Ergonomics Workplace Analysis
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Lecture – 02
Introduction to Ergonomics Workplace Assessment – II

Hello everyone, last class we tried to explain what is ergonomics, what are the varieties of domains available, and how do you implement ergonomics in various field. Also we explained that how ergonomics is interdisciplinary and intra disciplinary in nature. So, various people from various departments or various disciplines can integrate themselves into this particular subject, and they can implement this particular knowledge in their own field.

Also there are varieties of evaluation process available or sectors available where we really need to incorporate this type of evaluation system. So, we will continue with the discussion whatever we had last time and slowly we will go for the specific analysis. So, today I would like to explain you about the context in which we should apply human factors ergonomics, and why a context is important for evaluating or doing or implementing the human factors ergonomics issues or methods.

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So, first I will try to explain that focus of any particular system. Ergonomics is not an isolated system. It is like man, machine, the whole environment and personal technology is available. So, what we need to understand is the focus of that particular context. Human interaction is complex within natural and manmade system. So, we need to understand that aspect very nicely, and then we can implement these methods or methodology effectively. So that is very important.

Second is always we need to understand that behavior and performance or behavior and productivity. These are all inter related or it is interconnected. So, whenever we are trying to implement any kind of ergonomics methodology or ergonomics process or system, we should understand what is the relation between the human being or the present operator's behavior, and then effect of that on the performance and system.

Third is the whole system is comprised of number of interacting parts like human, technical, environmental, social etcetera. So, it is very obvious that total interaction among them is not linear. So, somewhere it is highly correlated, somewhere it is not that much correlated; or that correlation sometimes it is linear, sometimes it is non-linear. So, we need to understand that as well before we start practicing or implementing any kind of ergonomics methods or methodology.

Also we need to understand that holistic approach of a whole system. So, as I mentioned in the first point, it is not an isolated system. So, we need to see the holistic approach of whole thing, and we need to understand that implementation of that, particular emergent properties.

So, if we do not understand that, then it will be very difficult for us to analyze and evaluate further those data whatever we are going to collect. And finally, the embedded ergonomics practice. So, the success always depends on the position of human factors engineering or ergonomics in that particular organization, how it is placed, how it is present in the whole system. So, once we understand this context, then only it will be easy or it will be useful for us to implement any ergonomics intervention or evaluate workplace through ergonomics methodologies.

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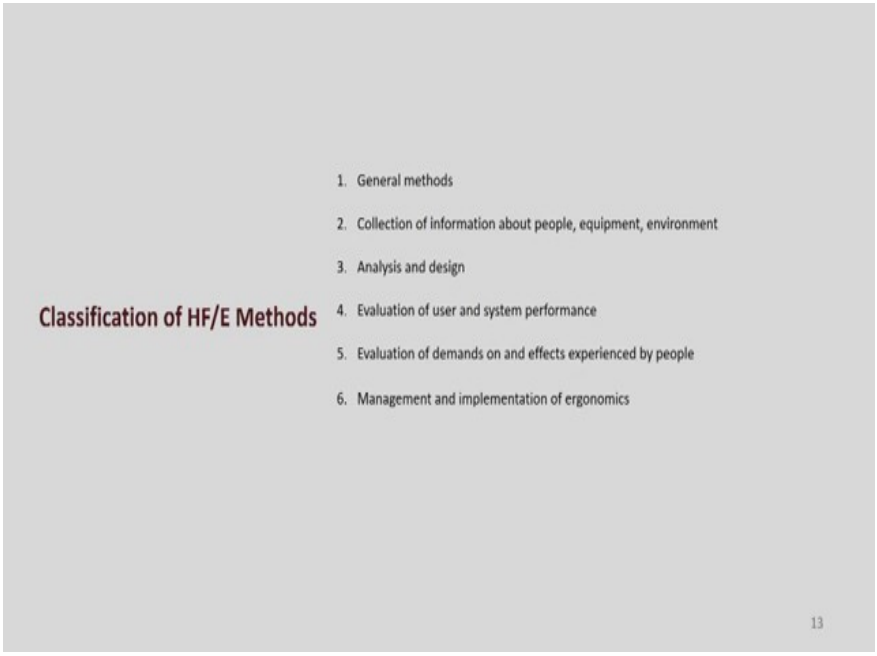

Now, I will take you for the classification. So, here I would like to mention that classification is very, very difficult as far as these ergonomic methods or methodology is concerned. Still we there are a group of researchers who try to categorize it, and basic six categories they have identified, and I will mention those categories over here.

So, first is general method. So, what this general method is? General method says that it actually represents the approaches of data collection or analysis and that can be used with range of different design or evaluation goals across a work system. So, any sort of data whatever we are collecting if it is common or general, so that comes under general methods. Although these definition these terminologies are not very specific.

Second one, collection of information about people, equipment and environment. What it is? It is nothing but observation or asking those people or recording those data from the actual working environment, so that type of data collection is also possible or we can consider it has a specific way of doing the evaluation of or workplace. Third one is the analysis and design. This is very important, and specifically in the field of research not only as a project these particular methods or methodology group is very important. What it does? It includes varieties of tools, techniques, instruments through which we collect information about the workplace and we try to analyze it.

Fourth one is the evaluation of system under a evaluation of user and system performance. So, how do we do that? So, what we try to do first at the beginning, when we try to see any system, we try to collect data as per the second component is concerned like information from the people, equipment and environment. So, once we collect those information, we to try to analyze as the fourth component like you know in detail, so that may be interlink. So, there are very thin line present between all these classification of the methodologies.

Fifth one is the evaluation of demands and the effects experienced by the people. Here also involvement of various instruments specifically bio measurements are important, important. Also we have varieties of questionnaires, detailed questionnaires, detailed methodologies and tools which helps us to understand those demand specifically, and that effect of that demand on that those group of people or group of operators. Sixth one is the management and implementation of ergonomics. Now, what I will do I will try to take you to all these individually in detail.

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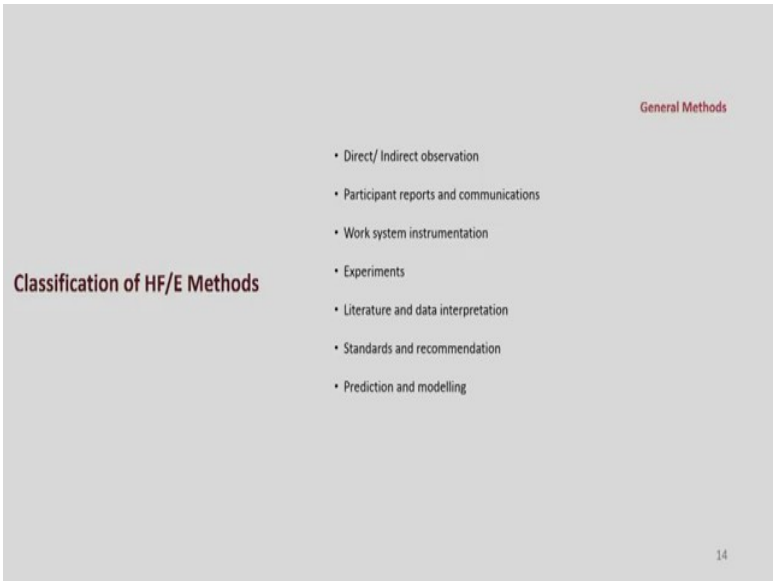

So, let me start with the general methods. So, in general methods, first comes as the direct or indirect observation. As I mentioned earlier that, all the six classification that I mentioned in your in the previous slides, the difference between each is not very clear, still we try to categorize it for our convenience. So, many times it happens that once we select one like suppose general, maybe it has a component as the fourth one or third one. So, it is very

common. So, once you start practicing probably you will be able to understand, and you will be able to categorize them according to those definitions or those nomenclatures.

So, what are direct and indirect observations. By nomenclature itself you do understand that what is direct observation and indirect observation. So, basically for direct we try to see the checklist, experts rating, photographs, video, and or also sometimes audio recording and event logging. So, these comes these all comes under direct observation. For indirect, what we can do is archival analysis, artifact analysis, data mining these are all the methods what we follow for the indirect measurement. Now second component for general methods is participants report and communication.

It is very essential in many cases, because as human factor engineering or ergonomics is such a subject where involvement of human being is very high. And we are actually trying to enhance the productivity or performance of the whole system although we are trying to keeping the human being in a good shape or you know hazards we are trying to minimize. So, taking responses from human being is very important. So, the second method or we try to follow in general method as the participants report and communication. So, what we try to do is different types of survey, questionnaire, ranking, rating, scaling then diary method and checklist. So, these are the important component of participants report.

Then let us start with the work system instrumentation. So, here there are varieties of system. Few of the system we will practice or we will try to show you in our laboratory that how we are collecting data, and then that is that can be implemented for our research purpose. So, few examples are eye tracking, video recording, data logging, all those things.

The fourth one is experiments. So, these types of experiments can be inferential and correlational design. So, it can be multiple or individual independent analysis can be done as the co variables. So, these things you need to really plan and have to need to collect data about those particular systems. Fifth one is very important that is the literature and interpretation. Here statistics is major important aspect, because whenever we are trying to take data from literature, we just cannot do the referencing of that. We need to understand, interpret as per my context. As I mentioned earlier also context is very important as far as ergonomics or human factor engineering implementation is concerned. So, statistical analysis comes under this particular part.

Also we have varieties of standards and recommendation. So, based on my context, based on my requirement, what I will do is I will choose a particular standard or recommendation or guideline, and then I will try to compare with my current literature or current available database or my own data ok. So, accordingly I will proceed further by either the design evaluation, or design implementation, or just building my own recommendation of that particular workplace system, so that is one.

In ergonomics, once we complete our whole research or once we complete our whole methodological process or methodologies, it becomes very important or it is very justified that through prediction modeling or different type of system modeling, so that is very important. So, once we do these types of prediction modeling, then it helps for the further researcher to carry forward the same kind of thought in their own field.

I will just give an example like if I want to say, these are the variables has an effect on this type of on some other type of variable. Now, how these dependent and independent variable are interacting with each other? If I do a prediction modeling from my own research data, then that model can be directly useful for other researchers, and it may save lot of time, also it is a big contribution towards the knowledge base of ergonomics and a human factor engineering. So, this is very important.

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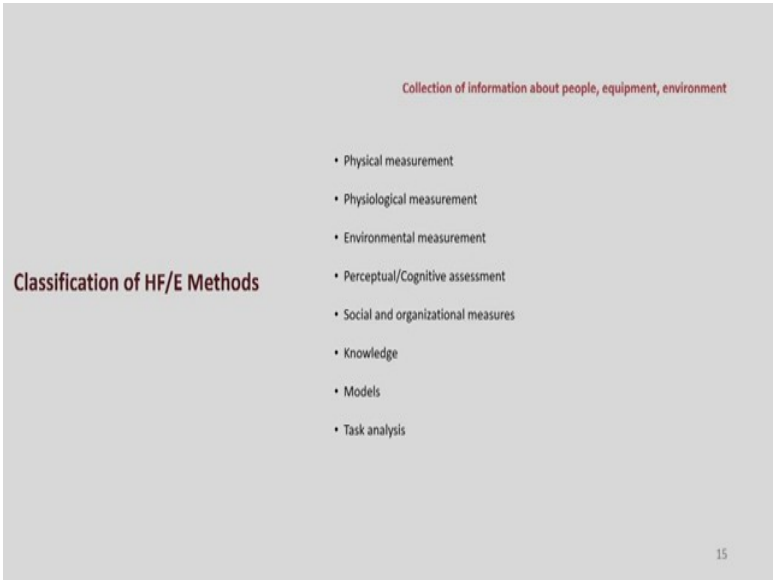

Now, let me take you to the second component that is collection of information about people, equipment and environment. So, first comes the physical measurement; so, collection of

information about people. So, first comes everybody whoever is associated with this particular field know that anthropometry is one of the important component. So, anthropometry, body scanning, you know ultrasound effect or many other physical measurements are very important over here.

Then next is physiological measurement. So, what it says? It talks about the heart rate variability, EMG, ECG, MRI, posture analysis, gait analysis, so all physiological variables we need to measure. Then comes the environmental measurements. So, here we have varieties of instruments available, and we can measure varieties of variables. So, mainly we use hygrometer, thermometer, sensor, light and sound meter, accelerometer and many other instruments. So, we will take small, small examples, and we will do those experiments also or we will try to explain you those small components.

Fourth one is perceptual and cognitive assessment. So, here we normally practice visual acuity, methods of limits, consult constant stimuli, intelligence states, spatial ability, response time, reaction time, we also call all these aspects, then is social and organizational measure. So, cultural problems, you know photo diaries, network analysis everything, and sometimes it is very important to understand the knowledge of that particular context from the people. So, here we do conceptual mapping, protocol analysis and others.

Also in this particular part what we do is modeling. What does this mean we may create logical mathematical model, we make or create biomechanical model, and these model can be useful as I said earlier the previous slide that prediction modeling that is only for prediction. Here only these that particular context we will be able to analyze using that particular model, so that is important.

And finally, the task analysis because when we are talking about the relation between the people, equipment and environment where all three are interacting with each other, task analysis is very important. So, among task analysis, we can do any type of work measurement; we can do hierarchical task analysis; we can do link analysis and many other work measurement system. So, this way we can collect data or information about people, equipment and environment.

Now, if you see whatever I explained in the general method and the information collection from the people, equipment and environment, the method somehow are interlinked with each

other. So, based on my context, what I will decide I will go for the first one or second one or in combination. So, it is not very specific.

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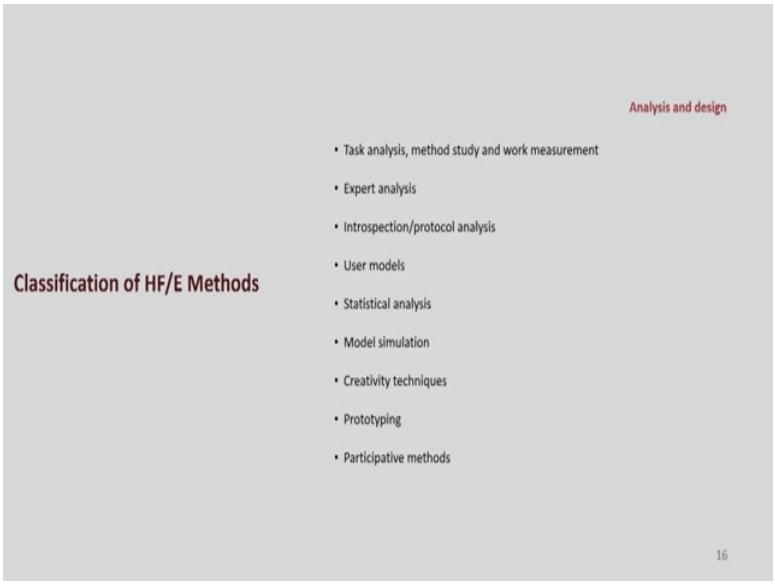

Now, I will take you to the third one that is the analysis and design. So, again when I will explain here, you will come to know how these are interlinked with each other. So, in the third one, we are saying task analysis method, study and work measurement is very important. Here it is more of quantitative analysis. So, when we are talking about task analysis, method study or work measurement, so we are talking about specific time specific value. So these things are will give you some kind of inferential analysis afterwards.

Then is the expert analysis. So, what we can do is heuristic we have various standards, then we have specific guidelines that we can use then introspection and protocol analysis, then users method. Of course, here statistical analysis is important. Then model simulation, then creativity techniques. So, here in the creativity techniques, we try to explain the scenario in particular way, and then we try to implement how this is important, and how the methods can be evaluated. Also prototyping, participative methods etcetera.

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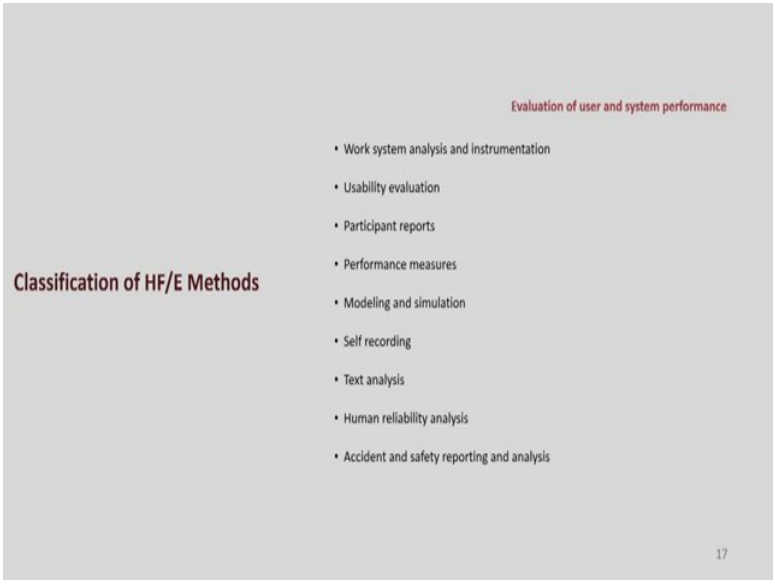

Now, I will take you to the next part that is the evaluation of user and system performance. Here also varieties of small-small methods available; again same thing that it is not very different than whatever we are discussing. So, work system analysis and instrumentation, usability evaluation, participants report, performance measures, modeling and simulation, self recording, text analysis, human reliability analysis, accident and safety reporting and analysis. So, these are the thing.

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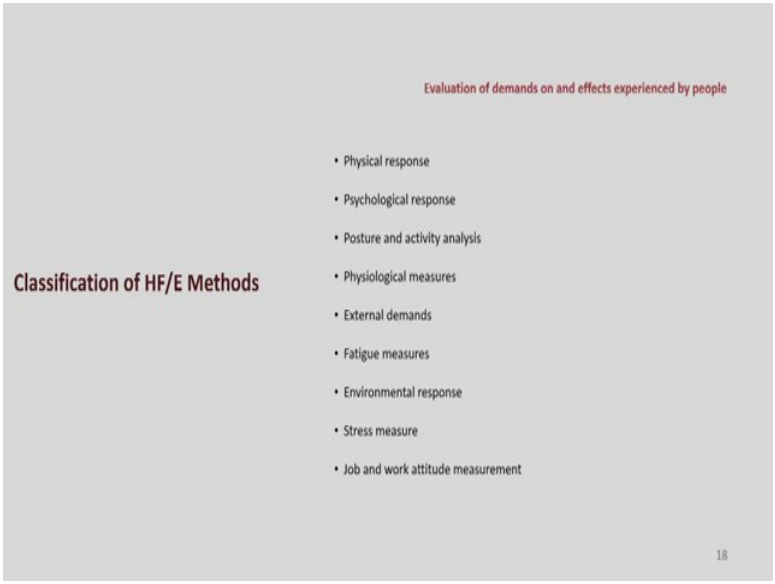

The next one is evaluation of demands and the effect of that demands on the by the people whatever they are experiencing. So, here lot of instrumentations are involved. So, when we are talking about physical responses; it may be subjective, it may be perceived, it may be objective. So, varieties of physical responses, we may collect then same as the psychological responses. So, psychological responses also you know subjective, task measurement and all those thing.

Here posture and activity analysis. So, we have varieties of tools. So, whoever know about ergonomics, people's posture analysis is very common that is the (Refer Time: 23:36), and many other small-small methodlogies available. We will be definitely discussing or if you have question you can ask. Then physiological measure as far as physiological measures are concerned, heart rate galvanic skin responses, oxygen uptake, brain activity, EMG, many other things.

Then external method like how much time I have to complete my job and how much time I am taking. So, ratio of that, maybe time pressure, frequency of the demand and many other demand process that we can use for the external method. For fatigue we can use critical flicker frequency, blink rate, response fatigue or maybe reaction time as the measure. Environmental responses of course, body temperature, hearing threshold, sensation loss, stress again as I mentioned so physiological responses. And, if you see the stress responses few parameters or few variables are common that is the galvanic responses, subjective responses etcetera. And job and work attitude measurement, so that can be done using any rating scale or through interview.

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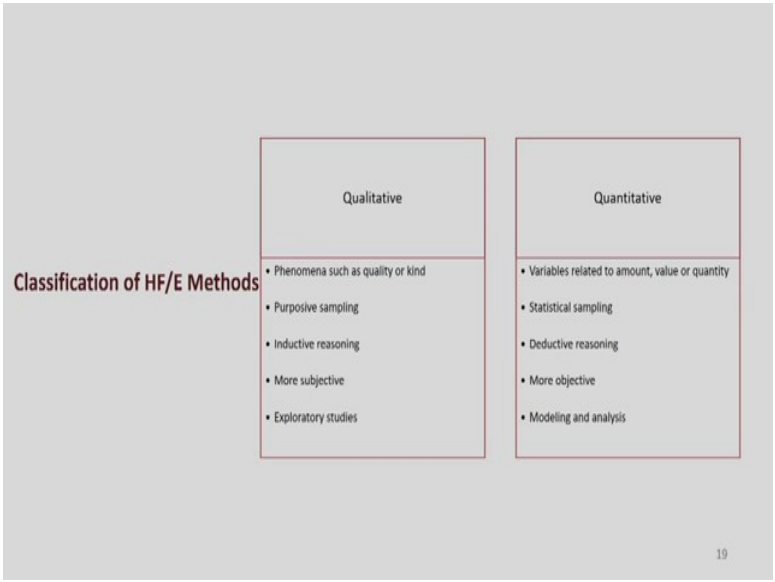

So, once we understand all this thing, we need to understand that what is qualitative measurement and what is quantitative measurement. Because, whatever we explained earlier these are the, these are based on how we are collecting data or how we are gathering information. Now, we need to understand what are the types of these information or value whatever we collected.

So, we can classify them into two major categories that is the qualitative and quantitative. So, in qualitative, we have phenomena such as quality or kind, purposive sampling, inductive reasoning, it is more of a subjective explanation. For quantitative, we have statistical sampling, deductive reasoning, this particular type is more objective in nature modeling and analysis.

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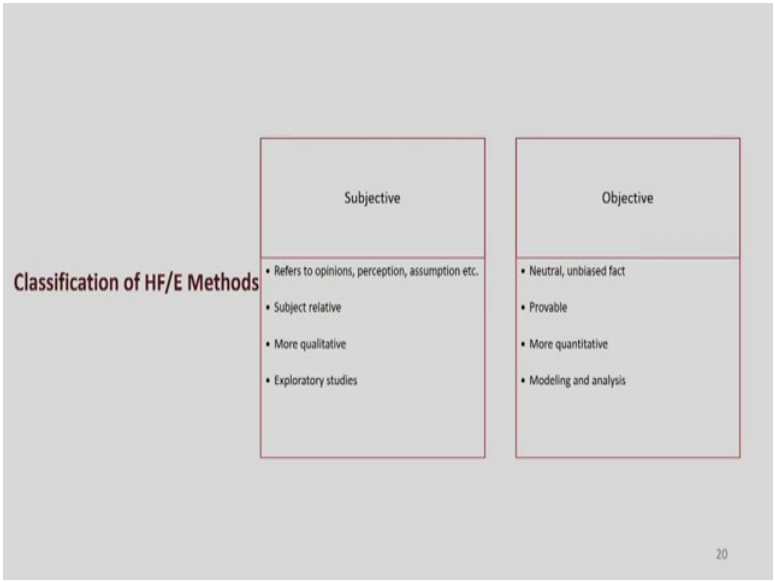

So, once we understand that quantitative and qualitative measure, we need to understand also what is subjective and what is objective. Subjective means whatever information you are collecting from subject as an individual and they are giving that responses. So, you do not have any control whatever responses they are giving. So, it refers opinion, perception, assumption, it is more of explanatory in nature, rating scale, questionnaire, all those things.

In objective, we have very specific tasks ok. So, it is more quantitative in nature and it can be used for modeling and analysis further. So, also sometimes we take data from subjective for modeling and say analysis, but objective data gives you better strength for any type of modeling and analysis data.

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Now, I will take you to some challenges or difficulties when we are going to implement or use ergonomics method. So, first I would like to mention over here is the developing methods that will integrate with other methods ok. So, because you need to develop one method, and you should understand how the other current systems are available. So, how they are integrating with each other. Then linking methods with ergonomic theory, whatever theory we have how that is connected with the methodology or method you are implementing. So, if it is very different, then it will become very difficult for you to establish the fact.

Then making the methods to use also it is important that it should not be. so much of complicated system that the learner cannot learn it easily or implement it easily. Reliability and validity of that particular system also cost effectiveness as I mentioned. Also here I would like to mention one thing, India being a developing country implementing ergonomic principle or methodology or methods for any situation is very difficult, because our manpower is very easily available. And we hesitate to implement varieties of thing or varieties of enhancement techniques or methods for enhancing their will being. So, it is very much related with the cost.

So, whenever you are developing any methods or methodology, we need to understand how cost effective it can be. It is not only in terms of money, it should be in terms of time, it should be in terms of the interaction process. Then we should understand whenever we are talking about ergonomics method, we should understand the ethical issues, because we are

we will be dealing with human being. So, human being is very important or critical aspect of this particular subject.

So, we should not violate any ethical principle or ethical rule. So, also I do suggest that whenever you are planning to do your any ergonomic evaluation or ergonomic study, you should first take permission from human ethics committee of your own institution, so that it becomes easy for you to implement that. Also you should take the signed informed consent from each participant whoever is participating for you. So, sign informed consent there is a specific format. So, you should follow those formats and then you can continue for your study.

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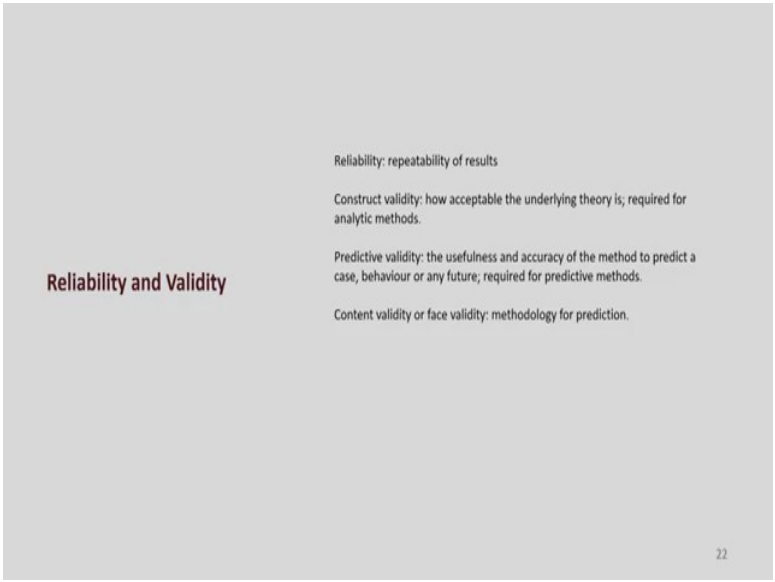

Then I would like to mention here as what is reliability and validity of any particular system. So, what is reliability? Reliability says the repeatability of your result right. So, suppose you developed one particular method or methodology, and you want to see is this particular method or methodology is reliable or not. So, that means, if it is highly reliable it should give a similar result for every context or every situation who what you are predicting in your while developing that methodology. So, if it is like that, then you can say it is reliable.

Then you should understand the construct validity, how acceptable the underlying theory is, and required for analytical method that you need to understand, then predictive validity. So, first one is constructive valid construct validity, the second one is predictive validity. So, the usefulness and accuracy of this method to predict a particular case, behavior of any future

evidence or incidence, and required for predictive methods. So, these all thing is very much related to your statistical analysis. Then content validity or face validity. So, these are the basic requirement whenever we are talking about ergonomic workplace evaluation.

So, till now whatever I was talking is more of a basic ergonomics concepts and required information. Now, I will take you to the slowly to the different methodology and methods.

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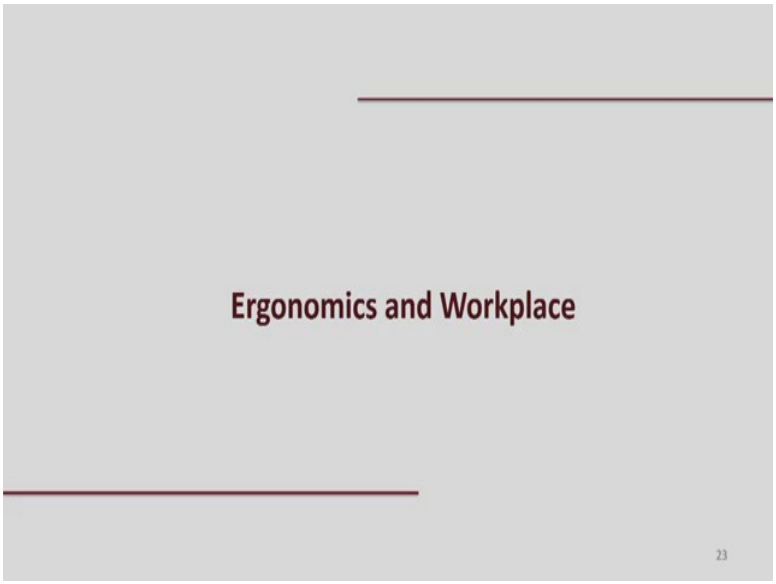

So, what is ergonomics we understood, now we need to understand what is workplace.

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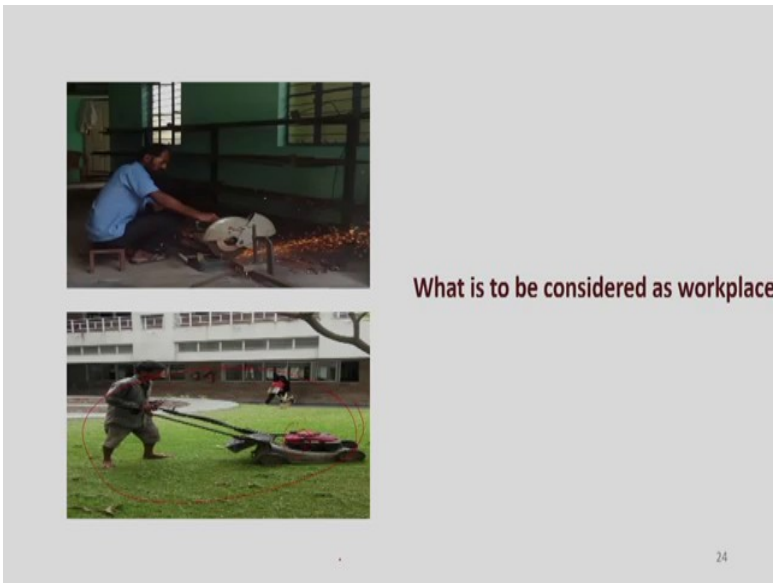

So, if you see this picture, so can you tell what is the workplace over here? So, work place means where a worker is working. Now, check this photograph as well that if we talk about the workplace, the whole field may be we may consider as the workplace. So, in workplace, the human being is present, that machine is present, that surrounding environment is present. Surrounding environment can be physical can be psychosocial. So, it depends.

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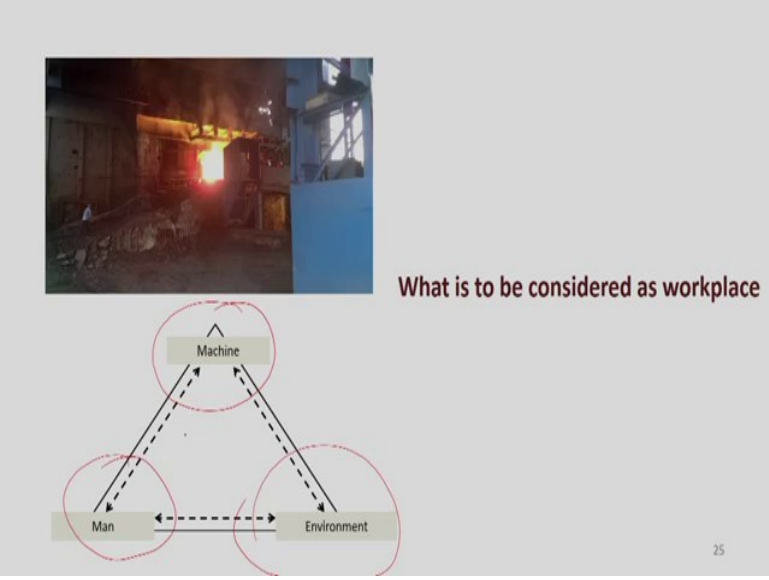

Now, take this example also here how the person is working within the range of a furnace. So, how it is? So, whenever we are talking about workplace, we need to understand human being first, then and machine, and then surrounding environment. So, all these three component of any workplace keeps on interacting with each other. So, when I am talking about ergonomic workplace evaluation, it does not mean only the physical environment exists there; it means also the evaluation of the interaction between the man to machine, man to environment, machine to environment and all these vice versa relation.

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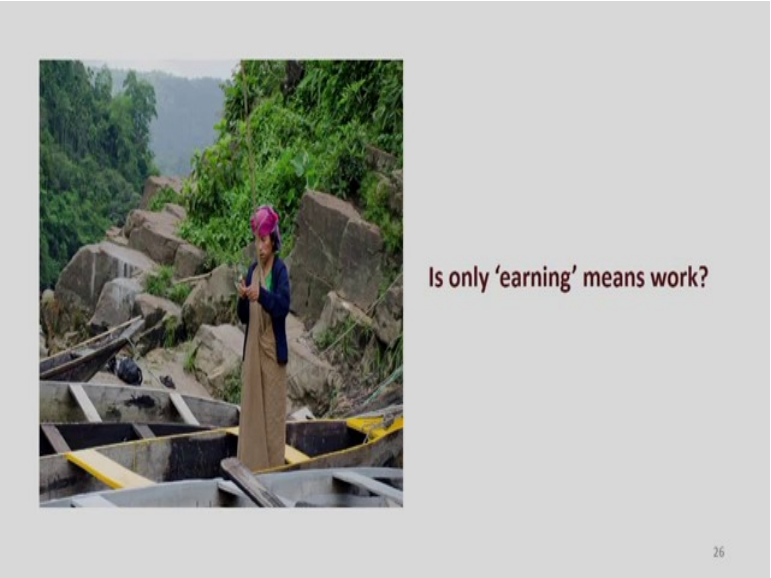

Now, here I would like to explain is what work means? Is this only when we earn money? For ergonomics, it is not. Whenever we are doing any job, it may be for my home, it may be for my child, it may be for my office, whatever would job we are doing or whatever work we are doing will be considered as the work. And we will take that surrounding, that particular activity as the workplace analysis. So, this is very important.

Take example of this particular female who is you know trying to catch fishes. So, it is in a rural area. So, she is not doing it just to sale that fish and earn money, maybe she is doing it for her home; so for her domestic need. So, here also if we like to do some analysis we can do and we will be considering it as an ergonomic workplace analysis.

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Now, the question is every time we are doing work, is it required to do an analysis? So, we need to understand job demand and the effect of that demand on the human health. So, wherever that demand and the effect is not matching, the ratio is not correct, or is not convincing, there only is the requirement of analysis. So, suppose this fellow is doing this particular this particular job in a whole day for maybe 1 hour or 2 hours, and then something else he or she is doing, and maybe this is not creating any trouble for him, we may not require to do analysis for it.

Of course, if design is concerned, sometimes we may design this broom, we may design or we may correct the way of doing it that may be required, but whenever we are trying to do so, we should understand why we are doing this analysis.

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So, why we should do ergonomic evaluation? When we are talking about ergonomic evaluation, so ergonomic evaluation whenever we are doing, we are trying to understand the relation between the extrinsic factor of any particular task and the intrinsic factor of any particular task, so interaction or the relation of each other. So, when we understand there is a demand then only we go for the further evaluation. So, what are the research applications? So, you can see on the left hand side, I tried to mention the research application; on the right hand side, I explained the practical application.

So, under research application of why we should do ergonomic analysis, so understanding the interaction of fundamental elements of work. So, when I am doing a particular job or particular task or work, maybe these terminologies are very specific we need to understand what are the basic elements of it. So, this is a pure research need, because maybe based on those elements, we will do the further analysis or maybe some design modification or maybe some implementation of other methodology, so that can be done.

New theory and framework generation, model and guideline as I am telling from my previous slides also, that model and guideline generation is very important, and then identify new gaps and problem. So, these are the research application. But ergonomics does not talk about only research; it has some practical aspect as well. So, for the practical aspect, we can say optimize the productivity, optimize the health and well being, improve the quality, quality not only the human health, it also talks about the quality of the product which is coming out,

improved employee engagement and efficiency, better safety culture, reduction in errors and accident, reduction in lost work hours and compensation demand.

So, when we are talking about implementation of any ergonomics issues or ergonomic intervention program or workplace analysis as far as research is concerned, we may achieve all these goals. But when we use the same methodology for our industry, we may achieve all these goals. So, it is very much interconnected with each other.

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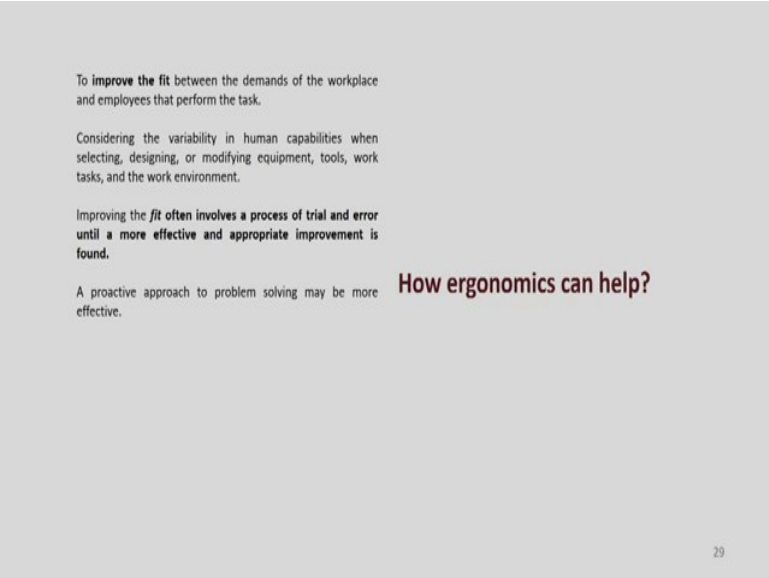

Now, how ergonomics can help first like when we are I am implementing some ergonomics principles or ergonomics method, how it help. So, it improves the fit between the demands of the workplace and employees that perform that particular task. If you study if you ergonomics book, you will come to know few term in one specific terminology that is fitting the job to the man.

Sometimes it is very difficult always that you know fitting the job to the man. Because, once I am working for the same job if somebody else is working always it is not possible for the management that fitting that particular job for me separately or for some him or her who is the next person separately. So, that is not cost effective because cost effectiveness is very important aspect for ergonomics. What we try to do is the balancing between fitting the job to the man, and fitting the man to the job. So, once we optimize that, one when that optimized point comes, then of course, the productivity will be in the higher stage. So, being a

practitioner of ergonomics, we always should look forward to optimization between the demand and the human performance or human ability.

Second is considering the variability in human capabilities when selecting, designing, or modifying equipment tools, work tasks, and the work environment. Third is improving the fit often involves a process of trial and error until a more effective and appropriate improvement is found. This is very important aspect. Next is a predictive approach to problem solving may be more effective ok. So, whenever we are talking about ergonomics, I referred this one in earlier slides also prediction is very important.

So, proactive that is important. So, when we are predicting, then we are taking it proactively. So, we are not waiting till accident happens. So, before accident happens, we analyze this may be because which can lead to accident we are preventing that. So, that is proactively we are dealing with that particular aspect.

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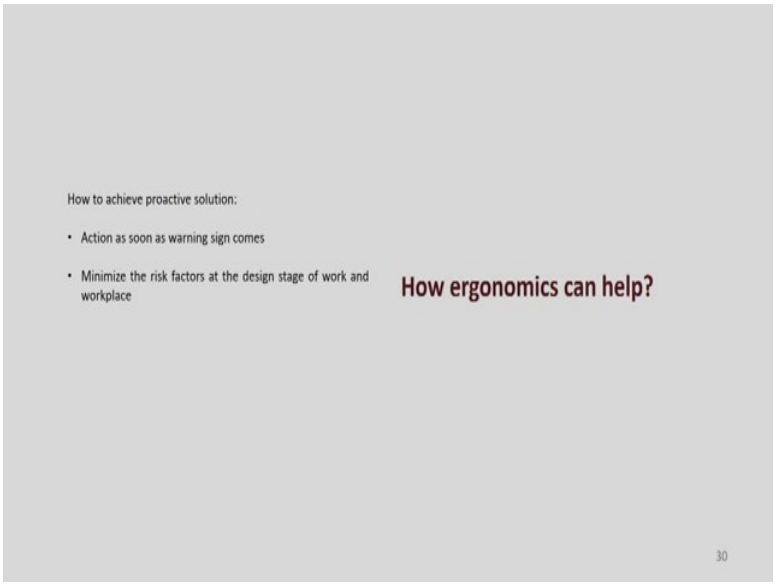

How to achieve a proactive solution? So, I will take you to that. So, action as soon as warning sign comes, minimize the risk factor at the designed stage of work and the work place. So, I will tell you about how to achieve the proactive solution. So, what you should do as soon as you see the warning sign you take the action. Suppose, you found in a whole workplace that 3 amongst 10 people are irregular because of some medical issue, and the medical issue is very similar in nature. So, you got a say sign there may be a problem. So, you try to evaluate why

it is, how it is and why it is coming repeatedly. So, proactively you are trying to see how you can prevent it.

Second one is minimize the risk factor at the design stage of work and workplace. So, when we will go for various evaluation methods, we will come to know that how we can use those data in the design phase. Suppose, you are designing the workplace, you are designing the tools and equipment to be used at the workplace, before designing itself you will understand how the ergonomic issues are and how you can improvise on that. So, if you do that proactively, you are actually preventing accident and increasing the productivity.

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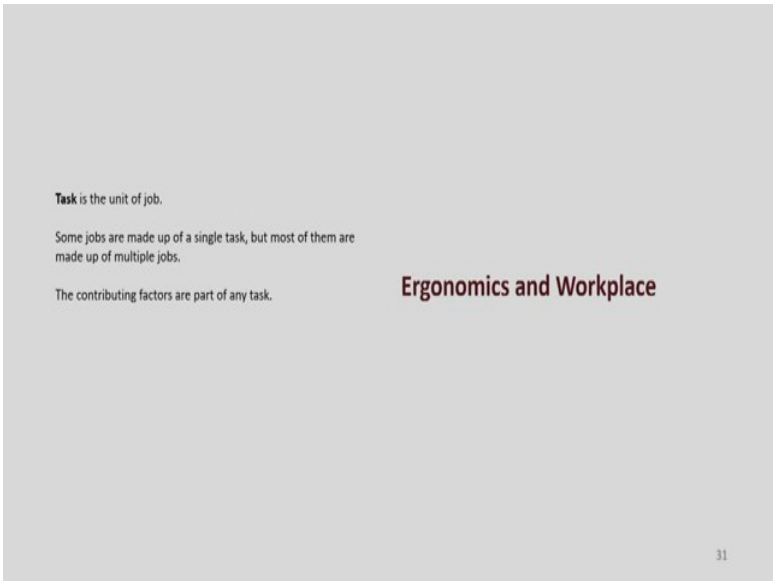

So, when we are talking about ergonomic and workplace analysis, we need to first understand: what is the basic element of the work and workplace. So, first one is the task. What is it? Task is the unit of a particular job, some jobs are made up of single task, but mainly any job is comprised of different small tasks. So, contributing factors are part of any task. So, if you analyze the whole workplace, you can find this small task, there may be a small problem, that is another task there may be another problem, may be they are interconnected or maybe they are individual. So, how to analyze it? So, that is very, very important.

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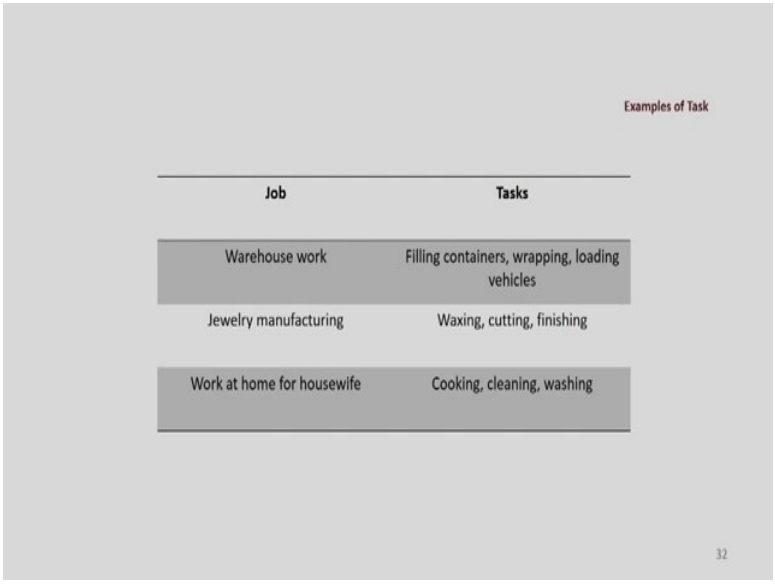

Now, I will just give some example. So, it will be clear to you suppose I am talking about the warehouse, to the work whatever you are doing within warehouse will call it as warehouse work. If you see the task, task may be the loading, unloading, rapping many other things. We are talking about a jewelry manufacturer, suppose I am talking about making a gold ring ok. So, here maybe waxing, cutting, finishing, polishing, all small, small, small tasks will be involved.

So, what you can do as a home task like you can pick it up, you find out a job and try to see what are the tasks involved for that particular job. Then how you that particular task is associated with the workplace, what you are going to define maybe slowly you can start practicing at home. So, that at the end for the assignment and examination, it will be easy for you to answer.

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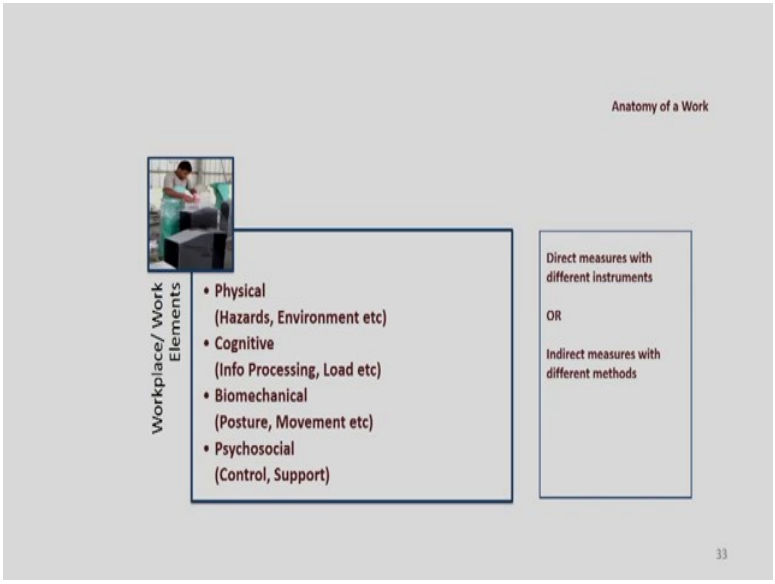

When we are talking about job or task or we are talking about the work, workplace, it is very important for us to know what the whole anatomy of any particular work is. So, that can be defined as physical, cognitive, biomechanical and psychosocial; as I explained earlier that these are very much interconnected with each other. So, from all these, we can do direct measurement with different instrument, and we can have indirect measurement using different methods or questionnaire or checklist.

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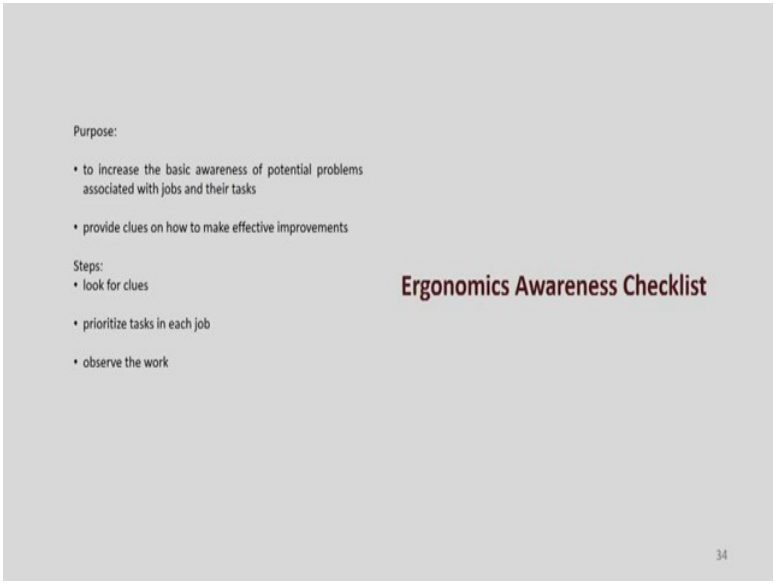

So, first I will take you to the ergonomic awareness checklist. What is the purpose of it? To increase the basic awareness of potential problems associated with the job and their task, this is the basic purpose. Second is to provide clues on how to make effective improvement, because it cannot say do this or do that, but it gives an indication this may be a route of improvement, so that is important. So, steps what we try to follow is look for clues prioritization of the task in each job. Suppose we have three jobs. In three jobs, first you analyze the first job, you find out what are the tasks available, you give the prioritization of that those available tasks, observe that whole work and analyze it further.

Here when we are trying to find the clues, prioritizing and observation, what are the things we should do, we should identify the employee fatigue or discomfort. As I mentioned in my previous example that you are trying to find out suppose three people among 10 are taking frequent leave or frequent break due to some medical cause or medical problem. So, you try to analyze it, then employees restricting their movements or ranges motion because of sitting or discomfort.

Suppose, I am doing a particular job on my desk, and somehow I am trying to restrict my left hand movement or right hand movement, or I am doing it in different way how I should what do in natural. So, if I find that why I am doing so, you should identify that. High absenteeism is a big cause big clue for you to identify that why it is happening. The next one is the poor productivity like if you have the suppose in a day you are making 10 product, and all of a sudden you see every day I am you know getting 8 or 7 products, so it had drop in the productivity. So, you should find out why this drop is happening.

Then if you are getting frequent customer complain, production bottlenecks, you should understand, then employee are reporting some kind of problem. So, problem may not directly related to the ergonomic issues, but that may be indirectly have a link with this ergonomic issue. So, whenever you are trying to find out this, you need to categorize it or you should give a ranking like for the prioritization. This is crucial, this is next, this is next, this is next like that.

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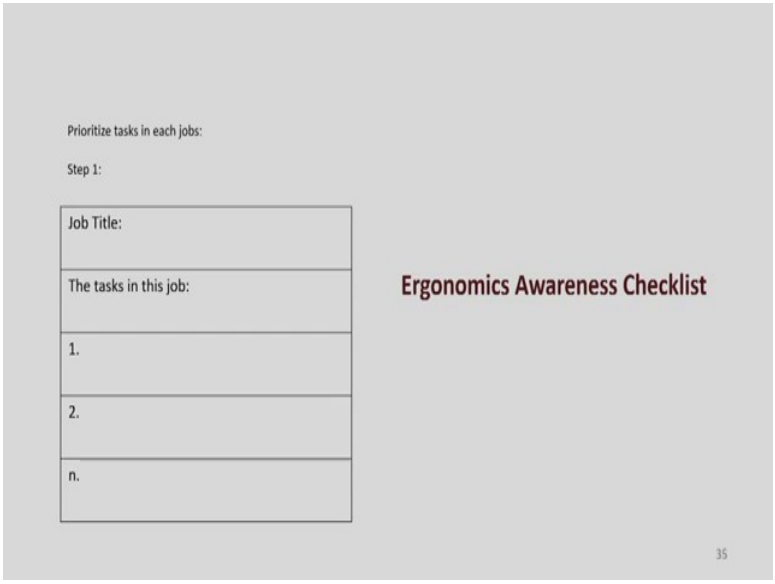

So, you can use this type of table for your prioritization.

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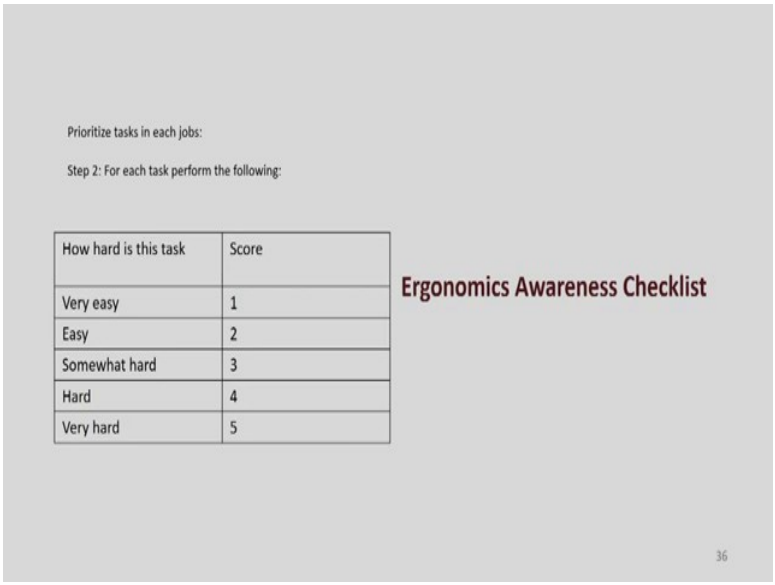

Now, you can give the ranking. This particular scale also you can use or you can use as per the requirement different scale, but this scale is very easy to you. So, I always refer in the beginning for the beginners to use this particular type of scale. So, it is a 5-point Likert scale, you can use it.

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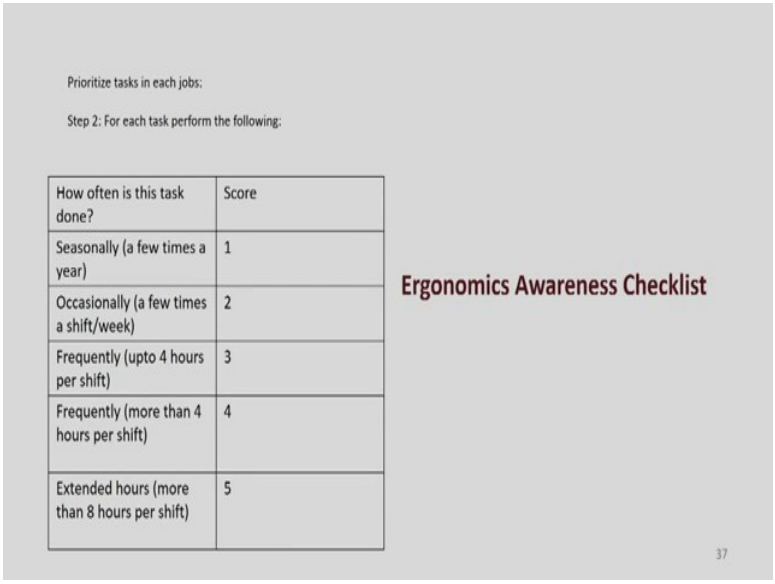

So, I will just give some example like how often this task is done you give a scoring. So, you can ask a question like how often this task is done, this particular question in a 5 point scale, very rare occasionally frequently that also you can have a description like up to 4 hours per shift, or more than 4 hours per shift, and extended hours that more than 8 hours per shift. So, this way you can give a prioritization checklist for people.

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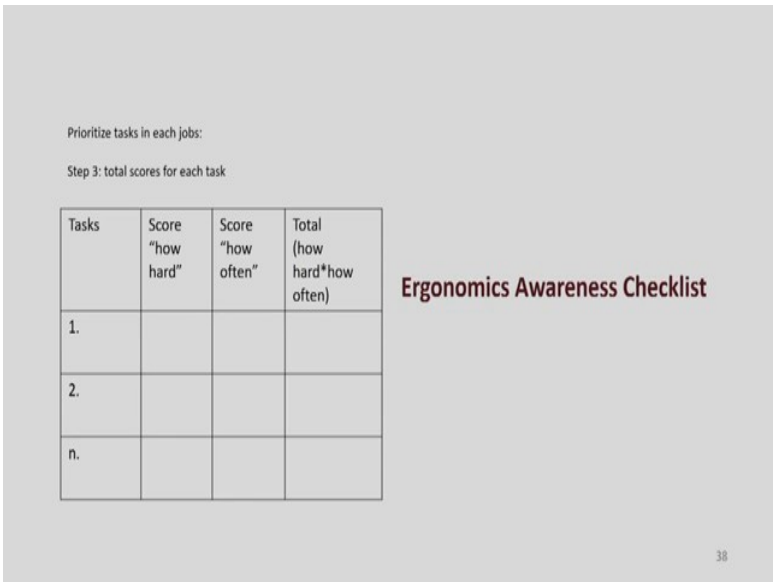

Also for each task you can give the total score; so, how hard, how often, and how hard and how often in combination so multiplication of that. So, if you get this scoring, from that you

can find out which component is coming as the priority level, which component is coming as the next level. So, when you understand. This task is very crucial for me. Then what I will do? I try to analyze it further.

So, this is the basic identification point. So, this type of awareness checklist you can use, and you can identify them. So, once we do this type of prioritization, what we can do is we will take those tasks or workplace element for further analysis.

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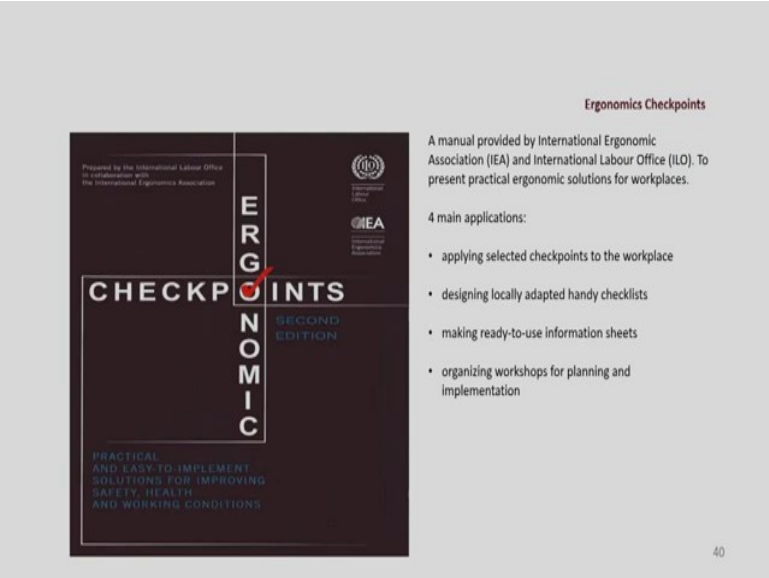

We have specific checklists available guided by given by ILO. So, this particular checklist you can refer, any time it is online this particular checklist available in their website.

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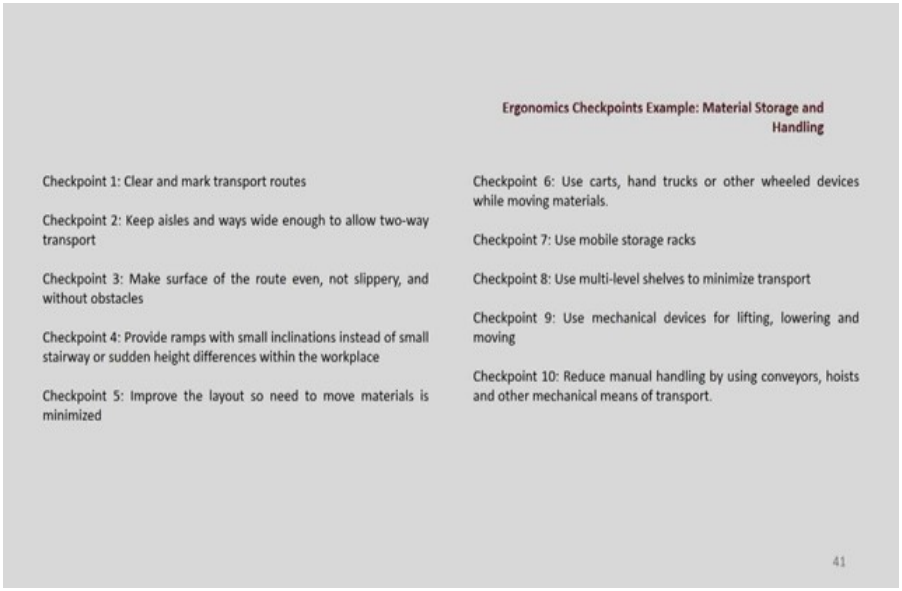

So, you can refer this also, we have some checkpoints. So, these checkpoints are very important we are talking about the ergonomic workplace analysis awareness checklist. So, first one is clear and marks the transport route very clearly which is very important because once the route is not clear, there may be an accident.

Second is keep the ways wide enough to allow two-way transport, because when we are talking about industry or transportation, we should have these movement very clear. Then checkpoint three make surface of the route even because if there is a problem in the whole route, there may be an accident, it should not be slippery, and it should be without any obstacle. Fourth is provide ramps with small inclination instead of small staircase or sudden height difference within the workplace, so very important aspect.

Fifth is improve the layout. So, need to move the material is minimized. So, suppose I have to reach from a point A to point B, I should minimize the route. So, whenever we are designing the workplace layout, this particular point we should always keep in mind and we should design it. Sixth point is the use cart, hand trucks and other wheeled cart devices while moving the material. Seventh is use mobile storage rack which is very useful whenever we are talking about this, and use multi level shelves and to minimize the transport.

Suppose, I want to keep which is need very frequently need to transport, we will keep it at that level, from here we can do the movement easily which is less frequently used material will keep it little on the higher side or where I need not to reach frequently. So, use

mechanical devices for lifting, lowering, and moving and reduce manual handling by using conveyors, hoist, and other mechanical means of transport.

So, here I will stop today, we will continue further. And, what I suggest you that whatever we learnt today we will take small example at home and we will keep on identify those elements.

So, in the next class, when we will start we may will be easily correlate those information with the specific methodology or methods.