CHAPTER 6
DESIGN OF ISAT903

6.1 Approach Used
Many design approaches are available for the design of software system. The approaches used for the design of ISAT903 is a structured design approach [GAN79],[YEC79],[OSI89] coupled with the top down approach [GIL83],[OSI89]. The reasons for using structured design and top down approach are due to the fact that structured design provides qualitative criteria which enable a designer to judge whether a design is good, fair or poor whilst top down approach will enable early discover errors of design and then making the correction before integration time [OSI89].

ISAT903 consists of five main modules are collectively known as Assessment Section, Reference Section, Report Section, Help and Exit. These modules are controlled by visual menu of Windows 95 operating system which invokes and executes them when a user clicks a certain button performed by these modules.
Figure 6.1 illustrates the organization structure of the five modules together with their functions respectively.

![Organization Structure of ISAT903](image)

Figure 6.1. The Organization Structure of ISAT903

Table 6.1 shows the description of the module name and function of the module.

<table>
<thead>
<tr>
<th>Module Name</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment Section Module</td>
<td>Allows a user to display the form and the question derived from 22 elements of ISO 9000-3. The Form is provided by Enter, Edit and Save button. This module also provided by button navigator : First, Next, Previous, and Last.</td>
</tr>
<tr>
<td>Reference Section Module</td>
<td>Allows a user to view the references related to the Quality System Standard ISO 9000-3.</td>
</tr>
<tr>
<td>Report Section Module</td>
<td>Allows a user to create : management report, summary compliance report and assessment summary report.</td>
</tr>
<tr>
<td>Help Module</td>
<td>Offer online assistance to user</td>
</tr>
<tr>
<td>Exit Module</td>
<td>Out of the system</td>
</tr>
</tbody>
</table>
6.2 Tools and Techniques Used

In conjunction with the techniques of structured design and top down approach, some of the tools were used to produce a structured design specification. These tools include Data Flow Diagram (DFD), Structure Chart (SC) and Hierarchical Block Diagram (HBD) that were constructed by Meta-Edit CASE tool. Meanwhile, the source program were constructed by Delphi 3.0 Tool and Compiler.

In the assessment section, there are 3 parts of sub assessments namely [ISO96]:

- **Framework** consisting 4 quality elements of ISO 9000-3
- **Software Development Life Cycle** consisting of 9 quality elements of ISO 9000-3
- **Supporting** consisting of 9 elements of ISO 9000-3.

As a result the total of quality elements can be a guidance for the user. There are 22 elements used as described in Figure 6.2.
Figure 6.2. Assessment Section

Each of quality elements consists of some questions with explanation as shown in Figure 6.3.

Figure 6.3 Example of The Question
Thus this tool is more than common questionnaire. This addition is used to reduce the errors and miss interpretation at the time of filling up that has a tendency to mark up the evaluation. The user also can refer the references related to this tool, besides the explanation on each question (see Figure 6.4).

Figure 6.4 Reference of ISO 9000-3

The user is also assisted by the Help Menu, to operate ISAT903 (see figure 6.5).
Welcome to ISAT903

- Introduction
- Getting Started
- Exploring ISAT903
- Glossary of Terms
- The List of ISO Institutions

Figure 6.5. Help

The list of International Bureau is also attached in the Help Menu to be utilized by the user to contact for getting the certification on ISO 9001, if they are ready to be audited by the External Certification Bureau [BUN95].

In the report section, the user may have the list of answers for every questionnaire, quality scoring per 22 elements and the average of quality scoring (see Figure 6.6 and Figure 6.7).
<table>
<thead>
<tr>
<th>The Compliance on</th>
<th>Firstly/Previously</th>
<th>Currently/Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>41. Management Responsibility</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>42. Quality System</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>43. Internal Quality System Audit</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>44. Corrective Action</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>52. Contract Review</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>53. Purchaser's Req. Specification</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>54. Development Planning</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>55. Quality Planning</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>56. Design and Implementation</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>57. Testing and Validation</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>58. Acceptance</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>59. Replication, Debug and Installation</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>60. Maintenance</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>61. Configuration Management</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>62. Document Control</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>63. Quality Record</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>64. Measurement</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>65. Rules, Pract. and Convention</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>66. Tools and Techniques</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>67. Purchasing</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>68. Included Software Product</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>69. Training</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

Figure 6.6 Management Compliance Summary

Through this report section, the user may know quickly the feedback of his quality system since this tool is designed interactively and user friendly. Therefore, can focus for the improvement action on the poor scoring of quality elements.
Figure 6.32 Structure Chart of Sub Module Quality Record

When the Quality Record module as shown in Figure 6.32 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Quality Record module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
6.3 Data Flow Diagram of ISAT903

Figure 6.8. views the whole system of ISAT903. It shows the inputs arriving from software Industry and outputs are created by the system returns to the software industry.

![Data Flow Diagram of ISAT903](image)

Figure 6.8 Context Diagram of Compliance Model By ISO 9000-3

6.4 Data Dictionary and Data Element of ISAT903

Data Dictionary and Data Element of ISAT903 can be shown in Table 6.2 and Table 6.3.

### Table 6.2 Data Dictionary of ISAT903

<table>
<thead>
<tr>
<th>Name of Data Store</th>
<th>Name of Data Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUESTIONS</td>
<td>[CL_NO] +SEQ_NO +ELEMENT+QUESTION+REMARK+ANSWER1+ANSWER2</td>
</tr>
</tbody>
</table>

### Table 6.3 Data Element of ISAT903

<table>
<thead>
<tr>
<th>Data element name</th>
<th>Approx. Size</th>
<th>Sample Values (data itself)</th>
<th>Narrative description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L_NO</td>
<td>2C</td>
<td>41 to 69</td>
<td>Clause number.</td>
</tr>
<tr>
<td>EQ_NO</td>
<td>2C</td>
<td>01 to 13</td>
<td>Sequence number.</td>
</tr>
<tr>
<td>LEMENT</td>
<td>40C</td>
<td>Training</td>
<td>The name of ISO 9000-3 element.</td>
</tr>
<tr>
<td>QUESTION</td>
<td>M</td>
<td>MEMO</td>
<td>Description of the Question.</td>
</tr>
<tr>
<td>EMARK</td>
<td>M</td>
<td>MEMO</td>
<td>Explanation of the Question.</td>
</tr>
<tr>
<td>ANSWER1</td>
<td>7C</td>
<td>&quot;Yes&quot;, &quot;No&quot;, &quot;Unknown&quot;</td>
<td>The First /Previous Answer.</td>
</tr>
<tr>
<td>ANSWER2</td>
<td>7C</td>
<td>&quot;Yes&quot;, &quot;No&quot;, &quot;Unknown&quot;</td>
<td>The Current / Last Answer.</td>
</tr>
</tbody>
</table>
Figure 6.9 shows five modules, namely, assessment section module, reference section module, report section module, help module, exit module and three data stores, namely questionnaires, references and help.

![Diagram](image)

Figure 6.9. DFD Level 1.

Output of the assessment section are scoring and quality rating of the software quality system which are presented interactively. Output of the reference section are any references regarding to the software quality system. Output of the report section are three reports, namely management report, management compliance summary, and assessment result summary.
Figure 6.10  DFD Level 2 of 1.
Figure 6.10 shows the 21 sub modules of the assessment section module, namely sub module: management responsibility, quality system, internal quality system audit, corrective action, contract review, purchaser requirement specification, development planning, quality planning, design & implementation, testing & validation, acceptance, replication, delivery & installation, maintenance, configuration management, document control, measurement, rules practices & convention, tools & techniques, purchasing, include software product and training.

![Diagram](image)

Figure 6.11. DFD Level 1 of 3

Figure 6.11 shows three reports that are created by the report section module, namely management report, management compliance summary and assessment result summary.
6.5 Structured Chart of ISAT903

Structure charts as shown in Figure 6.12 are developed to illustrate the calling and the sending of information from one module to another module. The structure chart is derived from the Data Flow Diagrams described in the previous section. ISAT903 is composed of a number of manageably small modules.

![Structured Chart of ISAT903](image)

Figure 6.12 Structure Chart of ISAT903

When the ISAT903 calls the Assessment Section module, the information mouse on click (moc) is sent to this module so that the assessment section module can executed. It is the same way to execute the other modules, namely Reference Section, Report Section, Help, and Exit.
Figure 6.13 Structure Chart of Assessment Section

When the Assessment Section module as shown in Figure 6.13 calls the Framework module, the information mouse on down (mod)/mouse on up (mou) is sent to this module, so that the Framework module can be executed. It is the same way to execute other modules, namely Life Cycle and Supporting.
Figure 6.14  Structure Chart of Module Frame Work

When the Framework sub section module as shown in Figure 6.14 calls the Management Responsibility, the information mod/mou is sent to this module, so that the Management Responsibility module can be executed by this mod/mou. It is the same way to execute other modules, namely Quality System, Internal Quality System Audit and Corrective Action.
Figure 6.15 Structure Chart of Sub Module Management Responsibility.

When the Management Responsibility module as shown in Figure 6.15 calls the Read Record Questionnaire module, the information mod/mou is sent to this module, so that the Management Responsibility module can be executed. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then Save the answer by sending the information moc to save the Answer module.
Figure 6.16 Structure Chart of Sub Module Quality System

When the Quality System module as shown in Figure 5.16 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Quality System module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
When the Internal Quality Audit module as shown in Figure 6.17 calls the Read Record Questionnaire module, the information mod/mou is sent to this module, so that the Internal Quality module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to the Question module. Then Save the answer by sending the information moc to Save the Answer module.
When the Corrective Action module as shown in Figure 6.18 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Corrective Action module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.19 Structure Chart of Module Life Cycle

When the Life Cycle sub-section module as shown in Figure 6.19 calls the contract review, the information mod/mou is sent to this module, so that the contract review module can be executed by this mod/mou. It is the same way to execute other modules, namely Purchaser Requirement Specification, Development Planning, Quality Planning, Design and Implementation, Testing and Verification, Acceptance, Replication, Delivery and Installation and Maintenance.
Figure 6.20 Structure Chart of Sub Module Contract Review

When the Contract Review module as shown in Figure 6.20 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Contract Review module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to the Question. Then Save the answer by sending the information moc to save the Answer module.
When the Purchaser Req. Spec. module as shown in Figure 6.21 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Purchaser Req. Spec module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.22 Structure Chart of Sub Module Development Planning

When the Development Planning module as in Figure 6.22 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Development Planning module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.23 Structure Chart of Sub Module Quality Planning

When the Quality Planning module as shown in Figure 6.23 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Quality Planning module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
When the Design and Implementation module as shown in Figure 6.24 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Design and Implementation module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then Save the answer by sending the information moc to save the Answer module.
Figure 6.25 Structure Chart of Sub Module Testing and Verification

When the Testing and Verification module as shown in Figure 6.25 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Testing and Verification module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.26 Structure Chart of Sub Module Acceptance

When the Acceptance module as in Figure 6.26 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Management Acceptance module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.27 Structure Chart of Sub Module Replication, Delivery, Installation

When the Replication, Delivery and Installation module as shown in Figure 5.27 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Replication, Delivery and Installation module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
When the Maintenance module as shown in Figure 6.28 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Management the Maintenance module can be executed by this mod/mou. The position of the record can be reached by sending the information MOC to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.29 Structure Chart of Module Supporting

When the Supporting sub-section module as shown in Figure 6.29 calls the Configuration Management, the information mod/mou is sent to this module, so that the Management Responsibility module can be executed by this mod/mou. It is the same way to execute other modules, namely Document Control, Quality record, Measurement, Rules Practices & Conventions, Tools & Techniques, Purchasing, Included Software Product and training.
Figure 6.30 Structure Chart of Sub Module Configuration Management

When the Configuration Management module as shown in Figure 6.30 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Configuration Management module can be executed by this mod/mou. The position of the record can be reached by sending the information MOC to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the Answer by sending the information moc to save the Answer module.
Figure 6.31 Structure Chart of Sub Module Document Control

When the Document Control module as shown in Figure 6.31 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Document Control module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.32 Structure Chart of Sub Module Quality Record

When the Quality Record module as shown in Figure 6.32 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Quality Record module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
When the Measurement module as shown in Figure 6.33 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Measurement module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.34 Structure Chart of Sub Module Rules, Practices, Conventions

When the Rules, Practices & Conventions as shown in Figure 6.34 module calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Rules, Practices & Conventions module can be executed by this mod/mou. The position of the record can be reached by sending the information MOC to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.35 Structure Chart of Sub Module Tools & Techniques

When the Tools & Techniques module as shown in Figure 6.35 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Tools & Techniques module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
When the Purchasing module as shown in Figure 6.36 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Purchasing module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
Figure 6.37 Structure Chart of Sub Module Included Software Product

When the Included Software Product module as shown in Figure 6.37 calls the Read Record of Questionnaire module, the information mod/mou is sent to this module, so that the Included Software Product module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.
When the Training module as shown in Figure 6.38 calls the Read Record of Questionnaire module, the information mod/mou sent to this module, so that the Training module can be executed by this mod/mou. The position of the record can be reached by sending the information moc to the Navigator module, namely Prev, Next, First and the Last. The input can be filled by the user by sending the information moc to answer the Question module. Then save the answer by sending the information moc to save the Answer module.