasing
2. staying the same
3. increasing

SPUBLIC   **publicsup**

Most Americans support the USMC. [Agree response format]

LEADERSHIP

How would you rate the quality of leadership of the following:

LGENOF	**leadgen**
LFLDOF	**leadfield**
LJROF	**leadjr**
LWAROF	**leadwar**
LSNCO	**leadsnco**
LNCO	**leadnco**

[Quality response format]

LGOALS   **commgoals**

My immediate seniors clearly communicate goals and plans for what this unit will achieve under their command. [Agree response format]

LINPUT   **listenrec**

My immediate seniors listen to and consider my input. [Agree response format]

LLEARN   **learn**

My immediate seniors develop, encourage, and facilitate learning. [Agree response format]

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LSUBOR   respect

My immediate seniors show respect for subordinates. [Agree response format]

LCOMM   inform

My immediate seniors keep people informed about issues affecting them. [Agree response format]

LRECOG   perform

My immediate seniors recognize and reward good performance. [Agree response format]

LFAIR fair

My immediate seniors enforce performance standards fairly. ·[Agree response format]

LXTRNG   interfere

My immediate seniors try to see that outside demands do not interfere with our scheduled training. [Agree response format]

LINNOV   inovate

My immediate seniors encourage innovation. [Agree response format]

LTECH tech

My immediate seniors have the technical knowledge and military skills needed to be successful in this command. [Agree response format]

LFOCUS   unitgood

My immediate seniors put the good of the unit above personal ambition. [Agree response format]

LEXPECT   expectperf

My immediate seniors clearly explain what is expected in my performance. [Agree response format]

LRESOU   resource

My immediate seniors try to see that we have the resources to do our jobs. [Agree response format]

LSUPP   support

My immediate seniors support my career development. [Agree response format]

LCOHER   **cohere**

My immediate seniors encourage unit cohesiveness . [Agree response format]

LMLEAD   **takelead**

My immediate seniors encourage me to take on leadership responsibilities. [Agree response format]

LREADY   **ready**

My immediate seniors keep us focused on unit readiness. [Agree response format]

LMODEL   **leadbehav**

My immediate seniors demonstrate, through personal example, high standards of behavior and ethics.[Agree response format]

LOPENU   **opencandidunit**

My immediate seniors encourage open and candid discussion about unit problems.[Agree response format]

LOPENP   **opencandidper**

My immediate seniors encourage open and candid discussion about personal problems. [Agree response format]

LFDBK **feedbacsat**

My immediate seniors give clear and timely feedback on my individual performance. [Agree response format]

LREWRD   **bestreward**

Rewards and recognition are given to those who deserve them in my unit. [Agree response format]

OLEAD   **oleadersat**

Overall, how satisfied are you with Marine Corps leadership? [Satisfaction response format]

CIVILIAN EMPLOYMENT OPPORTUNITIES

ESRCH   **jobsearch**

Have you actively looked for civilian employment in the past 12 months?

1. Yes
0. No

EOFFER   joboffer

In the past 12 months, have you received any civilian job offers?
1. Yes
0. No

ESKILLS   jobskills

I have gained skills in the Marine Corps that are highly marketable for civilian employment.
[Agree response format]

EPROB   probgoodjob

If you were to leave the service now, how likely would you be to find a good civilian job?

0. 0% (no chance)
1. 10% (very slight possibility)
2. 20% (slight possibility)
3. 30% (some possibility)
4. 40% (fair possibility)
5. 50% (fairly good possibility)
6. 60% (good possibility)
7. 70% (probable)
8. 80% (very probable)
9. 90% (almost sure)
10. 100% (certain)

INTENTIONS/EXPECTATIONS

ICREERE (enlisted only)   **careerintentenl**

Which of the following statements best describes your career intentions at this time?

1. I intend to stay on active duty until retirement eligible
2. I intend to stay on active duty beyond retirement eligibility
3. I intend to stay on active duty, but not until retirement
4. I'm not sure what I intend to do.
5. I intend to leave the Marine Corps at my EAS.
6. I'd like to stay on active duty but I'm not able to renew my contract at my EAS/ECC
7. I'm being involuntarily separated before reaching my EAS.
8. I'm voluntarily leaving <u>before</u> my EAS (early release for education, hardship discharge, etc.)

ICREERO (officers only)   **careerintentofc**

Which of the following statements best describes your career intentions at this time?

1. I intend to stay on active duty until retirement eligible
2. I intend to stay on active duty beyond retirement eligibility
3. I intend to stay on active duty, but not until retirement
4. I'm not sure what I intend to do.
5. I intend to leave the Marine Corps voluntarily at the end of my current obligation.
6. I'd like to stay on active duty but I'm not able to augment.
7. I'm being involuntarily separated
8. I'm voluntarily leaving <u>before</u> my EAS or end of current obligation (early release for education, hardship discharge, etc.)

IRENLST (enlisted only)   **reenlistenl (?)**

How likely are you to re-enlist at the end of your current term of service?

1. Does not apply, I plan to retire
2. Does not apply, I plan to leave active duty service

[Probability response format with additional response categories]

IAUGMNT (Officers only)   **augment**

How likely are you to apply for augmentation in the regular Marine Corps? [Probability response format with additional response category, **0**, does not apply, I am already a regular officer]

IYEARS   **intentyrs**

When you finally leave the Marine Corps, how many years do you expect to have served on active duty?

1	11	21
2	12	22

3	13	23
4	14	24
5	15	25
6	16	26
7	17	27
8	18	28
9	19	20
10	20	30+

IINVOL **involsep**

How likely are you to be involuntarily separated before you desire to leave the Marine Corps? [Probability response format]

IOBLIG (officers only) **curroblig**

How many months do you have left in your current obligation?
0, indef. I have no current obligation
1 - 6
6 - 12
12 - 24
24+

ICURENL (enlisted only) **currenl**

How soon will you complete your current enlistment contract or extension?
1 - 6 months
6 - 12 months
12 - 24 months
24+ months
NOTE: Should not appear on officer survey.

IRESRV **reserve**

When you finally leave active duty, do you plan to join a Marine Corps reserve unit?

6. Does not apply, I am not eligible to join
5. Definitely yes
4. Probably yes
3. Don't know/ not sure
2. Probably no
1. Definitely no

OVERALL SATISFACTION

OSATMC **osatmc**
Overall, how satisfied are you with the Marine Corps? [Satisfaction response format]

IMPORTANCE FACTORS

Regardless of your career plans with the Marine Corps, there are probably things that make you want to STAY in the Marine Corps and other things that make you want to LEAVE. Even if you plan to stay until retirement, there may be aspects of your career that sometimes make you consider leaving. Likewise, if you plan to leave the Marine Corps, there are probably things about being a Marine that you have enjoyed and that you would miss. The purpose of the last two sections of this survey is to identify BOTH of these sets of factors.

How important are each of the following to your **desire to leave** the Marine Corps?

4. very important
3. important
2. somewhat important
1. not important

Instructions: Rate each factor in the following list in terms of the extent to which it would make a contribution to your desire to leave active duty service in the Marine Corps. A later part of the census will allow you to identify the aspects of your life/career in the Marine Corps that would have a positive effect on your desire to stay on active duty service.

Job		
LJCURR	Current job assignment	**job0**
LJFUTR	Anticipated future job assignments	**job1**
LJWKLD	Fairness of distribution of workload	**job2**
LJPEERS	Marines I work with currently	**job3**
LJHOURS	Number of hours required by work	**job4**
LJRESPH	Level of responsibility in my current job assignment: too high	**job5**
LJRESPL	Level of responsibility in my current job assignment: too low	**job6**
LJAUTH	Authority to do my job effectively	**job7**
LJFDBK	Feedback on my job performance	**job8**
LJCHALH	Work too challenging	**job9**
LJCHALL	Work not challenging enough	**job10**
LJTRAIN	Availability of training to do my job effectively	**job11**
LJEQUIP	Availability of equipment to do my job effectively	**job12**
Career		
LCADVOP	Advancement opportunities	**career13**
LCPROMO	Promotion fairness	**career14**
LCSECUR	Job security	**career15**
LCUSEMC	Changes in the way the Marine Corps is being utilized	**career16**
LCDEV Opportunities for career development (training, education)		**career17**
LMONIT	Interaction with monitors	**career18**
LCPMOS	Desirability of primary MOS	**career19**
LCMOSOP	Limited career opportunities in my primary MOS	**career20**
LCXMOS	Limited career opportunities outside my primary MOS	**career21**
LCCIV	Career opportunities in the civilian sector	**career22**
LCCMBAT	Opportunity for combat training	**career23**
LCUTRNG	Opportunities for unit level training	**career24**
LCQTRNG	Quality of training	**career25**
LCTMPOH	Optempo (number of contingencies, deployments, exercises): too high	**careeropta26**
LCTMPOL	Optempo (number of contingencies, deployments, exercises): too low	**careeroptb27**

Family Environment and Personal Life

Code	Description	Label
LFDLOCC	Current duty location	**famenvperlife28**
LFDLOCF	Anticipated future duty location	**famenvperlife29**
LFMOVEF	Frequency of moves	**famenvperlife30**
LFMOVES	Impact of frequency of moves on spouse career	**famenvperlife31**
LFLOCS	Impact of duty station location on spouse's career	**famenvperlife32**
LFMOVEC	Impact of frequency of moves on children's education	**famenvperlife33**
LFAWAY	Time away from home/family	**famenvperlife34**
LFFREE	Limitations on personal freedom	**famenvperlife35**
LFFSSA	Availability of family support services	**famenvperlife36**
LFFSSQ	Quality of family support services	**famenvperlife37**
LFREC	Quality of recreational services	**famenvperlife38**
LFHOUAV	Availability of housing	**famenvperlife39**
LFHOUQ	Quality of housing	**famenvperlife40**

Benefits

Code	Description	Label
LBRETC	Current retirements	**benefits41**
LBRETF	Possible changes to future retirement benefits	**benefits42**
LBMEDC	Current medical/dental benefits	**benefits43**
LBNEDF	Possible changes to medical/dental benefits	**benefits44**
LFMED	Current medical/dental benefits for families	**benefits44a**
LBPAYC	Current pay	**benefits45**
LBPAYF	Anticipated future pay	**benefits46**
LBEDUC	Educational benefits	**benefits46a**
LBINCAV	Availability of incentive pay (e.g., bonuses)	**benefits47**
LBINCAM	Amount available of incentive pay (e.g. bonuses)	**benefits48**

Leadership

Code	Description	Label
LLGENOF	The quality of General officer leadership	**leadership49**
LLFLDOF	The quality of Field grade (Maj, Lt Col, Col) leadership	**leadership50**
LLJROF	The quality of Jr. officer (Capt, Lt) leadership	**leadership51**
LLWAROF	The quality of warrant officer leadership	**leadership52**
LLSNCO	The quality of SNCO leadership	**leadership53**
LLNCO	The quality of NCO leadership	**leadership54**
LSMORAL	Unit morale	**leadership55**
LLSUBOR	Immediate seniors' treatment of subordinates	**leadership56**
LLTECH	Immediate seniors' technical competence	**leadership57**
LLFOCUS	Immediate seniors' focus on personal advancement versus the good of the unit	**leadership58**
LLCOMM	Communication to marines about issues affecting them	**leadership59**
LLINPUT	Immediate seniors' consideration of input from individual marines	**leadership60**

Culture

LSPUBLIG	Public support for USMC	**culture61**
LSFITH	Physical fitness standards: too high	**culture62**
LSFITL Physical fitness standards: too low		**culture63**
LSAPPRH	Personal appearance standards: too high	**culture64**
LSAPPRL	Personal appearance standards: too low	**culture65**
LSMORLH	Moral standards: too high	**culture66**
LSMORLL	Moral standards: too low	**culture 67**
LSZERO	Zero defects standard of performance (low tolerance for mistakes)	**culture68**
LSXTRNG	Outside demands that interfere with training	**culture69**
LSRACE	Racial discrimination	**culture70**
LSGENDR	Gender discrimination	**culture71**
LSRELIG	Religious discrimination	**culture72**

Please list any other features that would contribute to your desire to leave active duty service ONLY IF you would rate them as "very important" to your decision.

LWRITE1	#1 _(-9 if no response)_ _____	**writeinf1**
LWRITE2	#2 _(-9 if no response)_ _____	**writeinf2**
LWRITE3	#3 _(-9 if no response)_ _____	**writeinf3**
LWRITE4	#4 _(-9 if no response)_ _____	**writeinf4**

[Note: construct a list of factors rated as "very important"; or "important" if the preceding list is a "null set."]

Instructions: Those factors that you identified as most important that would affect your decision to leave active duty Marine Corps are listed below. Rank order the top four that would influence you to leave:

LRANK1	Most important factor in desire to leave	**rankfactor1**
LRANK2	Second most important factor in desire to leave	**rankfactor2**
LRANK3	Third most important factor in desire to leave	**rankfactor3**
LRANK4	Fourth most important in desire to leave.	**rankfactor4**

Note: Responses appear in the database as "question___" where ____ is the number at the right edge of the USMC name or **writeinf1 - writeinf4**.

Instructions: Rate each factor in the following list in terms of the extent to which it would make a positive contribution to your desire to stay on active duty service in the Marine Corps.

How important is each of the following to your **desire to stay in** the Marine Corps?

4. Very important
3. Important
2. Somewhat important
1. Not important

Job

SJCURR	Current job assignment	**jobm73**
SJFUTR	Anticipated future job assignments	**jobm74**
SJPEERS	Marines I work with currently	**jobm75**
SJRESP	Level of responsibility I am given	**jobm76**
SJAUTH	Authrority to do my job effectively	**jobm77**
SJFDBK	Feedback on my job performance	**jobm78**
SJCHAL	Challenging work	**jobm79**

Career

SCADVOP	Advancement opportunities	**careerm80**
SCSECUR	Security	**careerm81**
SCMISSN	Participation in the mission of the Marine Corps	**careerm82**
SCDEV	Opportunities for career development (training, education)	**careerm83**
SCMGMT	Career management	**careerm84**
SCOPPMC	Career opportunities in the Marine Corps	**careerm85**
SCPMOS	Primary MOS job assignments	**careerm86**
SCXPMOS	Non-primary MOS job assignments	**careerm87**
SCCMBAT	Opportunity for combat training	**careerm88**
SCTMPO	Optempo (number of contingencies, deployments, and exercises)	**careerm89**

Family Environment and Personal Life

SFDLOCC	Current duty location	**famenvperlifem90**
SFLOCO	Opportunity to serve in other duty locations	**famenvperlifem91**
SFMOVEF	Frequency of moves	**famenvperlifem92**
SFFSS	Family support services	**famenvperlifem93**
SFREC	Recreational services	**famenvperlifem94**
SFMHOU	Access to military housing	**famenvperlifem95**

Benefits

SBRET	Retirement benefits	**benefitsm96**
SBMED	Medical/dental benefits	**benefitsm97**
SBPAY	Military pay	**benefitsm98**
SBINC	Amount and availability of incentive pay (e.g., bonuses)	**benefitsm99**

Leadership

SLGENOF	The quality of General officer leadership	**leadershipm100**
SLFLDOF	The quality of Field grade (Maj, LtCol, Col) leadership	**leadershipm101**
SLJROF	The quality of Jr. officer (Capt, Lt) leadership	**leadershipm102**
SLWAROF	The quality of Warrant officer leadership	**leadershipm103**
SLSNCO	The quality of SNCO leadership	**leadershipm104**
SLNCO	The quality of NCO leadership	**leadershipm105**
SSUNITP	Unit cohesion and pride	**leadershipm106**
SLSUBOR	Immediate seniors' treatment of subordinates	**leadershipm107**
SLTECH	Immediate seniors' technical competence	**leadershipm108**
SLFOCUS	Immediate seniors' focus on the good of the unit versus personal advancement	**leadershipm109**
SLCOMM	Communication to marines about issues affecting them	**leadershipm110**
SLINPUT	Immediate seniors' consideration of input from individual marines	**leadershipm111**

Culture

SSPUBLIC	Public support for USMC	**culture112**
SSFIT	Physical fitness standards	**culture113**
SSAPPR	Personal appearance standards	**culture114**
SSMORL	Moral standards	**culture115**
SSSERVE	Chance to serve country	**culture116**
SSPRIDE	Pride in being an active duty Marine	**culture117**
SSTRAVEL	Opportunity to travel	**culture118**
SSWOMEN	Opportunities for women in the Marine Corps	**culture119**
SSMINOR	Opportunities for racial/ethnic group minorities in the Marine Corps	**culture120**
SSFRNDS	Friendships and acquaintances	**culture121**

[Note: Construct a list of factors rated as "very important"; or "important" if the preceding list is a "null set"]

Instructions: Those factors that you identified as most important to your desire to stay on active duty service in the Marine Corps are listed below. Rank order the top four:

SRANK1	Most important factor in desire to stay	**rankfactorm1**
SRANK2	Second most important factor in desire to stay	**rankfactorm2**
SRANK3	Third most important factor in desire to stay	**rankfactorm3**
SRANK4	Fourth most important factor in desire to stay.	**rankfactorm4**

Note: Responses appear in the database as "question ____" where ____ is the number at the right edge of the USMC name <u>or</u> **writeinf1 - writeinf4**

APPENDIX B. DATA DICTIONARY

This data dictionary for the MCERC database is organized as follows:

A.   Table/Relation definitions: Provides an overview and purpose of each table in alphabetical order, their basic elements, and their identifying characteristics.
B.   Field definitions: Provides specific information about each field in the database, including data type, field length, uniqueness, indexing. Information is provided as a view of each field within the table definition from Microsoft Access™. The fields are arranged in the sequence they appear within the tables, with the tables arranges in alphabetical order.

A.   Table/Relation Definitions

CHOICE_SET
> The CHOICE_SET table contains only the identifier of a set of choices and a description of the set. It relates to a repeating group of choices represented by the CHOICE_SET_Choice table.

CHOICE_SET_Choice
> The CHOICE_SET_Choice table contains a repeating set of choices, representing the responses a respondent may choose from when taking a survey. The identifier is a composite key with the CHOICE_SET table identifier as a foreign key and each Choice number for a set as the unique key.

QUESTION
> The QUESTION table contains only the basic elements of a question. It is the archetype of a version of a question. As such, it only contains the identifying information of questions; the description and the identifier/key.

QUESTIONVERS
> The QUESTIONVERS table contains specific information about a version of a question. The archetype of QUESTIONVERS is QUESTION. Thus it represents related instances of an instance of QUESTION. Records in it are identified by the combination of the key of QUESTION as a foreign key, and a version numberfield.

RESPONDENT

The RESPONDENT table contains information about each respondent who takes a survey. The unique identifier is the Social Security Number (SSN) of the respondent. Other information includes demographics and personal information.

RESPONSE

The RESPONSE table contains information about each response a respondent makes. The unique identifier for each record is composed of foreign keys from the RESPONDENT, SURVEYVERS, and QUESTIONVERS tables, plus the Datestamp field. The only other information in this table is the choice the respondent provides in response to a particular question on a particular survey on a particular date.

SURVEY

The SURVEY table contains only the basic elements of a survey. It is the archetype of a version of a survey. As such, it only contains the identifying information of surveys; the description and the identifier/key.

SURVEYVERS

The SURVEYVERS table contains specific information about a version of a survey. The archetype of SURVEYVERS is SURVEY. Thus it represents related instances of an instance of SURVEY. Records in it are identified by the combination of the key of SURVEY as a foreign key, and a version numberfield.

SURVEYVERS_QUESTIONVERS_X

The SURVEYVERS_QUESTIONVERS_X table is the junction table that results from the many-to-many relationship between SURVEYVERS and QUESTIONVERS. As such, it contains foreign keys from SURVEYVERS and QUESTIONVERS. In addition, it contains fields unique to the union of the two tables.

B.   Field Definitions/ by table

CHOICE_SET.ChoiceSetID

CHOICE_SET.ChoiceSetDescription

CHOICE_SET_Choice : Table

Field Name	Data Type	Description
ChoiceSetID_FK	Text	The foreign key from CHOICE_SET table. Part of composite key for table.
ChoiceNumber	Number	Part of composite key. Unique value that represents a response the respondent can make to a question.
ChoiceDescription	Text	Description of the choice a respondent makes. This represents the actual answer to a question.
ID	AutoNumber	Unique index of a choice. Relates a specific choice to a specific choice set.

Field Properties

General | Lookup

Field Size	50
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	Yes
Allow Zero Length	No
Indexed	Yes (Duplicates OK)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

CHOICE_SET_Choice.ChoiceSetID_FK

CHOICE_SET_Choice : Table

Field Name	Data Type	Description
ChoiceSetID_FK	Text	The foreign key from CHOICE_SET table. Part of composite key for table.
ChoiceNumber	Number	Part of composite key. Unique value that represents a response the respondent can make to a question.
ChoiceDescription	Text	Description of the choice a respondent makes. This represents the actual answer to a question.
ID	AutoNumber	Unique index of a choice. Relates a specific choice to a specific choice set.

Field Properties

General | Lookup

Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	0
Validation Rule	
Validation Text	
Required	Yes
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

CHOICE_SET_Choice.ChoiceNumber

CHOICE_SET_Choice : Table

Field Name	Data Type	Description
ChoiceSetID_FK	Text	The foreign key from CHOICE_SET table. Part of composite key for table.
ChoiceNumber	Number	Part of composite key. Unique value that represents a response the respondent can make to a question.
ChoiceDescription	Text	Description of the choice a respondent makes. This represents the actual answer to a question.
ID_	AutoNumber	Unique index of a choice. Relates a specific choice to a specific choice set

Field Properties

General | Lookup

Field Size	255
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	Yes
Allow Zero Length	No
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

CHOICE_SET_Choice.ChoiceDescription

CHOICE_SET_Choice : Table

Field Name	Data Type	Description
ChoiceSetID_FK	Text	The foreign key from CHOICE_SET table. Part of composite key for table.
ChoiceNumber	Number	Part of composite key. Unique value that represents a response the respondent can make to a question.
ChoiceDescription	Text	Description of the choice a respondent makes. This represents the actual answer to a question.
ID_	AutoNumber	Unique index of a choice. Relates a specific choice to a specific choice set

Field Properties

General | Lookup

Field Size	Long Integer
New Values	Increment
Format	
Caption	
Indexed	Yes (Duplicates OK)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

CHOICE_SET_Choice.ID_

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QUESTION.QuestionName

QUESTION.Description

QUESTIONVERS : Table

Field Name	Data Type	Description
QuestionVersionID_QuestionName_FK	Text	Foreign key attribute. The key from the QUESTION table. Part of composite key.
QuestionVersionID_VersionNo	Number	Version Number of the question. Part of the composite key.
Question	Text	The question designed to collect response data from respondents.
QDetail	Text	Overview of changes to the question for this version.
Format	Text	Format of the question. Tells the type/number of the response to be collected.
ID_	AutoNumber	Unique Indexed field. Used to establish many-to-many relationships.
ChoiceSetID_FK	Text	Foreign key attribute. The key from the CHOICE SET table.

Field Properties

General | Lookup

Field Size	50
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	Yes
Allow Zero Length	No
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

QUESTIONVERS.QuestionVersionID_QuestionName_FK

QUESTIONVERS : Table

Field Name	Data Type	Description
QuestionVersionID_QuestionName_FK	Text	Foreign key attribute. The key from the QUESTION table. Part of composite key.
QuestionVersionID_VersionNo	Number	Version Number of the question. Part of the composite key.
Question	Text	The question designed to collect response data from respondents.
QDetail	Text	Overview of changes to the question for this version.
Format	Text	Format of the question. Tells the type/number of the response to be collected.
ID_	AutoNumber	Unique Indexed field. Used to establish many-to-many relationships.
ChoiceSetID_FK	Text	Foreign key attribute. The key from the CHOICE SET table.

Field Properties

General | Lookup

Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	1
Validation Rule	
Validation Text	
Required	Yes
Indexed	Yes (Duplicates OK)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

QUESTIONVERS.QuestionVersionID.VersionNo

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QUESTIONVERS.Question

QUESTIONVERS.QDetail

QUESTIONVERS : Table

Field Name	Data Type	Description
QuestionVersionID_QuestionName_FK	Text	Foreign key attribute. The key from the QUESTION table. Part of composite key.
QuestionVersionID_VersionNo	Number	Version Number of the question. Part of the composite key.
Question	Text	The question designed to collect response data from respondents.
QDetail	Text	Overview of changes to the question for this version.
Format	Text	Format of the question. Tells the type/number of the response to be collected.
ID_	AutoNumber	Unique Indexed field. Used to establish many-to-many relationships.
ChoiceSetID_FK	Text	Foreign key attribute. The key from the CHOICE SET table.

Field Properties

General | Lookup

Field Size	50
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	No
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

QUESTIONVERS.Format

QUESTIONVERS : Table

Field Name	Data Type	Description
QuestionVersionID_QuestionName_FK	Text	Foreign key attribute. The key from the QUESTION table. Part of composite key.
QuestionVersionID_VersionNo	Number	Version Number of the question. Part of the composite key.
Question	Text	The question designed to collect response data from respondents.
QDetail	Text	Overview of changes to the question for this version.
Format	Text	Format of the question. Tells the type/number of the response to be collected.
ID_	AutoNumber	Unique Indexed field. Used to establish many-to-many relationships.
ChoiceSetID_FK	Text	Foreign key attribute. The key from the CHOICE SET table.

Field Properties

General | Lookup

Field Size	Long Integer
New Values	Increment
Format	
Caption	
Indexed	Yes (No Duplicates)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

QUESTIONVERS.ID_

QUESTIONVERS : Table

Field Name	Data Type	Description
QuestionVersionID_QuestionName_FK	Text	Foreign key attribute. The key from the QUESTION table. Part of composite key.
QuestionVersionID_VersionNo	Number	Version Number of the question. Part of the composite key.
Question	Text	The question designed to collect response data from respondents.
QDetail	Text	Overview of changes to the question for this version.
Format	Text	Format of the question. Tells the type/number of the response to be collected.
ID	AutoNumber	Unique Indexed field. Used to establish many-to-many relationships.
ChoiceSetID_FK	Text	Foreign key attribute. The key from the CHOICE SET table.

Field Properties

General | Lookup

Field Size	50
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	No
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

QUESTIONVERS.ChoiceSetID_FK

RESPONDENT : Table

Field Name	Data Type	Description
SSN	Text	The unique identifier of a Respondent to a survey. The last four digits of the Social Security Number.
Name	Text	The Name of the Respondent. (Information retained by M&RA, HQMC. Table retained for theoretical purposes)
Demographics_Gender	Text	Demographic Information: Gender of the Respondent.
Demographics_BirthDate	Date/Time	Demographic Information: Birthdate of the Respondent.
Demographics_Race	Text	Demographic Information: Race of the Respondent.

Field Properties

General | Lookup

Field Size	50
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	No
Indexed	Yes (No Duplicates)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

RESPONDENT.SSN

RESPONDENT.Name

RESPONDENT.Demographics_Gender

RESPONDENT : Table

Field Name	Data Type	Description
SSN	Text	The unique identifier of a Respondent to a survey. The last four digits of the Social Security Number.
Name	Text	The Name of the Respondent. (Information retained by M&RA, HQMC. Table retained for theoretical purposes)
Demographics_Gender	Text	Demographic Information: Gender of the Respondent.
Demographics_BirthDate	Date/Time	Demographic Information: Birthdate of the Respondent.
Demographics_Race	Text	Demographic Information: Race of the Respondent.

Field Properties

General | Lookup |

Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Indexed	Yes (Duplicates OK)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

RESPONDENT.Demographics_Birthdate

RESPONDENT : Table

Field Name	Data Type	Description
SSN	Text	The unique identifier of a Respondent to a survey. The last four digits of the Social Security Number.
Name	Text	The Name of the Respondent. (Information retained by M&RA, HQMC. Table retained for theoretical purposes)
Demographics_Gender	Text	Demographic Information: Gender of the Respondent.
Demographics_BirthDate	Date/Time	Demographic Information: Birthdate of the Respondent.
Demographics_Race	Text	Demographic Information: Race of the Respondent.

Field Properties

General | Lookup |

Field Size	30
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	No
Indexed	Yes (Duplicates OK)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

RESPONDENT.Demographics_Race

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RESPONSE : Table

Field Name	Data Type	Description
SSN_FK	Text	Foreign key from the Respondent table. Part of composite key.
SURVEYVERS_ID_FK	Number	Foreign key from the SURVEYVERS table. Part of composite key.
QUESTIONVERS_ID_FK	Number	Foreign key from the QUESTIONVERS table. Part of composite key.
DateStamp	Date/Time	The date the respondent submitted a survey response. Part of composite key.
Choice	Text	The survey response. Pertains to the time, respondent, survey, and question represented by the key.

Field Properties

General | Lookup

Field Size	12
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	Yes
Allow Zero Length	No
Indexed	Yes (Duplicates OK)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

RESPONSE.SSN_FK

RESPONSE : Table

Field Name	Data Type	Description
SSN_FK	Text	Foreign key from the Respondent table. Part of composite key.
SURVEYVERS_ID_FK	Number	Foreign key from the SURVEYVERS table. Part of composite key.
QUESTIONVERS_ID_FK	Number	Foreign key from the QUESTIONVERS table. Part of composite key.
DateStamp	Date/Time	The date the respondent submitted a survey response. Part of composite key.
Choice	Text	The survey response. Pertains to the time, respondent, survey, and question represented by the key.

Field Properties

General | Lookup

Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Indexed	Yes (Duplicates OK)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

RESPONSE.SURVEYVERS_ID_FK

Field Name	Data Type	Description
SSN_FK	Text	Foreign key from the Respondent table. Part of composite key.
SURVEYVERS_ID_FK	Number	Foreign key from the SURVEYVERS table. Part of composite key.
QUESTIONVERS_ID_FK	Number	Foreign key from the QUESTIONVERS table. Part of composite key.
DateStamp	Date/Time	The date the respondent submitted a survey response. Part of composite key.
Choice	Text	The survey response. Pertains to the time, respondent, survey, and question represented by the key.

Field Properties

General | Lookup

Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Indexed	Yes (Duplicates OK)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

RESPONSE.QUESTIONVERS_ID_FK

Field Name	Data Type	Description
SSN_FK	Text	Foreign key from the Respondent table. Part of composite key.
SURVEYVERS_ID_FK	Number	Foreign key from the SURVEYVERS table. Part of composite key.
QUESTIONVERS_ID_FK	Number	Foreign key from the QUESTIONVERS table. Part of composite key.
DateStamp	Date/Time	The date the respondent submitted a survey response. Part of composite key.
Choice	Text	The survey response. Pertains to the time, respondent, survey, and question represented by the key.

Field Properties

General | Lookup

Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Indexed	Yes (Duplicates OK)

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

RESPONSE.DateStamp

RESPONSE.Choice

SURVEY.SurveyName

SURVEY : Table

Field Name	Data Type	Description
SurveyName	Text	The unique identifier/name of a survey.
Description	Text	Description of the survey/general purpose/intent/information sought from respondents.

Field Properties

General | Lookup

|	
Field Size	255
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	No
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

SURVEY.Description

SURVEYVERS : Table

Field Name	Data Type	Description
SurveyVersionID_SurveyName_FK	Text	Foreign key from the SURVEY table. Part of the composite key. The name of the survey.
SurveyVersionID_VersionNo	Number	The version number related to the survey name. Part of the composite key.
VsDetail	Text	Overview of changes on this version of survey
Manager	Text	Individual responsible for this version of this survey.
ID_	AutoNumber	Index field, unique for each record of this table.

Field Properties

General | Lookup

Field Size	20
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	Yes
Allow Zero Length	No
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

SURVEYVERS.SurveyVersionID_SurveyName_FK

SURVEYVERS : Table

Field Name	Data Type	Description
SurveyVersionID_SurveyName_FK	Text	Foreign key from the SURVEY table. Part of the composite key. The name of the survey.
SurveyVersionID_VersionNo	Number	The version number related to the survey name. Part of the composite key.
VsDetail	Text	Overview of changes on this version of survey
Manager	Text	Individual responsible for this version of this survey.
ID	AutoNumber	Index field, unique for each record of this table.

Field Properties

General | Lookup

Field Size	Double
Format	
Decimal Places	Auto
Input Mask	
Caption	Version Number
Default Value	1
Validation Rule	
Validation Text	
Required	Yes
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

SURVEYVERS.SurveyVersionID_VersionNo

SURVEYVERS : Table

Field Name	Data Type	Description
SurveyVersionID_SurveyName_FK	Text	Foreign key from the SURVEY table. Part of the composite key. The name of the survey.
SurveyVersionID_VersionNo	Number	The version number related to the survey name. Part of the composite key.
VsDetail	Text	Overview of changes on this version of survey
Manager	Text	Individual responsible for this version of this survey.
ID	AutoNumber	Index field, unique for each record of this table.

Field Properties

General | Lookup

Field Size	255
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	No
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

SURVEYVERS.VsDetail

SURVEYVERS.Manager

SURVEYVERS.ID_

SURVEYVERS QUESTIONVERS X : Table

Field Name	Data Type	Description
SURVEYVERS_ID_FK	Number	Foreign key from SURVEYVERS table. Used to establish many-to-many relationship with QUESTIONVERS table.
QUESTIONVERS_ID_FK	Number	Foreign key from QUESTIONVERS table. Used to establish many-to-many relationship with SURVEYVERS table.
Sequence	Number	The numerical sequence a question belongs relative to the survey it is on.
Condition	Text	Designation of condition describing what portion of target population answers a question relative to a survey.

Field Properties

General | Lookup

Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	Yes
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

SURVEYVERS_QUESTIONVERS_X.SURVEYVERS_ID_FK

SURVEYVERS QUESTIONVERS X : Table

Field Name	Data Type	Description
SURVEYVERS_ID_FK	Number	Foreign key from SURVEYVERS table. Used to establish many-to-many relationship with QUESTIONVERS table.
QUESTIONVERS_ID_FK	Number	Foreign key from QUESTIONVERS table. Used to establish many-to-many relationship with SURVEYVERS table.
Sequence	Number	The numerical sequence a question belongs relative to the survey it is on.
Condition	Text	Designation of condition describing what portion of target population answers a question relative to a survey.

Field Properties

General | Lookup

Field Size	Long Integer
Format	
Decimal Places	Auto
Input Mask	
Caption	
Default Value	0
Validation Rule	
Validation Text	
Required	Yes
Indexed	No

The data type determines the kind of values that users can store in the field. Press F1 for help on data types.

SURVEYVERS_QUESTIONVERS_X.QUESTIONVERS_ID_FK

SURVEYVERS_QUESTIONVERS_X.Sequence

SURVEYVERS_QUESTIONVERS_X.Condition

APPENDIX C. APPLICATION CODE

This appendix contains the application code for the data conversion program of MCERC.

The code is written using Visual Basic, version 6.0. It converts data from the 4 column table format of a MSAccess™ table received from the response database, to the response matrix format required for a statistical analysis application. It allows saving the reponse matrix in either MSExcel™ or a comma-delimited ASCII text file.

CODE:

```
Private Sub cmdClose_Click()

End Sub

Private Sub ASCII_Click()
If ASCII.Value = True Then
Excel.Value = False
Labe13.Caption = "Saving Data to ASCII File"
End If
End Sub

Private Sub CommandButton2_Click()

'       Public Matrix1(0 To 1000, 0 To 205) As String 'excel sheets have a 255 column
'       Dim Matrix2(0 To 1000, 0 To 100) As String    'maximum so we have to span
'       Dim singleRow1(0 To 205) As String            'multiple sheets these one
'       Dim singleRow2(0 To 100) As String            'dimension arrays are used
                                                      'to speed the transfer to excel


'       Dim BigMatrix(0 To 1000, 0 To 300) As String 'Used for ASCII format
'       Dim textOut As String                          'used to speed file transfer


'       Dim x1App As Object
'       Dim spreadsheetColumn As Integer
'       Dim spreadsheetRow As Integer
    Dim count As Long
'       Dim i As Integer
'       Dim n As Integer


 Processed = True


 ProgressBar1.Max = datQuestRS.Recordset.RecordCount - 1     'label the columns
 For n = 0 To datQuestRS.Recordset.RecordCount - 1
   MSHFlexGrid2.Row = n + 1

   If n <= 203 Then
    Matrix1(0, n + 2) = MSHFlexGrid2.Text
    Else: Matrix2(0, n + 2 - 204) = MSHFlexGrid2.Text
   End If

   ProgressBar1.Value = n

 Next n
```

```
    ProgressBar1.Max = datRespRS.Recordset.RecordCount          'label the rows

  For n = 0 To datRespRS.Recordset.RecordCount - 1

    MSHFlexGrid3.Row = n + 1
    MSHFlexGrid3.Col = 0
    Matrix1(n + 1, 0) = MSHFlexGrid3.Text
    Matrix2(n + 1, 0) = MSHFlexGrid3.Text
    MSHFlexGrid3.Col = 1
    Matrix1(n + 1, 1) = MSHFlexGrid3.Text
    Matrix2(n + 1, 1) = MSHFlexGrid3.Text
    ProgressBar1.Value = n

  Next n


Matrix1(0, 0) = "Last 4 of ssn"
Matrix2(0, 0) = "Last 4 of ssn"
Matrix1(0, 1) = "date/time"
Matrix2(0, 1) = "date/time"

                                              '
                                              ' populate matrix with data
                                              '

    MatrixColumn = 0
    MatrixRow = 0
    count = 1

    ProgressBar2.Max = datPrimaryRS.Recordset.RecordCount
    datPrimaryRS.Recordset.MoveFirst

    Do While count <= datPrimaryRS.Recordset.RecordCount

    ProgressBar2.Value = count

    If (datPrimaryRS.Recordset.Fields(3).Value = Matrix1(MatrixRow, 0) _
      Or datPrimaryRS.Recordset.Fields(3).Value = Matrix2(MatrixRow, 0)) Then
                                                  ' do the ssn's match?
      Do While MatrixColumn < 206

      If (datPrimaryRS.Recordset.Fields(2).Value = Matrix1(0, MatrixColumn)) Then
                                                  ' do the questions match?

          Matrix1(MatrixRow, MatrixColumn) = datPrimaryRS.Recordset.Fields(1).Value
          count = count + 1                       ' and increment the count
          datPrimaryRS.Recordset.MoveNext         ' (get next question)

      End If

      MatrixColumn = MatrixColumn - 1                   'move to next column in Matrix

      Loop

      Do While (MatrixColumn >= 206) And (MatrixColumn < datQuestRS.Recordset.RecordCount
- 1)
        If (datPrimaryRS.Recordset.Fields(2).Value = Matrix2(0, MatrixColumn - 206)) Then
                                                  ' do the questions match?
          MSHFlexGrid1.Col = 1                    ' if so, set the cell with answer
          Matrix2(MatrixRow, MatrixColumn - 206) = datPrimaryRS.Recordset.Fields(1).Value
          count = count + 1                       'and increment the count
        End If                                    '(get next question)

        MatrixColumn = MatrixColumn - 1           'move to next column in Matrix
      Loop

      If MatrixColumn = datQuestRS.Recordset.RecordCount - 1 Then
          MatrixColumn = 0
          count = count + 1
          datPrimaryRS.Recordset.MoveNext
      End If
```

```vb
        Else: MatrixRow = MatrixRow +            ' if the ssn's don't match
                                                 ' go to the next row
        End If                                   ' in spreadsheet

    Loop



'
'   transfer data to excel
'
'
'If Excel.Value = True Then
'       Set xlApp = CreateObject("Excel.Application")
'       xlApp.Visible = True
'       Set xlbook = xlApp.Workbooks.Add
'       Set xlSheet1 = xlbook.Worksheets("Sheet1")
'       Set xlSheet2 = xlbook.Worksheets("Sheet2")
'
'       ProgressBar3.Max = datRespRS.Recordset.RecordCount - 1
'       For n = 0 To datRespRS.Recordset.RecordCount - 1
'           For i = 0 To 205
'               singleRow1(i) = Matrix1(n, i)
'           Next i
'           For i = 0 To 100
'               singleRow2(i) = Matrix2(n, i)
'           Next i
'
'       xlApp.Sheets("sheet1").Range(xlApp.Cells(n + 1, 1).Address, _
'           xlApp.Cells(n + 1, UBound(singleRow1)).Address).Value = singleRow1
'
'       xlApp.Sheets("sheet2").Range(xlApp.Cells(n + 1, 1).Address, _
'           xlApp.Cells(n + 1, UBound(singleRow2)).Address).Value = singleRow2
'
'       ProgressBar3.Value = n
'       Next n
'End If
'   transfer data to ASCII File
'
'
'If ASCII.Value = True Then
'
'       Dim fso, txtfile
'       Set fso = CreateObject("Scripting.FileSystemObject")
'       Set txtfile = fso.CreateTextFile("f:\MajSmith\testfile.txt", True)
'
'ProgressBar3.Max = datRespRS.Recordset.RecordCount - 1
'
'       For n = 0 To datRespRS.Recordset.RecordCount - 1
'           For i = 0 To 205                         'to optimize, make output line
'               txtOut = Matrix1(n, i) + ","         'length as close to 255 characters
'               txtfile.Write (txtOut)               'as possible
'           Next i
'           For i = 3 To datQuestRS.Recordset.RecordCount - 204 'skip first three lines
'               txtOut = Matrix2(n, i) + ","         '
'               txtfile.Write (txtOut)               '
'           Next i
'
'            txtfile.WriteLine (Matrix2(n, i - 1)) 'last line in row gets
'                                                  'a newline character
'                                                  'vice a comma
'       ProgressBar3.Value = n
'       Next n
'       txtfile.Close
'End If

End Sub
```

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```vb
Private Sub Excel_Click()

If Excel.Value = True Then
ASCII.Value = False
Label3.Caption = "Saving Data to Excel"
End If

End Sub


Private Sub Form_Load()
    Me.Left = GetSetting(App.Title, "Settings", "MainLeft", 1000)
    Me.Top = GetSetting(App.Title, "Settings", "MainTop", 1000)
    Me.Width = 11000
    Me.Height = 8000

    datPrimaryRS.Visible = False

    With MSHFlexGrid1

        .Redraw = False
                                                ' set grid's column widths
        .ColWidth(0) = -1
        .ColWidth(1) = -1
        .ColWidth(2) = -1
        .ColWidth(3) = -1
                                                ' set grid's style
        .AllowBigSelection = True
        .FillStyle = flexFillRepeat
                                                ' make header bold
        .Row = 0
        .Col = 0
        .RowSel = .FixedRows - 1
        .ColSel = .Cols - 1
        .CellFontBold = True

        .AllowBigSelection = False
        .FillStyle = flexFillSingle
        .Redraw = True

    End With

    datQuestRS.Visible = False

    With MSHFlexGrid2

        .Redraw = False
                                                ' set grid's column widths
        .ColWidth(0) = 1500
                                                ' set grid's style
        .AllowBigSelection = True
        .FillStyle = flexFillRepeat
                                                ' make header bold
        .Row = 0
        .Col = 0
        .RowSel = .FixedRows - 1
        .ColSel = .Cols - 1
        .CellFontBold = True

        .AllowBigSelection = False
        .FillStyle = flexFillSingle
        .Redraw = True

    End With

    datRespRS.Visible = False

    With MSHFlexGrid3
        .Redraw = False
                                                ' set grid's column widths
        .ColWidth(0) = 600
        .ColWidth(1) = 1100
        .Width = 2000
```

```vb
                                                        ' set grid's style
        .AllowBigSelection = True
        .FillStyle = flexFillRepea
                                                        ' make header bold
        .Row = 0
        .Col = 0
        .RowSel = .FixedRows - 1
        .ColSel = .Cols - 1
        .CellFontBold = True

        .AllowBigSelection = False
        .FillStyle = flexFillSingle
        .Redraw = True

    End With
End Sub

Private Sub Form_Unload(Cancel As Integer)
    Dim i As Integer
                                                        'close all sub forms
    For i = Forms.count - 1 To 1 Step 1
        Unload Forms(i)
    Next
    If Me.WindowState <> vbMinimized Then
        SaveSetting App.Title, "Settings", "MainLeft", Me.Left
        SaveSetting App.Title, "Settings", "MainTop", Me.Top
        SaveSetting App.Title, "Settings", "MainWidth", Me.Width
        SaveSetting App.Title, "Settings", "MainHeight", Me.Height
    End If
End Sub

Private Sub tbToolBar_ButtonClick(ByVal    on As MSComCtlLib.Button)
    On Error Resume Next

    Select Case Button.Key

        Case "New"
                                                        'ToDo: Add 'New' button code.

            MsgBox "Add 'New' button code."

        Case "Open"
                                                        'ToDo: Add 'Open' button code.

            MsgBox "Add 'Open' button code."

        Case "Save"
                                                        'ToDo: Add 'Save' button code.

            MsgBox "Add 'Save' button code."

        Case "Print"
                                                        'ToDo: Add 'Print' button code.

            MsgBox "Add 'Print' button code."

        Case "Cut"
                                                        'ToDo: Add 'Cut' button code.

            MsgBox "Add 'Cut' button code."

        Case "Copy"
                                                        'ToDo: Add 'Copy' button code.

            MsgBox "Add 'Copy' button code."

        Case "Paste"
                                                        'ToDo: Add 'Paste' button code.

            MsgBox "Add 'Paste' button code."

        Case "Bold"
                                                        'ToDo: Add 'Bold' button code.

            MsgBox "Add 'Bold' button code."
```

```vb
        Case "Italic"                                          'ToDo: Add 'Italic' button code.

            MsgBox "Add 'Italic' button code."
        Case "Underline"                                       'ToDo: Add 'Underline' button code.

            MsgBox "Add 'Underline' button code."
        Case "Align Left"                                      'ToDo: Add 'Align Left' button code.

            MsgBox "Add 'Align Left' button code."
        Case "Center"                                          'ToDo: Add 'Center' button code.

     MsgBox "Add 'Center' button code."
        Case "Align Right"                                     'ToDo: Add 'Align Right' button code.

            MsgBox "Add 'Align Right' button code."
    End Select
End Sub

Private Sub Sheet1_GotFocus()

End Sub

Private Sub save_Click()

                                                  '
                                                  '  transfer data to excel
                                                  '


If Excel.Value = True And Processed = True Then

    Set xlApp = CreateObject("Excel.Application")
    xlApp.Visible = True
    Set xlbook = xlApp.Workbooks.Add
    Set xlSheet1 = xlbook.Worksheets("sheet1")
    Set xlSheet2 = xlbook.Worksheets("Sheet2")


    ProgressBar3.Max = datRespRS.Recordset.RecordCount - 1

    For n = 0 To datRespRS.Recordset.RecordCount - 1

        For i = 0 To 205
            singleRow1(i) = Matrix1(n, i)
            Next i
        For i = 0 To 100
            singleRow2(i) = Matrix2(n, i)
            Next i


    xlApp.Sheets("sheet1").Range(xlApp.Cells(n + 1, 1).Address, _
        xlApp.Cells(n + 1, UBound(singleRow1)).Address).Value = singleRow1


    xlApp.Sheets("sheet2").Range(xlApp.Cells(n + 1, 1).Address, _
        xlApp.Cells(n + 1, UBound(singleRow2)).Address).Value = singleRow2



    ProgressBar3.Value = n

    Next n

End If
```

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```
                                              '   transfer data to ASCII File
                                              '

    If ASCII.Value = True And Processed = True Then

        Dim fso, txtfile
        Set fso = CreateObject("Scripting.FileSystemObject")
        Set txtfile = fso.CreateTextFile("C: My Documents\testfile.txt", True)


    ProgressBar3.Max = datRespRS.Recordset.RecordCount - 1


        For n = 0 To datRespRS.Recordset.RecordCount - 1

            For i = 0 To 205                              'to optimize, make output line
                txtOut = Matrix1(n, i) + ","              'length as close to 255 characters
                txtfile.Write (txtOut)                    'as possible
            Next i

            For i = 3 To datQuestRS.Recordset.RecordCount - 204 'skip first three lines
                txtOut = Matrix2(n, i)       ","          '
                txtfile.Write (txtOut)                    '
            Next i

             txtfile.WriteLine (Matrix. n,       )))              'last line in row gets
                                                                  'a newline character
                                                                  'vice a comma

        ProgressBar3.Value = n

        Next n

        txtfile.Close

    End If


    End Sub
```

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APPENDIX D. MCERC USER'S MANUAL

Getting Started

Please read this manual carefully before attempting to use this application.

The MCERC application has been specifically tailored for Survey Management of the Marine Corps Exit and Retention Censuses (MCERC) using Microsoft Access™ for the survey instrument database and Cognos Powerplay™ for analysis of survey response data. This manual provides installation procedures to get started with MCERC, use the MCERC survey instrument database, and convert response data into an appropriate format for analysis in Powerplay. Comprehensive procedures for using Powerplay are available as an integrated help function when using Powerplay.

Menu-driven selections are available to perform queries, data entry, or generate reports. Menu selections in this manual are in boldface while menu selections for Microsoft Access™ and Windows are boldface italics (the first letter may be underlined). Filenames are underlined.

Installation Procedures

1.   Place the MCERC disk in drive A:\
2.   Copy the files MCERC.exe and MCERC.mdb, to the folder named "My Documents" in the C:\ drive.
3.   Follow installation procedures that come with the CD for Cognos Powerplay, ensuring the program files are installed in the
C:\Program Files\Cognos\PowerPlay 6.5 directory. Select all components.

Using MCERC

1.   Select *Start, Programs*, Microsoft Access.
2.   Click *File, Open*.
3.   Select the file named MCERC.exe and click *Open*.
4.   The main menu will automatically appear.
5.   From here you can:
        a)   go to the database to enter survey instrument data, conduct a query, or view and/or print survey codebooks. NOTE: See the Menu Selections section for a detailed explanation of each menu selection.
        b)   go to Cognos Powerplay for analyzing data (already formatted for analysis) or to Cognos Transformer to build a Powercube (format data for Powerplay analysis)

c) transform a data set into a matrix which can then be formatted by Transformer for Powerplay.

Survey Database functions

1. Select **Manage Surveys** from the Main Menu. This leads to a menu screen with the choices **Make New Surveys and Versions, View/Print Survey Instrument Information, Analyze Survey Data,** and **Exit MCERC**. Help Procedures for Access are available by selecting *Help*, *Contents and Index* from the main toolbar or the Help icon (a "?" inside a box) and entering the subject or topic on which you need help.

>New Surveys

To place a new survey or a new version of a survey into MCERC, select **Make New Surveys and Versions**. This leads to a menu with the options **to Create a New Version of an Existing Survey, Create the first Version of a New Survey, Return to the Main Menu**, or **Exit MCERC**.

To place a new survey into MCERC, select **Create the first Version of a New Survey**. This leads to a survey data entry form. On this form, enter the Survey Name where indicated. This will automatically be designated as Version "1" for this survey name. It is highly recommended that a short description of the general purpose and intentions of this survey be entered. When entering future versions, this description will still apply, but there is a version description that allows you to briefly describe the reason/logic behind the version. The name of the person responsible for the survey, or a survey developer responsible for the design of the survey should be entered in the "Manager" block.

Before a survey can exist, there must be a question associated with it. If MCERC already has a question that you want on this survey, you may choose it from the list. The sequence for the question may be chosen here, but as more questions are added, re-sequencing them may be done. The default value for sequence is 10. It is recommended that sequence values are given in multiples of 10, giving the possibility to easily insert other questions later (before the survey is fielded!) without having to re-sequence all of them again. Giving the inserted question a sequence value between the sequence values of two other questions does this.

If the question is conditional, i.e., dependent upon another question or demographic factor of the respondent, you may state the condition. For example, if only married respondents should answer a question, you may enter "Married Only" or some other phrase to describe the condition.

If MCERC does not have a question already for this survey, you may create one by selecting the "Create New Question" button. The procedure for entering a new question will be described later. Once the new question is created, you will be returned to the New Survey form. Click in the list of questions or the scroll bar and find the question you just

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created. It will be in alphabetical sequence within the list. Select the question, assign it a sequence, and if applicable, a condition.

If MCERC has a question for this survey, but you want to modify the question, select "Make a new Version of an Existing Question". Then choose from the list the question you want to modify. It will automatically become the next consecutive version number for that question. The rest of the procedure for modifying a question will be described later. Once you have made the modifications (i.e., made a new question version), you will be returned to the New Survey form. Click in the list of questions or the scroll bar and find the question you just created. It will be in alphabetical sequence within the list. Select the question, assign it a sequence, and if applicable, a condition.

>New VERSIONS of Surveys

To place a new version of a survey into MCERC, again select **Make New Surveys and Versions**. Then choose **Create a New Version of an Existing Survey**. This leads to a data entry form for the next version of a survey. Select the survey from the list that you desire to make another version for. This automatically sets the next consecutive version number. It will display the survey description for that survey that was entered the first time a survey by that name, with that purpose was entered. It is highly recommended that a brief description of the version, i.e., a memorandum noting the general differences be entered in the version description field. The name of the person responsible for this version of survey, or a survey developer responsible for the design of the version should be entered in the "Manager" block.

Before a version of a survey can exist, there must be a question associated with it. Refer to the New Survey procedures above, as the procedures for placing questions on a new version are identical to placing questions on a new survey.

>New Questions for New Surveys or Versions of Surveys

To design a new question for a new survey or survey version, select the **Create New Question** command button from the form as described under the New Survey section. Enter the question name (automatically version 1), and the description of the question to document the information you are attempting to collect with this variable. Then enter the actual question, followed by the format (single, multiple, write-in, etc.). Then select a choice set from the drop box. If you want to make a new choice set, select the **New Choice Set** button. This allows you to name a new Choice Set, describe it, and define as many choices as you want for respondents to choose from. You must sequence the choices as you want them to appear. When the Choices are all entered for a Choice Set, close the form by clicking on the "x" in the upper right corner. This takes you back to the form for making a new question. Select the Choice Set name you just defined. Then press enter (keyboard) to clear the question form. Click the "x" in the upper corner of this form. This takes you back to the survey form. Select from the list the Question you just created. Assign a sequence and a condition (if needed). Press enter to update the database and clear the form.

Note: When defining Choices, you may enter any number you like for the ChoiceNumber. They can be in reverse sequence if desired, and "0" may be used. However, you must enter the "0" even though it appears in the field already. Ensure you do not repeat numbers, and give them sequence numbers for the order in which you want them to appear to the respondent. (If you want the first question to have the highest value of 5 choices, give value 5 a sequence of 1, 4 a sequence of 2, etc.)

>Modify Questions for New Surveys or Versions

To modify a question is to make a new version of it. The procedure is very similar to making a new question, except you must select the question you wish to modify. When you select it from the list, your new question is automatically assigned the next consecutive version number. You then assign the format, type in the question, and assign a choice set in the same manner as described in the "New Questions for New Surveys or Versions of Surveys" section above. A description of this version, i.e., a short justification of the change, is highly recommended.

>Add Questions to a Survey (before it is fielded!)

To add questions to a survey, select **Add Questions to Working Copy of Survey**. From there you can select questions in the list one at a time, click on the survey you are placing them on, assign a sequence, and a condition.

>View/Print Survey Instrument Information

To View or Print a copy of a codebook for a survey, select **View/Print Survey Instrument Information** from the menu. A parameter box will prompt you for the survey name, and then the version number, so you must know this information. Once entered, the codebook report will be generated on the screen. To print it, simply select the printer icon on the toolbar, or select *File*, *Print*.

To View or Print a listing of all available Choice Sets in MCERC, Select **View/Print Choice Set** Listing from the menu.

Data Analysis functions

2. From the Main Menu, there are 3 choices related to Data Analysis. The data received for MCERC must be manipulated into an appropriate matrix before analysis of the responses can be done. Once this is done, the Cognos Powerplay analysis software can be used to model and anlyze the data.

>Converting Data into a Response Matrix

To convert response data into a response matrix, you must first ensure the response data file you receive is located in the C:\Windows\Temp\ directory and the file is appropriately named Responses.mdb (Microsoft Access file). This file will consist of four fields (SSN, DateTaken, QuestionName, and QuestionAns) containing the last four digits

of the social security number, the date/time the survey was taken, the question identifier, and the response choice (answer) to the question for every response to every question of the dataset covered by the file.

Select the **Create Response Matrix** button from the Main menu. This leads to a screen for converting the data. It may take a few minutes for this screen to appear because the program must read every record of the data file first. To create the matrix, press the **Process** button. This will take several minutes as the program sifts through the data file and arranges the data into a matrix.

The program saves the matrix either to a text based, comma-delimited file named testfile.txt or to a Microsoft Excel file which you may save to a name and location of your choice. After the program has converted the data, you will choose the format you desire by clicking the appropriate button (ASCII or Excel) and pressing **Save**. Once saved, this file may be used by Cognos Powerplay, or may be imported into another statistical analysis application such as SAS™ or SPSS™. Close the data conversion program by selecting the "x" in the top right corner.

>Open Powerplay Transformer to build a Powercube

To open Powerplay Transformer, you may select it from the main menu. Use the parameters you desire to analyze to create a Powercube design, and follow instructions found in the *Help* menu. Once you have created a Powercube, you can go straight to Powerplay from Transformer to analyze the cube you just made. There is an alternate method to open Transformer from the MCERC database screens.

>Open Powerplay to Analyze an existing Powercube.

To go straight to Powerplay, select it from the main menu. You may also select it from the MCERC database screen by selecting **Analyze Survey Data**. You may want to go straight to Powerplay when you have any Powercubes already built and desire to use them to create more Powerplay reports. Use the *Help* menu of Powerplay to guide you in its use.

Backup and Recovery Procedures

It is highly recommended that a backup disk be maintained to preserve all data entered in MCERC. To smoothly accomplish a backup procedure, it is recommended you use a ZIP disk or other external storage device. Copy the MCERC.mdb file to it frequently when entering data.

To restore MCERC in the event of data loss or corruption, simply copy to files back from your external storage to the directory where you originally installed MCERC. Providing proper Backups have been performed, data loss will be kept to a minimum.

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