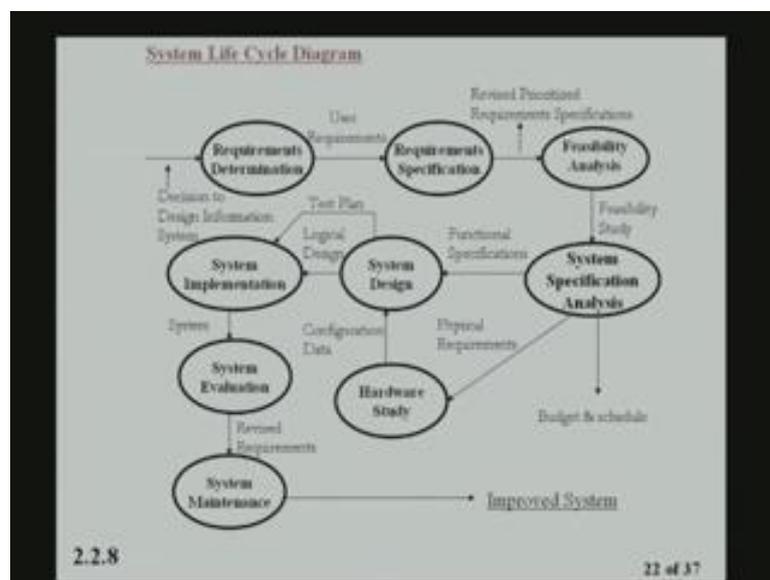


**Systems Analysis and Design**  
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**Lecture -08**

Last time, we looked at the 9 steps in System Analysis. And we will continue this time, first by looking at an overview of, what we discussed last time. And some additional points, I want to make. So, let us just represents these steps as a graph.

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This graph essentially shows the flow of various events, which happens, when you start systems analysis. This module consists of first starting with requirement determination, then specification, feasibility analysis, system specification analysis, system design, system implementation, system evaluation and system maintenance. Of course, as a part of specification analysis, we are there hardware study also.

Now, the way in which the graph is shown, it looks as though, it is one of the other of the other. That is why; this kind is known as a water flow or water fall model. But, actually in practice, it is never a straight line. In the sense that, you never start 1 and go to the next and do not look back at what happened earlier. For instance, you start off with a requirement determination.

Requirement determination says, primarily has the purpose of finding out, what the requirements are for the company, which need to be computerized. And when, you go to specification, you may start specifying. It might turn out, that some of the requirements, which was stated in the determination phase, may become not so relevant in terms of priority of the organization.

Further, if you go to feasibility analysis step, what might happen is that, what you consider as something which is required may not be feasible with the current status of the organization. So, you really have to go back and forth. In other words, when you get the feasibility analysis, you may find out, that certain types of analysis requirements, which you specified.

Even though, ideally, one would like to have it, it may not be possible within the cost constrain within time constrain within the available people and so on to implement. So, you got to prioritize and go back and re talk to the person, who are in organization, which wanted you to computerize some other operations. And tell them, that may be, this is going to be too expensive or take too long time and it is not going to be feasible and so on.

And similarly, when you go to the system look at hardware study and system design, you may again have similar situation. And so, you really have to kind of though in some sense, back and forth. That is each step, you complete and take a re look at what went on earlier and decide, whether what went on earlier is appropriate. If you find at any step, that there is a difficulty of implementing, what is expected to be implemented? Before, you start actually implementing, you really have to go back and change it.

Because, once you start implementation, you committed yourself. And there will be a lot of money spend and many projects, which are taken up by software companies, get into this difficulty. There is, they get into implementation too early, without doing proper study and when, they are through half implementation, they find out all difficulties. And so, there is so called cost overrun and the time overrun.

And this point is in fact, made very effectively in a book called Mythical Man Month. The book is written by an IBM Engineer, who was primarily in charge of developing large software system. And he said, the Mythical Man Month always they think, that one

man month is required to do this. But, it is only an imagination, when they estimated it, the estimate always come in correct.

In other words, whatever actually happens, takes much longer than what they talk, it will take. In other words, it turns out, that most system analysts and software engineers are over optimistic. They are over optimistic and they think, they can finish certain things in certain time and they are not conservative. They have to be conservative. So, the lesson, which is being learned over the years, is that, do not ever under estimate the effort time and money involved.

On any company, which is able to do a reasonable estimate of time, cost and so on is the company, which is going to make a profit. Otherwise, company is going to go under. And also, get into serious difficulties, in terms of the contracts and so on. So, the point, I am trying to make is that, this module, where I looked at each step, one after the other is not entirely the way, it happens in practice. And that is why; they talk about, so called spiral model.

That is, you get to some step and go back and review the previous step. And continuing the review at every stage and of course, the final review, definitely takes place, at the time of system evaluation. At system evaluation time, lot of things will come out in terms of, what is expected and what was actually achieved and what need to be changed and so on. And so, after certain time you have to go back, may be redo a lot of things, which you did earlier.

That is somewhat like, the situation in building a house. Even in building a house, there may be a clear plan at the start of the project. But, as you proceed, you may find, that the cost of items have gone up, you are going through a budget over runs and so on. And so, house owner may have only limited budget and he may stop at that time to reduce his requirements.

So, instead of using, say granite for the floor, he may decide, let us go and use mosaique or some other cheaper material. On using certain kind of expensive paint, use a cheaper paint. In other words, in all these, in all real life problems of making any complex system, there is always intermediate review, while the project is going on. And intermediate reviews will require revisit of earlier steps, which has done.

So, these are points, which you have to always remember, when you look at the so called system life cycle. The whole idea of a life cycle, I illustrate is to be able to kind of have some mile stones. That is for each of this, you decide certain amount of time, you allocate. But, they have mile stone and that mile stone, effectively assess progress. So, once, you assess the progress, then you can say, whether you are over time or under time, in terms of the time, you allocated for the project.

So, in that point of view, it is important to have the steps and but the steps, as I said are not really all that water tight, because, one will run to the other. But, primarily the idea is only to have some method of having clear understanding of the important steps to be followed, before you come to the final implementation. So, this is the entire process of going through a preliminary systems analysis.

Now, this analysis is done normally before actually implemented. In other words, there are two phases in any project development. And also, there are two types of software systems, which software engineers and computer scientist, normally would be designing, during their professional life. There are, one is called as software services. What is meant by software services is that, you go to an existing company and provide them information system or services to improve their operations. So, that their profitability of company improves.

So, in other words, you are actually within codes, computerizing the operations of the organization. Like for instance, in the case of Indian railways, the implementation of the entire reservation system was a beginning of the computerizing the operation of the railways. And it let to other side advantages, which made it possible for the railways to take tactical and strategic decisions and so on.

So, the point is that, these are the, you go to an existing organization and you try to either, if it is not already computerized, try to give them computers. And computer systems to do their business better or if they are already got computing facility, try to improve that system in view of the changes in technology. And newer systems, which has come, which continue to come.

For instance, simple example is, in the case of this retail industry, retail industry what I mean by that is, company like world mart, companies like food world in India and so on. They are very large retail shops. And when, they first computerized, they are using bar

codes for the products and so on. The bar code is used to scanned to get an idea about the product, the costing product and creating the bill and all that.

And now, the bar code is being replaced by new technology called RFID. That is Radio Frequency Identification. For instance, using a bar code and scanning it by hand, there is a small chip, which is entered into the product. And when the product passes the counter, where the bill is prepared, that is read wirelessly. And automatically, bills are prepared. So, that there is no need for human intervention.

So, this RFID tags are becoming in expensive. So, that means, these retail shops now are asking, shall I change my bar code system to RFID system. And go to the RFID system and in what way, it will improve my operations. Same way, so called logistic companies, like companies like, you know the professional courier or fedex, fedex is one large company and DRT C in India and so on. Many courier companies, which take packets and letters and delivers to home and so on.

So, the tracking of that and making sure, that delivery takes place within a certain contracted period is the require management of the packages from the time. They get it from the customer to the time, it is delivered to the intended addressing. So, this tracking is all nowadays done by using computing system. Previously, it is not being done that way.

So, there also, the technology is changing with the coming of internet, they are looking at different methods of tracking. And they provide on the web information for any customer to find out, given his package number, where it is currently in the chain. Whether, it is in the plane or it is arrived and things like that. So, you can actually track, even the customers can track and customers are normally do not track letters.

But, did you track, if they send something very expensive or something, which required you urgently. So, these things, what are the ones, where the software services are utilized by companies. The other very important area is called software products. Software products are systems, which you use again and again. Let may, for an example, word processor, it is a software product. The another software product is say, compiler for java or an operating system.

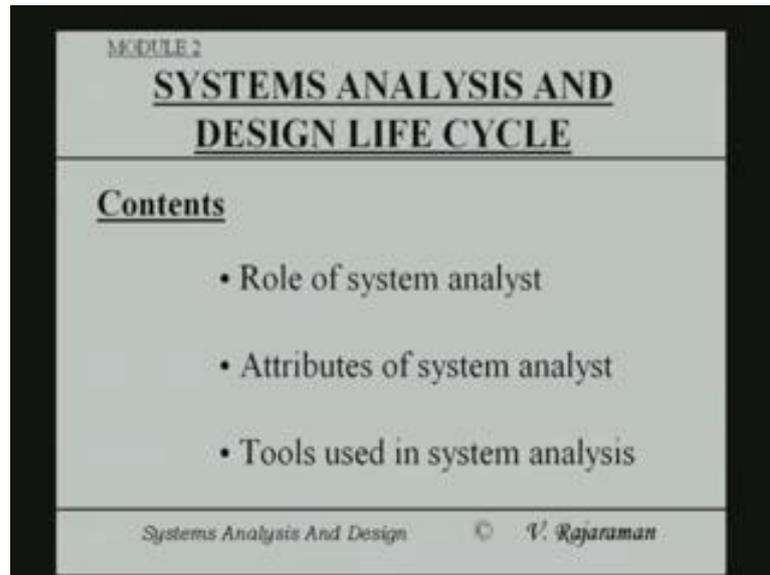
So, these are all products, which will be used again and again. Also now, new products are coming, like accounting product. That is, there is a fix accounting method, which is used and there is a product, you can buy and implement. In other words, instead of tailor making you have got ready made come things available, which some modification can be usable. So, these are kind of products, which are coming. The whole are security products, which are now coming.

To make sure, that whatever information is send on the network is secured. So, these are the types of products. The product life cycle is entirely different, from the life cycle, which you talking about for services. At this time in India, it turns out, that software services dominates. In other words, almost majority of companies, such as large ones like T c s or Infosys or Wipro all of them are primarily about, may be more than 80 percent of the total revenue comes from the software services, they give.

That means, 80 percent employment of Computer Science graduates will be in servicing industry. Even though, we are trying to get into the product industry, that is somewhat more difficult and also it is, in fact, more profitable. So, that, at this time, they are not yet graduated to a product type in any significant way. There are of course, a few products like binding products and so on, which are there, which are being made in India. But, by in large in services for which you are known.

Now, in the services area, the major job of doing the system analysis of a company, which requires this software services is done by a person called system analysts. So, what you are going to look at now is, what is the role of a system analyst in designing a system and how does it interact with others.

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Now, a system analyst is in fact, probably the most important person in the process of system development and creation of the requirements. But, if you look at over all software services, there are many people involved in providing the services. They look at the way, which it happens. There are number of steps, you might say, again which software services company has to go through. Before, they actually deliver a software product. The first thing is of course, to be able to get a customer.

And be able to market your company, saying that, your company has got certain special; you might say talents or special experience to be able to do that particular software service, better. So, this is what is called the marketing part. That is, you have to market your services. The marketing part is really done by the managers, top manager. That is, who are in the field for the company for a long time?

In fact, the top managers, want to continuously look at the markets. The kind of look at the strategy and they detect, what are the possible customers and so on. And then, they identify the customer. Having identified the customer, they send out people. That is, marketing, you might say software marketing. To essentially tell them, what experience they have, what they can do and stuff like that.

So, there is a way, first important step to be able to establish some credibility of your group, in terms of being able to do the required service for the company. So, having got some kind of a contract or at least, first step or a you might say, foot whole into the

company. Now, you have to start looking at the requirements and looking at the in what way you can improve their operations. So, that, you can convince the management to take your services and improve their operations on a hopefully in a significant way.

So, you had to be able to convince them and show, what is the kind of profitability, they will get. And the cost, which will be involved in doing this and do a cost benefit analysis. So, this is the part, which normally plays by the system analysis group, which starts it is work. You can take example of from real life, from a different field, namely, again house building. There are number of different types of people involved in house building.

First of course, is that, the architect has to select the services. So, the architect has to know, who are the persons, you are looking for service architect. And the architect, normally would be employed by a person, based on the reputation of architect of having done a good job earlier or through friends and through may be websites, whatever. So, having found an architect, then the first step architects idea now is, to get from you, your requirements.

And be able to give you plan for the house as I pointed out and also interact with the engineer for construction to be able to get an estimate of, how much is going to cost you. So, this is something similar to the system analysts. System analyst is really equivalent in terms of the software systems, he has system architect. He has to a kind off. In fact, many companies call these people, system architects.

Because, they have primarily have a different type of a, you might say a knowledge and make up compared to the people, who are actually going to construct or implement. If I take go back to my example, in construction of a large building or house or whatever, the architect gives the complete architectural plan and cost estimates. So, that is the first step. And also that time, the materials, which will be used. And the time estimate or the time required to do it and all that, will be given by this architect.

So, once, the architect gives that, now a number of people come into that picture, later on. That is, there is an actually a structural engineer. Structural engineer will give you the structural drawings in terms of foundation and in terms of various pillars and so on. For a large building, the structural engineer is extremely important person to give you a stable structure, which is stand up to a number of things. Like, you know, earth quakes or floods and things like that.

And so, structural engineer gives you a structural design of the building. The architect does not have to be a structural engineer. But, the architect has to understand, what structural engineer is done. In terms of materials, he used and the architect has to able to tell the structural engineer, that there are some new material to come, which may make it somewhat cheaper to have that structure. And so, there is always a feedback between these two to decide on the structure.

Having come up with the structure, the structural engineer of course, may be hired by the architect or the architect may have the contractor. This contractor has sub contractors like structural engineers and so on. And this structural engineer is one part and having come up with the structural drawings. Then, you have the next set of drawings. You prepared in terms of the walls, the other materials to be used and the complete engineering drawing for implementation.

The engineering drawing for implementation is made by the civil engineers, who are also structural, who also can interact structural engineers. In fact, civil engineers also know structures. Same way, that the architect also knows structures. But, structural engineers are specialist. They know more about the structures. And then, once the civil engineers prepare all the plans, then they next step is to how work as, may sense the and so on.

Even, when in large buildings, apart from the structure, there are also other issues, which are involved. Like, you need to have an electrical system. So, electrical system means, air conditioning and lighting system and security system and whole lot of things, which go with electrical systems. So, there is whole lot of electrical contractor, electrical engineers, who do this electrical part.

If they are going to put air conditioning, you need to have an air conditioning specialist to be able to tell you, what is the heat load of that building going to be? And in order to maintain the heat load, what kind of air conditioning is required. And how much of tonnages is required and things like that. So, there is air conditioning specialist, who get into the picture.

And after that part, then there is a plumbing, water lines and so on. What plumbing has to done and plumbers get into the act. So, all these work, what you have to coordinate it, because you cannot start your electrical conduits. Before, you finish the walls, because normally the conduits are put inside the walls. So, there is always a step by step in terms

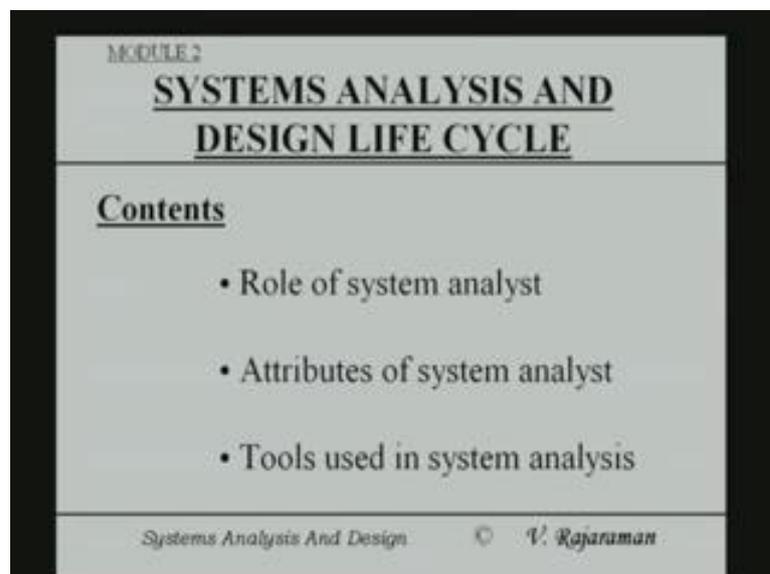
of the fact, that there are same thing, which can be done, only after certain other things are completed.

Like, unlike the foundation is completed and the pillars are completed, the walls cannot be put up. Unless, the walls are put up, the electrical conduits cannot come up. Unless, the electrical conduits come up, HAZY cannot start. So, there is a complete interlinking avoid is, so they work on a same kind of a chart, time chart, which is prepared by architect, giving certain times on each of them.

So, in analogy equivalently in computing, there will be specialist, who will be network specialist, who will talk about, what best network to use. There will be programming specialist, who know the particular type of programming system to be used. So, there will be data base specialist, who know, how well to design a data base. So, there will be a different types of people, who all have to cooperate, before you make up a full software system.

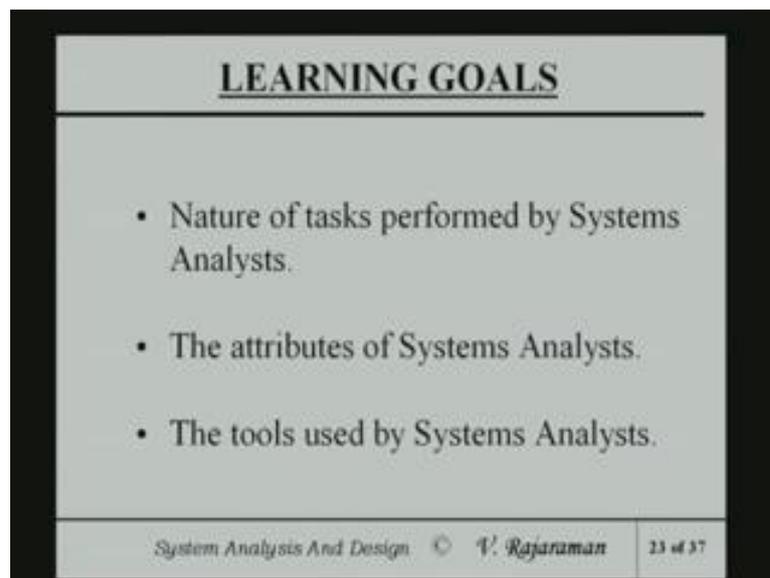
Just like, if a large building is constructed, the overall specialist, who have to really work together and they have to understand one another. One another to be able to without any type of a misunderstanding, which leads to time over flow or cost over flow, have a proper system design. So, this is the kind of situation, like which happens in complex software systems, just like it happens in complex large building projects. So, the role of system analysts is somewhat similar to role of marketing.

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And so, in order, the architect has got certain attributes, really system analysts must have certain qualities or attributes to be able to successfully or detect a system. And certain number of tools, you must use. Tools in trade, you might say, in order to do that, like architect tools or drawings. Scale models and estimations and things of that type.

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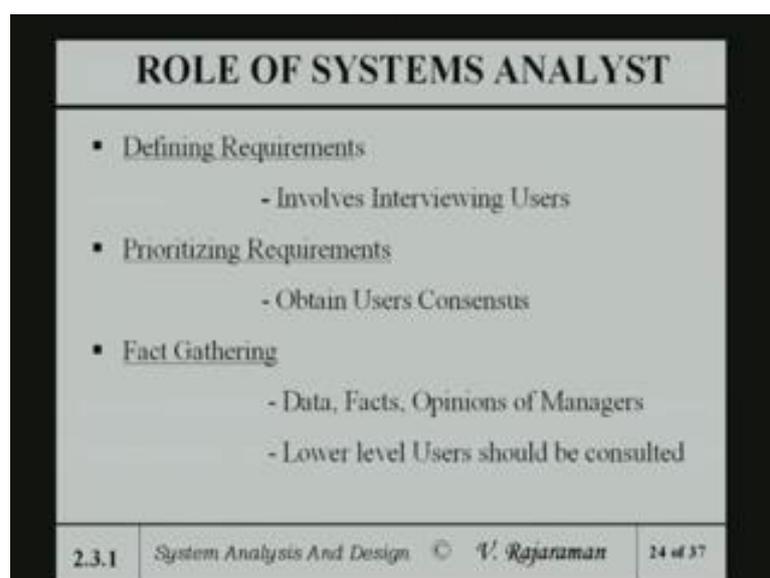
**LEARNING GOALS**

- Nature of tasks performed by Systems Analysts.
- The attributes of Systems Analysts.
- The tools used by Systems Analysts.

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So, we also look at the nature of task performed by systems analysts is attributes as I said tools.

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**ROLE OF SYSTEMS ANALYST**

- Defining Requirements
  - Involves Interviewing Users
- Prioritizing Requirements
  - Obtain Users Consensus
- Fact Gathering
  - Data, Facts, Opinions of Managers
  - Lower level Users should be consulted

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So, first step as I pointed out, in which the system analysts get into the act is defining requirements. So, defining requirements is a fairly complicated operation and takes a fair amount of time. In fact, the amount of time spend in requirement determination or determining requirements is well worth it, because, if you start the design and in the middle, you find that, you are not getting certain requirements or the customer. Suddenly, thinks about certain requirements, which you did not think in the beginning.

Then, you have to go back and redo a lot of things, you did. So, at the stage of requirement determination, it is good to spend a fair amount of time to find out and in inverse interviewing a lot of users. When, it is meant, when I say interviewing, you have to talk to people starting from the top managers to the ultimate users, who are going to actually operate the system like clerks and so on.

So, all levels of people, they are able to interview and prepare reports based on that interview. Apart from interview, they also have to kind of look at documents and re documents in the organization. Because, documents will give you the existing methods, they are using for cooperation. So, looking up documents, understanding documents, interviewing users, understanding, what they require and so on is the first part, which requires certain amount of journalist.

Who is able to have patience and listening and understanding, what one wants and then, prioritizing requirements, by obtaining the users consensus. In other words, there will be always confuting requirements and one has to kind of save, which are most important, which are not all that important. And within the con conflict, decide the conflux and we come up with a consensus, among the ultimate users of the system. To come up with the best possible prioritized requirements and which you will try to do.

So, doing, as I said, you have to gather facts, interviewing is one method of gathering facts. Facts, not only means actually looking at document and correcting data, but even things like opinion of people, what they feel and so on. So, there are lot of things, which are Hazy, which is not well stated. So, these are the ones, which are difficult and that is why; interview is required. Because, hazy requirements are the ones, which you find out while talking and as I said lower.

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**ROLE OF SYSTEMS ANALYST**

- Analysis and evaluation
  - Arrive at appropriate system
- Solving problems
  - Hazy requirements converted into specific requirements

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And after doing all these arrive at an appropriate system. Hazy requirement is converted into specific requirements. So, you come up with a just like an architect consult with a, what the architect considers the appropriate house for you or appropriate building for a company. That is presented to the customer and the customer has to give approve. Otherwise, you have to go back and change the thing.

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**ROLE OF SYSTEMS ANALYST**

- Solving problems
  - Suggest many alternative solutions
  - Quantify cost and benefits

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You have to suggest many alternative solutions. A good architect will not give you a single plan. The good architect will give multiple different plans. Because, there is no

unique way in which you can solve the problem. There are many, many different possibilities of different ways and one may be liked by your customer for no good reasons in terms of may be quantitative reasons. But, may be even bias. So, one may not be right.

So, within that, you have to give alternates. So, that ultimately, your user or customer as I say is a king. The customer is your, the person, who is going to pay you. So, you have to pay attention to the customer and whatever his feelings are in terms of the system. He feels the best require meet his requirements, quantify cost and benefits. This is part of the feasibility analysis.

Now, in fact, once you quantify cost and benefits, you again have to kind of, if you have alternates, for each alternatives, you have to give the cost and you have to give the benefits. So, that the user can make informed judgment, inform judgment is based on the cost benefit analysis and all the multiple solutions, which you gave. So, unless, you give multiple solutions, normally customers are not satisfied. They say, cannot you did in a better way or different way and so on.

So, very often the customer may also suggest. There is also another way, because after all system analysts is not a person, who is been with that company for too long. See the point is that, system analysts, today may be designing a system, for insurance company, tomorrow he may do it for hospital. Another project may be for a bank. So, over the professional life of a system analysts or system architect, he may be designing systems for many different types of organizations, hospitals, hotels, banks, insurance companies, transport organizations, logistic operations and so on.

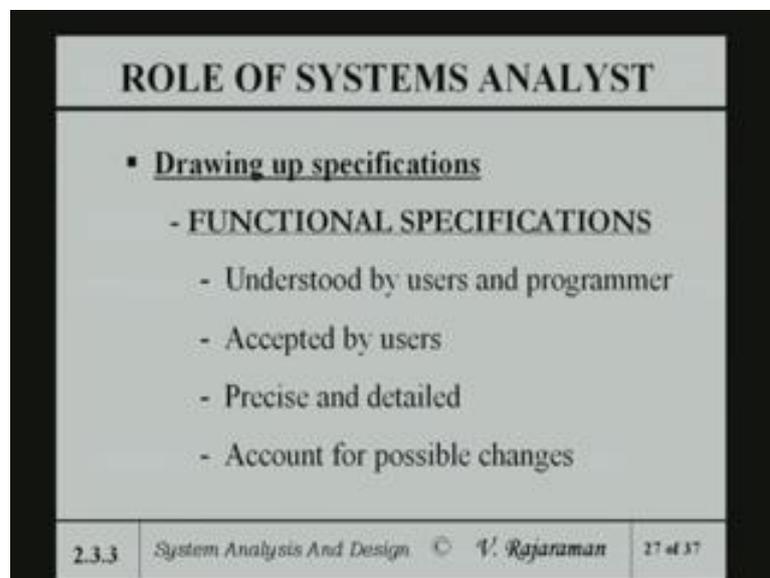
So, each of these companies and organization have their rare guns, which you normally will understand. So, you better you have to ask, whenever you get a doubt, it is better to ask and clarify. And many people use acronyms, which we do not fully understand. And acronyms can be expanded by the person, once you say that, he do not understand, what acronym means. So, these are the question, which you have to be careful with the analysts and because of that, there is both good good things and bad things.

If a person has gone through many different types of companies, he is not biased with the certain solution. If he is doing banks all the time will it for particular bank something, you try to kind of a duplicate for other bank and it may not be like the other bank.

Because, it is not a unique difference, which comes. So, there is always an advantage of having it being a generalist, who has an idea of doing different types of project on which the person is worked.

So, even system analysts also want their management to give them different types of project. So, that they will grow or they will learn more about this job, rather being kind of put into one narrow area, all their life. Because, it becomes boring. So, point really is which I am trying to make it is, you want to have multiple solutions and gives costly effective analysis solution.

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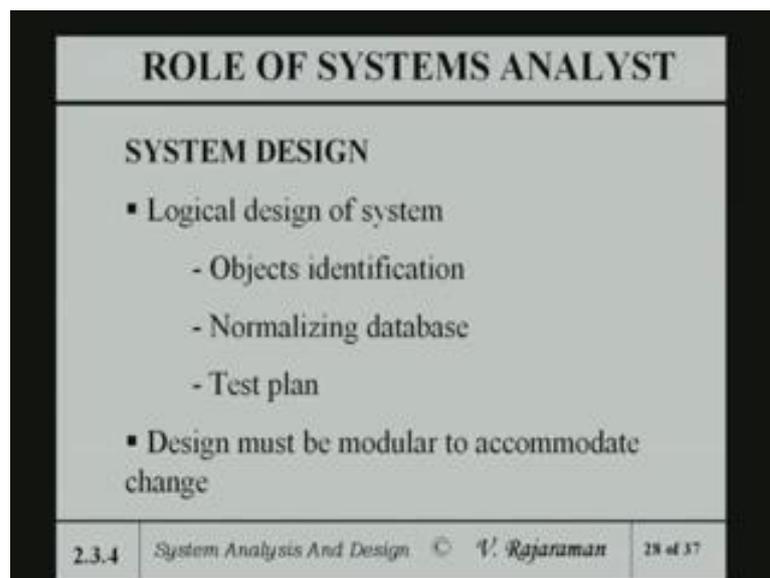
And once, you come up with the requirements, you have to come up with specifications. And the specifications had to be on one hand, understood by the user and also the programmer, who is going to implement. For instance, when the architect talks to you, the architect presents you a drawing, which you understand. Because, drawing is something, which is a universal language, you might say.

Even without being an engineer, if a plan of your house is given and elevation of your house is given, like a scale model with card board. Any person with common sense will understand, what the person is getting. Similarly, you have to have some method of documentation, which is understood by lay users. Programs, will not understood by the lay users.

So, programs are not really documentation from the point of view of the ultimate user managers and so on. So, you have to give has some tool, which is more like a drawing. On one hand, the drawing is understood by the user. The drawing is also understood by the contractor, who is going to build your house. So, it is got to be similarly, you have to have tools, which on one hand, it is understood by the user. On the other hand, understood by the programmers to be able to program.

Actually, precise and detail, unless this precise and detail, program cannot proceed. And it should also at that stage, account for possible changes. As I said software systems unlike hardware systems will always undergo change in their life time. So, it is extremely important to be able to build a system, which will accommodate change easily, without great amount of re breaking something and rebuilding again. So, you have to keep that in mind and account for possible changes, which may occur.

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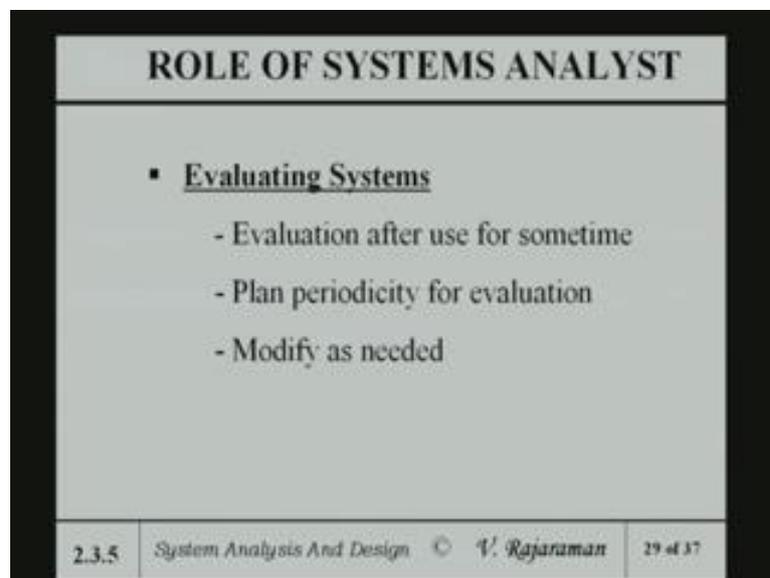
And you design a system logically, like nowadays, object oriented methods are ones, which are used to allow this flexible changes. Also, to be able to use existing building blocks. So, there is lot of advantages, people talk about in terms of object. There is also object based diagrams, which are used nowadays, which can be made understandable both by the users and by the person, who is going to program.

So, certain types of notations, which are being experimented with not universally used experimented it lot of people accepted it. In terms of providing a proper inter phase

between users and designers or implementers. And you have to kind of look at the data bases design, normalize them and proper test plan. Testing is extremely important, before you actually deliver a system.

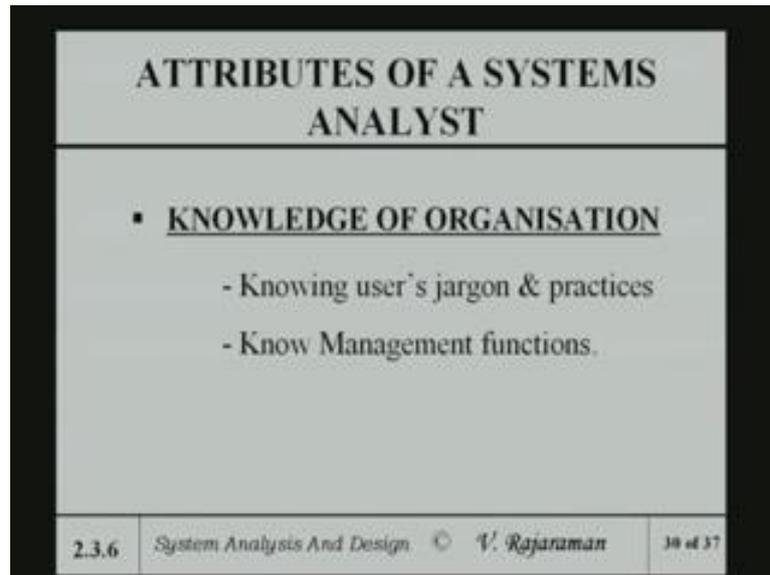
So, test plan has got to be designed at the time, you design a system. So, that, before gets into implementation stage, you are able to do some preliminary testing. So, you do not wait till the last moment to be able to test the system. And find, what the problems with the system. And illiterate that, it should be module design and design to be able to accommodate changes.

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And you have evaluated it, after using for some time, plan periodicity of evaluation, how often, you are going to evaluate and modify as needed. So, these are points, which are required in terms of the evaluation. Because, system evaluation, which is done is important to be able to deliver a system.

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As I said after evaluation, you also have to maintain. Maintenance means, not only correcting errors, which you made. But, also putting improvements or at the end of the process, users may think, that certain requirements are not fully met. And so, they would like to kind of implement or something new and that of course, normally companies ask for extra time and money, today that.

But, if you are able to do that reasonably fast to the satisfaction of customer, next time around the customer has got something to be done, he will rely on you. So, there is always to kind of have a good will, with the customer, you have to be able to accommodate, at least certain changes, at the evaluation time, with reasonable ease. And later on of course, any large changes, which is required, we can cost it and we can ask for a new contract and things like that.

So, in order to be able to do all these, there are certain attributes, which are required for system analysts. He has to understand the organization. The organ and practice his organization. Know the management functions, what functions are there and for each function what is required. This is being considered, fair length earlier. Knowledge of computers and software, system design tools and keep abreast of modern developments.

So, you should understand, what new things are coming, like for instance, they pointed out, the RFID tags, which are replacing bar codes. So, the analysts must know, that the RFID tags are coming. And they are going to be used and demand it, by the users. And

similarly, there are lots of changes in networks, which are coming. Higher speed networks are coming. And similarly, it is also lot of class changes in the computer themselves.

Higher amount of memory, different types of memories, like now, flash memories were not there 3, 4 years ago. Now, flash memories are replacing floppy disk. So, the analysts must know, that the flash memories have come and wherever, flash can be used. You should be able to tell the user, that you better use flash in this cases. So, the point is that, computing technology is an evaluate discipline.

It changes almost every 3, 4 years, there is a big change and they say, what you call para time shift. Shift from one method to another method or one basic type of organizational architecture of systems to another architecture of systems. So, architectural changes also take place, which changes in technology. Lot more rapid in computing compared to other engineering disciplines. So, that is what makes it very challenging. So, he has to keep abreast on modern developments.

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**ATTRIBUTES OF A SYSTEMS ANALYST**

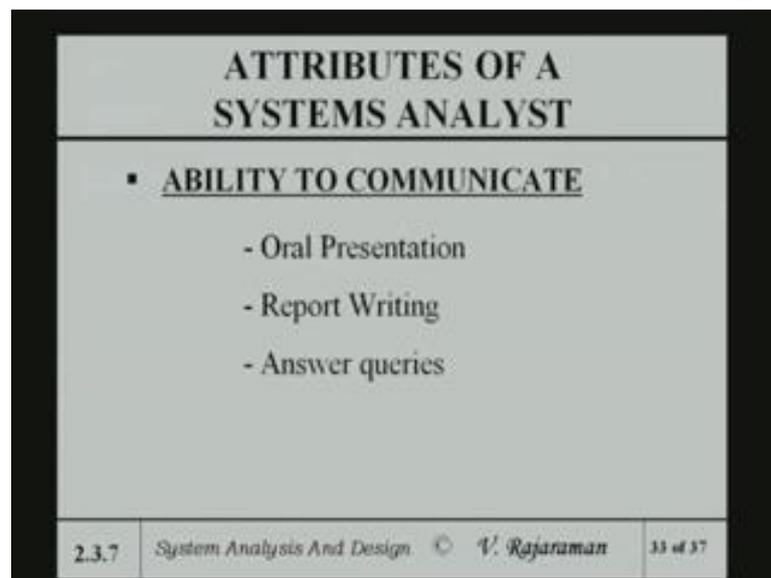
- **GOOD INTERPERSONAL RELATIONS**
  - Need to work as team member
  - Lead smaller teams
  - Interface with programmers & Users
  - Motivator.

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That is true of course, of any good engineering organization and an an engineer, but my lot more important for computer science people. Now, system analysts has to as I said interview users at different levels. Start starting with top management, down to the clerical staff, who are going to use in system. So, if you need to able to have good interpersonal relationship.

Need to work as a team member. These knowledge tips inter phase the programmers and users, users at various levels. You should be able to motivate the team to perform in terms of the program; you do in terms of the data bases and so on. So, by in large system analysts role is one is that of a leader also.

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Now, at the time of talking to a user and having, when the requirements are determined by for the user, you have to prepare some kind of a report in present orally. The requirements to the managers of the user organization, so in order to be able to do that, you have to had good communication skills or oral presentation skills. That is one of the reasons, why nowadays with computer science curriculum, they try to put one particular subject called technical communication.

Technical communication orally is extremely important attribute of a good system analysts. In fact, one would find, during a professional life, the early communication is important that almost all level. That is, if you are a marketing person to market, you have to be able to convince your customer, that the product, you are trying to sell or service you are trying to sell is worth it. So, you have to able to communicate orally in a convincing manner.

Doing that, you must have reasonable amount of confidence and appear that, you are the master of that subject. So, these are important attributes of a analyst to communicate and also, you have to write the report. Because, ultimately whatever you communicate orally,

as you put down in paper as a report. The report is used by two types of people. Report is used by the managers of the organization for which, you are doing the service.

And the report also will be used by your manager to understand, what you have done. And the report will also be used by the person, who is going to implement system. So, that person has an overview. So, report must be very clear and nicely written. Clarity is very important. Brief at to the point and understand them, without too much of organ and so on.

So, that, any person with reasonable amount of intelligence can understand it. So, report writing is important and be able to patiently answer questions from the users of the system. Very often the questions very we may consider very stupid. After all for the company, which you are designing a system the person is not a expert in computing. So, he may ask certain questions, which are almost stupid. You may consider stupid.

But, you got be fairly diplomatic and be able to show that, you know properly answer the question. You know, how to the conviction of the person and so, this requires certain amount of diplomacy and patience.

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**ATTRIBUTES OF A SYSTEMS ANALYST**

- **ANALYTICAL MIND**
  - Problem solving attitude
  - Ability to assess trade offs
  - Sound commonsense
  - Curiosity to learn about new organizations

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Analytical mind, which is of course, required for any good engineering person, but not so for an analysts. Because, he must have problem solving attitude, look at a problem able to solve it in different ways. Ability to assess the tradeoffs, when you do a feasibility

analysis. There are certain gain and certain losses. Any large system is always a trade off which is there.

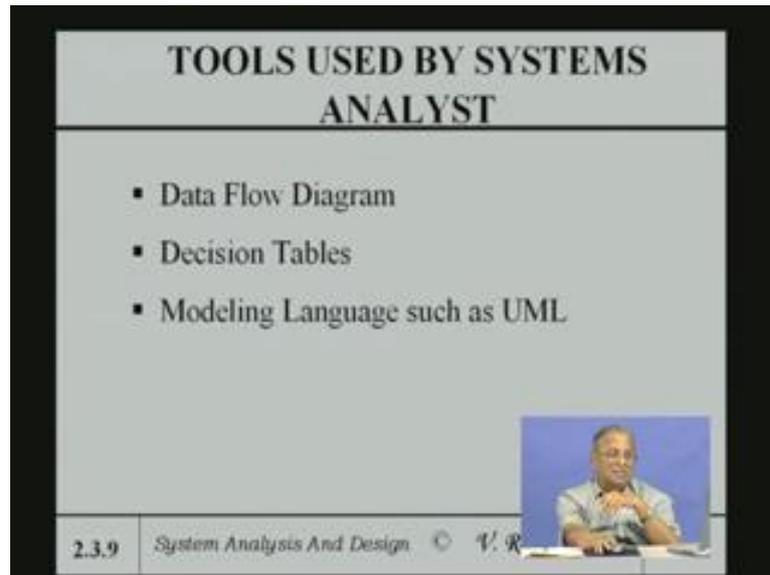
And like simple example of trade off and civil engineering may be that, if you paint your walls with plastic emulsion paint, it is going to be expensive at the beginning. But, by stand of 10 years, 10 years you do not have to do a thing. And anything, which is happens in the walls you can go and wipe it off with soap. Of course, the benefit the cost is high and the benefit is there.

But, if you cannot afford it, then use a simple distemper, you have to tell the customer that, you have to spend again, after 3 years. Your question is, what the customer chooses, same way, in a system, you may produce different types of systems. One would be fairly expensive accommodate a lot of change. And you do not have to be maintenance, because you already taken into account certain requirements, which you fore saw, that occur later on.

And implement it this time itself, which the customer will think off and so, the cost is higher. You might say, you know that later on, you may not have to change anything. This is going to provide you for 5 years no problems. So, these are kind of issues. So, these are tradeoffs. Sound common, sense of course, able to understand, different fields and so on and you must have, it is very easy to say, saying common sense.

But, more difficult thing to get that, kind of a common sense, which you get from experience. Curiosity to learn about, new organizations and what the organizations do.

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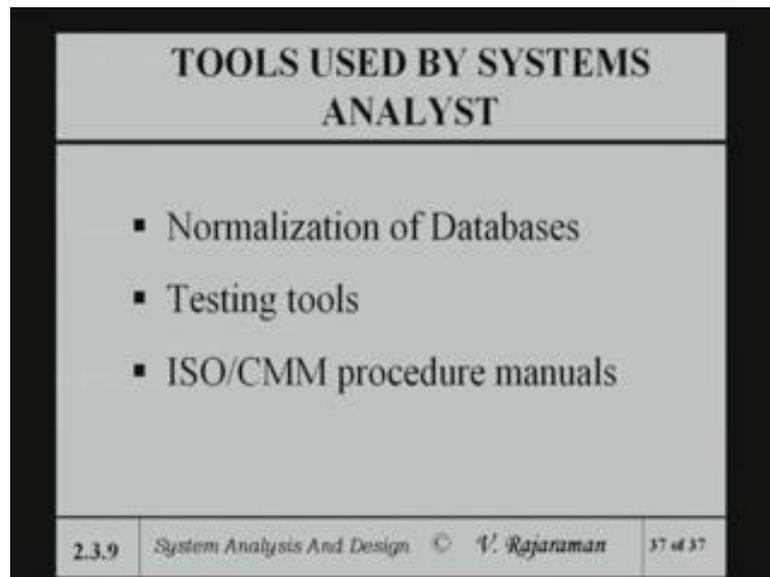
And the tools, which are used, like a plan for a building. Data flow diagrams are certain tools, which will give the flow of data into various processes. The outputs, how the outputs are taken, how they are processed by next step. And it gives a clear idea to the user of what document is supposed to create. How the documents flow or data flow and how will it be processed. What kind of reports you get. So, even a prototype in that stage may be something, which is useful.

Decision tables, the complex decision processes. You got to be complex set of rules in insurance company; you can explain that as a table, decision table to both the customer and also to the programmer. Both sides can use it and in fact, it is being found that a good decision table brings out even errors in the current rules of insurance companies. Because, they are all thought out, logically in great detail with Forbidden rules.

And rules have a tendency, there are some set of a rules and rule over amendments are already organ on. So, amendment in the add, they may contribute some wider rules. So, these are not taken care of, in the system. So, when you do an analysis, logical analysis, decision tables, these things come out.

And there are modeling languages for the universal modeling language, which is thought to be object oriented design methodology, which one has to know. There are techniques called use case analysis. Look at different cases and use cases and so on.

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Normalization of data bases, this is again technique, which data base designer has to know. Various testing tools which are there and nowadays people look for, so called ISO International Standard Organization or CMM procedure manuals for deciding of a getting a good quality system. So, these are quality constraints of certain procedures, you follow.

The ISO and CMM are essentially tells you the documentation and procedures, you have to follow. If you follow these procedures and have these documentations, certain amount of confidence, that the quality of the product or the software system, you produce will be up to the mark. So, the whole idea is to come up with the systematization of procedures. And systematization of procedures is the primary aim of both ISO and CMM. So, these are things, which an analysts should know.

So, this kind of, we have reviewed this whole area of system analysis and the roles of system analysts. And now, I think, we have get into the actual act of the various tools and techniques in designing a system, which we will do in the next lecture and go on from there.