Ergonomics Research Techniques

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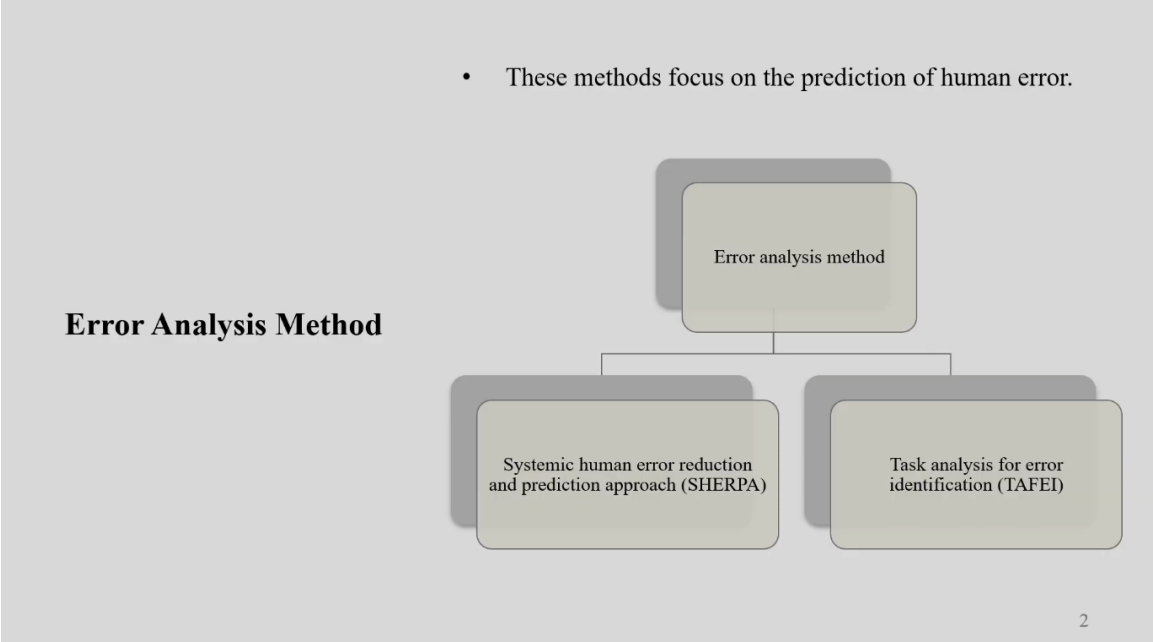
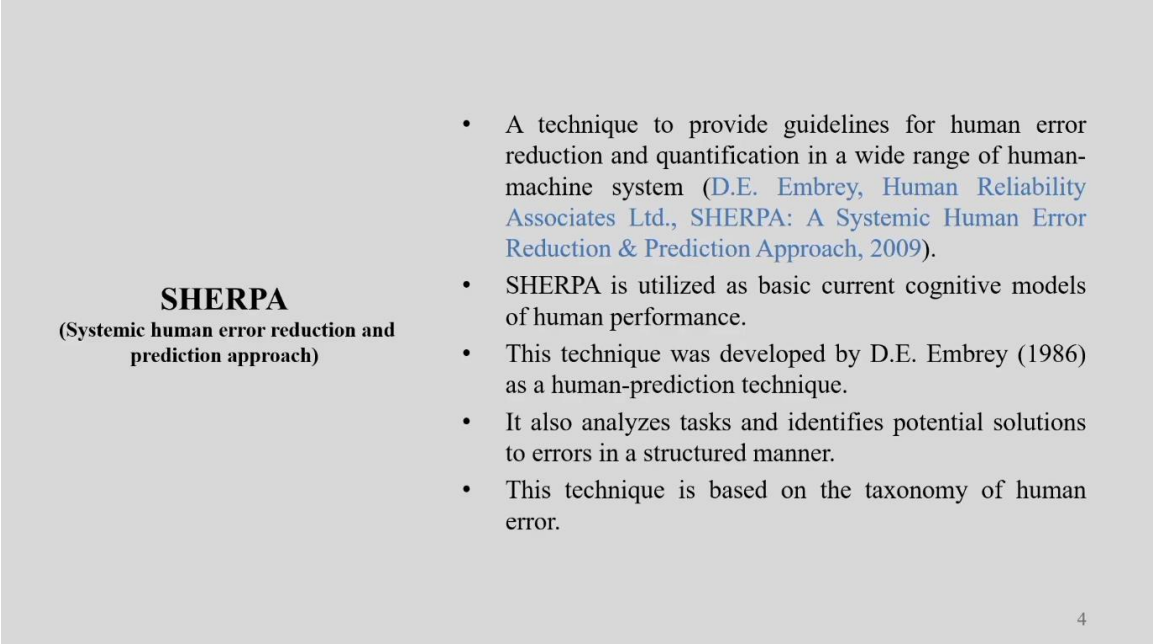
Week 9: Lec 30- Error analysis methods

Systemic human error reduction and prediction approach (SHERPA)

Welcome back. Today we will try to understand little bit more about behavioral and cognitive methods. We will try to discuss today about the error, ok. So, first let us understand what are the impacts of error and how and what are the methods we normally practice to measure it or actually evaluate it, ok. So, why error? So, definitely I suggest everyone to go for formal definition of error, ok. In general understanding error means when we are performing a particular task or particular job if there is mistake. This mistake can happen due to man or the we can say the operator or by the machine. Now, how do we understand, how do we assess them and based on those assessment, how can we take a decision that where the intervention can be done to improve the situation, today we will be discussing on that particular area. So, error analysis is very much important to prevent the further accidents whatever is know we can predict. So, we can predict the accident and we can prevent them. Also if we can minimize the see error free, 0 error in many cases it may not be possible. However, we can minimize to the maximum possible level so that the total production or total productivity or performance may increase, ok. So, always when we design a particular system, our aim is to minimize the error. Of course, the target is 0 error. However, in many cases it may not be possible to achieve, but we will try to minimize it as much as possible. Now, when we will be able to do this, we will be able to do this only when we understand how to analyze it, how to measure it, right.

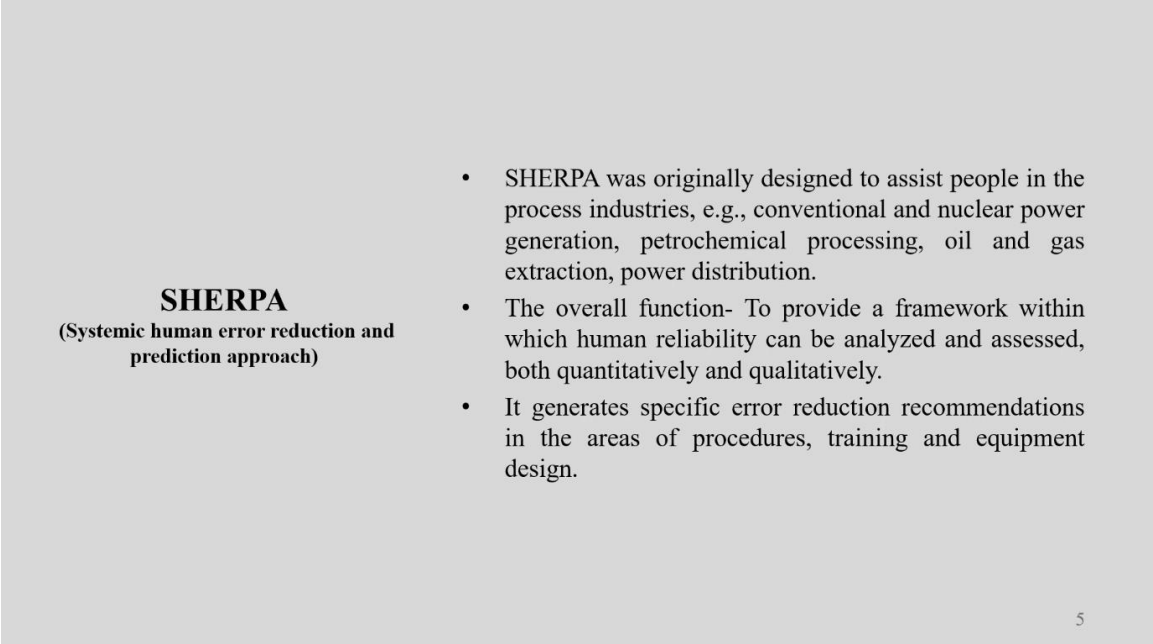


So, today we will be discussing two very much useful method through which we actually analyze the error, ok. So, mainly it will discuss about the human error, ok. So, prediction of human error in a particular system. So, we are actually trying to predict it. So, it is not that whatever after the accidents happen or after the hazard happen, then we are actually cancelling. No. Once the system is in place, we are trying to understand what is the possibility to like the error to be present, human error to be present. So, we will be analyzing that. So, we will be discussing two major method. First one is the systemic human error reduction and prediction approach. So, from name itself you can understand it is human error reduction, ok. So, whatever human errors are we are trying to reduce it and actually we are trying to predict it, ok. So, human systemic and of course, it is a systemic method. So, systemic human error reduction and prediction approach, we call it in short form SHERPA. Another is task analysis for error identification, task analysis for error identification, TAFEI, ok. So, SHERPA and TAFEI. Today we will discuss SHERPA and in the next class we will be discuss the TAFEI.

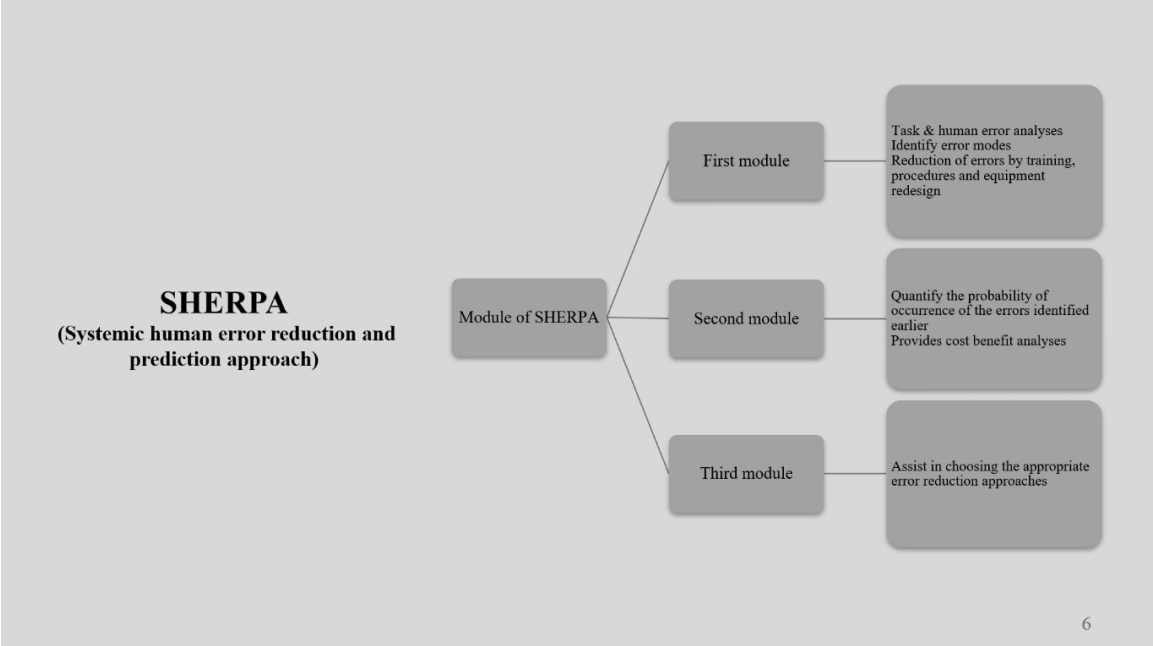


So, let us start with SHERPA. SHERPA means systemic human error reduction and prediction approach, ok. So, let us understand who is the inventor of this particular method or tool and how do we use it. So, it is a particular technique to provide guideline, ok. So, it gives us a guideline for human error reduction and quantification in a wide range of human machine system. So, whenever we have a system where human and machine is interacting in a broad way, in a interacting in a bigger way, in that case we are trying to understand the human error reduction and we are trying to quantify, ok. We are trying to quantify what is the kind of human errors are. So, if we can do this, probably this will help us to know design further how we can reduce and how we can improve the situation, ok. So, it is not very old tool, it is very recent tool 2009. So, you can understand it is not two decade at all, ok. So, two decades old tool. So, SHERPA is utilized as a basic current cognitive models of human performance. Of course, as I mentioned it is to identify the human error, ok. We are not right now in this tool talking about the machine error, we are talking about only human error. So, it is associated with your human performance, ok. So, we need to understand, we need to really go through the detailed definition of error, we need to understand the detailed definition of performance, activity, productivity, compatibility, you know, comfortably, all these definitions. So, as these definitions are not scope of this particular course, I am not going to go for the each definition, but I suggest everyone to go for all these definition. If you have any query, we can discuss it in our question answer session. So, this technique developed in 1986 by D. E. Embrey as human prediction technique. So, it also analyze the task and identifies the potential solution, ok. So, it analyze the task and identifies the potential solutions to error in a structured manner. That is why I said it is a systemic, ok.

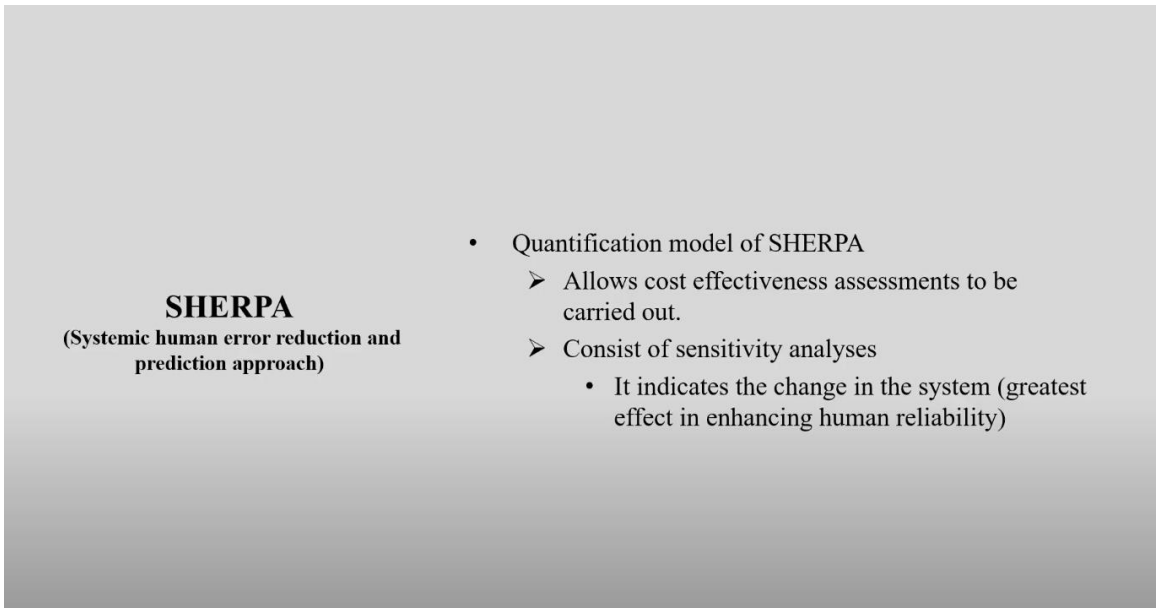
It is a systemic process. So, in a structured manner. So, this technique is based on taxonomy of human error. So, let us discuss more about it.



So, SHERPA was originally designed to assist people in the process industries, ok. So, initially when it started, when it is being designed, it was for the process industry specifically for example, that conventional and nuclear power generation, petrochemical processing, oil and gas extraction, power distribution, etcetera. However, similar industries can also use this particular process and nowadays based on the research objective, we use this SHERPA method to understand more about human error or to quantify the human error in different other industries as well. It is not only limited to these industry, ok. It is not only limited to these industries. Initially, it was developed for these industry. So, the overall function of this particular tool or method that is the SHERPA is to provide a framework within which human reliability can be analyzed and assessed both quantitatively and qualitatively. Here it is very important. We are actually going to analyze it quantitatively as well as qualitatively. So, when we have a quantitative method or quantitative data to understand the human error, so it becomes very easy for us to establish if there is an intervention and what is the percentage of improvement in the due to the intervention. So, claiming the return on investment, claiming the improvement is very easy as it is quantitative in nature. Whereas, it gives a qualitative assessment also which will help you to argue how this is going to help, this intervention is going to help. So, both way you can get benefit if you use Sherpa to identify your error understanding or error of human performance. So, it generates specific error reduction recommendation in the areas of procedures, training and equipment design. In all these cases, it is possible, but it is not limited, ok. You can depending on your objective, research objective, you can take some other area as well.

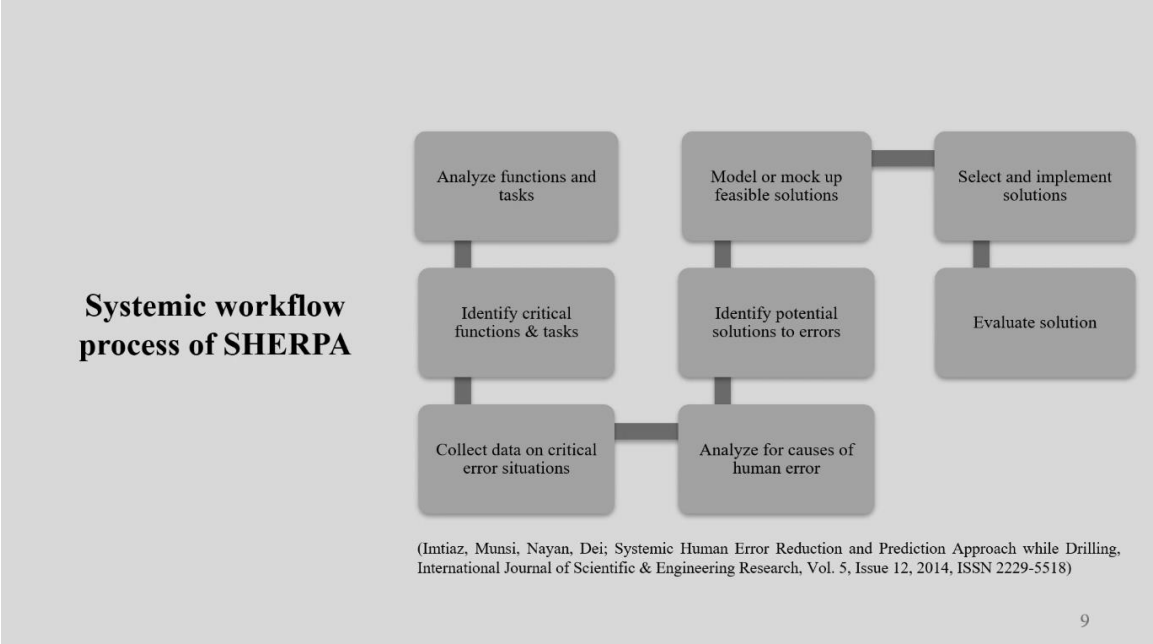


So, I mean to say here that in SHERPA, we go by three major module. So, I will take you one by one. First module says that task and human error analysis. So, what exactly it does? The task and human error analyze, identify the error modes, reduction of errors by timing, procedures and equipment redesign. So, these all the things we are going to discuss in the first module, ok. In the second module, what we are trying to do is quantify the probability of occurrence, ok. So, we are trying to quantify the probability of occurrence of what? Of the errors identified earlier, ok. So, we are trying to take a case, we are trying to take an example and try to identify the probability of occurrence in the error identification, ok. The next part is provide cost benefit analysis. So, it is very much quantitative in nature in the second module. In the third module, what we try to do is we try to assist in choosing the appropriate error reduction approaches. So, from the second module, what we did? From the second module, we try to understand or we try to quantify that what is the kind of errors happen due to human in your earlier cases, ok. From there in the third module, we are trying to predict that how we can reduce that particular error. So, it is a very systemic analysis. First, we are identifying the task, we are drawing the you know different agendas what is happening in this particular task. Then, we are trying to quantify that where the problems can happen already happen in a particular case, similar case and from them from that data, we are trying to understand if we do this, what is the kind of reduction? If we do that, what is the kind of reduction? So, we get lot of comparison. So, this way in the in specific three module in a specific three phase, ok, we try to understand the errors performed by the human and how we can reduce it, ok.



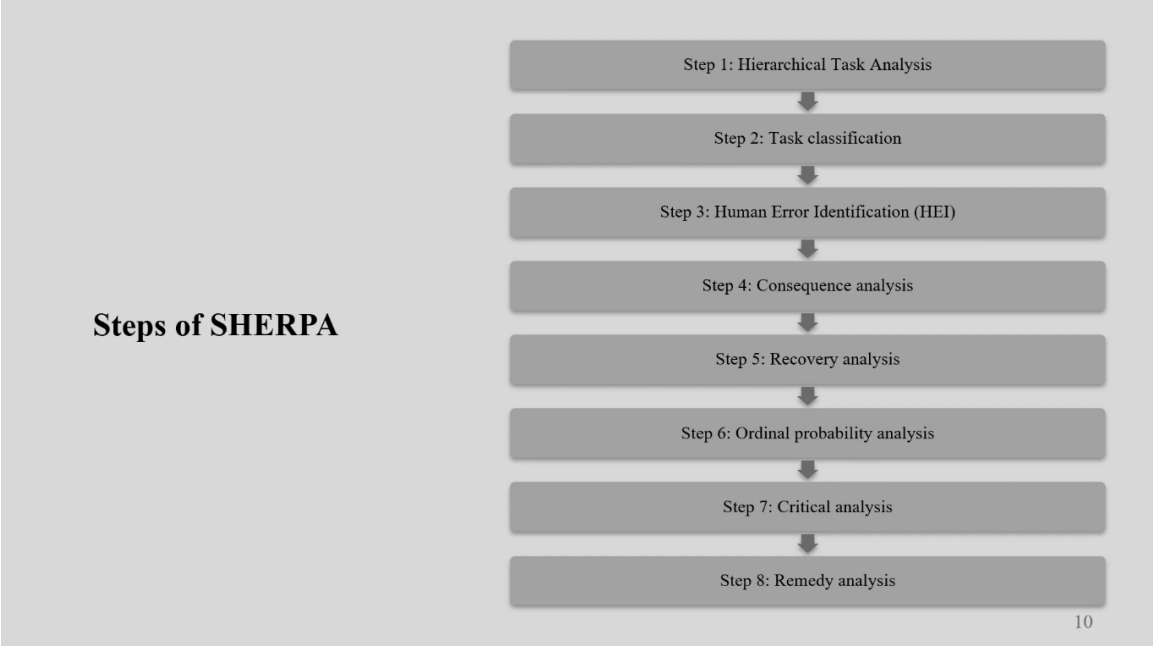
So, let us understand more about this. So, quantification model of Sherpa. So, this particular part allows cost effectiveness assessment which need to be carried out and consist of sensitivity analysis. Now, what is this sensitivity analysis? It indicates the changes in the system. So, if greatest effect in enhancing human reliability. So, if there is a small change, what is the impact of that change in the human reliability, ok. So, it actually gives you an understanding of sensitivity of that particular error, ok. So, if a single error, I will just give a small example maybe. So, if there is a small error in one part of the whole process, what is the kind of impact is happening at the end of the process? So, if the impact is negligible, then maybe this error is not having greater, you know, the gravity of this particular error may not be very high. Whereas, if the impact is very high of a small error, the gravity of that particular error need to be taken care and there is a point where we need to do an intervention, ok. So, we are actually trying to understand from these impacts how we can prioritize our error reduction starting point, ok. So, definitely there are 5 errors or 6 errors. We do not know where to start our, you know, intervention. So, through this quantification method, we will take a decision that where we can start our intervention, ok. This is very important that is why.

So, this is a kind of overview. So, we select the safety criteria of a particular task. For every task, we definitely follow some specific safety criteria. So, critical events or critical task, from that we do task analysis. Then we do error and consequence analysis because if there is an error, definitely there is a consequence, right. So, what is the gravity of the consequence? So, all these things we analyze it, evaluate the current performance influencing factors because if we do not understand the influencing factor of that performance, we may not be able to take a proper decision. So, from the error and consequence analysis, we actually take a decision that what are the performance influencing factors and how these are having impact in the actual performance, ok. So, once we do that, what we try to understand to improve the efficiency of all these factor to minimize the error probability. And if we do that, then based on the whole model, we try to develop the training or IFU content based on the task and risk available in that particular situation. So, this is the overall journey of SHERPA and we try to complete these all component in this when we perform SHERPA.



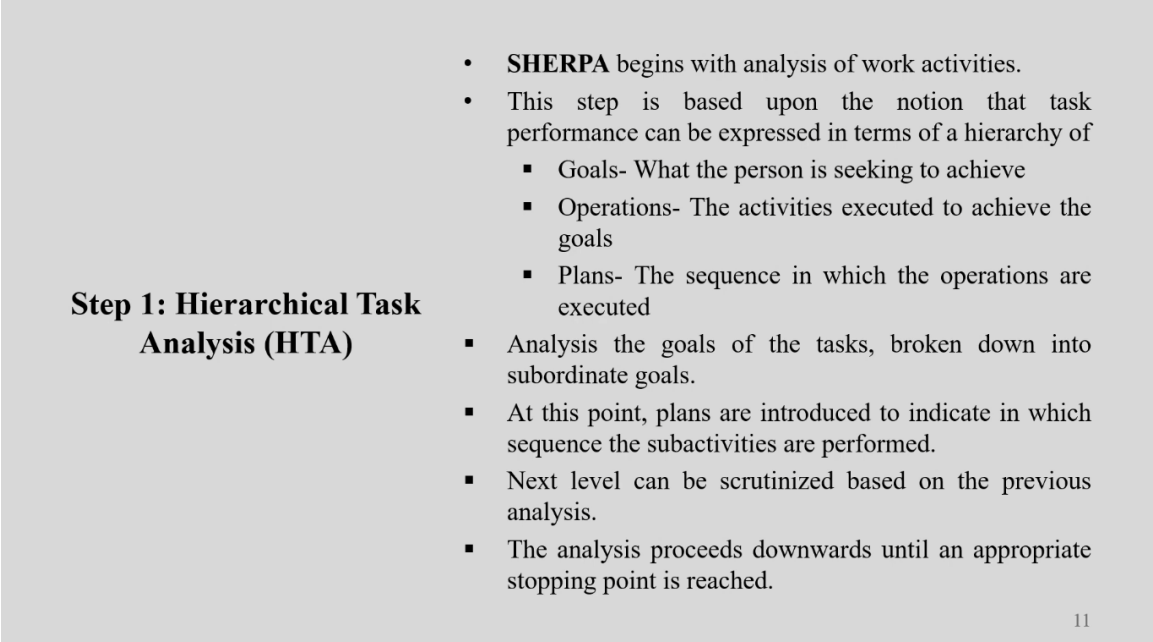
So, let us proceed towards the workflow that we do. So, it is typically this particular schematic diagram has been taken from a particular publication that I mentioned in this case, ok. So, this is the detail. How it starts? It starts with the analyzing the function and task, ok. So, here we can take definitely help from hierarchical task analysis or any other task analysis method. So, we start with the analysis, ok, analysis of the functions and task. Once we do that, what we try to do? Identify the critical function. Here it is very important the critical function, ok, critical function and critical task. So, we have 10 tasks to be completed, right. So, in that 10 task or 10 steps, maybe everything is not critical, 2 or 3 will be more critical, right. So, we need to understand by seeing the chart, seeing the task analysis that which one is critical. So, we have to identify that critical function and critical task. So, I am repeating many things in the whole process because these are the very critical portion when you actually try to practice it with your own example, ok. So, once we finish the identification of the critical function and critical task, we collect data on the critical error situation. So, this error situation is very important because we need to take these data from earlier incidences, ok. So, it is like, you know, if you want to predict, so you need to really understand what already happened, ok. So, based on that happened data, you need to predict if you do this modification, this is going to happen. So, that is the kind of prediction, ok. So, once you identify the critical function and task, you are going to collect data on the critical error situation. This critical error situation that critical error situation data will give you the identification of causes of human error. So, human error never comes automatically, right. So, a person who is skilled enough to do a particular job, all of a sudden he or she will not do any kind of error till there is no influence, ok. There must be something which is going to impact or which is going to influence the person to make that error. I

just give an example, somebody is doing a particular job and on the particular day, maybe due to some mental stress, maybe you know something happened in their family or maybe some conflict with the peer or something, there is, you know, what I can say, the person is not in a position to concentrate. So, lack of concentration on that particular moment for a particular reason. So, we need to understand that causes of human error. So, human error, once you give a particular training to do a particular job, it is expected the person know the whole process. Still there is an error, still there is a, you know, problem, there can be a problem, ok. We need to understand why that problem. Is that problem due to personal reason or due to some design element exist in that particular situation? If we do understand this is related to some design element, maybe we have a chance to improve it. Whereas, if it is personal, then we need to really understand where that problem is, how do we can solve those problem. So, we get a proper understanding, proper categorization of why these errors are coming. So, causes of human error, ok. Once we get that clarity that where and how the problems are and what are the causes of those particular human error, what we try to do identify the potential solution to those error, ok. So, if this particular error due to some design element, we directly go for the redesigning process. If it is related to the training, we try to redesign the training. If it is related to some personal development, we try to go for it. So, depending on the category that we received from this particular step. So, this step is very very, actually this two step this and this is very important because it gives you an actual decision, ok. Here you need to really take a proper decision. If we do some mistake in these two step, what will happen the further analysis will go wrong. So, here expertise is very important, ok. So, it is not that the novice researcher may do it alone, they should take help from the experts. They do practice it and then they may consult their data, their research ideas with the research results, not ideas, the results with the experts, then only you can get good result for this and this particular step. So, once we complete the understand, you know, we complete the step where we are analyzing the causes of human error, we actually try to seek for what? Seek for solution, ok. So, we know there are three problems, three causes, causes of that particular error. Now, we try to understand what are the possible way to give the solution. So, here now your, you know, actually novelty will come of your research, ok. So, you try to identify those potential solution to those error. You, once you identify them, you model them or do a mock up, ok. Try to see if you do these changes or you do this intervention is there any impact and if there is an impact, what is that impact? Is it reducing or increasing, ok? So, once you have all this, you do a comparison and go for the selection step and once you do the final selection, you go for final evaluation. So, whatever was there in the beginning and how much you could reduce or how much you could enhance the performance and how much you could reduce the human error.



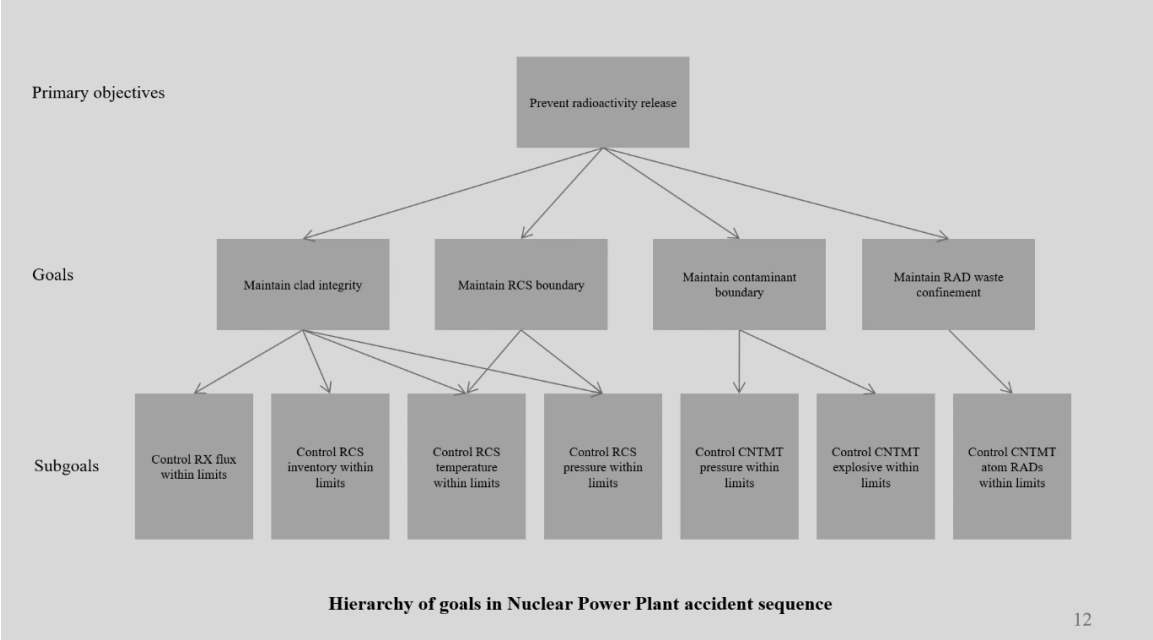
So, this is the whole process of or systemic workflow of the SHERPA, ok. So, let us go into more detail of these steps. So, we did that this one, this particular process is the overall analysis, overall steps. Now, let us go by one by one steps. Like for this first one analyzing the function and task, what we will do? We will go for the hierarchical task analysis. As I mentioned in our earlier classes that hierarchical task analysis is very much beneficial to give an understanding the steps to be followed in a detailed manner and how the branches are being established in a particular task. So, for each element of your job, how they are connected with the human and the machine, how they are connected with each other, what is the kind of input you have and what is the kind of output you have for a particular system, everything, every detail you will get from hierarchical task analysis. So, this is, this should be the very very first step of SHERPA. So, once you identify your task, once you identify, ok, this task we need to analyze for our error analysis, very first job is to do a, to create a HTA table or HTA tree, ok. Then you go for task classification. Once you have the task clarified in the tree, then you go for the task classification. Then human error identification as I mentioned in earlier slide, then consequence analysis because once you do human error analysis or identification, then only you can understand what is the kind of consequence you are going to get due to that particular error. If you do that consequence analysis, you may also get a chance to understand that is there any possibility to recover that. Here this particular step is very important, ok, because in many cases if there is an error, there is no chance to recover that particular task. I am just giving example. Maybe we are in a crockery making workshop, ok. So, if there is a breakage in that whole crockery set, ok, maybe glass or something, so if that happens, if there is a chance to recover that, you can redo it. However, if the breakage is too high or the it is not possible to recover that, then the

impact is very high, right. So, this recovery analysis will tell you the breakage of your error, ok. So, once we do the recovery analysis, we go for the ordinal probability analysis. So, put it in on ordinal scale. I will discuss it in detail in my next slides. Then go for the critical analysis and once we do this, we go for the remedy analysis. So, this is the overall steps. All these are the steps to be followed for SHERPA. Now, let us go one by one in detail. Anyway, hierarchical task analysis, you did it earlier. So, but still I will give you little more idea.



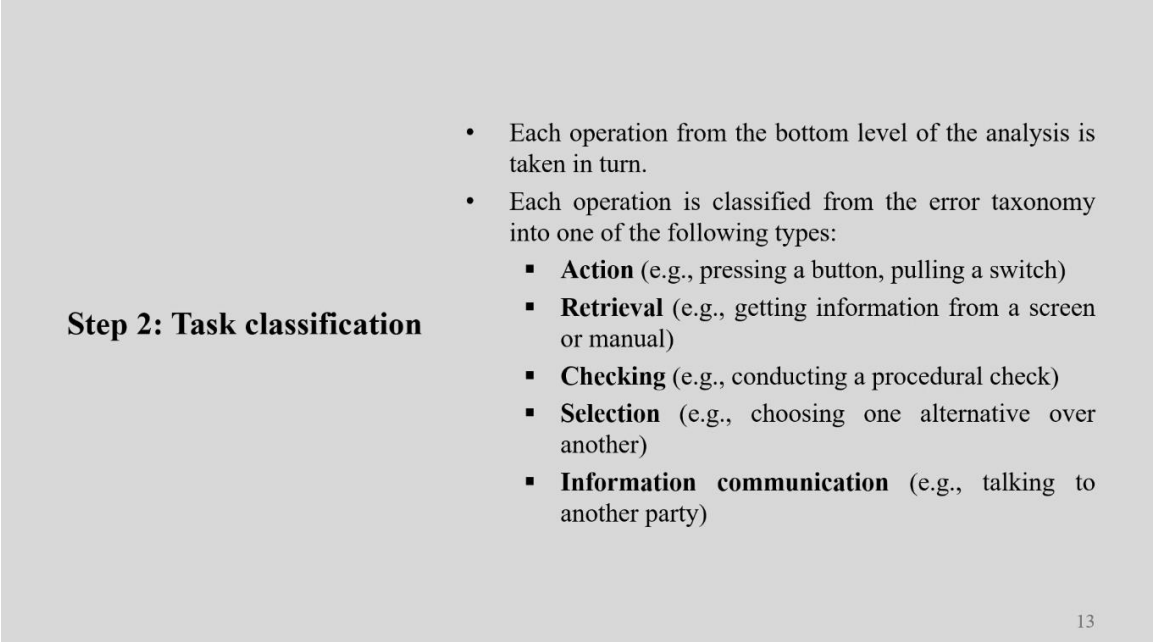
So, as I mentioned, SHERPA will begin with the analysis of the work activities. This particular step is based upon the notion that task performance can be expressed in terms of hierarchy either by goal, operation and plan. So, what is goal? Goal, first you have to fix what the person is seeking to achieve. So, it is not only for a particular person if it is a complex system like where two man or two machines are connected with each other, then you need to see the goal of the whole system. Then operation, the activities executed to achieve that particular goal and the consequence, the plan will be the sequence in which the operators are going to execute that particular operation. So, we decide on all those things. It is a these are the basic steps to be followed for HTA. We discussed all steps detailed in HTA analysis in earlier classes. So, you can refer them. So, then is the analysis, analyze the goals of the task broken down into subordinate goal. At this particular point, plans are introduced to indicate in which sequence the sub activities are performed. So, plans and sub plans, plans for major goal and sub plans for the sub goals. So, next level can be scrutinized based on the previous analysis. Whatever analysis already you will have based on that, you can do scrutiny for that particular plan and the analysis proceeds downward until the appropriate stopping point is reached. Here, the appropriate stopping point mean till the time you do not get the element of the

task and what is element? Element means a particular task which is not possible to break further. So, for a particular task or particular job, you keep on breaking them, you keep on branching them till you get a smallest element which is not possible to break further in technically. So, till that you need to keep on go further, further, further. So, that way you can create the tree or the shape like this for hierarchical task analysis. So, at the bottom line, you will get all these elements.



So, it may looks like this. So, it is an example for the nuclear power, power plant accident sequence. So, first you see this, this is the primary objective. What is this? Prevent the radioactive release. If there is a nuclear power plant accidents, how? What is my objective? Objective is to prevent the radioactive release because if there is a release in the radioactive elements, there will be a disaster. So, our primary objective is to prevent that. To do so, to achieve that objective, there are four major goals. First goal is maintain the clad integrity because if all these clads are integrated properly, there will be less chance to release those radioactive elements. Then maintain the RCS boundary properly. So, if you keep on maintaining them in a sequential manner, in a phased manner, of course, there will be less chance to do to meet, to face such kind of accidents. Then maintain the contaminant boundary because if the boundaries are maintained properly, there will be no contamination. So, the radioactive products will not come out because the boundary will prevent them, prevent those products to come out in the other area. And the last one is the maintain the radioactive waste, radioactive that elements waste in the confinement zone. So, these are the major goal. So, first is maintain the clad integrity, second is the RCS boundary maintenance, third maintain the contaminant boundary properly and maintain the already waste confinement, ok. So, these are the four major goal to be achieved. Now, in the next part what we try to do is we try to break

them all these four parts to go into more detail to understand where the possibilities of error. So, you can see in the next phase what I have written for the first goal that is the maintain the clad integrity, we can do control the R-X flux within limit, ok. Within limit we can control the R-X flux, we can also control the RCS inventory within limit, control the RCS temperature within limit, also the RCS pressure within limit. So, inventory, temperature, pressure if I control, control within limit then definitely we will be able to maintain the clad integrity along with controlling the R-X flux, ok. So, if we do that we will be able to achieve the first goal. In the second goal when we are talking about the maintaining the RCS boundary we have two major major things to be done that is the controlling the RCS temperature within limit and controlling the RCS pressure within limit. So, you can see here the you know interactions are happening. So, these two component RCS temperature and RCS pressure, ok, controlling these two component are actually associated with both RCS boundary and the clad integrity, ok. So, you need to establish. So, here you are actually getting the branches, you are getting the networks, you are trying to understand how. So, this will help you to give an understanding if there is a problem where the impact will be and what is the kind of impact will be. So, if there is a problem with this particular thing it is not going to affect one, it is going to affect both, right. So, if that happens definitely the impact is quite high. So, you you are actually getting a quantitative assessment you are getting an better understanding what is the impact if error happen in this particular area, ok. Similarly, for this case where you are talking about the maintain the contaminant boundary you are getting to control the CNTMT pressure within limit and explosive within limit. So, pressure and CNTMT explosive within limit. If you do so, then you can maintain the contaminant boundary and for the RAD waste confinement what you have to do? You have to that atom RADs within limit you have to control. So, here is the single impact. If this this goes wrong it will impact only here, if this goes wrong it will impact only here. However, if this or this goes wrong it will impact here and here, ok. So, you can really understand that what is the degree of importance of all these sub goals are, ok. And these you can only get when you do the hierarchical task analysis. This is just an example you can have your own data, you can really create these networks and you can find the interactions between each goals and sub goals.



Now, once we have all those thing what we need to do is in again in through from the task analysis results. So, each operation from the bottom level of the analysis is taken in turn and each operation is classified in these sections, ok. Action, retrieval, checking, selection and information counting. I just gave you the examples over here. Now, we got all these details that what are the impacts, what are the elements depending on the sub goals, goals and the primary objectives. Once we have all these data ready what we need to do we need to understand that error by human error, ok. So, human error identification. So, here you have all these sub goals, all these sub goals and for each case we may get an understanding of the human error. So, you have action, you have retrieval, you have checking, you have selection, you have information communication.

Step 3: Human Error Identification (HEI)

- The classification of the tasks in the previous step leads the analysts to consider credible errors modes.
- This errors are associated with the activity, using the error taxonomy (**Table 1**).
- For each credible errors, a description of the form that the error would take is given, as seen in **Table 1.**

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So, let us understand in from the next table how we can do the human error identification. So, for action error.

Action Errors	Checking Errors	Retrieval Errors	Communication Errors	Selection Errors
A1 Operation too long/ short	C1 Check omitted	R1 Information not obtained	I1 Information not communicated	S1 Selection omitted
A1 Operation mistimed	C2 Check incomplete	R2 Wrong information obtained	I2 Wrong information communicated	S2 Wrong selection made
A3 Operation in wrong direction	C3 Right check on wrong object	R3 Information retrieval incomplete	I3 Information communication incomplete	
A4 Operation too little/ much	C4 Wrong check on right object			
A5 Misalign	C5 Check mistimed			
A6 Right operation on wrong object	C6 Wrong check on wrong object			
A7 Wrong operation on right object				
A8 Operation omitted				
A9 Operation incomplete				
A10 Wrong operation on wrong object				

Table 1: Taxonomy of Credible Errors

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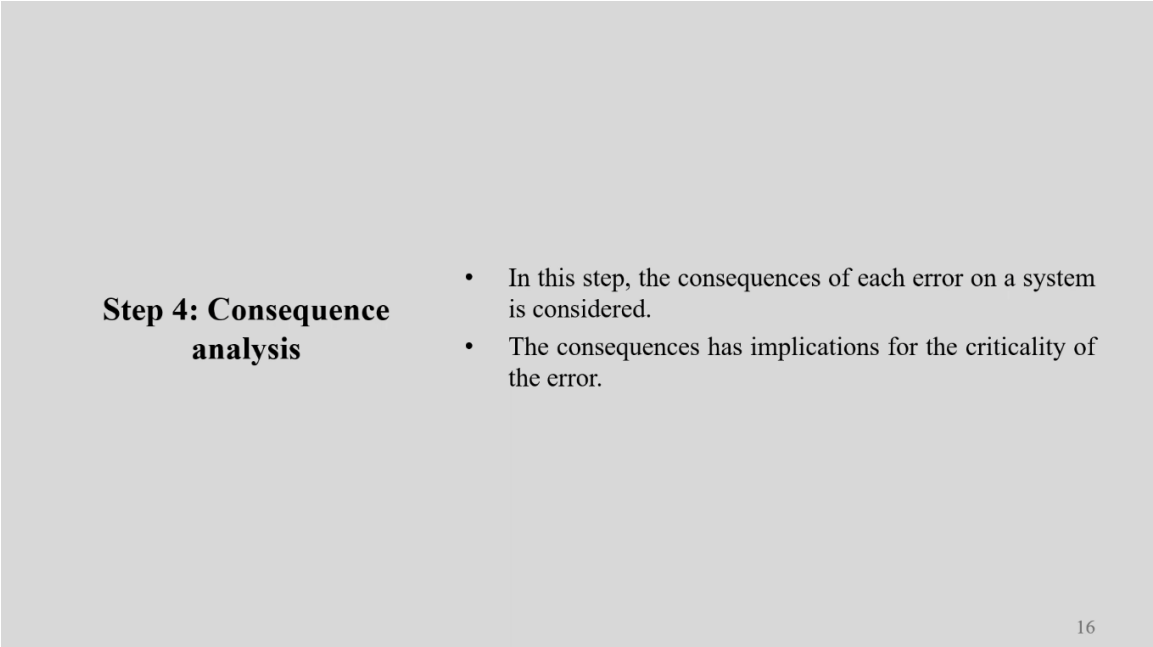
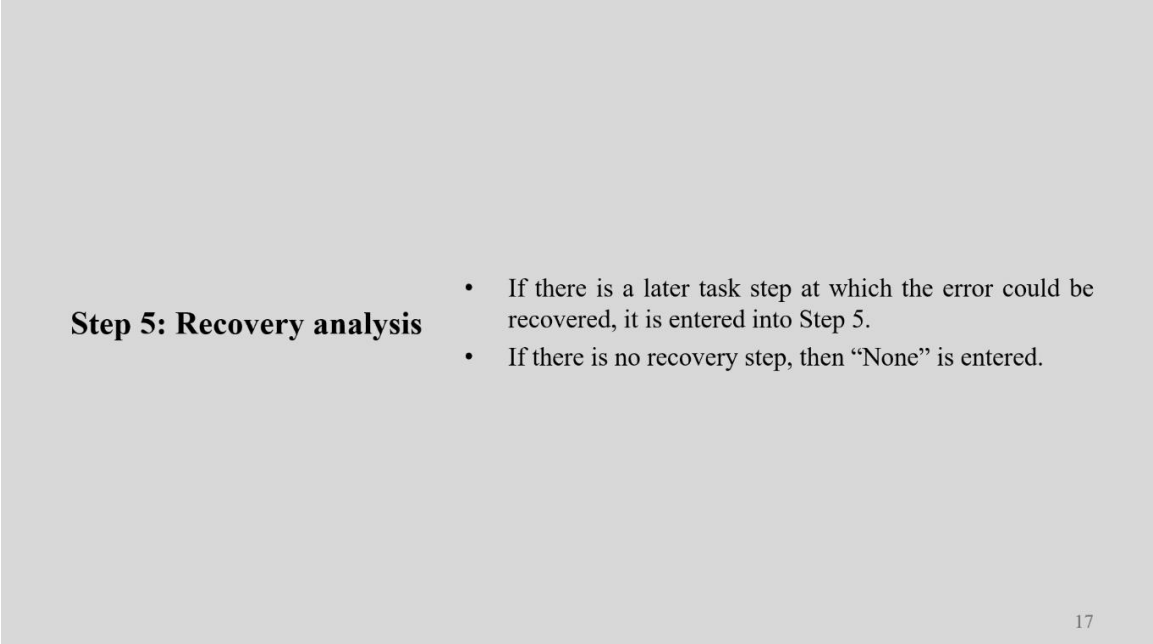
So, in action error, so I just wrote A action error that is why A1, A1, sorry this would be A2, ok. It is a typing mistake. A1, A2, A3 like that I have given you the list and this is not my, so it is already established example and we have taken it, ok. So, for A1 maybe operation is too long or too short, maybe then there will be an error. Operation is mistimed at the time when it is supposed to happen it did not happen at that time it happened in some other time. So, there is an error. Operation is wrong in is in wrong

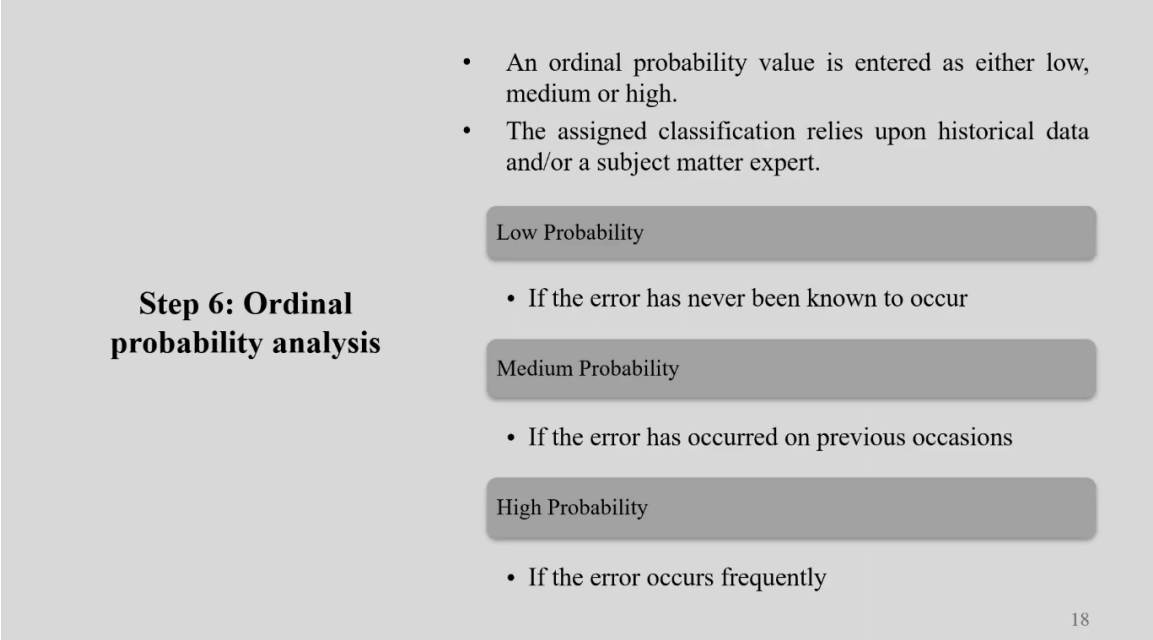
direction. Operation is too little or too much. So, if that happens maybe people the concentration varies, right. So, maybe the error can happen. Then misalignment, no right operation on wrong object. So, all these actions error can be possible for this particular task that is the action. Similarly, we can have error in the checking. So, what are the possible checking error? Maybe see all these cannot be possible to be together. Maybe 1, 2 or 4, 5, 6 in combination or permutation or a single error, ok. Anything if it is present then that will lead to the error, ok. So, you need to identify. So, these are possible you may give 1 or 2 more terminologies if that is not being given here, ok. For checking errors maybe the checking is omitted or checking is incomplete or you did you are looking for right check, but the object what to be checked is wrong or you know checking is done. However, it was done in a wrong timing. It need to be done before you did the checking afterwards. So, maybe there that is an error. So, that way checking errors are possible. Similarly, retrieval error which says that information not obtained or wrong information obtained or information retrieval is incomplete, ok. That is possible. Of course, communication error because when we are in a complex system there is lot of chances we have miscommunication or error in communication. So, information not communicated properly, wrong information communicated or information communicated, however, it is incomplete, ok. So, this way communication errors can happen and of course, selection error when you are taking the decision, the decision is little wrong. So, selection either omitted or it is a wrong this selection made, ok. So, these are the possibilities. So, these are the taxonomy of credible error. So, from this particular table what you can do? You can once you have the hierarchical task analysis ready, HTA tree is ready, you can find out that what taxonomy you are going to use for your analysis at which stage, ok.



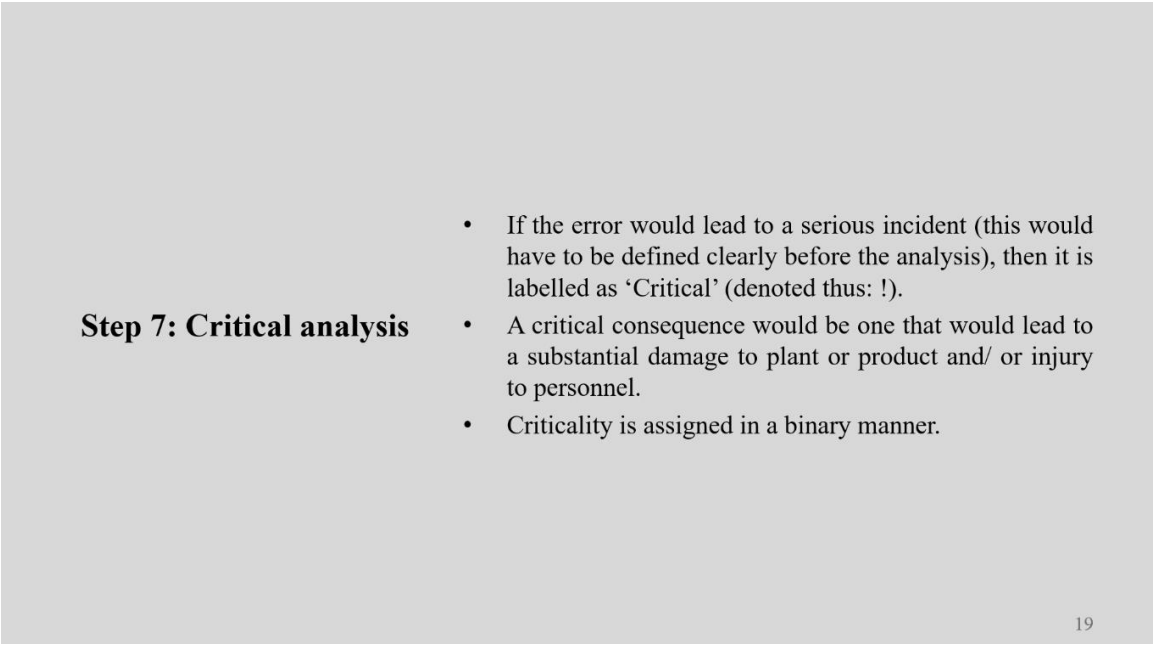
Then step 4 is the consequence analysis. I have already explained that once there is an error of course, there is going to be an effect, ok. So, that particular effect will give you an understanding how big the problem is. So, in this particular step the consequences of each error on a system need to be considered and has a kind of implication for that criticality of that error. So, you are going to get a degree, ok. You are going to get a gravity understanding gravitational understanding that what how big the problem is if I make this error.



Now, this particular step as I mentioned earlier also some cases it will be there, some cases it will not be there. If there is a possibility to recover this particular step is present. However, if there is no possibility to recover this particular step in that particular step it will be written as none, ok.

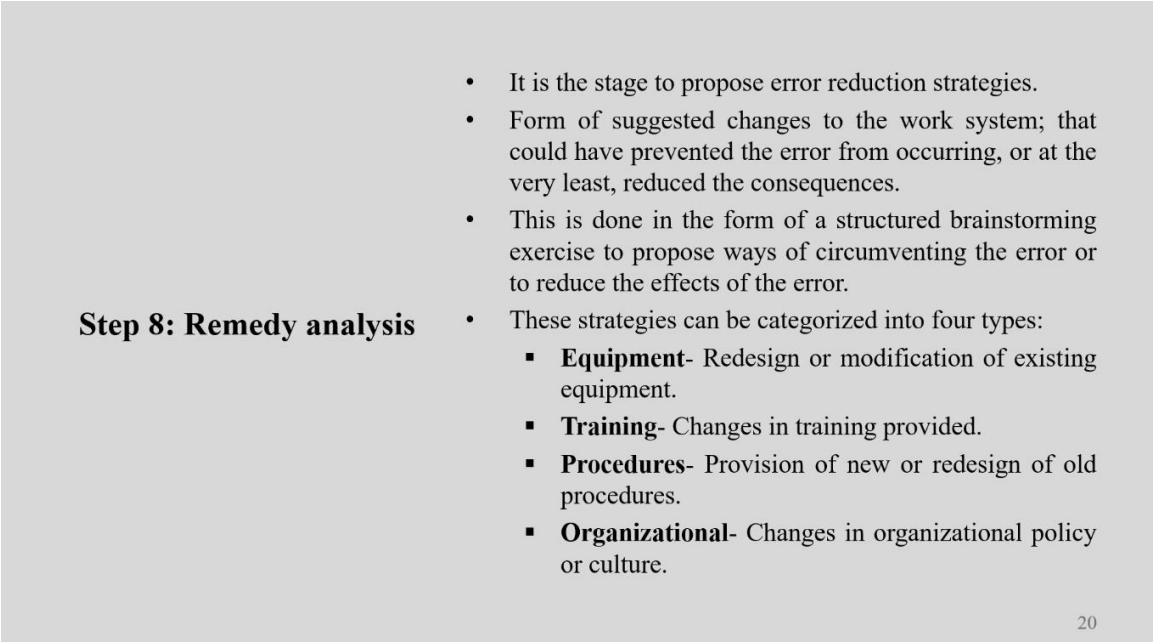


Then you need to do the ordinal probability analysis low, medium and high. So, low means if the error has never been known to occur. So, that is the known probability. So, of course, these all information are from the tacit knowledge, experts knowledge, stakeholders knowledge, ok. Medium probability if the error has occurred on previous occasion. However, the probability is kind of not very frequent and high if the error occurs very frequently.



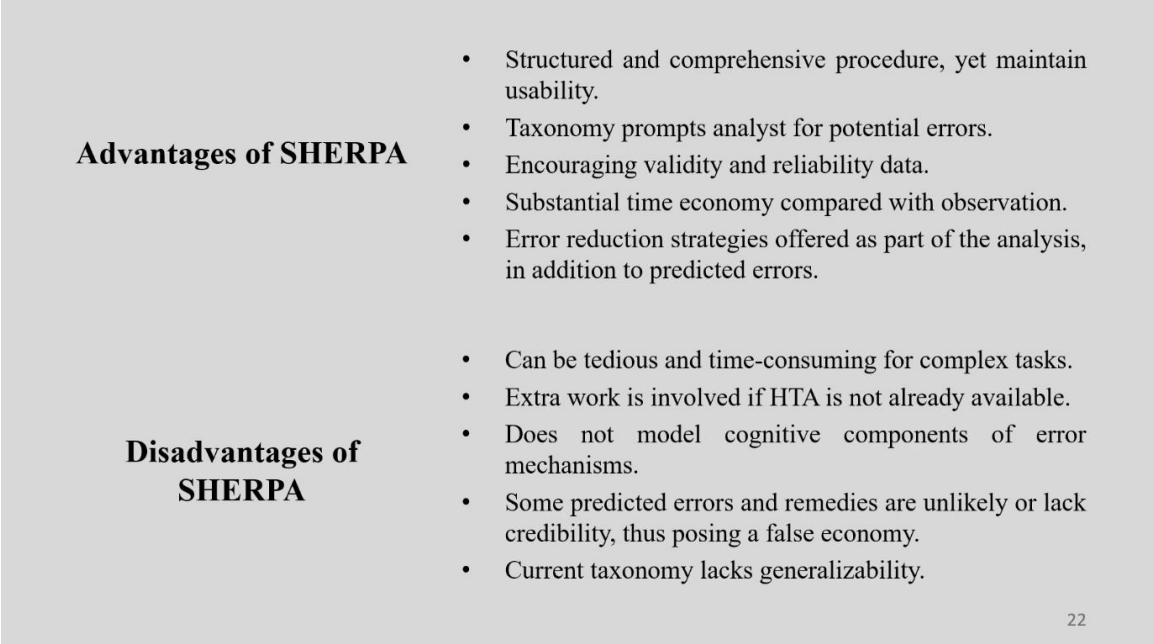
Now, this comes the you know critical analysis. If the error would lead to a serious incident, ok. If the incident is very very serious then it is labeled as critical. The critical

consequence would be one that would lead to a substantial damage to the plant or the product or causes an personal injury and criticality is assigned in a binary manner 0, 1, 0, 1, ok. If it is critical then 1, if it is not critical then 0, ok.



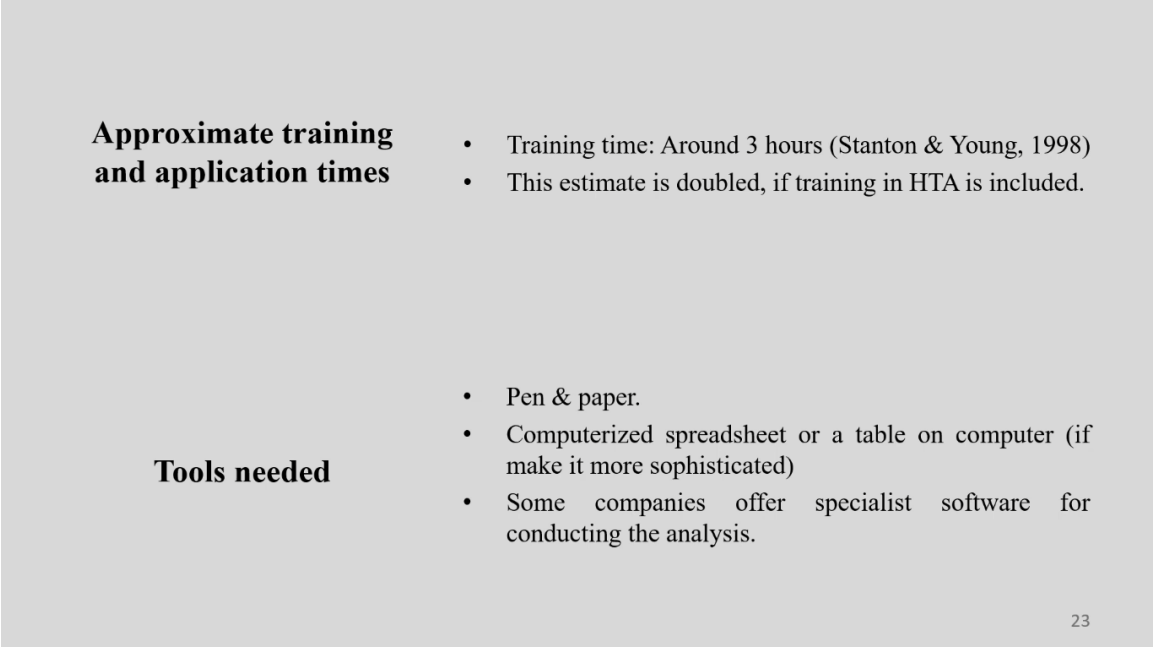
And then remedial analysis, what you need to do over here, it is the stage to you know propose error reduction strategies, form of suggested changes to the work system that could have prevented the error from occurring or at the very least reduced the consequences. And this is done in the form of structured brainstorming exercise because it is not possible for us to just get the remedy just one click, ok. So, you have to really do a brainstorming activity. So, this from here actually it never comes one day, ok. You have to keep on scrutinizing your earlier results and from there only you can have the data, you can have an understanding what are the possible way to give you the remedy. So, it can be equipment, it can be training, it can be procedure or it can be organizational depending on the previous results that you are getting that variety or type classification of the errors. You need to think of equipment redesigning, you need to think of if there is a possibility to do the changes in the training, you need to think the you know various provisions of new or redesign of the old procedure or any organizational policy or cultural changes is required to minimize that error, ok. So, this is very very critical and it is very much required with you know expert decisions are very much important. So, here is your actual contribution towards the result, ok. From this particular portion only you will be able to understand that where is your, where is the novelty of your research or novelty of your task, ok. Some of these remedies may be very costly to implement because you must have done it in different way. It needed to be judged with regard to the consequences, criticality and probability of the error. Each recommendation is analyzed with respect to these criteria. What? Incident prevention efficacy. So, first you need to

understand is it effective to reduce the incidence. So, the degree to which the recommendation if implemented would prevent the incident from occurring. Cost effectiveness, the ratio of the cost implementing the recommendation to the cost of the incident multiplied by the expected incident frequency. User acceptance, this is also very you know important, users acceptance, ok. That you must have given a brilliant idea. However, if the users are not accepting it, your you know intervention does not make any change in the whole system. So, it need to be accepted by the user. So, the degree to which the workers or organization are likely to accept the implementation of recommendation, this is a major major challenge. This is also challenging because if it is very much costly definitely you will not be able to manage or convince your partner to implement it. However, this is more challenging if the end users are not going to accept it, then the whole process will fail and the practicability because if the application is not practically possible, you will not be able to implement it. So, all these you know prevention efficacy, cost effectiveness, user acceptance and practicability need to be checked when you are actually designing the remedy.



So, let us discuss about the advantages and disadvantages. So, there are several advantages. So, it is a structured and comprehensive procedure and yet maintain the you know usability. It uses the taxonomy prompt analyst for potential error because you know if you have established taxonomy, it becomes very easy for us to you know pick it up. So, encouraging the validity and reliability of the data, substantial time economy compared to with any other observational study and error reduction strategies offered as part of the analyst in addition to the predictor analyst. However, there are lot of disadvantages. So, it can be tedious as you understood from the starting to end it takes so much of you know time and you know scrutiny, you have to be very rigorously involved

in the whole process. So, it is a very tedious and time consuming and if when it is a complex job. If it is simple then also still you can manage, but if it is a complex task it is very much time consuming. Extra work is involved if the HTA is already not available. So, you have to first get the HTA and then do the thing and does not model any cognitive components of error mechanism that is not possible and some predicted errors and remedies are unlikely or lack credibility thus posing a false economy it is possible and current taxonomy lack generalization. So, maybe we can work we can think of a research area where we can do more generalized taxonomy. So, these are the disadvantages.



Training timing, yes, initial training timing is kind of 3 hours. Of course, it is not fixed for everyone. You may take some more time or someone if already knowledgeable they can pick it up very quickly and it estimate is doubted if the HTA calculation is not included. Pen and paper are sufficient for this thing and computerized spreadsheet, Xpel, Excel may help you to create all these table in the computer and some cases we have some specific software. However, I am not very much aware about them. I never used it personally, but I know there are some such softwares are available where basic data if you provide it will give you the analysis. So, these are the things we wanted to discuss for SHERPA. And this is the whole structure. I will pause here for a minute to understand this structure. This is the whole structure. Whatever I discussed in my earlier all slides, I just tried to jot it down in together so that you get a very clear understanding how the SHERPA looks like and how you are going to start and how you are going to end over here. So, let me pause for a minute. Maybe you can take a look of this whole structure. Of course, here I suggest everyone to take a task and perform it, put it in this particular fashion and try to see how you can complete it. So, hope you understood this particular structure clearly and next class I will take you to the TAFEI. So, for now, thanks and I

suggest everyone to practice this one. Without practice, without doing it yourself, you will not be able to get the data correctly. Thank you.