Systems Analysis and Design
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Lecture – 31

We are talking about, controls information systems. And we will very quickly review couple of transparencies, just for continuity.

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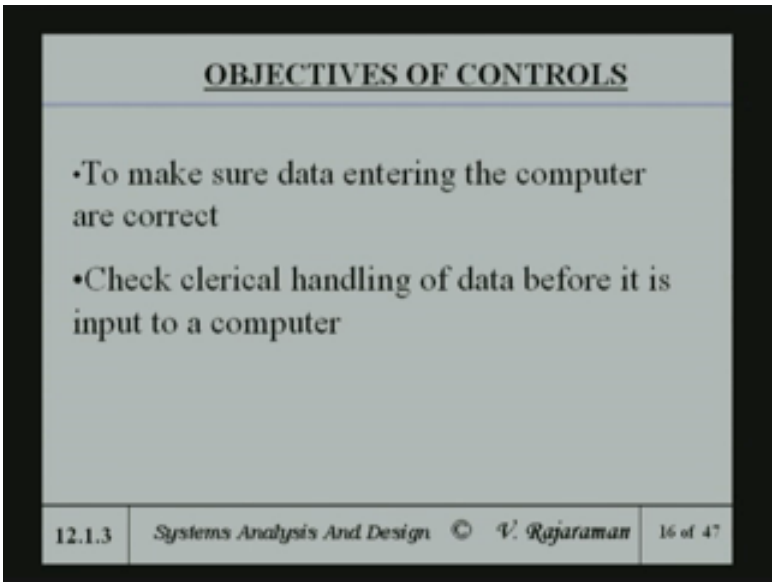

The primary objectives of controls is to make sure, that data entering the computer, they are all correct. Because, as you know, any in correct data is going to give you incorrect results and data entry is all clerical. So, clerical handling of data, before it, is input to the computer has to be properly organized and checked. And this is a very important part, particularly, when you are starting a new project.

For instance, the Karnataka government is now trying to computerized, what they called the land, urban land records. Particularly, the ownership of certain piece of land for the last 15 or 16 years, for legal purposes. In other words, as the land is free of debt is called incombence and so on. So, for it is been done all manually. Now, when they want to go to the computer, then they have to enter all this data clerically. Somebody, has to sit down and look at all those registers and enter it.

So, unless, you organize the clerical entering of data carefully, so that, new errors are made in the entry. Later on, any processing they do and give legal documents to an owner, saying that, there is no data in that or a prospective purchaser. There will be legal complications. So, you have to be extremely careful about the clerical handling of data. And you have to do a lot of cross checking and it is not a very simple affair.

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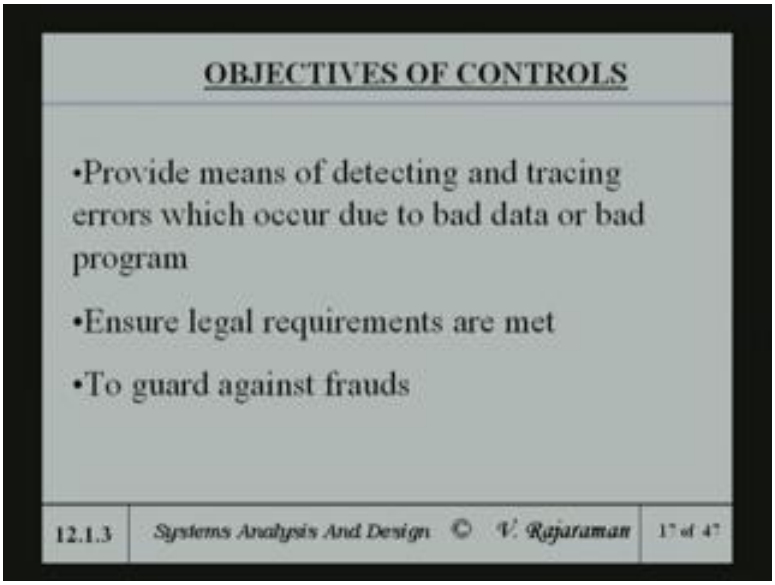

Also, there should be means of detecting and tracing errors, which occur due to bad data entry or bad programs. In other words, you have to find out, whether the errors in after computing, we find some errors, the errors may be either due to bad data entry or may be due to bad program. You got to be able to isolate and so one of the objectives of control is to be able to isolate. And detecting and tracing errors, also requires some method of making sure, that while before the data is actually entered. There is some cross checking, which take place.

And in the case of land records for instance, always a responsible person, who is an official of the government has to authenticate, every entry, the signature. To say, that the entry is correct and this will hold the person responsible. So, this is called audit trial. That is in other words, there is a signature, which says that, this person has done it. And so, if he has been careless he can be taken to task.

So, ensure legal requirements are met. I said, if there is an incorrect data entry, later on, it leads to a legal complication. This signature is an important part of any legal matters

will be come up later. And to guard against frauds, because, when somebody enters data, particularly valuable data, like records of holdings of lands, if intentionally frauds are made, then one has to be able to guard against.

In other words, make sure that, fraud do not occur, before they occur. In fact, you should not, let frauds occur at all. This particularly, true about financial data, particularly banks and so on. Financial data, were they handle, lakhs and lakhs of rupees, there are always room for fraud. And one has to be extremely worry about, making sure, that controls are there. So, that, frauds are detected.

Even, true about marks of students in examinations which are being entered. If there is a fraud, by a clerk, entering clerk; that has to be guarded against the appropriate controls. In other words, you should make sure, that a fraud, if at all occurs is detected early. So, you must have some way of doing, I will tell you, how it is done, particularly for exam, paper marks and things like that.

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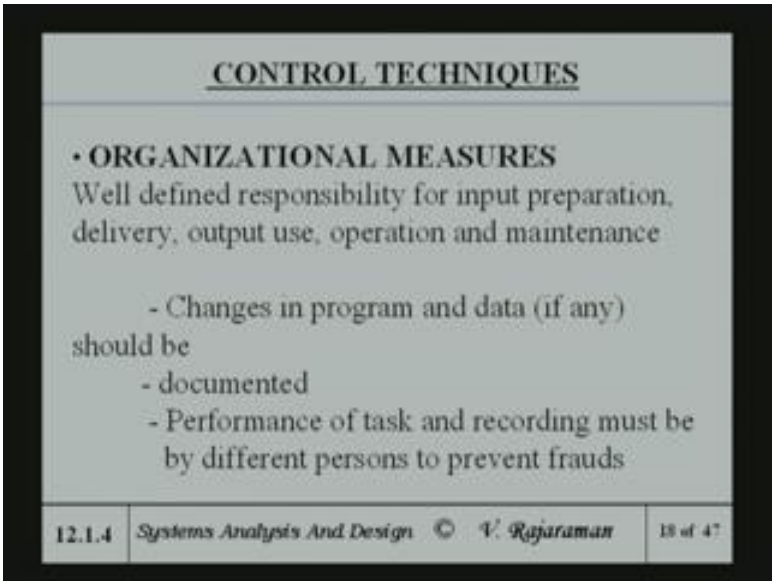

So, there are many measures, including organizational measures. There is well defined responsibility for input preparation, delivery, output use operations and maintenance. That is each person, who does a part of the work is clearly his role is mentioned and his role restricted to that. He cannot overstep, whatever he is been told to do and that is important as a part of control.

And changes, if any made to that a program has to be documented. And who made the change has got to do put there, either with a signature or in fact, nowadays, they have biometric controls. In other words, when somebody changes and he puts his thumb print there. Saying that, he has the person, who was change it and only authorized people can change it and should documented.

Performance of task of recording must be different persons to prevent frauds. Let me give an example. In the case of marks for instance, if you are trying to use a control total, that is, you take a set of marks and made the control total. And if the person, who makes the control total is the same person, who can enters the data. What you can do, to interchange two marks and the total is still remain the same.

Suppose, somebody has got 70 marks and somebody got 17 marks. You can interchange 17 and 70. For 70, for the person, who has whom, he is favoring and then, the total control total will remain the same. So, the control total will not detect this. So, the control total has got to be made by a person other than the person, who is going to do the data entry. So, the person, who is doing the task of data entry, must not also have the responsibility of finding of control total.

So, these two different people are there and the control totals are kept with the 3rd person. And when the data is processed, the totaling is done on that data and it is checked against the control total, to make sure that the two match. And this checking is done by a supervisor. And we have to make sure that, you do not make it easy for the person to commit this kind of a thing.

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So, there are number of types of controls. One is called input preparation control input. Preparation control means, while preparing the input, you must make sure, that some measures have taken to detect errors. And also trail and find out, where the errors occurred, very important thing is sequence numbering. That is, each data record entered must have a sequence number.

So, you can actually count, the sequence numbering and if anything is missing out of sequence, then you know and even deleted, intensively or may be accidentally. So, one should be able to find out, missing records or duplicate records. So, this is detected by a sequence numbering. Batch controls are like control totals, I talked about. That is, you take a batch of 50 and total a particular field and this totaling is done by somebody else.

And when the program is actually run, this total is generated. And this total is checked against the total, which the person may have and the person, who entering should not know at what point the control total is being put. So, in other words, if he knows, where the control total is being put, then still the possibility of fraud is there. So, you may randomize it. You may do it, for 30 records first, by do it for next 40 records and so on.

And at random place, you can do the totaling and then, you can check it by running the program. And many places, particularly, if it is a financial data or here in case of mark sheets and so on. There are situations, where people do a data entry and data verification.

That means, somebody enters the data, one way of doing this is that, one person enters the data and all that data goes into a floppy.

An independent person, whom the first person does not know, does the entire data entry also independently. That means, a duplicate in the work. So, when you duplicate the work, you have to be careful. Because, it is going to be lot more expensive in terms of time and cost. But, some cases, it is inevitable. So, that judgment has to come from the analyst or what are the data, which are critical, where you have to do a data entry and verification.

In the olden days, when punched cards are being used, there is one machine called a data entry machine. The other one is called a verification machine. Where, the data entry is done by both people, the entire data is put into the other machine. And then, any incorrect entry, that card is thrown out. But now, of course, data is when is entered, it may be stored in a floppy disk. And the other data entry operator may also enter it in a floppy disk.

Then, you have program, you run both these data, both these floppy disk, which are inputs to a program or a checking program and it will check record by record. And if there is any discrepancy between any two records, it will point out the sequence of that record, where the error has occurred. There you can go back and compare the two records and see, which is also with the original. To see, which one is in error and correct that error.

Even, though it takes a little time, this effectively an approach, which is a cautious approach, where particularly the something is going into a very valuable database. You make sure, that the data, which is going to a permanent valuable database, does not have un avoid, you know, avoidable errors. Of course, you may also be selective, in terms of the fact that, certain fields, you may not duplicate and which are not all their important. But, certain fields, which are important, you might said a duplicate.

So, those kinds of judgments is up to the analyst. And apart from the batch totals, that is taking the particular field and adding all that and putting a control total. In some cases, you also have a record totals. And record totals again, particularly things like for instance interchanging of two marks and so on. Unless, it is done whole sale, the entire records are interchanged, which is of course, rare.

But, it that anyhow will be detected by the control total, if it is randomized, the record total, records a specific field, specific fields in that record. Then, there again to got against fraud, what you do is, you need not add all the fields in a record and keep a record total. What you may do is, pick random fields in the record, make that total and that is done separately and kept by a separate person. And so the person, who is entering does not know, which particular fields have been added together.

And it will never be the same, may be for different batches, different record totals are kept. But, record totals is a very good method of again detecting data entry errors, which may occur. The errors may be accidental or it may be intentional. Here case, the record with total will bring out, which record is in error. Of course, we looked at the key, for a key field, self checking digits are always used.

And we actually looked at the modulus 11 check digit system for a certain numbers, for keys, which are numerical. I also pointed out, that the same idea can be use for alphanumeric fields by using say modulus 37 or modulus some, you know prime number. In the case of, if is capital letters and digits, then the total number of characters are 10 digits and 26 alphabets, so 36.

So, next larger prime is 37. So, it is modulus 37 can be used. So, these are self checking codes, which again is a method of looking at the any errors in the entry.

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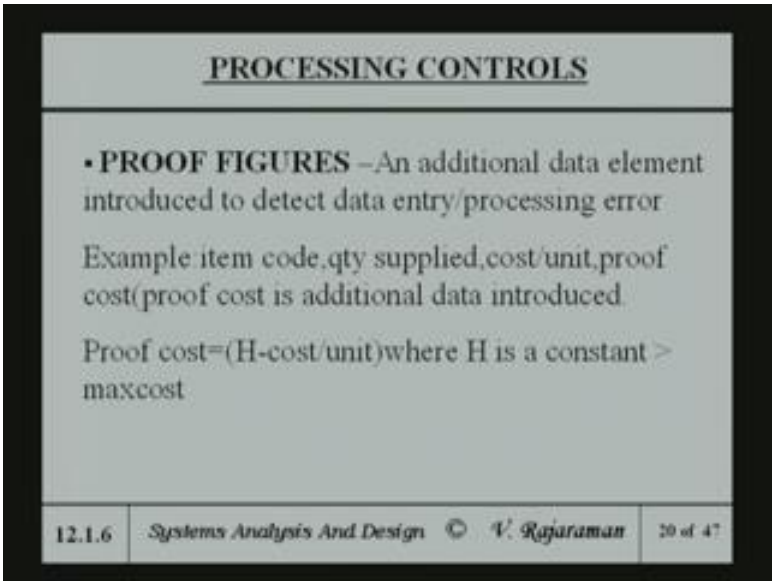

One more thing called the proof figures, where actually this proof figure is a processing control. In other words, if normally we except that in addition, new errors are made by the computer. Normally, computers do not make errors. It is only a program, which can make an error or data entry, which can be make an error. Both of them will be brought out by this control.

For instance, I am take an example, if you are taking a field, you know record with item code quantity supplied and cost per unit. To this, you add something called a proof cost. Proof cost is, you take the highest possible cost, suppose, a cost lies between, say 15 rupees and 25 rupees. You take a number, which is may be 50, which is much above this range.

And then, create for each record, one more field called a proof read. Where, you subtract from this number 50, the cost of each of those cost per unit of each of those records, this called a proof cost. And you keep it as a one more field.

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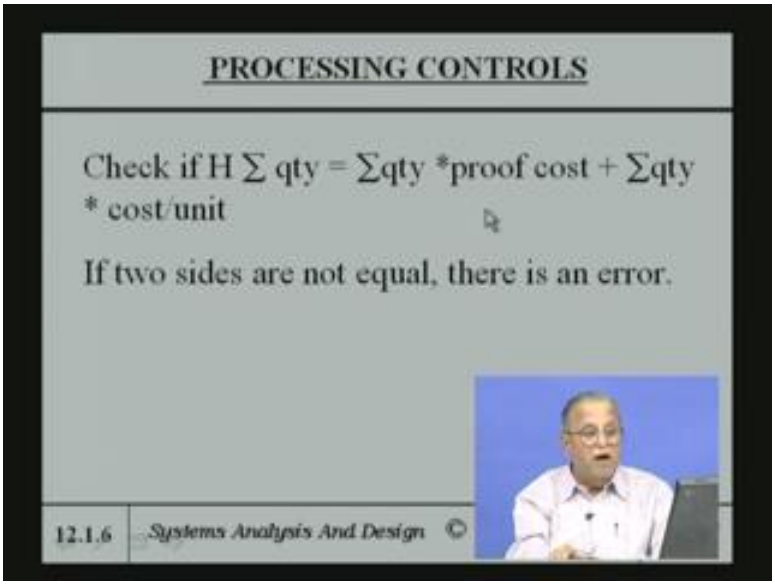

And the way, it has used is, you multiply, you add up all the quantities, multiply by the proof H, the 50 in the case. That should equal, the sum of quality times proof cost, which is plus quality times cost per unit. In other words, if these two are equal, in other words, you can see that very clearly, proof cost is H minus cost per unit. And so, H minus cost per unit, sigma cost per unit will become negative.

And become, it will be subtracted from sigma quantity cost per unit. And what will remain will be H quantity and so, the two sides should be equal. So, if the any mistake made in any of the entries will be brought out. And also, if there is any error made in the addition process, there are also will be brought out. If the two sides are not equal, there is an error. So, this is again one more method of detecting errors.

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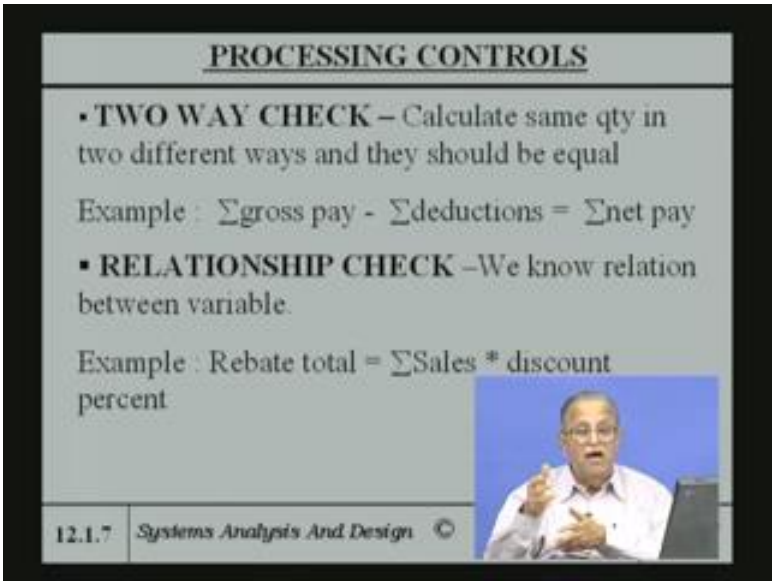

There is also something called a two way check. In other words, your payroll, you have gross pay detections and net pay. You add up all the gross pays, add up all the detections, for a group, control group. And then, add up all the net pay and these two should; obviously, be equal, they do not equal. Then, there is some error, which you can trace, because, provided you keep your batch sizes small enough. Then, you go back and say, where the error occurred.

And similarly, if they are giving rebates or percentage discount, discount percentage times the value of the sale, added together, should give the total rebate total, which of discount total, which the company has given. This again is a pure arithmetic. But, then again data entry error again be brought out. And even, processing processing errors will brought out. If there any error, which is brought out in the processing, that is, in terms of the way in which you wrote your program, even that will be brought out.

Normally, we except that, machine arithmetic will be not be incorrect. But, they have been also in cases, where, when new chips are introduced, they did have in some cases,

absolute errors. And one are to vary in that case, of course, they will recall the chip, later on. But, then for the initial period, there could be error. The responsibility, always for the data processing community, to make sure that, there is a no errors are coming, because of the errors, which are made by computers.

Because, the public perception, if there is any error, they always blame, it is a computer error. It is not a computer error normally, it is an error of the programming, it is actually human error. Because, the program is incorrectly written or a data entry error, which is also human. Normally, errors are human not mechanical. But, we have somehow, feel more satisfied to blame a machine rather a person.

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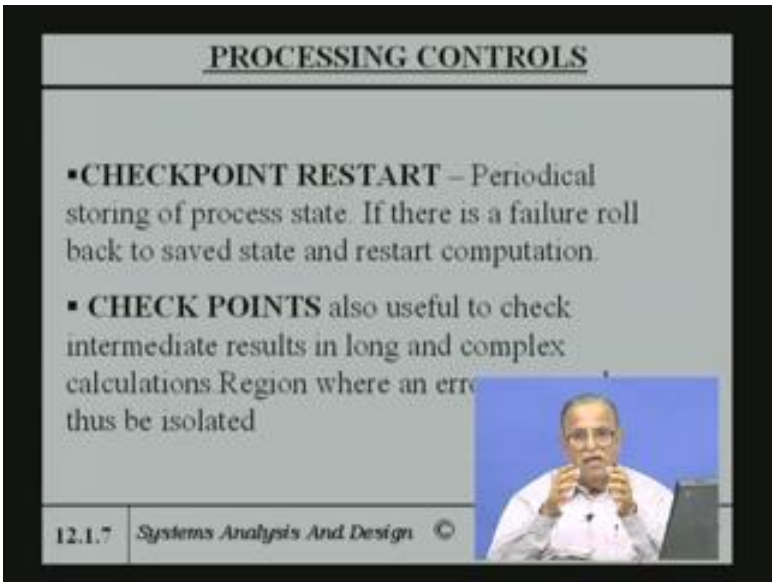

Now, there is one more kind of a system, which is used called checkpoint. There is periodically, while the particular a long calculation, which is going on. At appropriate periods, you store the process state. Process state includes, all the registers, whose values are important. And also, the map of the memory, what all, it is contain memory in the case data processing.

Maybe, you know, entire memory map would be very important thing to have, because then you can reselect. And at the checkpoint, you take some controls of that point. So, you periodically store, all the process states and the entire memory map with the machine. And if there is any failure in the machine, later on, you can rollback to that

point of failure and restart again. The whole idea is that, certain programs take hours together to run.

Suppose, after running for two and of hours and the computer, particular data intensive programs. It is also more apt also for scientific programs are always take a long time. But, even commercial programs, that is data processing programs for doing say, million records of student examinations, then it is going to take a fair amount of time. Even, it takes 1 minute per person; it will take fairy long amount of time. So, what you have to do is, it is a very long run, there is always a possibility of some failure.

The failure could be, due to some malfunction of the computer, which may be, because of power fluctuation or may be because, some disk error occurred. And there could be many, many reasons; particularly you may run a very long program. There is every possibility, that there could be some kind of a problem, which may occur. And particularly, if it occurs, towards the end of your processing, now, if you process for 2 hours and you just have a minimum 15 minutes more work to do and things crashed. So, the entire 2 hours work is all loosed.

So, in order to avoid that, what you do is, may be every half an hour, you take a check point. That means, you are storing the entire state of a computer in some back up device, like a hard disk. And then, whenever an error occurs and the system stops, suppose, it stops after 2 hours and 10 minutes. You have, if you took every half an hour, you have the map of the entire system at the end of 2 hours. So, you do not have to run the 0 to 2 hours.

You go back those borders status at 2 hours and continue from there. So, you only lose 10 minutes of computing. So, that is a great thing. So, check point and restart is extremely important. Particular, if you are having a long program from the point of a failure. Also, from the point of view of checking intermediate results, the very long and complex calculation, you can identify the region, where the error occurred. Because, the controls, essentially check points are place where you have some check results.

And you combine the check result with what it actually machine gave. There is an error, then you know that, you probably have to go to the previous check point and see. And that is the way; you can roll back and recover.

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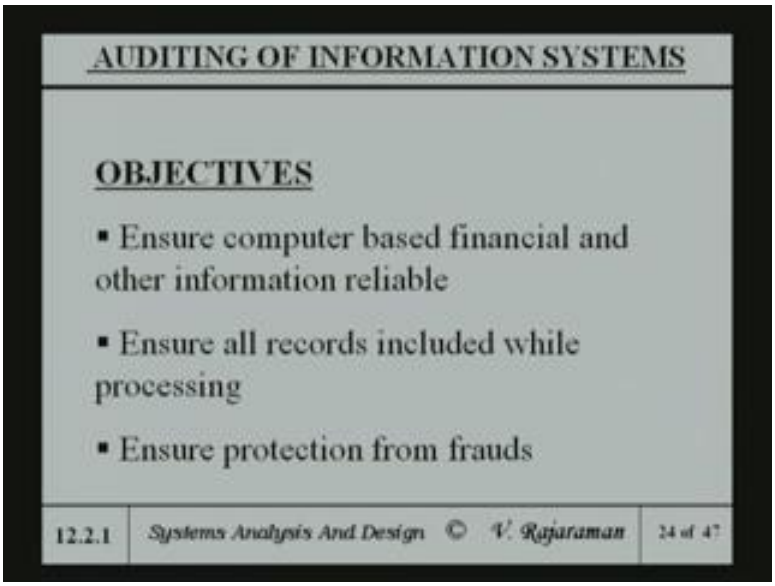

Auditing, there are very important area in data processing. Auditing essentially means that, there is an independent check of, what you are really doing. So, independent method, independent person comes on checks, go through your processors, which you are using. And also, you have any other careless mistakes, which has been happen and whether, you have put the proper controls and so on.

And whether, you have proper check points, all those issues, about control check points, and record totals, batch totals, all those issues. The auditor reviews the entire process and the auditor job is to have an independent audit of your system. And certified that, your system is in reasonably secure state. That means, normally frauds cannot take place or frauds are, even if they take place, it can be detected.

So, auditors job is both to prevent from the frauds and also to trace any fraud, which occurs and trace it and find out, whose is responsible for that. So, the objective are ensure, particularly computer based financial and other information is reliable. And you are being in lot of financial data processing in the machine is any kind of a financial irregularity occurs. That is got to be detected and prevented.

In fact, prevention is much more than detection. But, prevention is, one of the aims of audit is to have methods of preventing and then later on detecting. Ensure that, all records are included, while the processing is being done. As we do not, particularly for instance, if you had a examination processing results is suppose 1,25,000 students took

the exam. All 1,25,000 students results must be actually taken in the account wise processing and no records is missed.

Ensure protection from fraud, of course, I mean, there a prevention of fraud. There are three methods, which people talk about in this and of course, in this lectures, I can give you enough flavor of all the methods. Because, there are books have been written on that. It is a very complex subject and there are certified auditors, who undergo a course and get a certification from an appropriate body.

And certified auditors of information systems are in great demand. Because, they go and look at particularly, programs written in banks, insurance companies and so on. And certify that enough precautions have been taken to prevent fraud. So, the auditors primary role, particularly certified auditor role is to certify, that appropriate precautions have been taken to prevent. And later on, of course, the auditor may be called on, called up again, it is actually a fraud occurred to fix responsibility.

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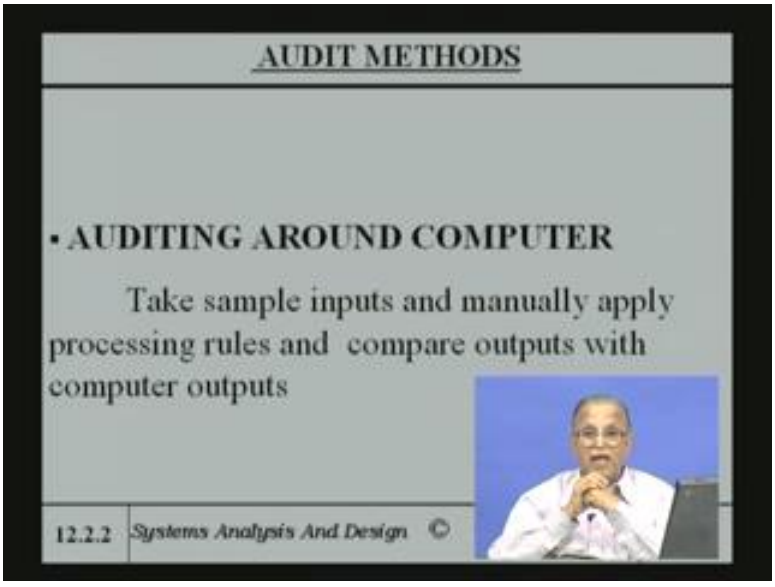

One method is called auditing around the computer. So, in this case; that means, he does not actually work with a computer, per say, might say. But, it takes sample inputs from that, normally applies the processing rules and compare the results. If you take randomly some records do the processing, which is call for and then, compare with the machines results and see, if they match.

So, in other words, in the case exam processing of students, you may take randomly on students marks in various subjects add that up and keep it as a control. And when the thing is run, you can again look at it and see, that is you will go to original document before data entry. So, he has a total from their and after the data entry and after processing, then you will compare, that against, what you have did manually with the original data here access to.

So, this ensures, that no fraud has really taking place. If the people know that such an auditors being done, then we lot more careful. They we will not actually be careless in doing some frauds, because after all persons always worried about being caught.

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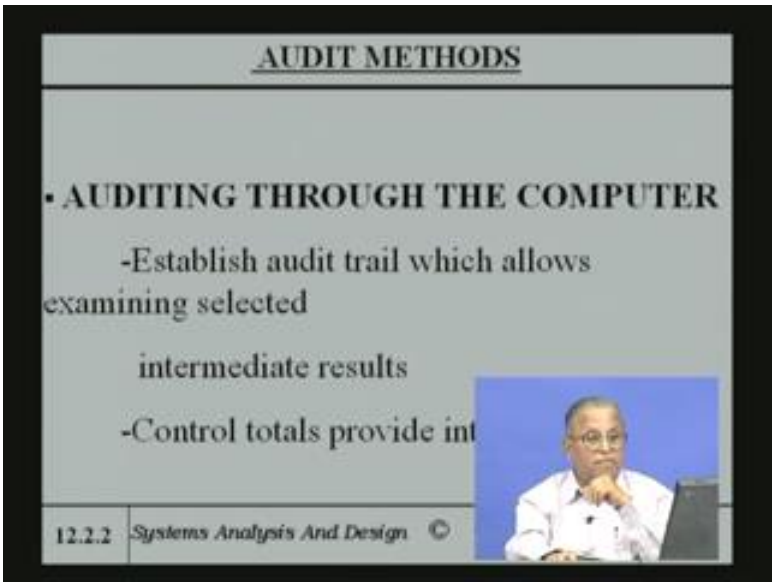

There is another method called auditing through the computer. That is, in the computer itself, you establish audit trials, which allow examining selected intermediate results, like for instance, I talked about control totals, say at random places. So, the auditors may decide at what point a controls may had we put. And you may not reveal it to anybody.

And so, he will has a controls with himself and with the program is run, he will compare his controls with the machines control, machines results or the intermediate results. So, control trials may have intermediate checks.

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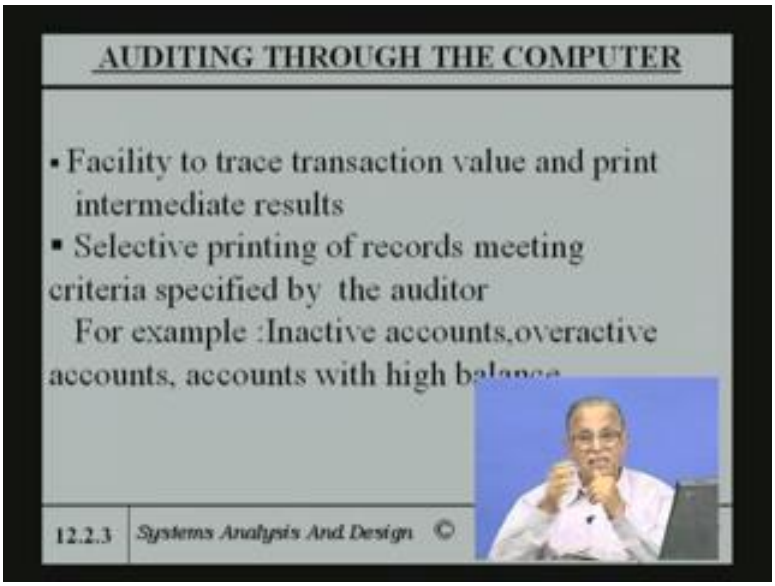

Facility trace transaction values and print intermediate results. In other words, in between in a randomly gets a point and do a printing of intermediate results of certain transactions. And you may decide that, certain records had a printing, based on some criteria, only he knows that, like inactive accounts, over active accounts. If you observe, banking application, accounts with a very high balance, systems like that, has to be checked.

Because, very often inactive accounts are once, which are targets of fraud stirs. Because, they know that the person has not been dealing with an accounts. So, he is not checking his accounts very carefully. So, you can do certain kind of fraud and then, may be even compensate. In other words, he may temporarily withdraw some money, from in active account and reimburse it later on.

Particularly, if he is not complete control over the data, which is on a computer. Whereas, if the auditor does it random points, inactive accounts and suddenly, finds some activity. Then, you can take, you know, find out if that activity, which the activity took place. Is a legal activity by the actual person, who has the bank account or done by somebody as a fraud.

Similarly, high account with high balance are always targets of fraud stirs. So, these are all things, which the auditor may decide. The high balance, actual value high or the value of inactive and so on, can always are set by auditor had more secret to the auditor. It is

not known to the person, who are running the system. So, that, that is a little surprise factor. That is very essential to have prevention.

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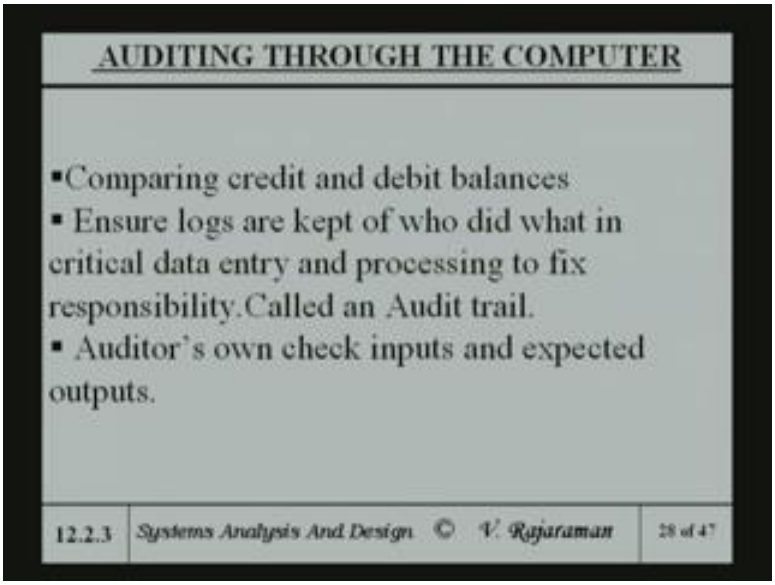

And so, the comparing credit and debit balances at random intervals. That will you know that, that essentially will tell, about the total credits, what is total debits and comparing them. Ensure, logs are kept, of who did it what, in critical data entry and to fix responsibility. That is, so they have to create an audit trail. There is, in the case for instance, I talked about the land records, where it is being manual done.

So, in fact, while the record, where being entered, the person, who enters the data, he puts his thumb print at the beginning and at the end. And the auditor will check, if there is any error, thumb print is a unique identification. Of course, thumb print readers are now available. And some comparisons also are very easy against a set of, because, only a set of people will be authorized to enter data.

So, you only had to compare thumb print, against that 10 or 15 thumb prints. So, that is much faster than random checking of any thumb print. I mean, the police have more difficult problem, because, they had to check the thumbprint against universe of criminals, which is can be very large. Whereas, in this case, the set of people, who handle data is a small set. So, thumbprint can comparison will be fairly fast and you call bio metric.

So, there is normally resorted to many of the recent transaction, because it is just an electronic. You do not have to use black inks and so on. You just put your thumb and that little reader. And then, machine scans the thumb print and then, stores it in the machine. So, if the any error occurred, he can find out, who is an audit trail, you can find out, who did it and where is a careless error or it is a intentional error. And auditor himself put some check inputs, which are randomly created, without the knowledge of the rest of the persons.

And then, he knows an expected outputs and sees, what the machine does. So, that to some extent, it also checks the any programming errors, if it all occurred, that can also be check by this.

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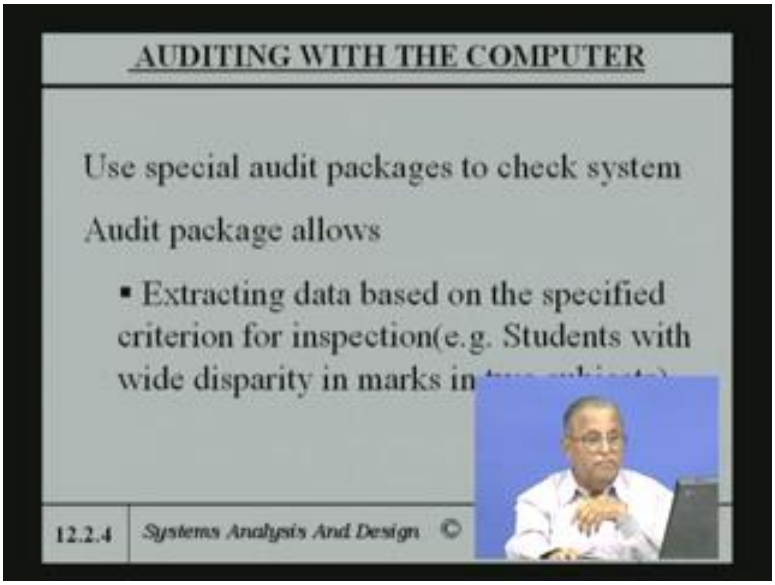

There is something called also auditing with the computer, user special audit package. There is a computer program, you write called an audit package to check the system. Audit packages; allow extracting data based on specified criterion. For inspection, is suppose, there are 2 students with 80 marks in one subject and 18 marks in some other subject. Then, this program may throughout that to see, whether correct data entries will be made.

Because, there is a possibility, that if somebody got 80 somewhere, the probability of getting 80 in somewhere else is quite low. Such discrepancies the audit package, where actually do a filtering job of based on certain criteria. And that will also be specific to an

application and based on that, the program is run on the machine and it actually brings out the appropriate records.

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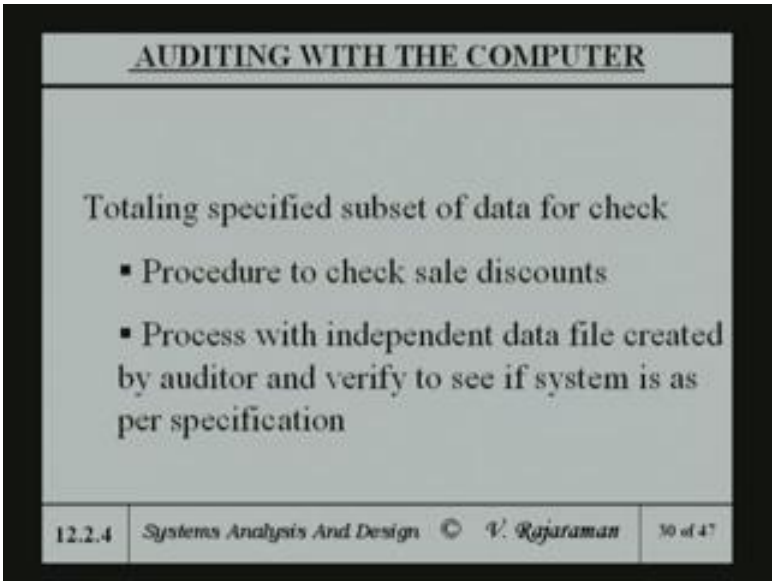

Totaling specified subset of data for checking. Then, it is a subset is not to anybody except the auditor. Procedure to check sale discounts, process with independent data file created by the auditor and verify to see, system is in a as per specification. That is, he can actually locate the SRS and create something which is dummy dat. And see, if the SRS given by the customer is might be the actual system, which is delivered.

So, there is, of course requires the auditor, not only to be aware of computer procedures or programming and so on. But, also about methodology, which is to be kind of used to write audit programs and so on. And also, the possible places where fraud can occur. That is why; we said that, auditors or a certified set of people, who have to undergo to a regress training and to had a have knowledge also.

And that is a very currently avail fairly look at a profession, because that not many people are time of getting in to this profession. Testing is a very important part. In fact, there will been companies set up, whose only job is a 3rd party testing of programs, download by some companies. The reason, they want to have a 3rd party testing is that the person, who develops the program has a certain kind a mind set. And you may not easily find errors in it.

Whereas, the person, who is independent external agent, he is not biased, he will probably do a job of testing, which is reasonably thorough. Because, nowadays of course, the even in companies, they have teams of programmers. That is, there are 2, in fact; they have something called an extreme programming, where there are two programmers, who do the same thing. And then, each one does a, so and so called code walk, through the other.

That is, you need a write a piece of program and somebody else, go through that program, which exist. He writes a piece of program, you go through and check it. Then, the two are put together to make the full program. So, in other words, almost manual checking is being done by two independent people. And this is kind of a code walk through, which is routinely used by many companies to detect errors or testing the program.

Apart from that, the code walk through has also got whether important application, namely, understandability of the code. Understandability of code is very important for maintenance purposes. And so, the card, if somebody else walks through their code and is able to understand it. That is, if not able to understand it, then of course, you say, it is a bad code, you ask the person to rewrite the code. If you able to understand it, then it is a reasonable code and you can test it, independently.

So, there are two types of testing at the program level, you can test the program. But, then a system consists of many programs. So, one has to worry about the entire system.

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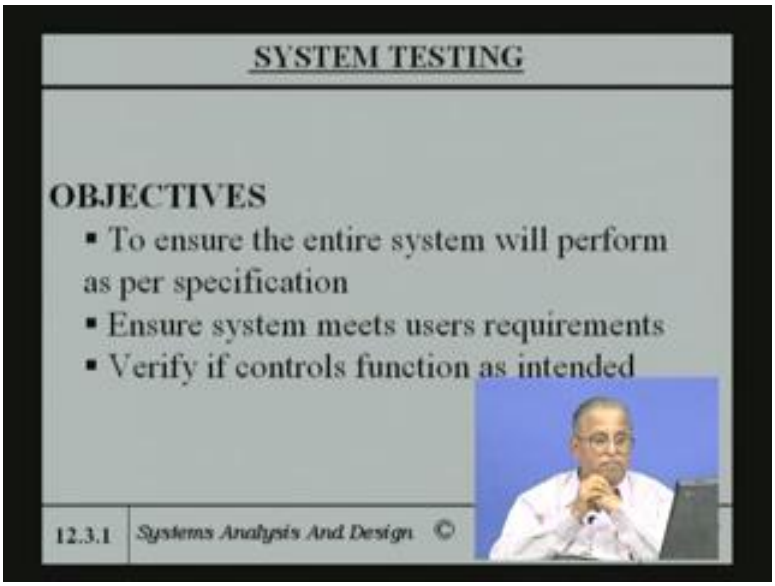

So, the system testing, the objective is to ensure, the entire system will perform as per specification. Because, system contains lots of modules, each module may have multiple programs. And so, system testing is very important. And make sure that, system meets user requirements. Again, as I said, the most important thing in any commercial data processing is to meet users requirements.

And because, he is a person, who is going to pay you. So, testing, one of the objective is to make sure of that, verify control functions controls are put properly and they function as they are intended.

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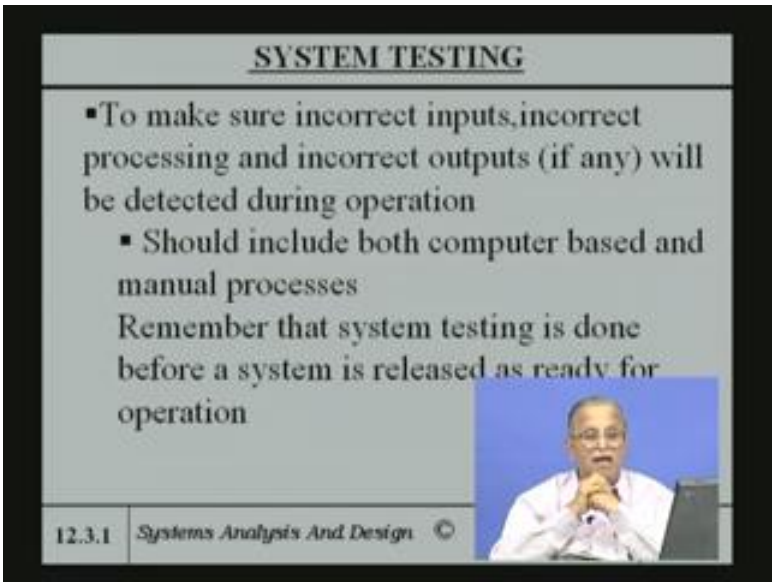

System testing is to make sure, also that all incorrect reports, incorrect processing and incorrect outputs, if any are detected during operation. In other words, if you put lot of batch controls, if you put audit trails and so on. But, system testing, again at the time of testing, before it is delivery to the customer, you make sure, that proper precautions have been taken for detecting incorrect inputs incorrect, processing rules. As well as in and your incorrect programs will lead to incorrect outputs.

So, include both computer based manual process. In other words, not everything is completely, system testing as I said, code walk through the manual process. So, one person, writes the code, somebody else is manually checking it. So, both manual and the automatic processor, we used. Remember the system testing is done, before a system is released and ready for operation.

Because, once you system starts operation, then you really cannot touch it, as for as possible. Because, once the system is delivered and you start meddling with it, the customer lose complete confidence with you. Secondly, any errors which show up and the operational time are very expensive. That takes lot of effort to correct, it will also by lead to heavy financial losses of the customer.

So, that is a duty of the systems, people who deliver, the company which delivers the software to make sure that, thorough testing is done in all kinds of situations. Before, it is released to the customer; your customer does not get into any kind of a problem.

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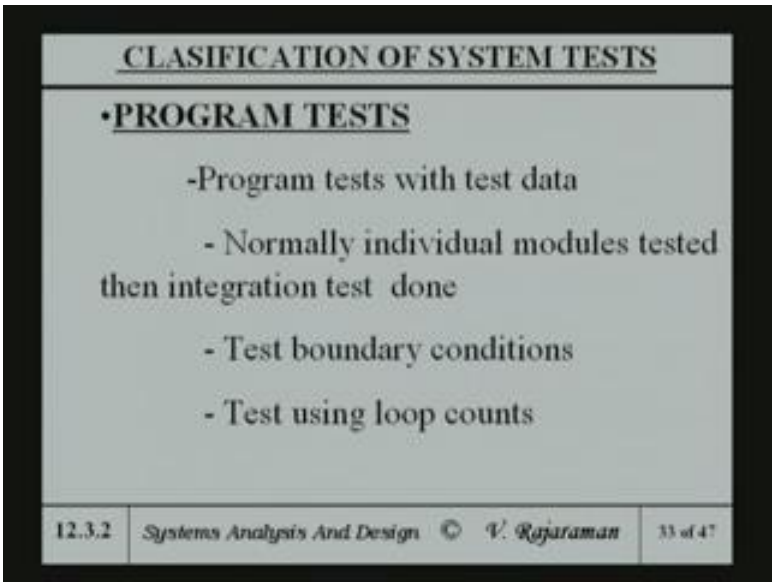

System test can be classified as program test. While, program test code walk through is one method. And test data is another. Test data, you create some test data and test the program with test data. And that testing is done by a 3rd party. That is not by the person who created the program, but test data is created by somebody else and he also runs the program on that test data. See, if the answers are as expected.

If that many of these companies is specialized in testing. Essentially, have methods, there unique quality or selling point, you might say is that, they are able to be a reasonably thorough testing by creating necessary sufficient data. To kind of more or less give a certification, that the system is working correctly. Normally, individual modules are tested and the integration tests also done.

That is, module test is not sufficient, because, when you interconnect, there are a boundaries, you got to check. And within the program of course, you do in programs, loop checks, loop counts, loop invariance are all methods are actually used for in programs.

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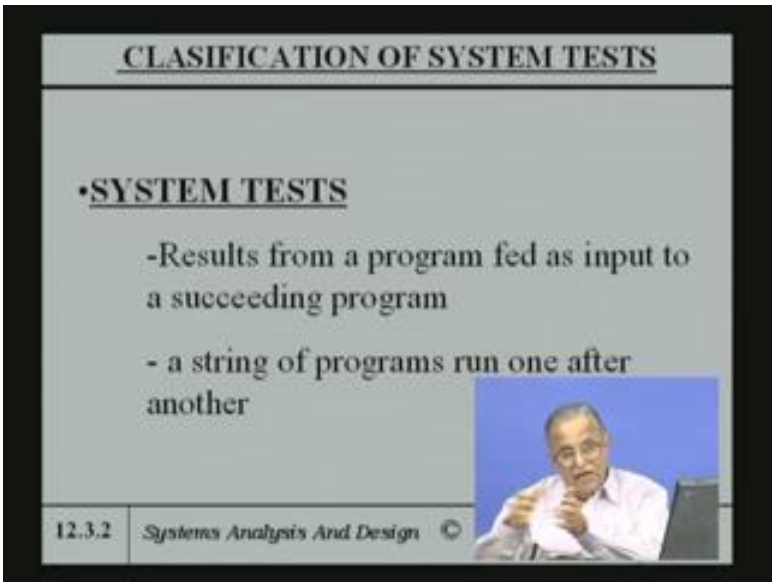

Results, when a program fed as input to a succeeding program, because many programs go together and becomes system, you have to see, whether the proper inputs are being go to the next program. As string of programs run one after the other, to see, if all of them properly synchronized and give the expected result.

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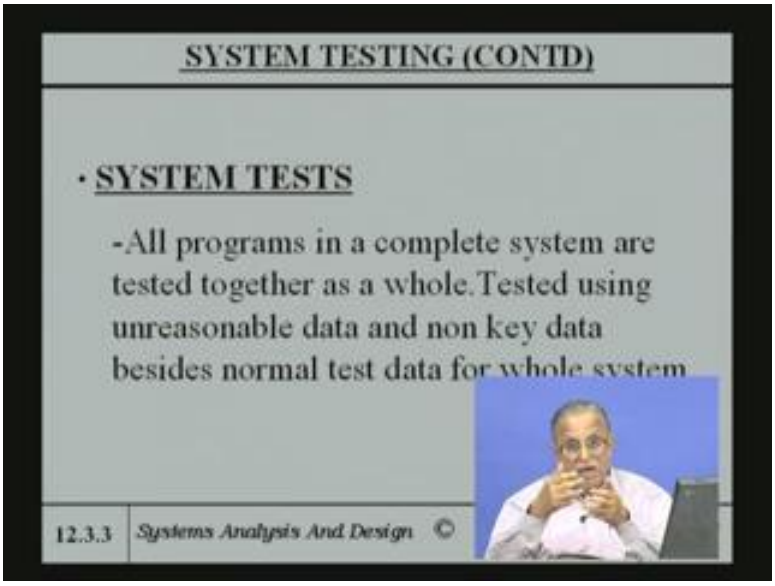

All programs in a complete system are tested together as a whole, tested using reasonable data and unreasonable data, both and non key data, besides normal test data for the whole system. Other words, you give something, which is unexpected and then see, if the

system, see kind of brings out, data entry error or system behaves as expected. Something, unusual data is putted system should reject it.

If the system does not rejected, that uses it for processing, then, obviously something very seriously wrong with the system. So, these are thing, which system test has suppose to bring out.

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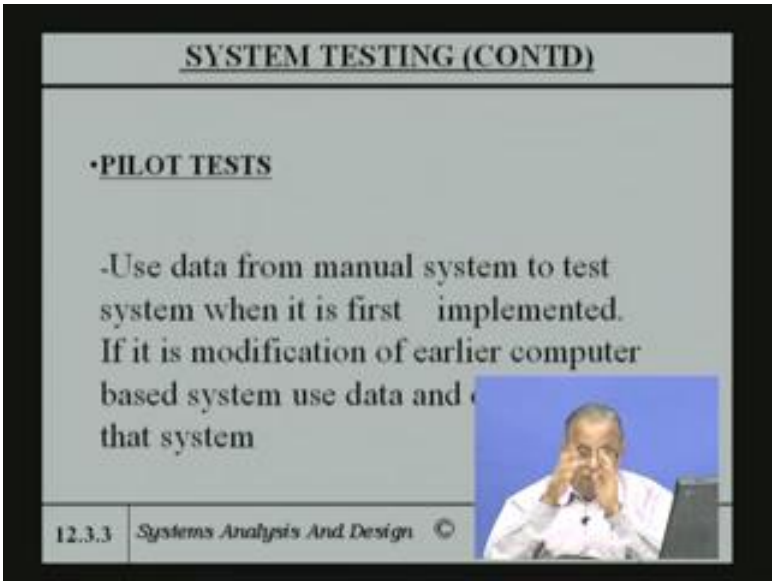

And there are pilot test, when the systems actually delivered to a customer, you have a pilot run. In other words, before actually goes into what is called a production run. That is, use it daily, day to day for the operations, you have pilot tests. In other words, you run a manual system or say the earlier system. Earlier system, which is actually existing and you also run the new system. And whatever the earlier system did, because earlier system was operational for a long period of time, hopefully, most the errors have been removed.

So, you check the new system and see, if the earlier system results and the new system results match, for a under a same conditions, of course. New system, very often may add functionality, but the old function was still be there. So, at actually check the old functions first. And of course, the new functionality is checked separately. And the pilot rank in that run, what the new functionality gives to the customer is also a evident to the customer.

So, with a modification that earlier computer system, use data input and output, from the old system, that is what, I will say.

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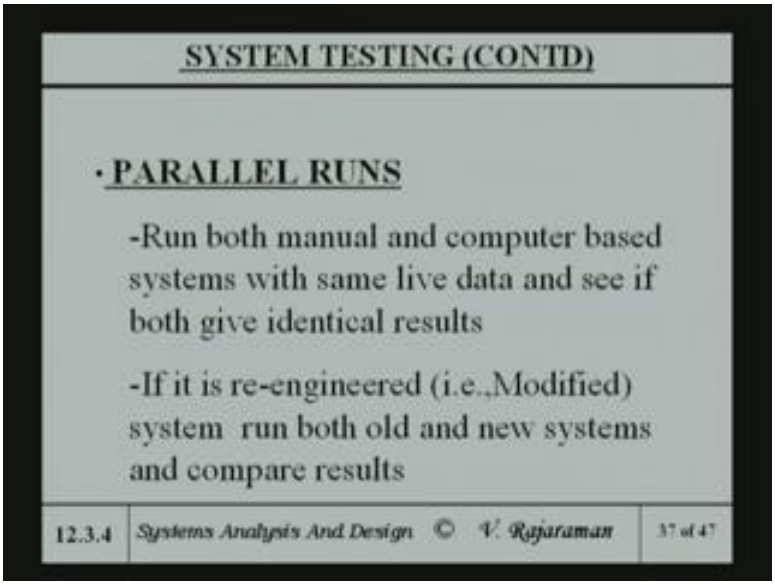

Parallel runs, in other words, run both manual and computer based system, there is a manual system, already going on. You form the manual system and computer based system, till you kind of result the manual system. That is, you retire the manual system and tally to the computer based system. Pulses of hotel, small hotel, when it currently having complete manual system, you go there and make a computer based system for them, they may still run the manual system for some time.

While, the computer based system is also running in parallel and many arrays come out of the computer based system as compared to what is going on in manual system. Then, you know, that there are you could actually even trace, where the error occurred. So, this pilot test, pilot test are very important, parallel runs for both the manual and this. And similarly, for if the existing program, you run both of them. If re engineered system, run both, old and the new and compare the results.

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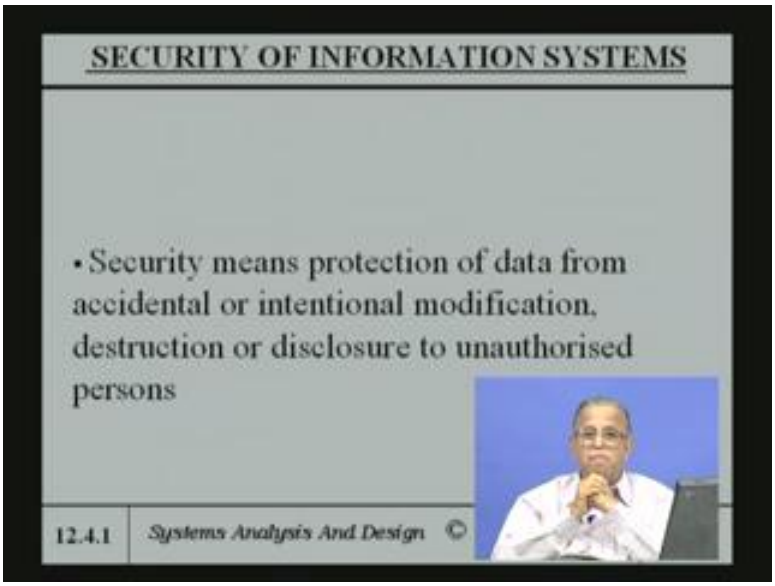

Now, one more topic is about security. We talked about control, we audit talked about audit, we are talked about testing. Now, the another very important part of any information system is security. Security means, protection of data from accidental or intentional modification. Destruction or disclosure to un authorized persons. In fact, this is a major concerned of many of all business process outsourcing outfits.

Recently, there is a case, where a person, who has working in a bank, disclose the credit card numbers of the number of customers to fraud stirs in a different country. And the fraud stirs, uses credit card, numbers to de fraud. The customers and takes out money or purchase items, from there, using that credit cards. In fact, the fraud was not detected, till about almost half of million pounds, were loosed and customers complaint about transactions, which have never made.

So; that means, the system, which have been in place, has is that secure. By allowing certain people, who you cannot trust the data, which is too valuable. In fact, is suppose credit card data and stuff like that and they are stored in the database, it should be encrypted. It should not be just available for anybody, do download and look at the number; it is got to be encrypted. Proper security measure is to kind of encrypted.

In other words, garbled it in some way and then, the encryption, decryption key is known only to a supervisor. And so, the processing is done, the storage is done with an appropriate data, processing is done with an encrypted data. But, with the key, gave by

supervisor and then, before it is stored back again, it is again encrypted. In between the access is extremely restricted, because processing part not many people are deal with.

But, data many people deal with. In fact, data entry operators deal with original data and of course, you have to be extremely careful at data entry stage. Because, I said that you have to make sure, that the data entry operator does not know, what in a particular record. So, that, we cannot essentially use it, for any of fraudulent purposes. Security means, protection of data from accidental or intentional modification destruction or disclosure.

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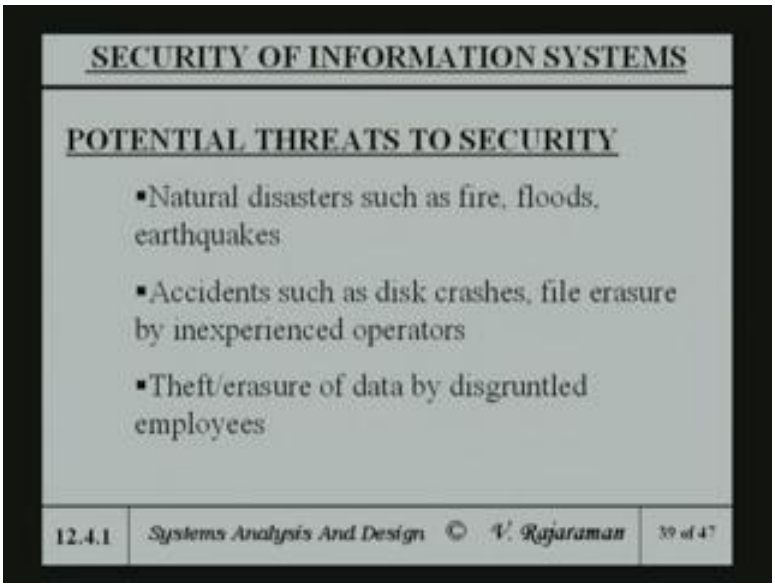

The natural, there are certain threats to security, natural disasters. In other words, you know the last year, there is a huge rain in Bombay and certain bank computers are all affected. And so, there data, which is got to be secured, were almost lost. Unless, it took some precautions to do for that. Disaster can be like floods, Bombay floods, this year again, there is a lot of train and they are afraid and may be again, be flooding and so on.

And we had things like tsunami, which create havoc, in many of the coastal areas. And earth quakes, which can destroy buildings or terrorism, like you know, the 9, 11 terrorism, were many banks were destroyed. In that, when the world trade center was effectively destroyed. So, one has to make sure, that the data, which are important resource, for many companies are is actually not easily tamperable.

And also that, it is protected, in case, there is some problem, like a disaster, you can recover the data and restart your work. So, similarly accidents can occur like, disc lashes, file erasures and in experienced operators and so on. So, you have to guard away such accidents. Theft to erasure of the data by disgruntled employees, because again, these are to be guard against. So, these threads are so called security threads.

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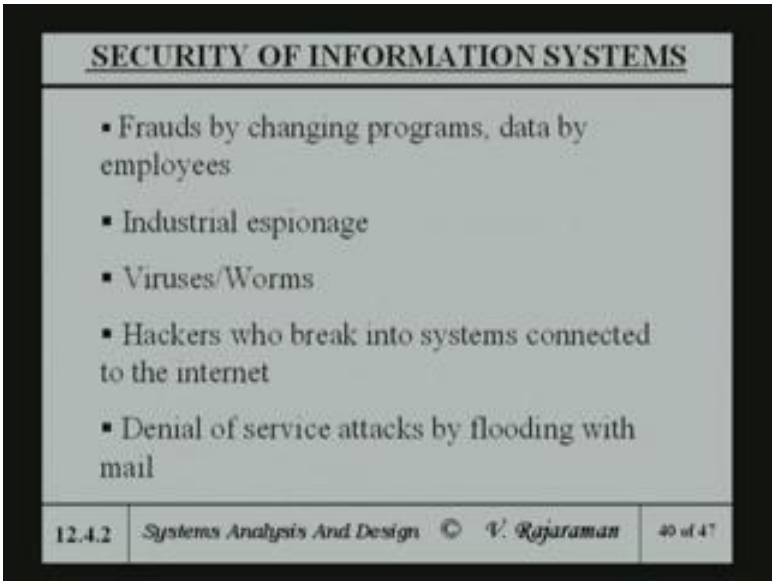

Frauds by changing programs or data by employees, industrial espionage in somebody from outside not to get hold of your valuable data. Like, it may be a competitors, say strategy. And in fact, even companies guard, when it jealously, what they sold where and that information. Again, is people are, who try to kind of steal them to kind of have a proper competition. Because, viruses and worms are ever present in particularly in networks, where they are generated by wandles and send on the same as internet.

Hackers, who break into system, connected to the internet and try to steal data or kind of spoil data. Denial of service attacks by flooding with mail. In other words, suppose you have a website and legitimate users, one to get hold the web site. But, you create the dummy or daemon program with every 2 seconds; it goes in kind of such an enquiry to a website. For all practical purposes, this web site may be, unapproachable or inaccessible to legitimate customers.

Legitimate customers is just keeping that very busy, like your phone. You know, somebody, who can give you go on, giving you non sense calls; he can keep your phone

busy and not let others use your phone. So, this kind of a denial of service attacks. So, these are all, you have to guard against.

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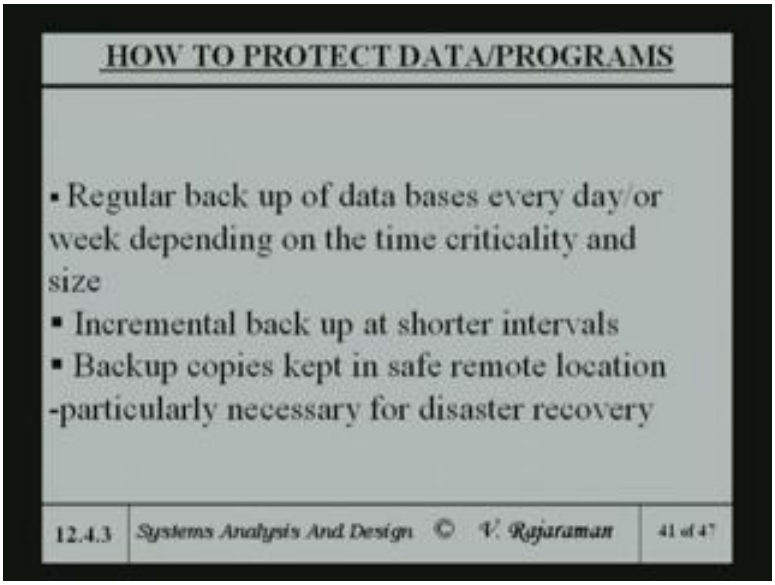

So, to guard against things like disasters and so on, you have to take a backup of all your data, regularly. In other words, every normally, what is done in banks, at the end of the everyday, what they called an incremental backup. That is, whatever changed, during the day, from the database, which was present at the beginning of the day, all that changes are stored.

And this changed data, that is stored, then every week, they will take a complete backup of all the data. So, that at the most, you will know one weeks data. Because, every day you are essentially take up incremental thing. So, if it is 7 days incremental changes and use a data, which was stored 7 days ago, you can re clear everything. And if it very important data, you may backup in so incremental backup. You may do entire backup.

But, entire backup is very expensive in terms of storage space. So, you do normally incremental backup. And backup copies are kept in a different place. In other words, they doing a weekly back up for instance are the disk, all the disk data may be put in tapes or cd's depending on situation. We yield upon a data, people not only put it on tapes and those tapes are stored in a different location, completely.

In other words, your bank was situated in say some somewhere in Bombay. You put it possibly another suburb Bombay or even in a place like Pune, which is about 100 miles away 150 miles away. So, that, the probably the disaster is the place, which is stored 100 miles away is much lower. So, you can still recover the data that way. And we take an incremental backup, as I said and backup copy, were kept as a same in remote place for recovery.

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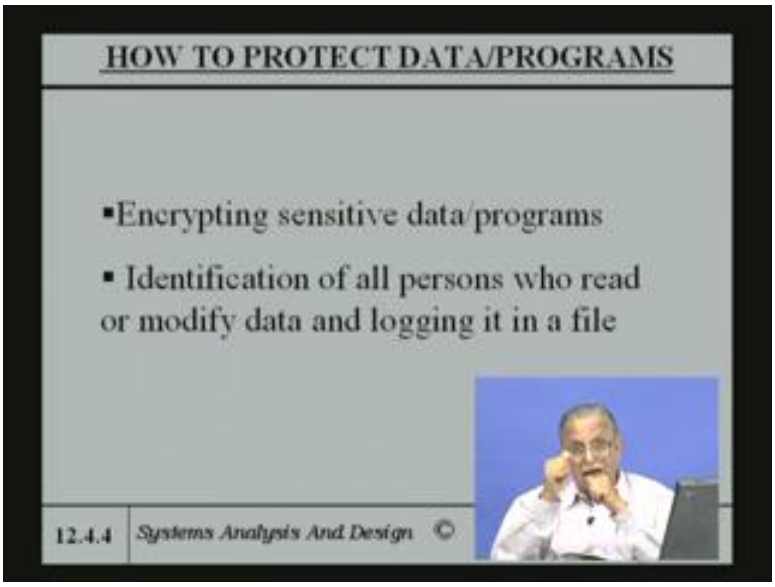

And of course, encrypting case said, sensitive data has be encrypted and stored. And all, identification of all persons, who read that modify data, particularly use a particularly for for critical data thumb print is essential. Otherwise, you have some method of trailing, the person who logged in, logged out. Many companies, even have a video camera, which captures the person, who had accessed and who did this.

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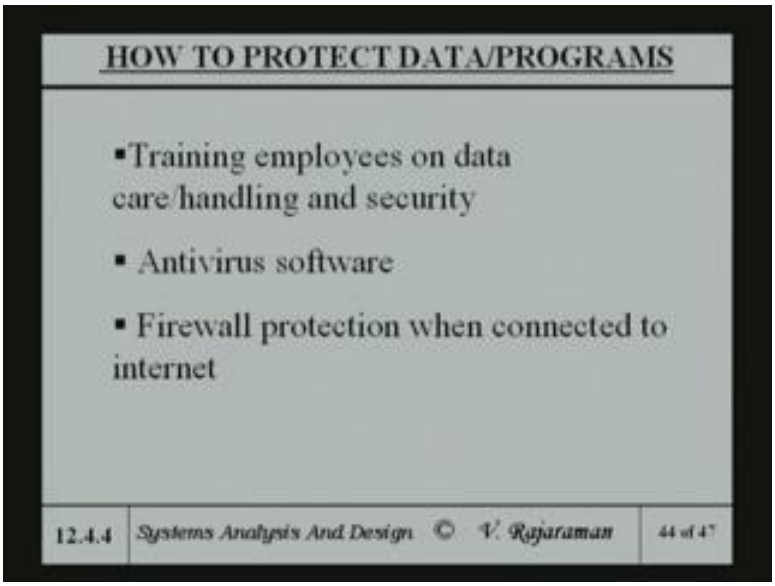

And so, there are primarily many methods of doing this. And of course, I am also almost coming to the end of this module. But, I do not have time to cover the entire module. So, I think, I will take the rest of it, next time and revise little bit of the previous part. Like maybe, I will start at this point and then, complete this particular module.

Thank you