Chapter 1

Introduction

Back Ground of Research

We cannot escape the truth that we involve with the Computer in our daily life. It would be part of our working and living environment. It is almost like basic office automation nowadays. We use it to create and edit most of the document and all of the documents have the time calculation involve in it. It will either record the time directly onto the document or record the date and time that we create the document. It seems to be quite normal in term of the operation. But, the problem arises because of small bug that we use 2 digits to represent the year. So when the year 2000 arrives, these 2 digits may misinterpret.

We have to trace back to 1960s to 70s. At that time the memory and the storage are very expensive. Therefore, writing the software in the way that can minimize the memory and storage usage was important. In practice, there are large percentage of computer operations rely on date calculations, and by cutting the amount of space occupied by the year-dates in half is seems to be a good idea. This convention was carried forward, even when the cost of the memory and storage began to reduce in 1980s.

By early 1990s, the problem began to appear. Boeing Company was the first company to report this problem. This is the starting point for all major companies to realized the date calculation after year 2000 and beyond suddenly become problematic. However, there are little efforts happened to address this problem.

By 1995, this problem is quickly gain the consciousness of the people. It is known as "The Y2K Problem" or "The Millennium Bug". However, only few company taking it seriously. They thought that their programmers can fix those thing easily. Until the middle of 1997, that view was changed forever. Many companies had begun the

formal Y2K review and remediation programs. Then it turned out to be that Y2K problem is deeply embedded in the system of the business worldwide, and very resistance to quick fixes.

With this problem, it can cause the computer to interpret year 2000 to be year 1900. This can cause major mistake in time calculation, for instance, 2000 – 1998 = 2 but 00 – 98 = -98, or 98 for some application that do not allow negative. The result might be that your accounting software see your Account Receivable as overdue due to the facts that no customers paid in 98 years.

Apart from the fact that the computer can misinterpret the year 2000 to be year 1900, we have the leap year offset problem. Leap years are calculated by simple set of rules. Unfortunately, there are some system and application do not recognized the year 2000 as a leap year. This will cause the date after 29 February, 2000 to be offset incorrectly by one day.

There is basic rules that calculate the leap year. The rules for calculate the leap years are as follows. Leap Year rules in order of precedence:

Rule 1:

If the year is a multiple of 4 (divisible by 4 leaving no remainder) then the year is a leap year.

Rule 2:

If the year is a multiple of 100 (divisible by 100 leaving no remainder) then the year is NOT a leap year.

Rule 3:

If the year is a multiple of 400 then it is a leap year.

However, most of the programmers do not aware of the rule 3. Which would make the date calculation wrong. From these rules, year 2000 would be special year. The year 2000 is a special leap year that only happens only once every 400 years.

There are some other problems involved with the special meaning of the date that happens due to the way programmers use some date to represent the code as well. For instance 9/9/99, it means either it is invalid date or ignore that date. Within each

organization, the special date codes may have been used differently. This is one of the main reasons that no single tool can locate all uses and/or minuscule of the date data.

Nowadays the communication between companies, people and computers are all passes through some form of computer base systems. With this problem in mind, there are some other potential problems involved as well. The awareness that we have about the Y2K or the Millennium Bug in the Financial and Accounting environment is not enough. In the manufacturing environment that has the date calculation involved in the equipment will effected from this problem as well.

There are 2 types of problem concerning about the manufacturing environment equipment. The first type is the equipment having problem by itself. This can result in the malfunction of the equipment. This would cause a lot of damage to Product in Production equipment. For Facilities equipment, this can cause potential problem for Safety, Security, and Environment.

Another type of problem is due to the new IC manufacturing company, required a lot of expensive materials and equipment. All of them are linked to each other in some form to communicate and transfer data to achieve the most accurate and fastest data transfer. If individual equipment handle and interpret the time and date in different way, this can cause the whole system to malfunction in that network. This will result in damage to the products, equipment, and the commitment date for our customers.

Technically, this problem is quite simple to understand. The solution to the problem is tending to be fairly simple as well. However, the scope of the problem makes it difficult. Every piece of hardware, software, and embedded system must take it into account. This including everything from mission-critical central accounting systems to small applications, which must be examined for date-handling and how those dates might effect the rest of the environment.

Statement of Problem

From the expert in the computer systems and other technologies, had indicated the potential date that may cause misinterpret in date representation. This representation may cause malfunctions to occur when a system date or application date crosses the year 2000 (whether that is the actual arrival of the date or for date processing purposes) or when the system or application must reach back into the 20th century data after January 1, 2000. These malfunctions can include:

- Arithmetic calculations
- Comparisons
- Sorting or sequencing
- Incorrect recognition of leap years
- Conflict with "00" and "99" as values designated with meanings unrelated to date
- Rolling over of system date data, filling up storage registers
- Failure of one or more system elements

From these possible outcomes, it can be big threat to Business if it has to deal with the data interpretation accuracy or so-called 'Mission–critical' to that Business. The expert in the field already identify the area where Date interpretation in the environments in which mission-critical applications may be affected by Year 2000 issues include [10]:

- Aviation / Aerospace
- Telecommunications / Transportation
- Finance / Banking
- National Security / Defence / Law Enforcement
- Bio-medical

A rational approach to Y2K analysis produces at minimum a three-year timeline for assessment and repairs in many businesses: A year to assess, a year to fix, a year to test. Although this timeline may shorten in some small companies, but in some companies, even a three-year was an optimistic guess. This is applied to all organization in Singapore, Thailand and the rest of the world.

We need to approach this problem as a 'Mission Critical' project in most IC manufacturing company, in order to ensure our customers that we will not damage their product and shipment plan through out next few decades. As we mention before, our business nature involves in expensive materials and equipment, moreover the land in Singapore's case. Therefore, our customer will expect to get the product just in time for their usage. With a miss-shipment, it can cause our customers' factories to hold up most of their production easily. For our case, the incoming materials are having the same nature, which mean that we will expect to receive our materials just in time. If there is any malfunction in our equipment, it will cost us very high to keep that stock. This is due to the fact that Singapore is a small island and land value is precious. Every company is practicing just in time approach to minimize the stock, which resulted in heavy fine for miss-shipment. Hence, it is worth for us to ensure that our company will not effect by this millennium bug before it happens.

Many big organizations in Asia start to address this issue seriously only recently, within 1998. It seems so obvious that these organizations have many computers and equipment that has date calculation involved to assess. This also includes the IC manufacturing industry, since it is, by nature of industry, a big organization. These companies put a lot of efforts and resources to assess, fix, and test it out before the end of 1999. However, in a big organization to tackle this problem in a short period less than 2 years is seems to be impossible. One of the solutions can be focus on the most critical system and ensure that it will works by the end of 1999 and left non-critical system to be unfixed, at the rollover, until we can get it done afterward. Therefore, we need to assess the criticality of the equipment contribute to the overall damage and assign & Prioritize the tasks.

Hence, we need to manage the organization not to be just Y2K compliance as soon as we can, but it must as much as we can we well. Furthermore, we also need to have the contingency plan for recover from the disaster.

Purposes of Research

The objective of this research is to develop criteria and a working model of implementation of Y2K compliance for Production Equipment in IC manufacturing Industry.

Scope of Research

This research will be conducted under the following scopes:-

1. Formulation and Implementation of this Project will only valid for Production Equipment, especially Implant Module, which is one of the area under production equipment.

2. Formulation and Implementation of Plan and Procedure for Y2K compliance in IC manufacturing company.

For this level, we can separate the activities into 6 small phases. Although the formulation and implementation of Y2K compliance was started well before the research taken place, this research would still include the activities of overall project, which are:-

Phase 0 - Initial Study & Preparation

At this level, the research will determine how to find the necessary information from Vendors and other source of information. In most of the IC Manufacturing business case, they get majority of the information from SEMATECH (Semiconductor Manufacturing Technology, Detail in Appendix B).

Phase 1 – Awareness

At this phase, the research will determine how to make the Employee aware of the situation and facts. In this phase, the research will also introduce techniques and tools to gain the awareness to all members.

Phase 2 – Assessment

> This research will show how to assess the equipment on hand, Inventory and Assign the ownership. Another area that this research will look into is the Business Risk Evaluation involved the Year 2000 Readiness. At this phase, the research would also develop the Compliance Approach, Resource Estimate & allocation, and Detail Work Plan.

Phase 3 - Implementation

> At this phase, this research will guide how to check operability for the Year 2000 status of all equipment from suppliers. And also test the year 2000 compliance of all the systems. With this checking and testing experience, it will serve as a guideline to develop the disaster recovery plan for the real scenarios.

Phase 4 - Correction and Recovery

> At this stage, if there is any failure from the previous phase in any system, the research will guide how to repair, replace, re-deploy, reconcile and upgrade the system that fails the compliance criteria for all the systems.

Phase 5 - Final Audit & Certification

> At this stage, the research will explain how to properly document all the certification for all of our equipment for international year 2000-readiness certificate.

3. Completion of this Project will be before the end of 1999.

Expected Benefits

1. Prevent year 2000 problems that might happens.

2. Gain project implementation experience.

3. Gain the competitive advantage by Y2K Compliance. This will make the company gaining the reputation in term of capability to cope with all new standards.

4. Control and minimize the cost of Implementation Plan, by upgrade only the necessary components to comply with our goal.

5. With the proper planning and management, this will enable the Time Compress to make systems Y2K compliance before end of 1999. (within less than 2 years)

6. Enhance the strategic relationship with our suppliers and customers, since there are a lot of communication and cooperation between customers and suppliers.

Research Procedure

1. Study for initial work status and further information.

2. Since the project is already started, this research will document all the activities completed and explain how to develop the Strategy to complete the Y2K Compliance project.

3. Implementation and Testing.

4. Analyze result, Correction and Recovery.

5. Audit and Summary of Problems.

6. Documentation.

Research Schedule

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1. Liturature Study	■	■	■	■								
2. Document completed work	■	■	■	■								
3. Implementation and Testing	■	■	■	■	■	■						
4.Analyze result, Correction and Recovery				■	■	■	■	■				
5. Audit and Summary of Problems								■	■			
6.Documentation											■	■

Table 1.1 : Research Schedule

Literature Surveys

Jitcharoongphorn, Atikom – 1998

This Thesis involved the recommendation and improvement of the Project Planning and Cost control in a Food Service Equipment industry. The area of discussion is the way to make the whole process more efficient for carrying out project activities. In this case, the 2 majors key study is New Cost Estimation System and Project Management Information System. By approach the improvement program as a project point of view, we can achieve betterment of the preparation and control, as well as the improvements in the coordination between the departments, which lead to on-time commissioning of the project.

Seymour, Jim – 1998

This Article emphasizes on the Year 2000 problems in the America in year 1998. In this article includes the root cause of the problem and history of Y2K awareness development. Some examples of the applications that have problems and solutions are also included. He also explains the awareness, result and solution for Y2K problem as an approach from end-user and organization point of view.

Thomas C., Royer – 1997

This paper is discuss about the ways to evaluate the software for year 2000 compliance. The evaluation start with determination of bounding process that established the product's limits and its interface to the outside word. After we determined the boundary of the system, then we can establish the compliance goal. This would make us able to determine the critical date and start the real evaluation.

Kornwinai, Bu-ngha and Danaisawat, Kriengsak – 1998

This article is base on the real case of Implementation of Y2K compliance in Thai Airways International. The approach that they did was separate the project into 2 working unit, the Management and Working group. They manage this project as a

Mission Critical due to the fact that it concern with the safety of the Passengers. This article involved the implementation steps and procedures that they followed

Cleland I., David – 1995

This book deals with the Project Management Directly. It emphasizes on the Strategic Design and Implementation aspect especially for the organization. This book is distinct from other Project Management in the point that it try to make use of the theoretical and practical literature that placed Project Management in the context of Design and execution of organizational strategies.

Lewsiriwong, Wanchai – 1998

This article focuses on the solution of Year 2000 problem for Thailand in the economical crisis. He suggested many ways that we can do to make the computerize system become year 2000 compliance. However, most of the concern in this article still be the most economical solution.

Liew, Melanie – 1998

This article discusses about the situation of the year 2000 problem in Singapore. She gave the broad idea of people, small and big organization react to this problem in Singapore. In this article also include some examples of Singapore companies in dealing with year 2000 problem.

SEMATECH - 1998

This article topic is SEMATECH YEAR 2000 Readiness Test Scenarios. It is the Test Scenarios that agree among the international Semiconductor Companies to follow this standard. The companies that participate in this standard includes:

AMD	Digital Equipment Corporation	Hewlett-Packard Company
Hyundai Electronics	IBM Corporation	Intel Corporation
Lucent Technologies	Motorola	National Semiconductor Corporation
Philips Semiconductor	Rockwell International Corporation	ST Microelectronics

Siemens   Texas Instruments Incorporated   TSMC
Semiconductors

The details of the SEMATECH YEAR 2000 Readiness Test Scenarios are included in the Appendix B.

LEE Lionel Y - 1998

This is Guideline that written by IT Manager for Singapore Technology Group. This guideline is called ST Y2K Transition Guide. This guideline involved all of the general aspects for the companies under Singapore Technology Group to implement toward Year 2000 Compliance and Prepare for Millennium Cross-over. This includes the Internal, External, Technical and non-technical preparation for Year 2000 Transition.

IEEE – 1998

This article is the guideline that IEEE organization of America recommended the industry to follow this general guideline in order to cover all the aspects of the Year 2000 Compliance Program. This would also include the year 2000 definition, terminology and critical date involved with the organization risk exposure. This definition is the most famous definition implemented in Semiconductor Industry.

BSI DISC - 1998

This British Organization is a part of British Standard Institution (BSI). This article provide the Year 2000 definition and terminorlogy for the Year 2000 Implementation for the public and Provate Sector in UK. This is another famous Year 2000 definition that are widely use in the industry.

William Perry –1999

The methodology and technique of Year 2000 software testing are discussed and implement in this book. The details are cover all aspect of the organization implementation project. The combination of Project Management and Technical knowledge is the key effort to achieve the goal.