System Analysis and Design
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Lecture - 30

Last time, we were discussing about HTML. It stands for Hyper Text Markup Language. It is primarily the language which is the first language, first markup language; which made it possible, to retrieve documents stored, in the world wide web.

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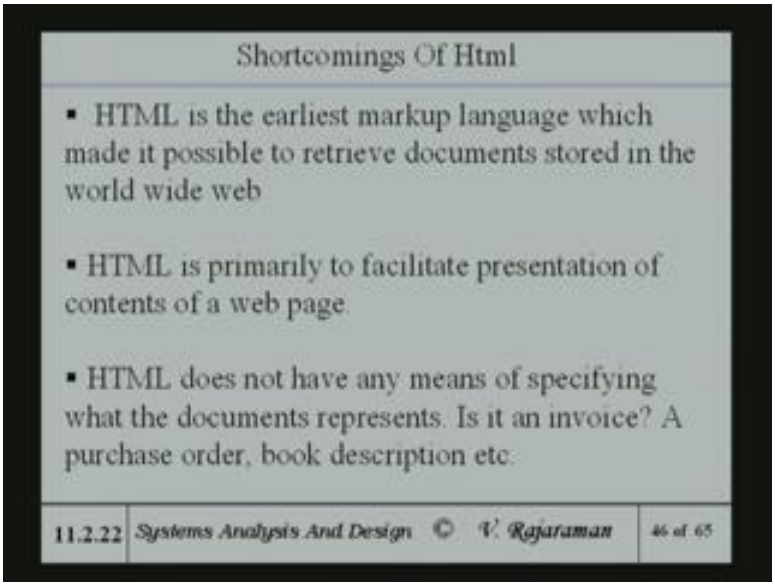

Before that, they did not have a clear method and idea of navigating through so many thousands of documents, spread all over the web. And the greatest contributions which is made, by the first inventor of world wide web. And the associated documentation, whose name is Berners-Lee, who is working at Cern in Switzerland. Cern lab, which is a actually a nuclear physics lab, in Switzerland. His contribution was to think about this kind of a hypertext.

That means, linking a text to other text. And then, associate with it, a markup language was essentially proposed by him. And it was refined and consortium, called the world wide web consortium, called w 3 consortium nowadays solidized HTML. And in fact, today lot of the work which is done, on the world wide web. All the new standards and new applications which come on the web, are all cleared by the world wide web

configuration. That is the group of people, technical people primarily who form a group to swift through all ideas, which come to them.

And then, ultimately standardized, what is to be used by all users of web. This kind of a standardization is extremely important. Particularly, when a worldwide set of people are going to be using some facility, which is not really owned by them. The machines are all owned by device organizations. And they are all connected together, interconnected. So, they have to cooperate. In a cooperative system or a cooperative world, they extremely important for all the cooperating entities; to follow a common protocol, common standard.

And otherwise, it is just not possible to communicate. It is like saying that, communication requires, that we all speak a common language. Otherwise, we did interpreters everywhere see. So, the whole idea of standards, is essentially what has ((Refer Time: 04:15)), the wide spread use or the world wide web. So, HTML is a standard, which has been upload by the world wide web consortium, of technical experts.

And it is actually run on a professional basis. And time to time, they do get new proposals. They swift through proposals and accepts among them. And then, the standardization group gets together, to standardized it. So, HTML is now that way, kind of a standard, which is used by all the users of the world wide web. In other words, if you really want to put, one of your own documents on the web.

Or to make your own website, which is to be accessed by other people, you have to follow this standard. Otherwise, nobody can access you. So, in other words, you are force per say to use a HTML as a standard language, to specify your entire document, which you store in your web page. So, web page design, essentially consists of lot of course, esthetic issues. And what information are to get in there and so on.

But, over and above that, it also needs to have certain structure. And a structure or a syntax is what is decided by the HTML. And that allows your document, also to be linked to others. And you can also link to other documents. Not only other documents, but other images and so on. As you pointed out, there are anchor tags to get other websites. And you can use a SCRC command, to be able to get to images, which are stored elsewhere. It may be not necessarily in your web page, it could be in somebody else's web. But, you can link to that particular image.

And get that displayed, when you use it for some purpose. And in fact, most people have web pages, which conveys a lot of information about themselves. And also includes very often, particularly academics they are publications. And many other information about themselves. And of course, companies find extremely important, to have web presence as I pointed out last time.

So, HTML primarily presents, as a facilitates presentation of the contents of the web page. It does not say anything about, the nature of the content. Is it an invoice, is it a bio data, is it a purchase order, is it a book description, you do not really know. From the way in which the HTML is designed. It only says what headings are to be put, what is to be a bookmark, what other pages to visit gets linked? And other kinds of information.

And it does not say anything about the what it contains, I mean what is the meaning of the contents. Also has no means of specifying the type of data. Otherwise, is it a number, is it a character string, is it a structure, data structure is specifiable.

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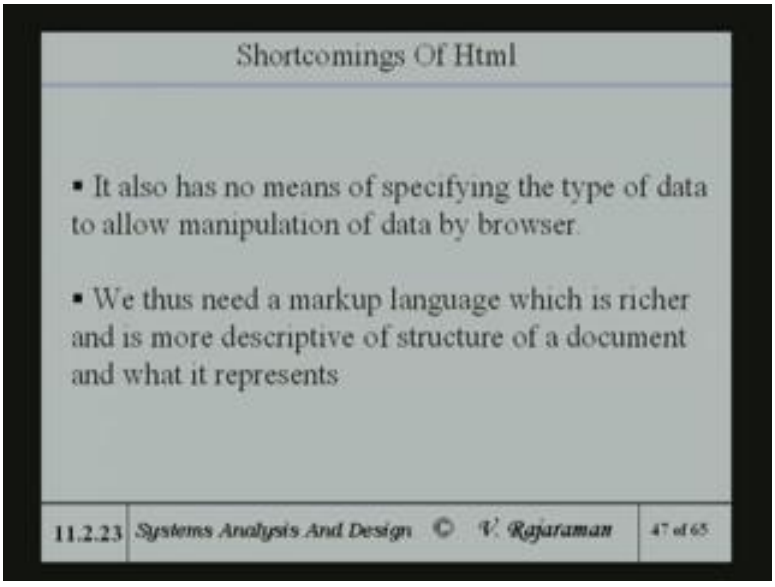

We just need a markup language, which is richer. And it is more descriptive of structure of the document. And what it represents, in other words apart from the syntax of representing the pages. You also have to putting some meanings or semantics, which others can understand. So, this is a kind of a quest, which people got into, in other words they try to come with a new language. And so the result of that is, a mark language

called extensible markup language; which has become now standardized by the world wide web, consortium.

And in fact, it is based on a very generalized markup language. And I will say something little bit about it. But, I am this purpose in this course, is not get into great detail, about markup languages in general. But, there is a generalized markup language, whose subset is the extensible markup language, called XML. XML, the actually you could have call it EML, but EML looks somewhat odd. So, to this use XML, using the second letter of the word extensible.

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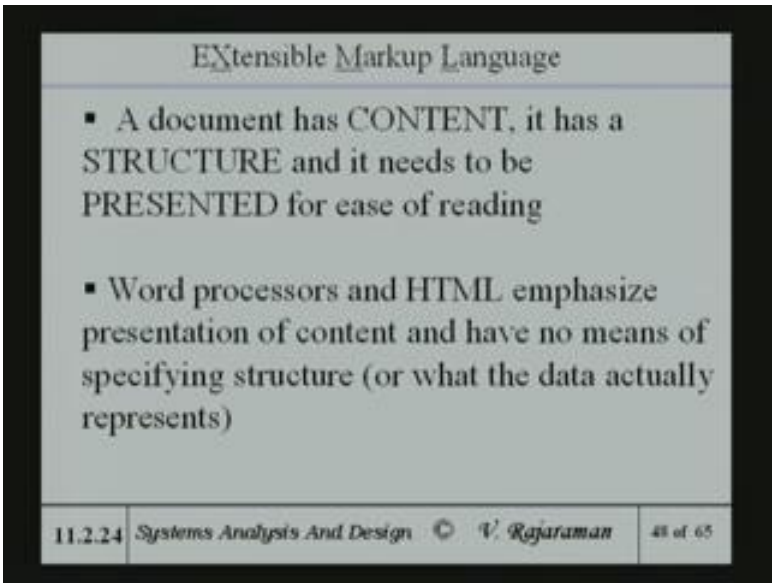

Document has content of course, and it has a structure. And it needs to be presented, in the for ease of reading. Word processors in HTML, emphasize presentation of content. And have no means of specifying, what the data actually represents, the structure and the content. What it actually contains, what information does it contain? So, presentation is emphasize of HTML. Like paragraphing, bold facing, italics, connecting to other documents and so on.

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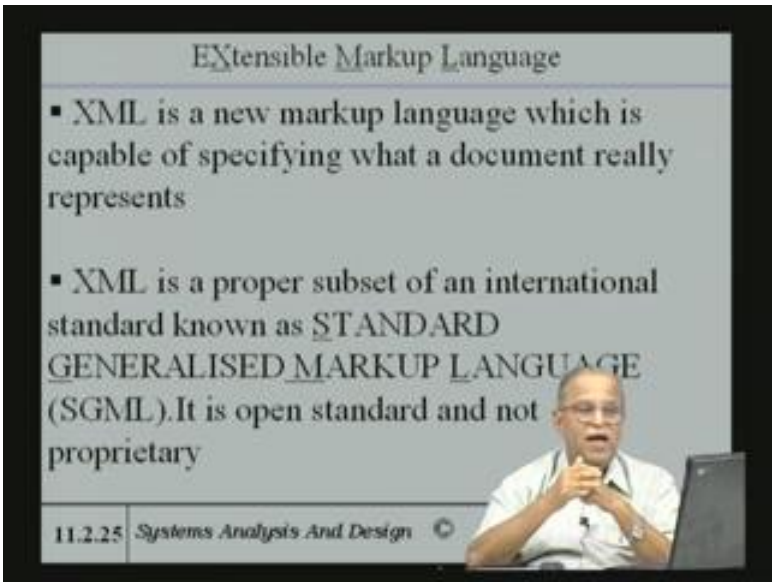

So, XML is a relatively new language, it is not I would not call it an year old. It is already become may be 4, 5 years old now; which is capable of specifying what a document really represents. It has, it is a proper subset in the international standard, known as standard generalized markup language or SGML. And SGML was actually proposed by a group of information scientist. Including librarians and others, whose specialized in this area. And it is a open standard and it is not proprietary.

In fact, this standard was very, very general, And so general, that implementation became a little bit of a reissue. And so based on SGML, there are actually derivatives or subsets, which effectively use a same spirit of the SGML. But, they do the job with the simpler language, which you can learn quickly. And also can be implemented. And other words you require, some method of translating that.

And that is the implementation issue. And implementation is as important, as just proposing something again. These again and again occurs in computer science. You know in the early days, ALGOL are organic language, was considered of extremely good standard language, promoted by Europeans. And in fact, it is a very good language from the point of view of learning. From the point of view of actually the syntax of the language.

At at the time it was invented or actually proposed it does considered a very great advanced. Over the existing language that time, for scientific work. Namely the Fortran

and for business data processing namely Cobol. But, of course, Fortran was a primary language for scientific computing. And ALGOL was suppose to kind of replace that. When it so happen that, ALGOL was very nice, in terms of the proposed structure of the language and so on; syntax, semantic rules and what not.

But, when it came to implementation, it became very inefficient, comparably it became inefficient. And Fortran compliers are lot more efficient. So, even though ALGOL is a good language. Everybody type of agreed to that, but then when it came to use, people used Fortran, because it is efficient. And of course, in those days, computer power is it a premium. And computer time was not easily available. And efficiency was as important.

Or in fact, more important than the beauty of the structure of the language. ALGOL spent a lot of time in the beautiful structure of a language. So, in some people says that, ALGOL has a same status as Sanskrit, which is chanted by a few high priest. But, nobody really uses it. Primarily because, it is difficult in some sense. And for day to day use, people use something simpler and that is what is happen to ALGOL. Same thing about HTML.

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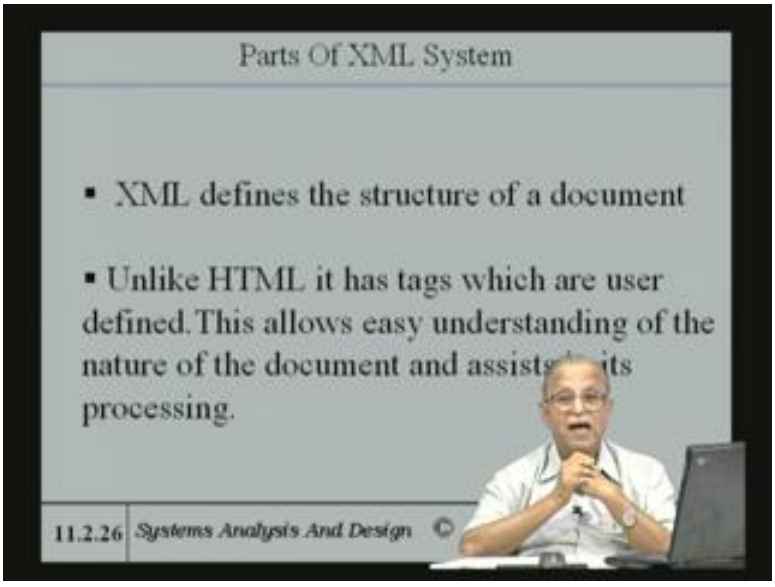

HTML is gain, super set of all possible markup languages. And of course, sub set one of the sub sets, proper sub sets you might say is XML. XML defines the structure of a document. Unlike html it has tags, which are user defined. In html the tags are all static, like h 1 is user headings and I for italics and so on. And of course, there is no marker at

all, what the document really contains. Whereas, XML has user defined tags. And using those user defined tags, you can kind of guess, what that document represents.

If in a, for a human reader and of course, for a computer interpret, you have to define the tags again, somewhere. And that what is the method which is used. In other words, XML gives you the freedom, to define your own tags. But then, it also puts imposes on you, a requirement. That the tags be explained in some language, let us called DTD, but I will come to that.

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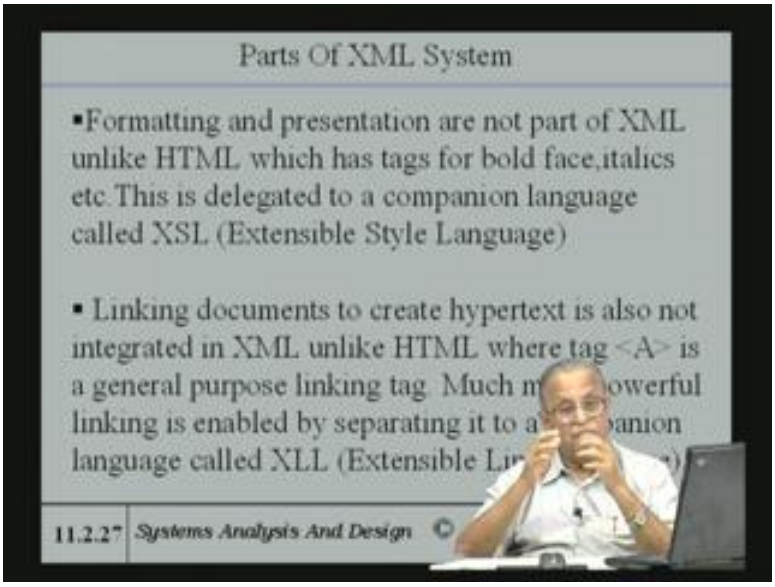

And formatting and presentation are not part of the XML, unlike HTML. On the other hand, you know this is delegated to other language. Formatting part is delegated another language, called extensible style language. Because, essentially formatting is one of style, you know bold face and italics and so on. So, there is a XML extensible style language, which accompanies that. And say something about the how to kind of format that document.

But, the markup language say something about the content. Linking documents to create hypertext, is also not integrated in XML. So, to extent it is not as simple to use for multipurpose. And much more powerful linking is enabled by separating it, in a companion language, called extensible link language. In other words, it divides the concerns which are addressed by HTML into many parts. One is say, look at the style, the other is to look at the links.

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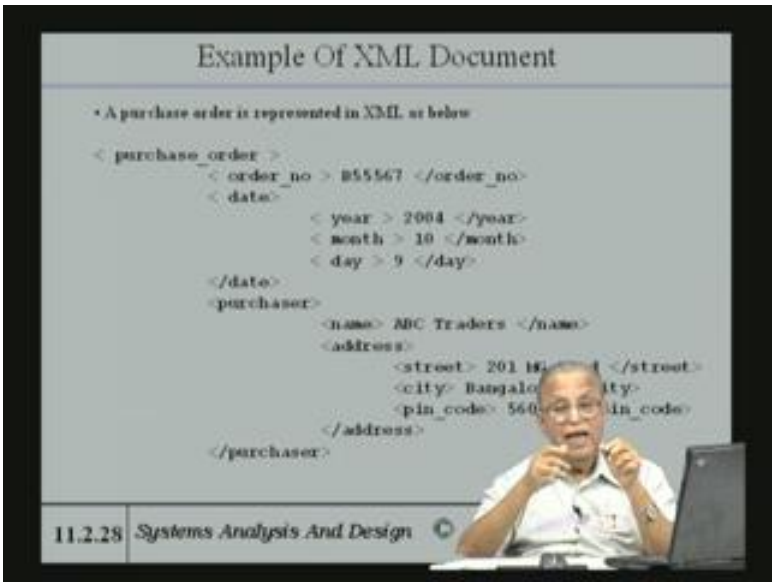

And the important part namely a content, is what XML effectively emphasizes. Like for instance, a purchase order is printed using XML. I am not this course, I cannot talk about the entire syntax of XML and describe XML, in great detail. Actually books have been written on XML. And there are courses, which talk to you and which deal with XML at great line. But, from the point of you of an information, systems analyst designer. The reason I am talking about XML is that, when you go to web based design.

Particularly for e-commerce and so on. You must have some understanding, of the way in which the content is presented. And meaning of the content is presented. In that is the reason I have give you a flavor of what XML is, without getting into great depth about XML. And so in XML a purchase order, in this case the tag which is defined, is the purchase order. That itself is the tag. So, from the actual tag, one can guess that the document which follows is purchase order.

So, you can have order number, date of the order, purchasers name and purchasers address. As you can see, just like an HTML there is a begging tag, like in this case order number is the beginning tag. And order number is got an end with a slash, in front of the order number. So, the whatever is contained between these two tags, is actually content the order number. And the date of the order, again it gives the date. So, from the tag, you can associatively guess, what the content is.

And so these are all user defined tags. And name and slash name, so you know what ABC traders are having their address.

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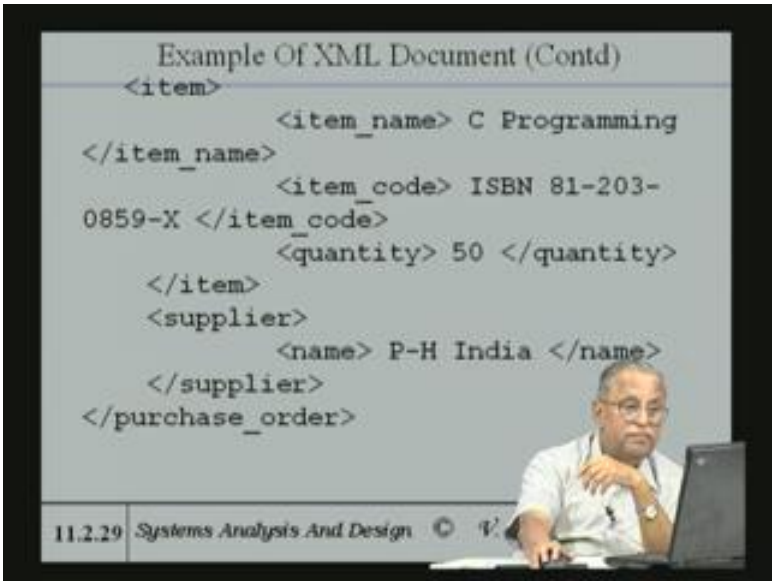

Similarly, item suppose in this purchase order, there is an item to import. You have an item name, item definition contains, item name which is C programming. Item code, in this case item code is ISBN number of that book. And quantity in stock, the purchase order has to mention the quantity. So, 50 is to be ordered and suppliers name is given as the suppliers name. You can also give suppliers address and so on. In other words, the entire purchase order document, can be put in the XML format.

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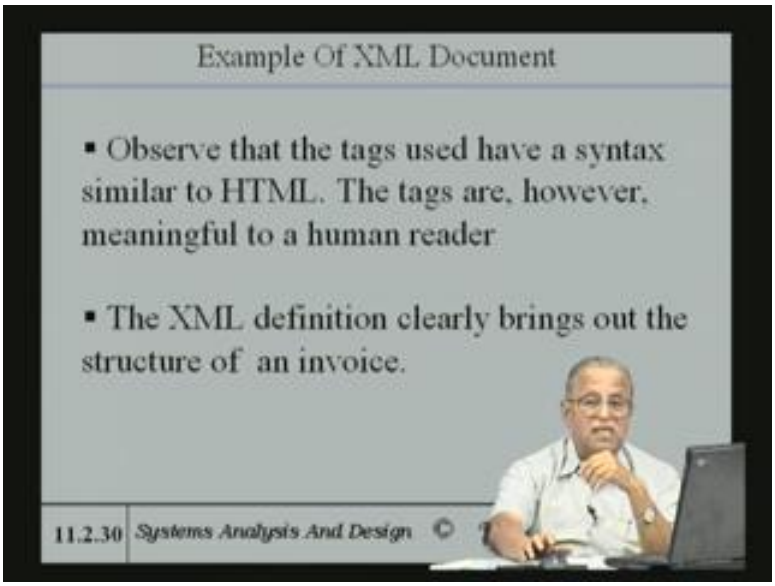

Observe that tags, tags used have a syntax similar to HTML. Tags are however, meaningful to human reader. And XML definition clearly brings out, the structure of an invoice. What it the invoice consists, what are the purchase order contains and that is brought out.

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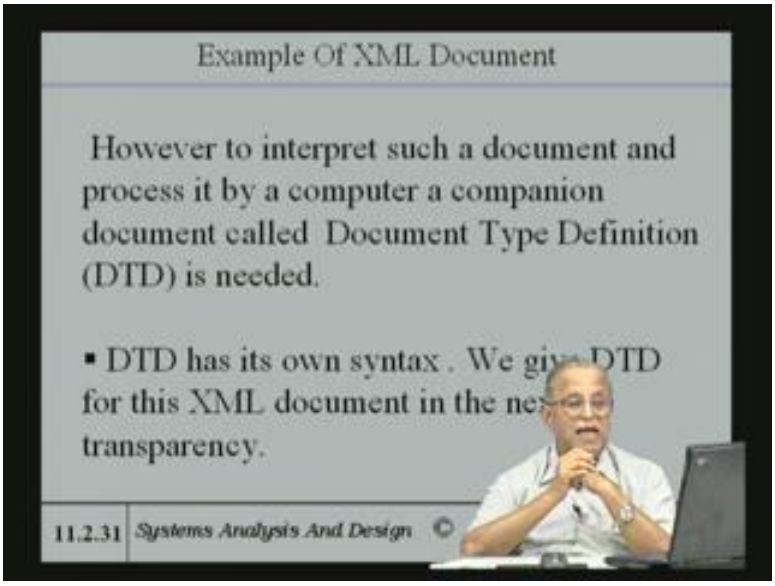

However to interpret such a document. And process it by a computer. A companion document called document type definition is needed, that is DTD. Document Type Definition, has it is own syntax. And we give DTD for this XML document.

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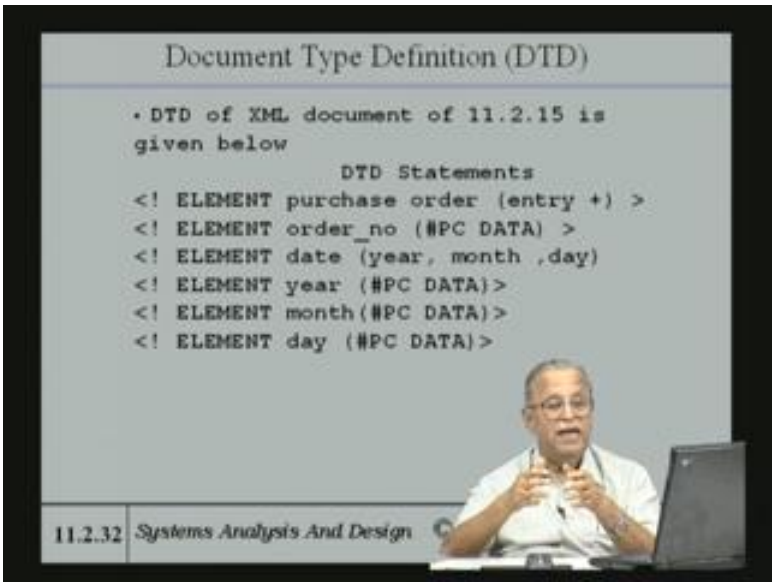

That is purchase order, there are the these are all, they look Gibberish view. But, just like any language, it is got some type of it essentially says, the elements of purchase order, order number, date and so on. And date contains year, month and day, it is actually a structure. And year is a day, numeric data, month is a numeric data, day is a numeric data. So, there are many parts of it, which describe as a numeric data or alphanumeric data and so on.

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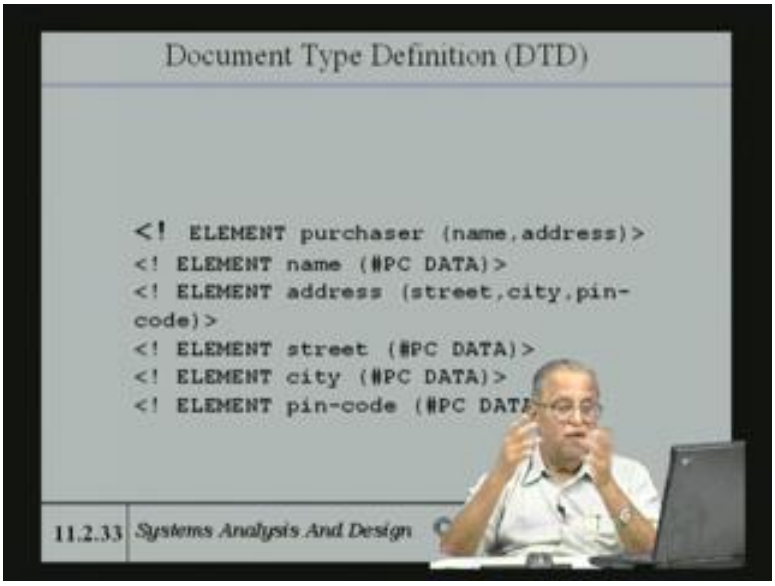

So, DTD specifies all that. And name is a character data and so on. So, there are actually in this case, see these things there all defined in the language. And as their books have been written, you have to learn, like any, learning any language.

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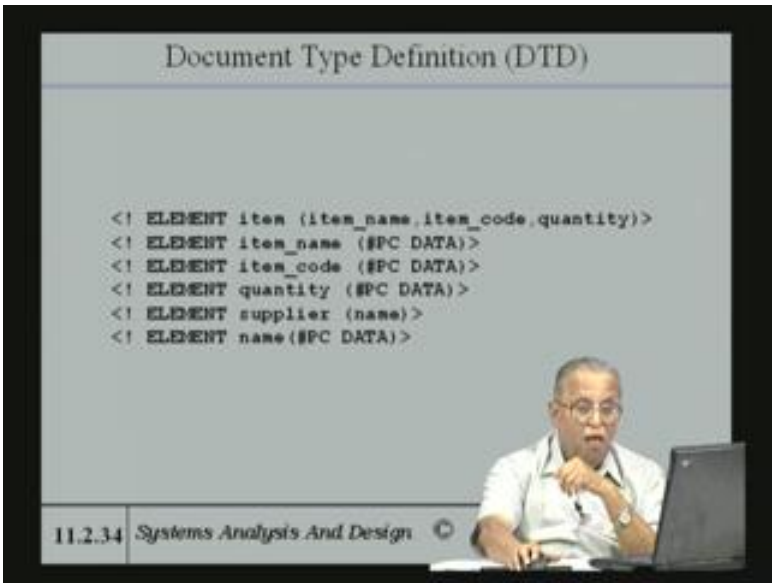

Here learn all the syntax, to be able to write your own DTD; and your own XML document. So, say I continued, everything which occurs in that particular XML document. Every tag has been defined, in terms of what item for instance, consist of three parts. Item name, item code, quantity. And item name and item code are character data; and supplier name also this is got a ((Refer Time: 21:21)) character data and things like that type.

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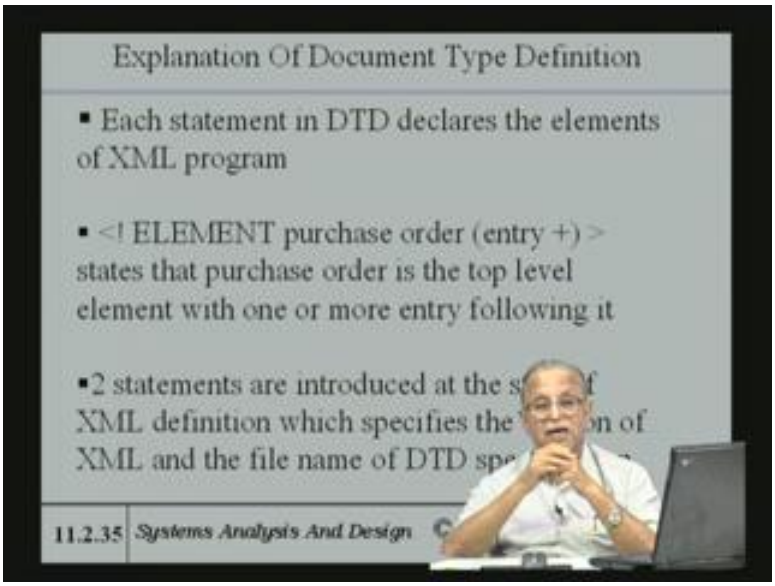

Each statement in DTD declares, the elements of XML program. Entry plus states the purchase order element is the top level element, one or more entry following it. Two statements introduced at the start of the XML definition, which specifies the version of XML. And file name of DTD specification, that DTD specification itself must have a file name. So, that is all is specified.

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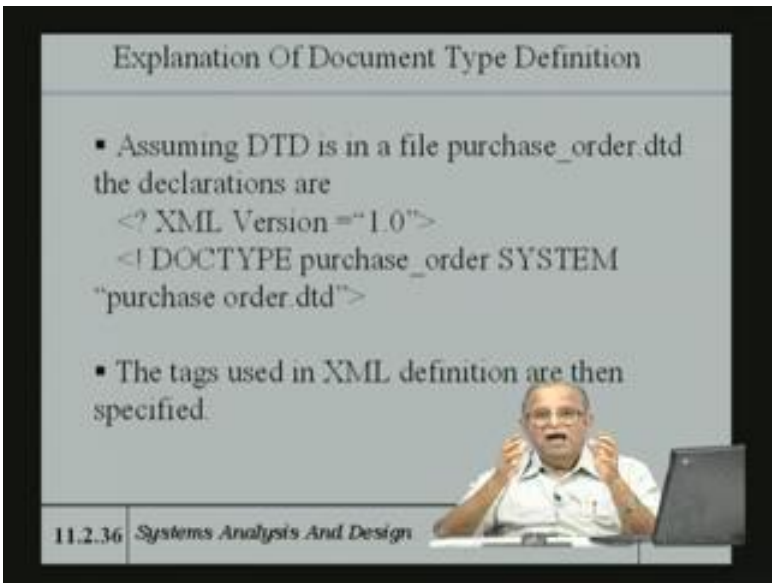

So, assuming DTD is a file purchase order DTD, then the purchase order dot dtd has an entire description, whichever put down, it is an XML version so and so. DOC type

purchase order, system purchase order, there is stored in a file named purchase order dot dtd. Tags used in XML definition are those specified in that DTD. So, in other words XML is not a standalone, XML is there. Along with it you got DTD, style language and linked language.

All that together is actually a packet, which is lot more general than a single language, called a single HTML. And which is obviously much more complex, but much more powerful. From the point of view of use, it has semantics, it can be processed and so on. Whereas, HTML is only formatting.

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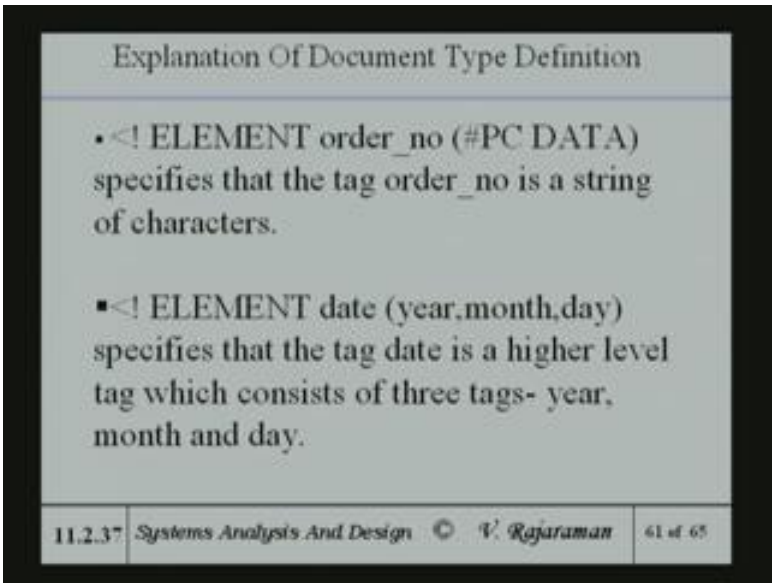

So, various elements, PC data string of characters, dates specifies the tag, date higher level tag, which consists of three tags.

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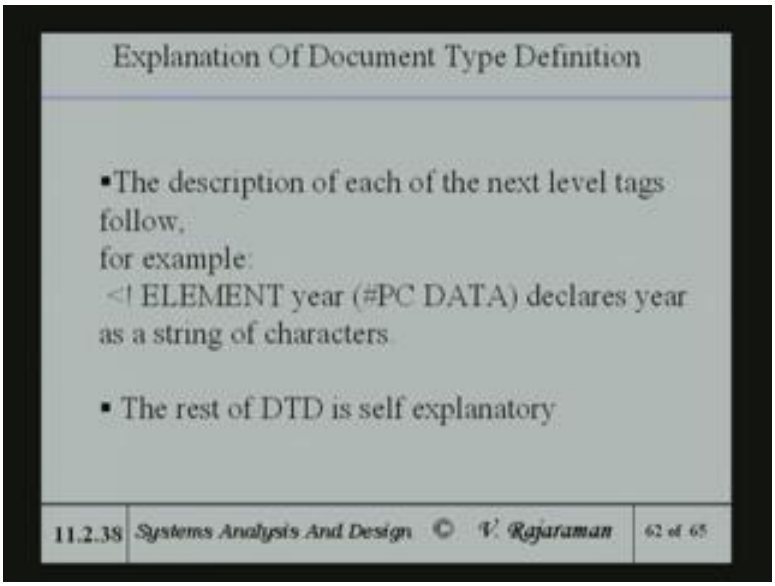

And year declares year of string characters. And rest of the details similar.

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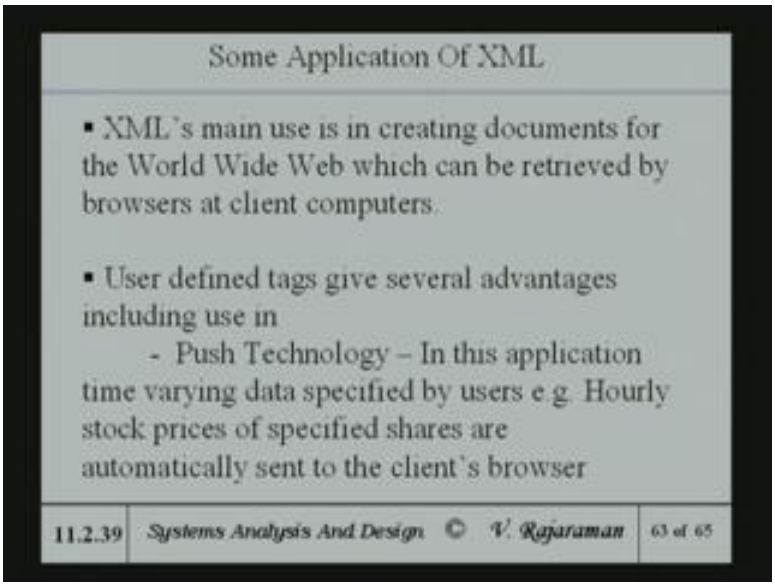

XML is main use in creating documents in world wide web, which can be retrieved by browsers on client computers. And then, interpreted user defined type, give a several advantages. You see, there is a you can send or push information to the user, who can interpret it, using the DTD. Time varying data can be specified by the user, for instance the a push technology in other words, if you are a stock broker.

And you want to get periodically data on the stock market situation, then every hour or every half an hour depending upon what you specify. There will be little (Refer Time: 24:02) will wake up. And send out that information from that website, in to yours. And then, you can interpret it, with the standard XML interpreter, which is sitting in your machine. And so many things which are time varying, like stock prices.

We want, we are interested in getting periodically cricket scores, something like that. There are also can, nowadays it is there in somewhere in the web. And it can push to you, that information once in whatever interval you specify.

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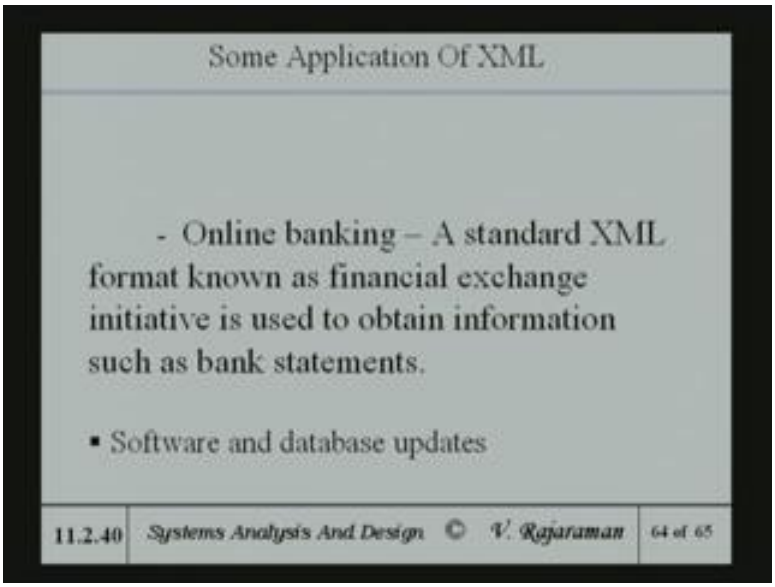

So, for online banking, a standard XML. For banking of course, the tags are all very specific. Because, things like the withdraw or deposit or write the cheques or the transfer certain amount and so on. They are all part of the standard XML format financial initiative. And is used to exchange information, such as bank statements.

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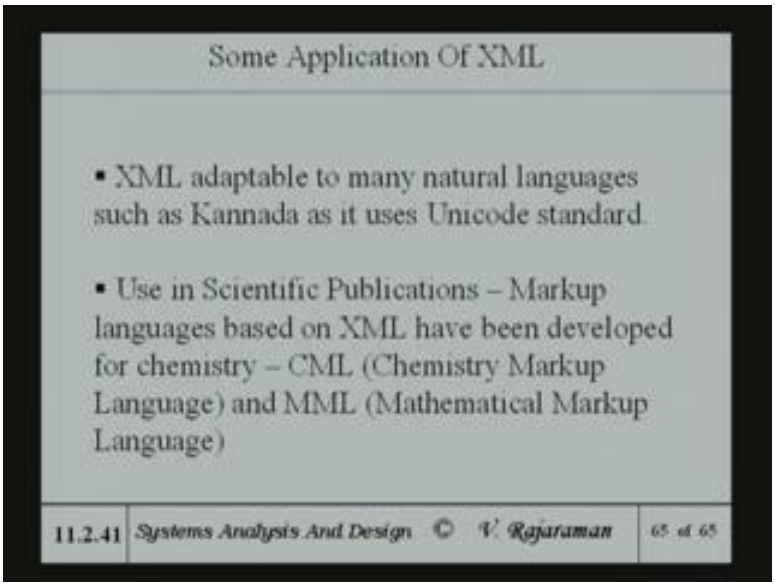

And similarly software and data updates, are all essentially pushed through an XML document. XML is adaptable to many natural languages. Such as Canada and Unicode standard is used. In other words, it is not language specific, XML is not specific only to English. You can use other language tags. As for the machine is concerned, the those tags will be interpreted as a Unicode or set of bits. And it does not know any difference between, while it is Canada or Tamil or English or whatever.

It only understands the bit string language. And that is what the whole thing is about. That is whole advantage is that, it is somewhat language independent. So, you can have an XML document in Chinese, or in Hindi or whatever. And that is the beauty of this methodology. Provider of course, everybody uses the same kind of a coding method. And XML standard is a Unicode, as I pointed out earlier Unicode is a 16 bit code, which has capable of representing, any language in the world today.

And also other subsets are of SGML. Similar to XML have been used in other areas scientific publications, markup language that are used. That is something called chemistry markup language. Because, chemistry and mathematics and physics and so on, has their own gorgon. Has their own interesting requirements, like mathematics will require represents sets, vectors, matrices and differential equations and stuff like that.

And chemistry will have to have, to represent organic molecules of all shapes and sizes. And chemical formula and so on, for that chemistry markup language is there. So, in

other words, markup language idea is very powerful idea. And that is useful in many areas of human activity. And you can actually specialize it. And of course, things like chemistry markup, mathematical markup and so on, have been standardized by appropriate user groups.

So, there is a chemistry group, which has sat together. And sat, what is an appropriate markup language to exchange documents or papers in chemistry. Similarly, in mathematics. Because, if you look at a standard word processor, mathematicians do not like very much. Because, mathematicians, in mathematics you have sub scripts, super scripts, sometimes double supers scripts, and double sub scripts. And all types of parenthesis and symbols, there exist I belongs to and so on.

So, they require something which is appropriate for their short hands which they use, mathematicians use. And that is what is essentially done in the mathematical markup language, by the appropriate group. These are all becoming important, because regardless of whether you are chemist or a mathematician or a physicist or mechanimist. Today, everybody is interconnected on the web. And there is a large group of cooperating scientist or cooperating individuals. And so one would like to communicate easily between groups. And that requires standardization, that is what they have done.

So, I have given you a flavor of the world wide web. And the way in which documents are stored in the world wide web. And the documents are processed, are they need for markup languages. And there is essentially very quick birds are view or 2 lectures on the whole thing. It does not really do justice to subject, but other hand, it is enough for us to kind of understand, the implications of the electronic commerce.

And how these are all useful in electronic commerce. Because, we are more interested, later on in this course, electronic commerce. Because, system analysis and design today, is not restricted to a single computer. Because, restricting to a single computer is extremely constraining. Today, no computer is isolated, every computer is connected to every other computer.

So, organizations also work with LAN’s in their own organizations. So, many of the modifications, they are taking place in the design of information systems, have to keep in mind, this new fact. Namely the interconnection, in communication between computers. And we also have to be concerned, about the fact that, once you have interconnected

machines, of not only a single organization. But, multiple cooperative organization, we had to have proper standards of communication. And proper protocols and so on.

And is also the emerging technology, called web services. Many of the software services, are offered by companies on the world wide web, available to you. Like they are providing things like accounting packages. Available as a web service. So, you can get down to that web, to their accounting package and pay by use. So, is a lot of transformations, which really taking place in the area of systems for organizations. The way in which computers are being used by the organizations, is undergoing a shift.

And we will see probably in the next 5 years, a new emergence, the new paradigm or new method of actually using computers. And appropriately new methods of designing systems, for this changed world. So, I think you should be aware of these things, because in your working life, which will be next time probably to hopefully 30 years or so. There is going be a lot of technological changes. And you got to be continuously update it and keep yourself up to date.

And that requires, you have to kind of a at least an appreciation at this stage of where these networks and so on going. And that even though the basic ideas of the system analysis and design, we have been talking about are still important. You got to be kind of looked at, from a slightly different perspective, of being able to provides a web service. Like for instance, we got web service available to check your decision tables, for logical correctness and so on.

Then, you will actually logon to that web service and use that. Instead of doing your own work, your own checking and so on. So, will be an assistance which comes from the web. And it will be economically in the long run, here if you have to pay for it. See that the points, which you have to keep back your mind. While working in the industry, in terms of new trends, which occur all the time. And our field as we know it is very dynamic.

And it is never, it is not static. And it continuously unlearn, what you have learnt and relearn new facts as we go along. So, I am going to now talk about, another important topic, which is there. Whether it is going to be a network, or whether it is going to be a single computer, or whatever it is. This is the importance of control, audit and security of

information systems. In fact, the security of information systems, becomes lot more difficult and important.

When you go to a network of computers. In network of computers, when computer connected to every other computer. Security issue is become a very very serious issue. Mainly because of fact that, people easily snoop on the... And there are the people who are who can hack on the machines, and get data which does not really belong to them. And it may can trade the data. There is been lots of frauds, which are being committed all the time using the internet to kind of raid banks, account numbers and stuff like that.

Similarly, credit card companies are forever, alert about somebody breaching their security. And getting in to their website. And steal credit card numbers, password and stuff like that. So, I think it is extremely important. To worry about not only security, but auditing. In other word, auditing something breach occurs. See actually if a breach occurs, somebody has done a fraud, we are able to track down the fraud step.

So, you must have an audit trail, which is called. Other words, do you able to pin point, who did it at what time he did it, who often he is done it. So, once you can pen it to a particular person, you can take, you can actually app depending up on the kind of thing he has done. He may even be sent to jail, if he has done a fraud, of financial type he can go to jail. And new information technology act, even says even that if you hack in to somebody else's website. And alter that website and is do some damage, mischievously, not necessarily to steal, even then you are liable to 6 months in presentment.

So, there is a serious offence. So, audit trials are very important. And control is the, what you really require is controlling the make sure, that you put in enough of a safe guard, in the design of your system. In such a way that, such frauds that are minimized. In other word, even some frauds occur or some mistakes occur, not necessarily fraud, an error. In data entry or error somewhere, along the line occurs, that error has been detected early in the life cycle of the system.

So that, the error does not remain there and propagate further. So, control is an important part, what control should I put to avoid problems.

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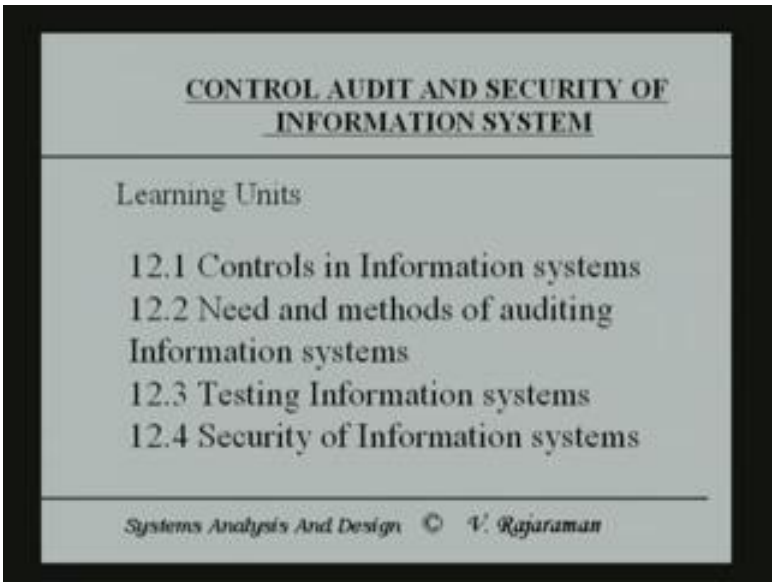

We need methods audit and testing of information system. Whether information system you deliver, is you make as per the specifications or not. And security as I pointed out, so what will learn about these are these.

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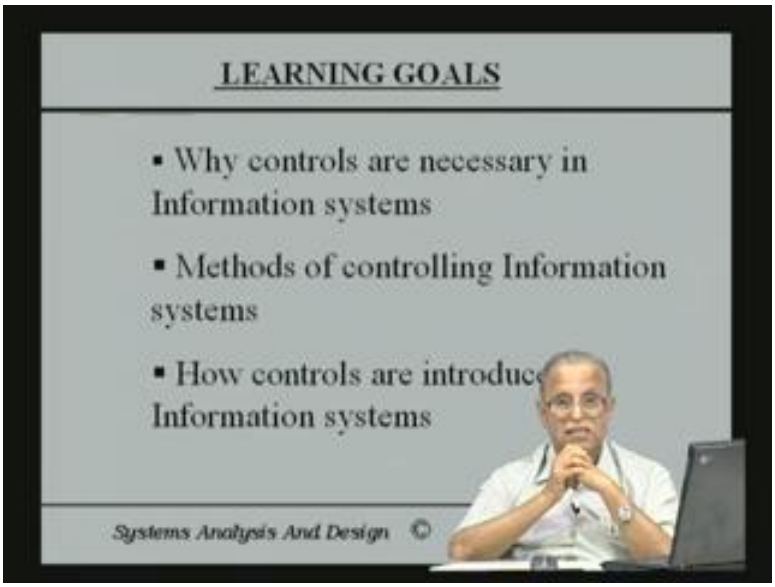

Since, the primarily we ask the questions, why controls are necessary, in information systems. And how to, what methods are used to control information systems. And how to control, that is why it is required and what are the methods available; and how to

implement those methods. ((Refer Time: 37:00)) And apart from similar questions, we will ask about auditing.

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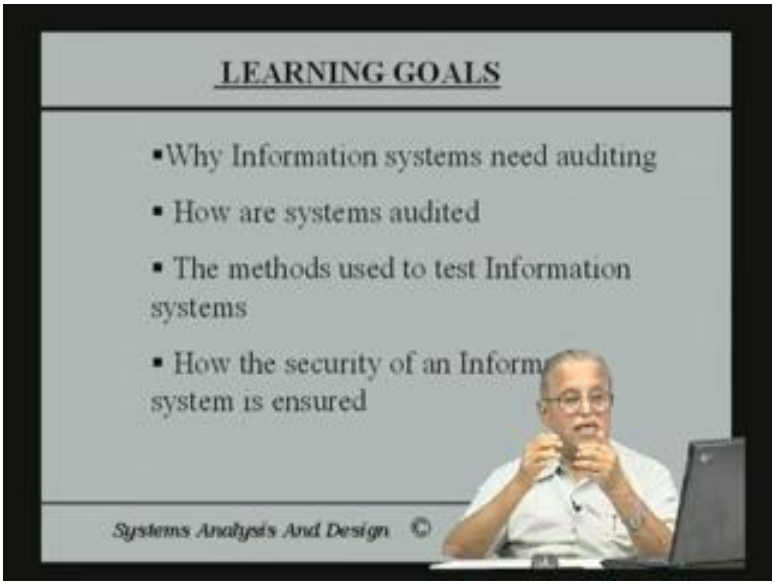

Say like the, for instance we talked about control. Similarly, we talk about audit, why they require auditing. How are systems audited, the methods used to test information systems. And how the security information systems ensured. In other words, similarly what are the methods available and how to implement them. Are all common method that it is control or audit or security, all three topics we have to ask the same questions.

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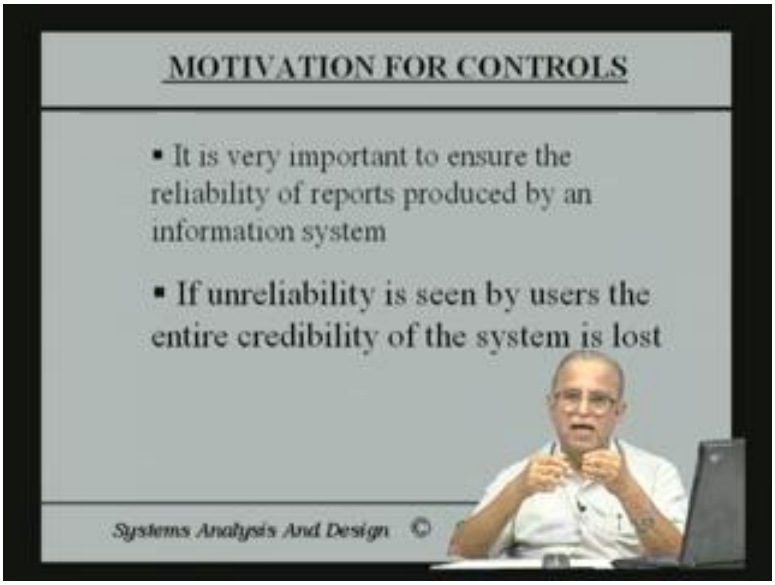

And as I been pointing out, it is very important to ensure the reliability of reports produced by an information systems. If unreliability report is seen by users, the entire creditability of the system is lost. This is as I pointed out very often exam results, if a mark sheet is a wrong. Wrong sheet goes to a person, apart from causing, unnecessary hardship for the students. It also reflects badly on the way in which the system is designed, to give a wrong information.

So, people completely loose there trust on the information systems, or the computer. They always start blaming the computer and not the person, who design the system on the computer. Computers would not make any mistakes normally. There is no hardware mistakes, which are made by machines. In other words, no additional mistakes are normally made. Whereas, mistakes are in programming, in data entry are made by people. So, you got a guard against peoples weaknesses and that is what the whole thing is about.

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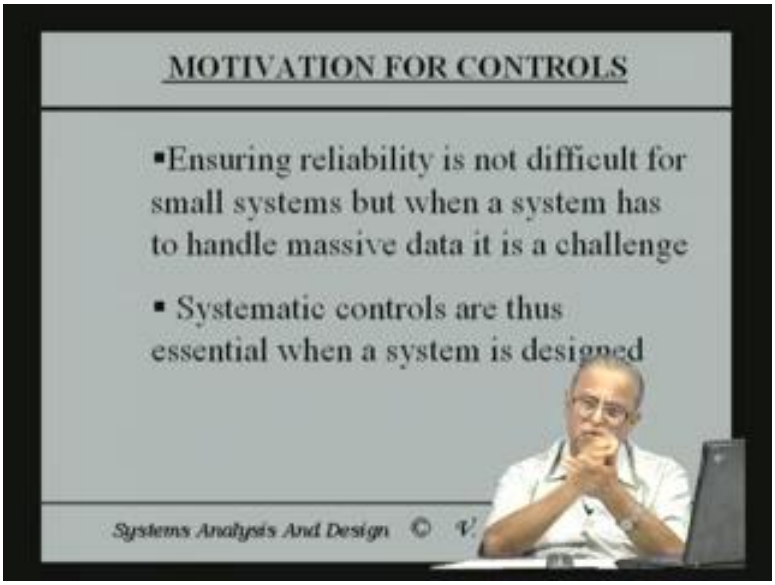

Ensuring reliability is not difficult for small systems. Or small systems, you can essentially go through a walk through and two people can look at it and so on. But, it becomes million lines of code, it becomes important to have systematic controls.

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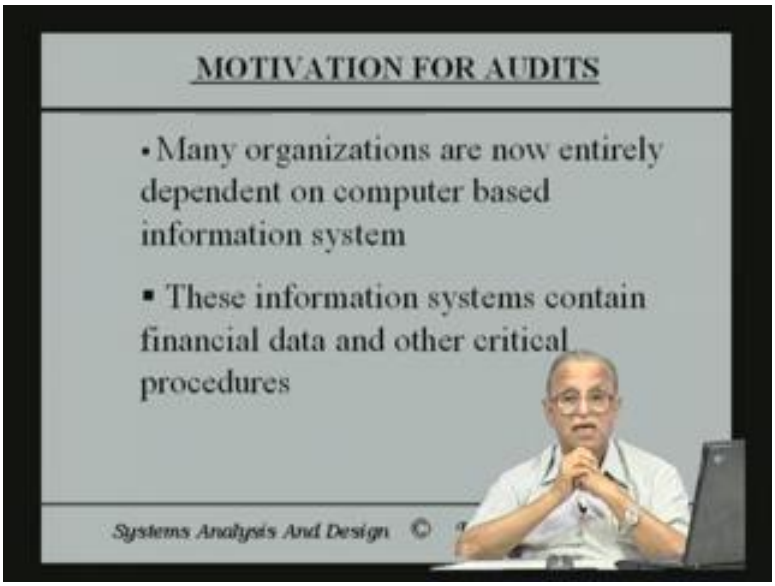

And so for the large systems, designing a large is quite different role designing the small. Many organizations, companies are entirely dependent on computer based information systems. They are got rid of their manual systems. They are all based on computers. Because, everything is connected, everybody's desk has got a laptop or a PC, desktop computer. And there is a whole network. So, because of that, the dependence becomes very high. When dependence becomes very high; and also there is a lot of sensitive information.

Like financial data, in the case of engineering companies, their drawings and so on. Any companies got data, which is sensitive to them. There sales figures may be, and what their plans are in the future. Strategic ideas, lots of things, which are specific for the company. And all these things are effectively stored in a machine.

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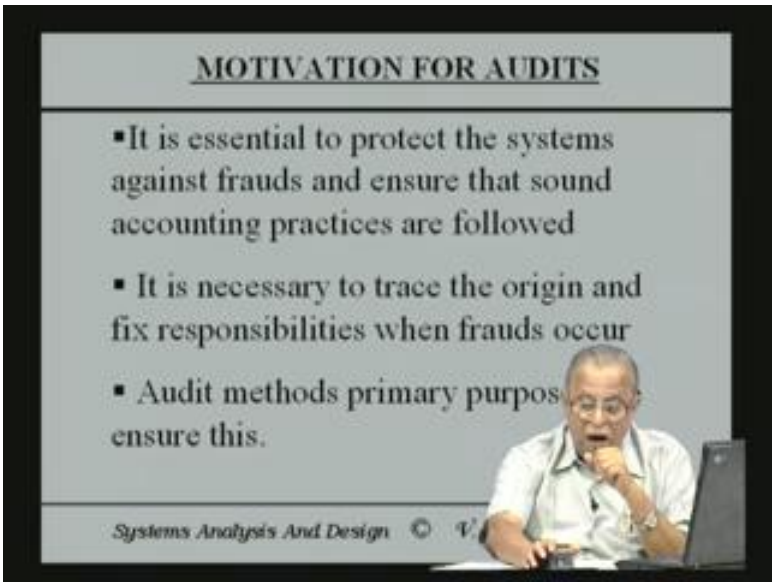

So, it is essential to protect the system, against frauds. And ensure that sound accounting practice are followed. The accountability as well the accounting. If it is a actually do with financers, you are of sound accounting policies. Necessary to trace the origin and fix responsibilities as I said, if the fraud occurs, audited primarily for this.

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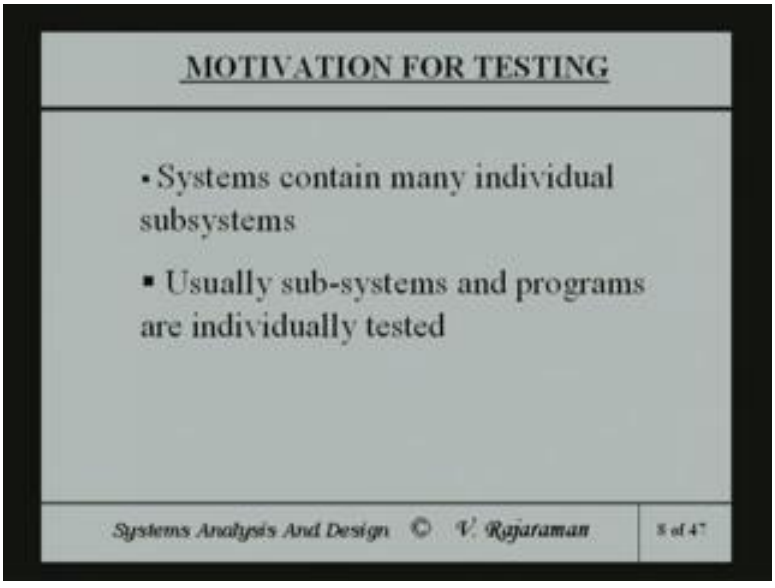

And a system contains many individual sub-systems. Because, it is a million line code, one monolithic system cannot really be handled easily. It will be divided into sub-systems or modules. Different people will design different modules, at least we all to be

link together. That is the whole motivation there object oriented modeling, which we looked at. Where objects are all designed separately and then, objects are link together as over components; to get the whole system working.

So, even though sub-system you work, when we link them together, to make a full system. It may have some fault, like a zigzag puzzle, you have a lot of thing which you had put together. The whole thing should look correct. And if you do not have that ability to put them together properly, then there will be errors in the final system. So, apart from individual sub-system, the entire system is being designed, as we tested.

And when the integration occurs enforce in errors, make ((Refer Time: 41:41)). So, before releasing the system, the entire operational system should be tested for correctness and completeness.

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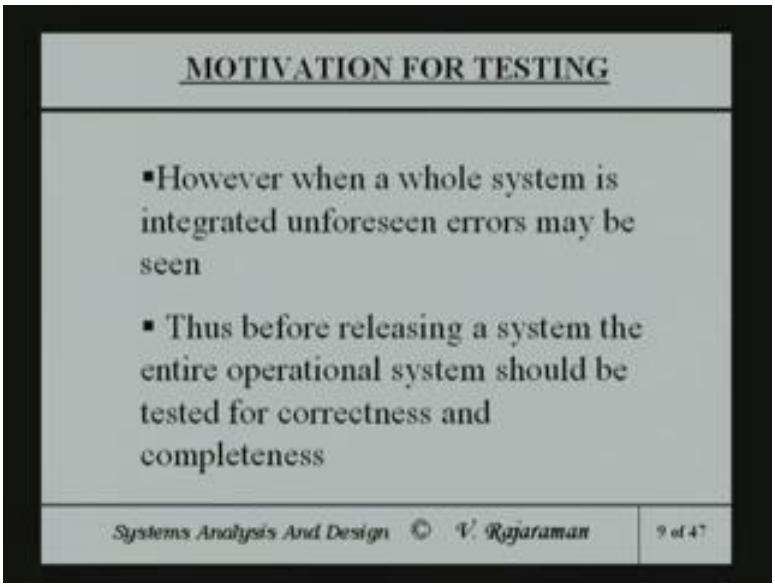

So, this is very important, but on the other hand, it is very difficult. So, people claim that, if you every system individually works, you have a higher confidence, that the inter connected system will work. But, you have to really look at the interfaces, is the system giving the right information required by the other sub-system. Is it interpreting it correctly, your question which you have got to be answered very carefully. In other words, if it is best isolate of them.

So, that error made by some other system, does not affect what happens in this system. So, each system should be self contained. But then, even then if some message or something comes here, they interpretation with that message; is it correct. That is what is important to kind of look at.

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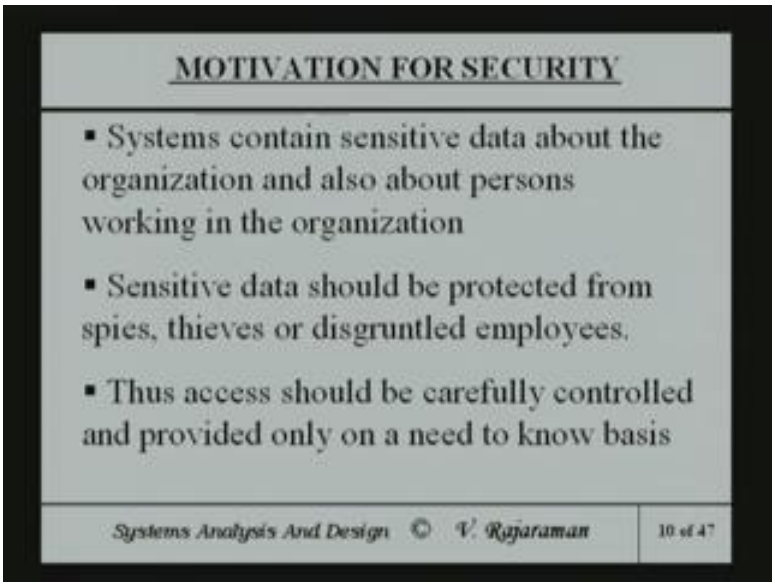

Systems contain sensitive data about the organization. Also about the persons working in the organization. That is not the private data, about people. And in hospital systems for instance, has been lot of data about patients, medical data. And in any company, there we have a data about the salaries of individuals. And in any bank, there will be a lot of data about the account holders. How much they have hold and what is their withdrawal and deposit pattern and so on.

These are all very sensitive. And will got to be very very careful about protecting them. From thieves, sometimes it is ((Refer Time: 43:30)) employees. Thieves are of course, fraud stirs to kind of take it away and try to sell it. That is seems to happening in our, many of our so called call centers and so on. We are all security conscious, then the call center employee can really steal some data.

And sell it to somebody else and this is being happening, in the last few months. There have be in paper news items and so on, which have brought out these and those credibility of those call centers. And so called BPO, that is Business Process Outsourcing

organization. Depends very much on ensuring privacy. And ensuring also security or whatever they are actually assign to.

So, it is extremely important to worry about the fact, there are employees who kind of has ((Refer Time: 44:32)). There are outsiders who tried to get into your system and steal and lastly they are ((Refer Time: 44:40)) employees. Somebody who are happy is about to leave you and so on. And he intentionally kind of corrupts, some staff as a revenge for whatever he thinks, has be the wrong communicating ((Refer Time: 44:55)) and so on. That is and these are all human qualities, I mean also done human beings are our own weaknesses.

In the weak moment he may even sell it, otherwise he may be a very honest person. So, the point really is the system designer, has a responsibility to make sure that... Because of the human weakness, if something is done this detected. And first of all you prevent it, prevention is lot more better than auditing. And finding out who do and fix responsibilities and so on; where the first step you have to prevent it. And if you unable to prevent it, then only you have to worry about.

If you do not prevent, how do I fix responsibility who has done the fraud. So, if you go, so the I want to point out that the most important thing is to make sure. If the proper controls that you prevent it to begin with. And so that is essential what the controls are all about as. So, access should be carefully controlled and provided only to persons on need to know basis. You should not allow unnecessarily people to get into data bases and so on. For which they have no business to get into.

And also sensitive databases where they are stored in disk and so on. They got up encrypted, unless they are encrypted or garbled. Otherwise, when somebody retrieves it by either desire by mistake, you can get across data which is no business to get into. And only people who were authorized will be given the decryption key, to be able to decrypt it and use it. For whatever the user want to make it. For only for people who are doing; very often the encryption and decryption is done with finger prints.

And finger print readers are now widely available. And you just put a finger print, only if you put a finger print, the database gets decrypted. So, tomorrow you cannot say I did not do it, because you are your thumb print is there. And the time at which you logged on is there and all that is there in the machine. And so you have been watched continuously

by system. These kind of things are the what is required ((Refer Time: 47:26)) design to prevent.

Because, if people know that, they are being watched and whatever they do, they will be detected sometime or the other. Then, they will be much more carefully, they will not hopefully it will prevent them from doing the fraud. So, the fear of going to jail, is what keeps a lot of people honest. So, it is the same way, in this case the fear of being caught is also as important, as when they want to design a system. So, you put certain amount of apart from responsibilities of course, people suppose to have. You also had a put along with some little bit of controls. So, that is also some might say audit trial you.

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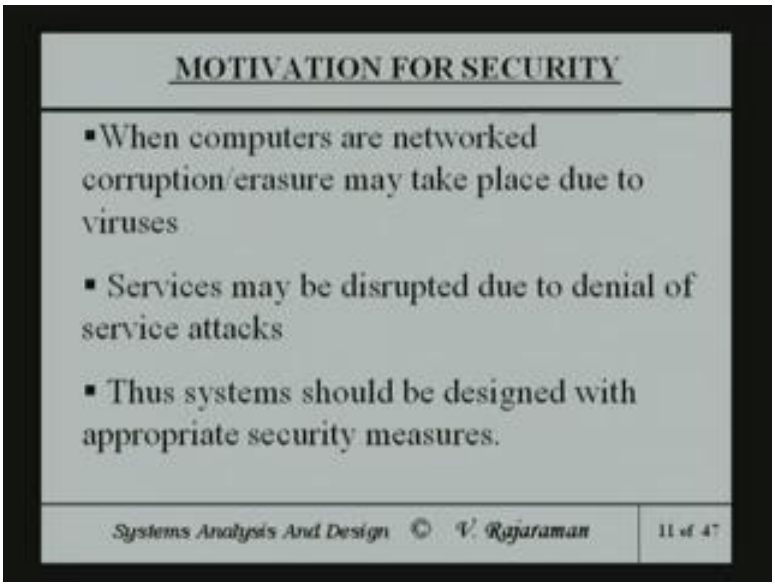

Computers are networked corruption, erasure may take place due to viruses. Viruses are ever present problem in a network of computers. So, you have to make sure that, viruses do not get in. There is also something called denial of service attacks. In other words, what they try to do is, if you are doing e-commerce or using website, the send other computer generates thousands of enquiries. So that, legitimate users cannot get in to your site.

So, in other words the fraud stair, has really denied legitimate service to your other customers. By effectively keeping your space engaged, analogy would be like somebody, if they want to make your telephone inoperative. What the person can do, is to call you and not hang up. That becomes more or less, the kind of or held up, because you put

down. And then, you can give continuous, he can be having a machine to continuously call you.

And keep your computer engaged. So, that somebody else wants to legitimately call you, he cannot call you. Because, your computer telephone is always engaged. Because of somebody's fraud, being a fraud, like repeatedly calling your number and with no message. The call comes from the computer, you pick it up and there is no message just a whistle and then, you put it down. And immediately another call comes, it can be a nuisance.

Same way, somewhat like a denial of services, something similar to that. In other words, they are fraud with a lot of enquiries by a legitimate people. Systems should be designed with appropriate security measures.

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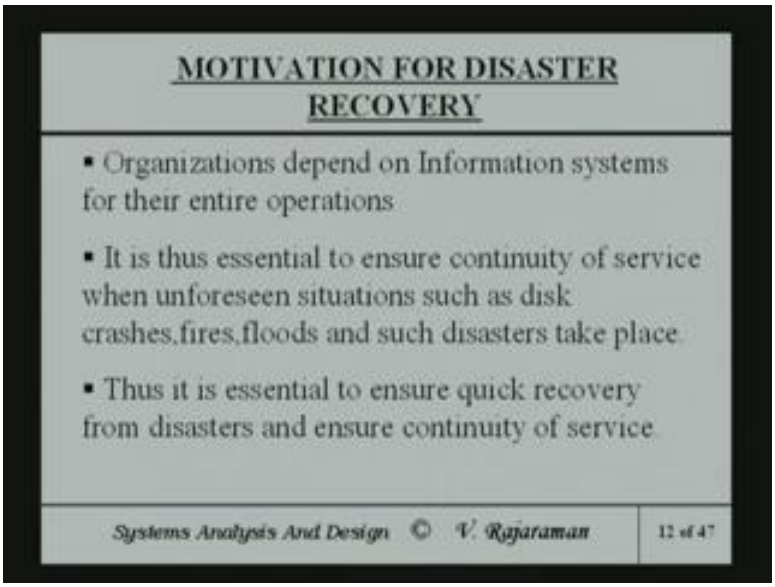

And is one more thing, which is very important nowadays. There is disaster recovery, disaster recovery is something which is essential. Like for instance, last year in India, there is a lot of disasters. There is a earth quake in Kashmir, there is a an earth quake in Gujarat, there is a flooding of Mumbai. In fact, lot of computers in the suburbs, computer centers are all flooded. And computers became in operated. And of course, everybody talks about the 9.11 as when the world trade center was destroyed.

Whole lot of computers, in that building belong to many companies, banks, insurance companies and so on, all got destroyed. And so they have a problem of these disasters, you cannot force. That the idea flood, the floods in Bombay was supposedly the biggest floods were over 100 years. Similarly, floods also occurred in Bangalore and main places flooding occurred last year. So, these are all I am talk about, when I say last year, it is year 2005 there is a lot of disruption during the Monsoons.

And so the modulation depend entirely on a computer, when such a disaster occurs. They must have business continuity plan. In other words, there service should not be disrupted. And the databases should be protected. So, there are two situations, one is you must have continuity of service is called business process continuity; and also some archiving. So, that you can recover your databases and so on.

So, it is essential to ensure quick recovery and disasters; and ensure continuity of service. So, there are many levels, depend up on the criticality of your operation, you would get into different levels of disaster recovery. If you have a airlines reservation system; and the reservation system is down for 2 hours, people have lost lot of customers. And so one would like to have a system thereby, even if there is a failure of a major server. Then, some other server takes over.

And continuous the service for you, so this kind of thing which you make sure and disaster recovery. So, primarily then we see that, the requirement for control, requirement for audit and requirement for security. And also part of security, disaster recovery, you might say something like, one aspect to security. Security one aspect is of course, protecting the other aspect, protecting is intruders and so on. The other is protecting us natural calamities, both are important.

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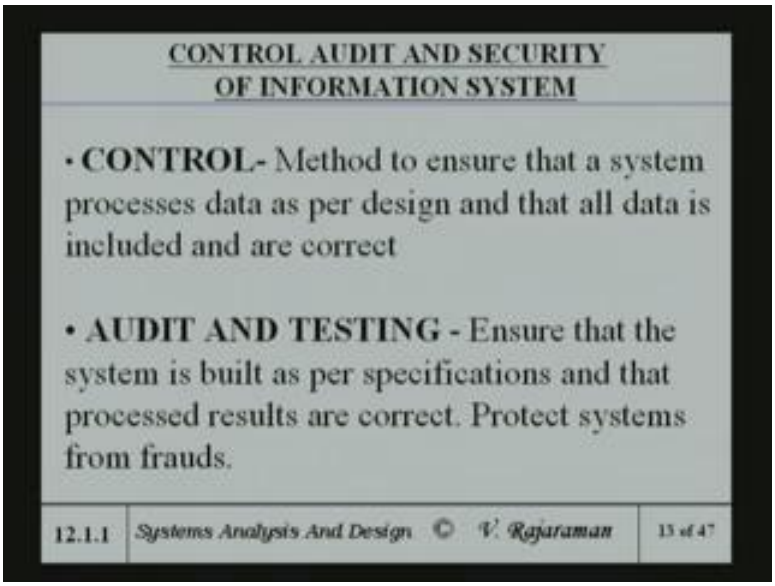

So, control are methods to ensure that system, processes data as per design. And that all data is included and are correct. So, very often some data are left out. Like when you are entering data of lot of students, who exam processing results come. If you leave out a few students, the results would not be declared. And we got really worry about, what happen particularly is badly affected. And you have to make sure that, all the data is included and that all data is correct.

Audit and testing ensures that, the system is built as per specifications. And that processed results are correct; and protect systems from fraud.

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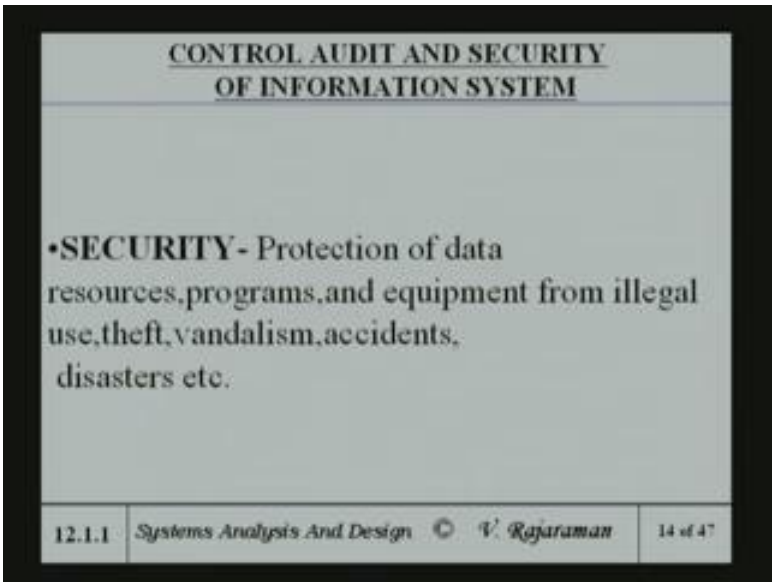

Security is concerned with protection of data resources, programs and equipment, from illegal use theft, vandalism, accidents, disasters, etcetera. So, we effectively have security, audit and testing and control. These are three aspects, which are very important.

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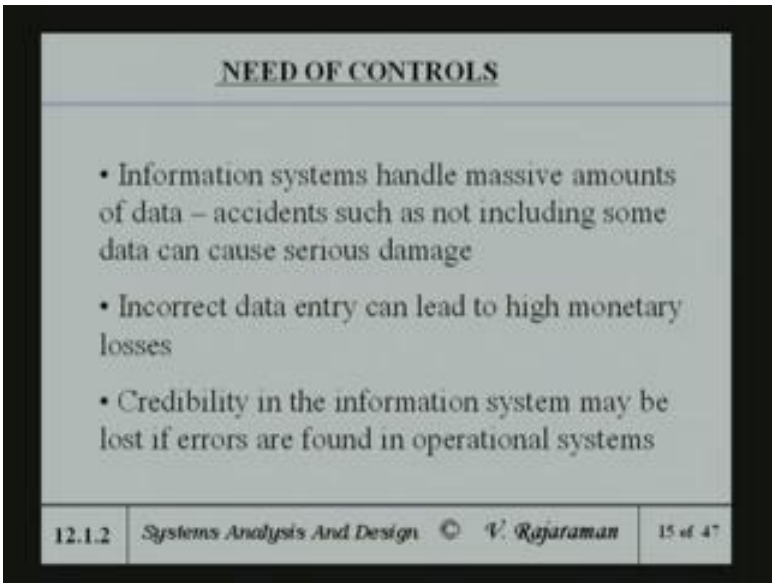

As I said information systems handle massive amounts of data, accidents such as not including some data can cause serious damage. Incorrect data entry, leads to sometimes high monetary loss. Suppose, somebody enters in a bank, data entry is 1000, 1 lakh is a huge loss. Now question is who is going to bear that loss. Credibility is also loosed,

suppose you withdraw 1000 rupees. And suddenly if I am with a lakh of rupees wtih somebody is, it shows a lakh of rupees withdrawn.

Of course, you do not have a lakh in your bank, then immediately say the computer is made a mistake. Even though the program is not correct or the system is not correct.

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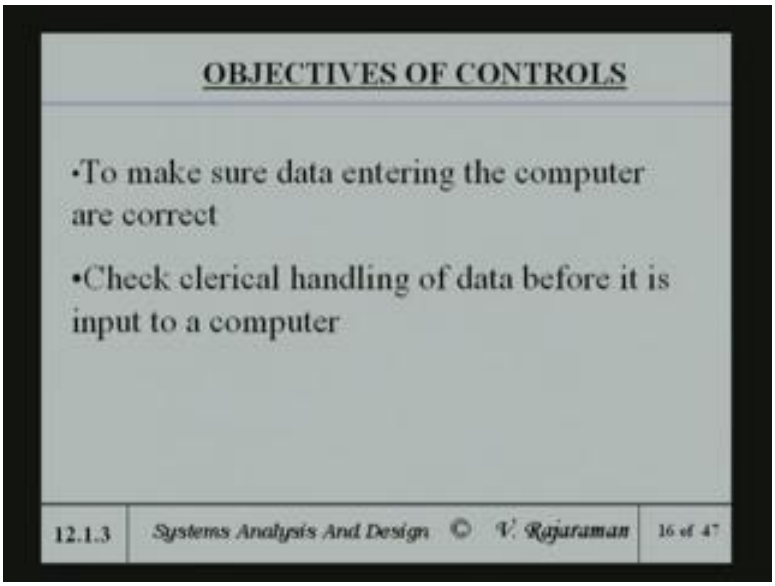

Controls to make sure the data entering, the computers are correct. That is what you have to make sure. Check clerical handling of data, before it is input to the computer. Any mistakes in clerical handling, after all this is union problem.

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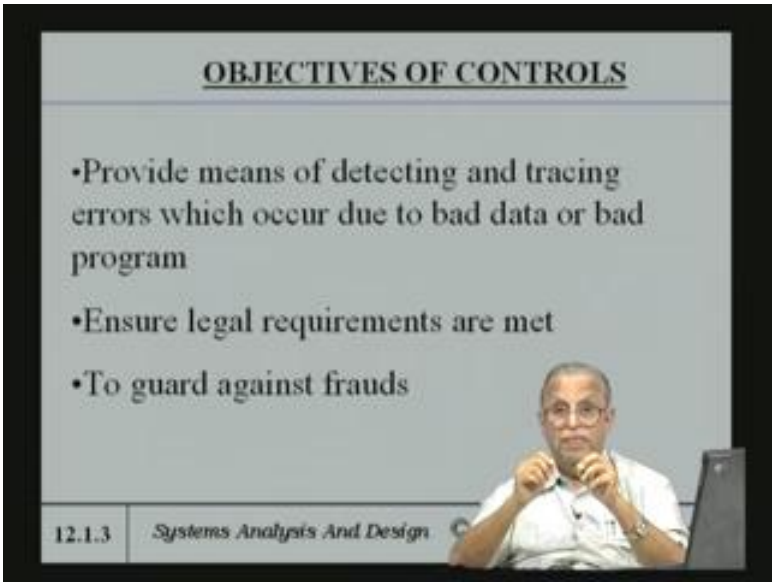

Provide means of detecting and tracing errors, which occur due to bad data or bad program. It can be the errors can occur, because of bad data input or bad programs. In fact, the common saying is garbage in, garbage out, a program may be correct. But, if suppose you feed wrong data, you get answers will be wrong. Ensure legal requirements are made, very often the legal requirements which particularly the banking and so on.

Where there is an requirement for regular audit. And in some organization, there is a public audit. So, the system should be designed, so that it is amenable to such audits. And all the legal requirements are met of course, to guard against frauds.

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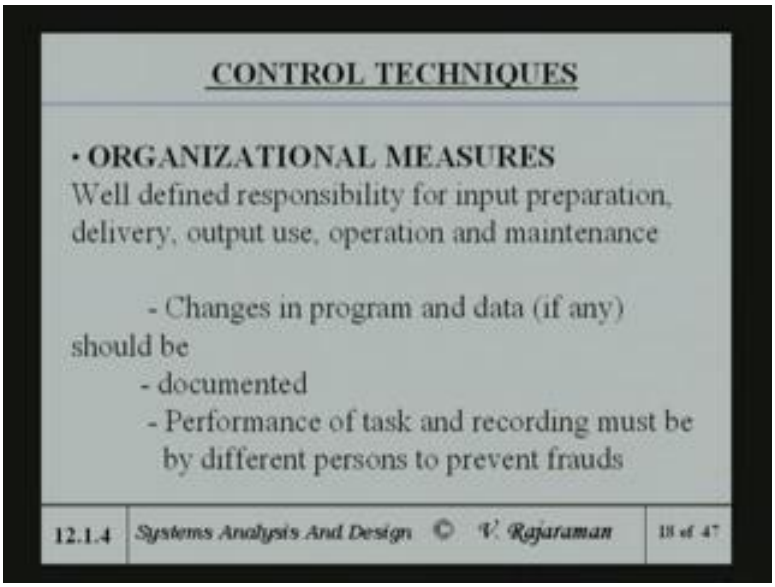

Many techniques here available, for control. First of all there is something called organizational methods. In the organization, you must have well defined responsibility, for input preparation. It is a growth for input preparation. And they are well trained for doing that. And you have to make sure that, when this preparation is done at the end of the preparation, they correctness the prepare data is checked. Any error is automatically detected.

Delivery of that data, output use, how is the output use, operation and maintenance of computer. Operation and maintenance of not only the hardware, but the application software, which is running on the machine. Because, they are mainly concerned with the application software. If there are any changes in the program, it may be due to some requirement changes.

But, any changes should be documented, because it could be a fraud somebody change the little. One must change in the program to debit, rather than credit. And that can play havoc, so plus instead of minus. And so any kind of a change has be documented. And let us call trail, who made the change, when was it made. Performance of the task and recording must be different persons to prevent frauds, banks follow it regularly.

In other words, in fact they have double account entry and so on. And for instance, when the cheque is entered by somebody. Somebody has checks the balances at the end of the day. Particularly, for cash transactions and cash beginning at the end or responsibilities of two different peoples. See it is counted and given and then, counted and taken back by different person. And not by a same person. There are the control measures are techniques which are used.

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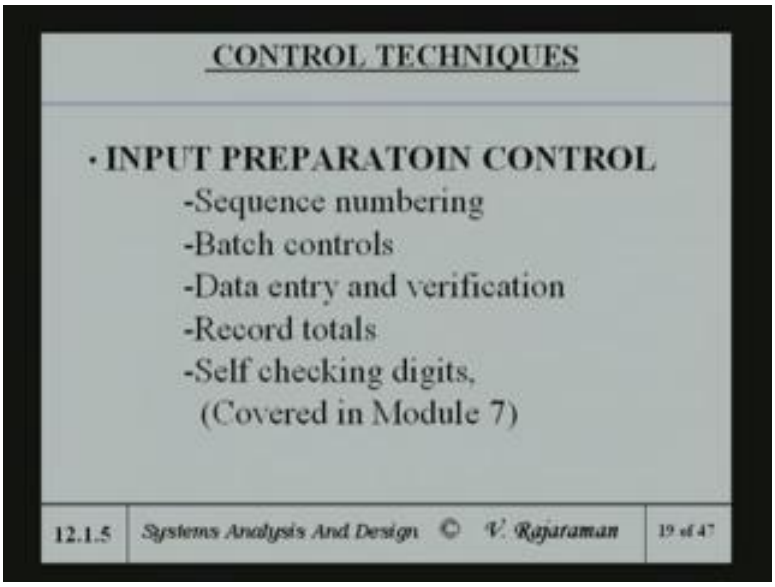

One is called input preparation control, where you have sequence numbering. So, if you list anything in a sequence numbering, we will tell you what you are missed. There are batch controls, for the whole batch. And data entry and verification. Whenever data is entered, somebody also enters it. And the two are compared and verified. And there are totals of a records. And self checking, there is self checking codes we talked about in earlier case.

In other words, the checking of numbers so that, it essentially input is correct. So, I come back to this again next time. And look at the input preparation controls, in great detail. Because, we are running out of time today. So, will see you next time.