Applied Ergonomics
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Module - 04
Lecture - 18

Hello and welcome to this applied ergonomics lecture eighteen. We were talking about the various job ranking techniques, where we discussed about the paired comparison method, and discussed how in a machine shop over a period of time with a paired questionnaire of what is better than what it could actually arrive at a ranking scheme for the various jobs which are involved in a machine shop. So, I would like to just enumerate little bit of advantages then disadvantages of the paired comparison the ranking job ranking system. So, the basic advantage that such a system may have is in terms of it is simplicity is basically laying on a paper two different jobs and comparing which one is better than the other. So, it really does not require staff you know you, know and does not really require any sophisticated tools of job evaluation.

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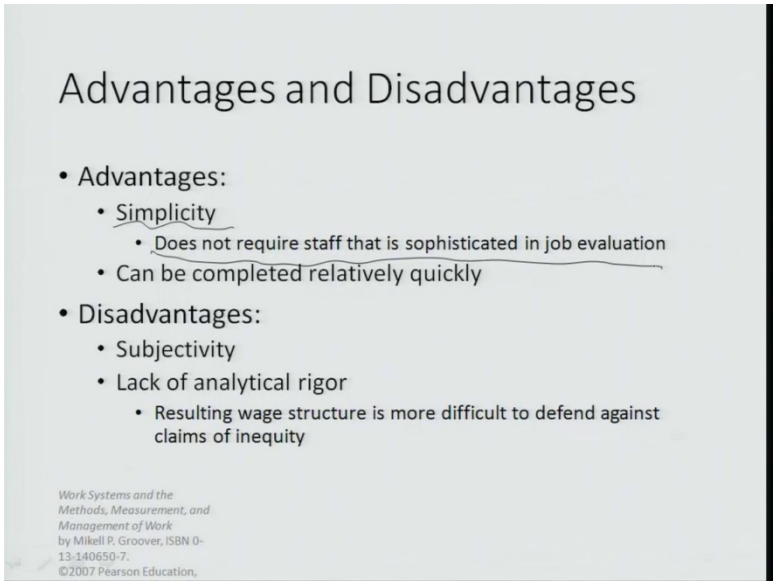

It is merely the capture of experience and experiential knowledge which can be used for doing such paired comparisons. And of course, it can be completed relatively quickly

because if we compare each job to the other one. You have a ranking matrix where it says how many times one job has rated higher than the other; obviously, if the highest one in the whole comparison comes out to be rank one and so on so forth.

Of course there is a huge set of disadvantages one of the major disadvantage is being the subjectivity. Subjectivity meaning that you know you basically only on the use of experiential knowledge are able to delineate one job in respect of the other and you have to believe that experience. So, if there is a you know individualistic preference of a certain kind of job over other that preference factor comes in.

And so there is always a subjectivity involved in the judgment between the paired comparison, which will create the paired comparison. And of course, there is a lack of analytical rigor. And so, if I wanted to base my wage structure against let us say this kind of paired comparison matrix, it may not be a very appropriate mode to defend the wage structure against claims of inequity etcetera. Because obviously, such paired comparisons are more humanistic in nature, the person who is involved in taking a decision about one job is better than other always has a subjectivity in an in question.

So therefore, there is no rigorous way of looking at on a more quantitative manner, the different grades of jobs that can arise. Let us look at some classification methods. So, the qualitative method in which job grades are defined in advance of the ranking process rather than after as in job ranking methods are known as job classification. So, once the grade definition are established, and these are lot of tiers into which the different jobs are graded or evaluated. So, the evaluators then decide which grades which grade job should be slotted into which of the grades using job description as the basis of the classification.

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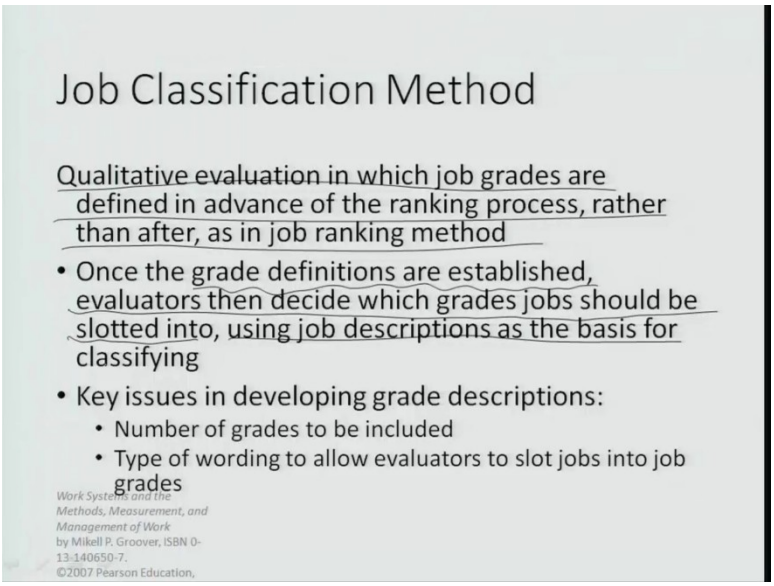

So, you basically now classifying all different you know jobs into different grades of jobs. So there is a supervisory grade there is technician grade, there is a foremen grade, there is a worker grade. And then of course, there is an administrative side there is a manager grade and you know above.

So, you basically trying to classify based on some similarities certain jobs similarities in term of performance etcetera, and also ranking is initiated in a manner of these different grades into which you have now graded all the jobs or task which are a time. So, the key issues in developing the grade description would be number of grades to be included and type of wording to allow evaluators to slot jobs into job grades, and you know typically the job grade descriptions should include key words and job factors to permit a variety of different job descriptions to be slotted into corresponding grades.

For example job factors could be like, difficulty and variety of work. So, based on that you could grade jobs into the more difficult ones from the lesser difficult ones. You have a degree of supervision required or exercised there is a judgment required in some jobs.

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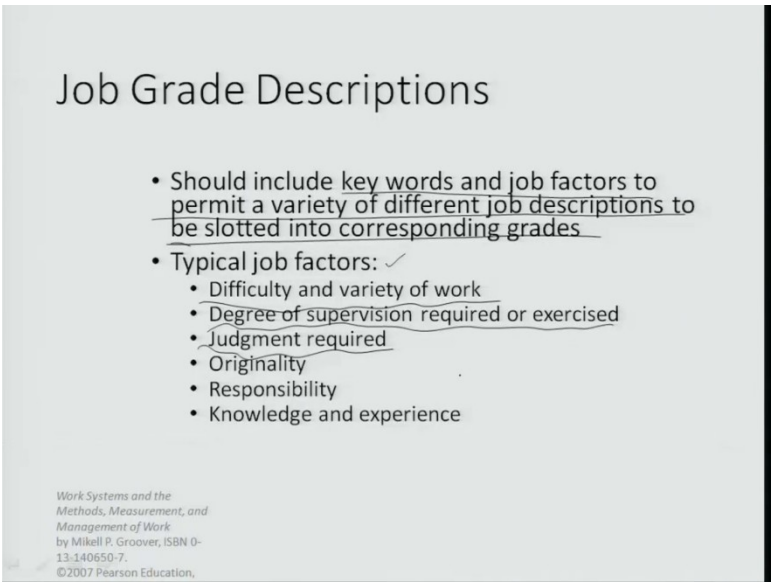

So, if there is high degree of judgment then there could be a certain grade, if there is a lower degree of judgment to be required to be needed then there is a certain other grade. So, you can look at for example, quality jobs you know quality assurance based jobs which lot of it depends on the judgment. So, you have originality based, responsibility based and knowledge, and experience based grades or classifications. So, it is very important to word the job grade description accurately. For example, the language you that you must use must be sufficiently general that jobs from diverse technical fields could be classified into one of these grades.

For example there can be fields like engineering accounting legal fields from where aspirants may come up for a certain job grade. And so, if the job grade is quite generate it could include typically expertise from all different domains ok.

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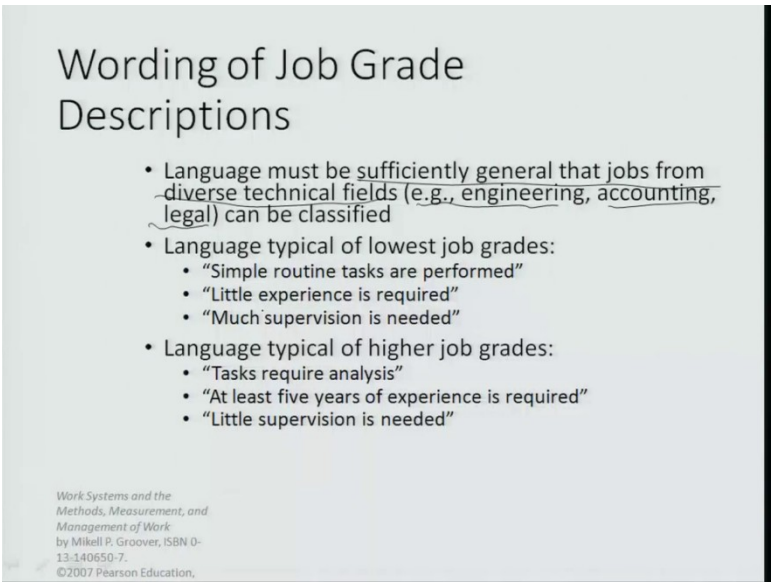

So there therefore the classification is held by the generality of the language which is put in. So, for example, for the lowest kind of job grades the very general terms that are used in you know job statements and let us say even advertising is simple routine tasks are to be performed, a little experience is needed or much supervision is needed. Or on a higher job grade you would say a tasks which require analysis at least five years of experience which is needed or very little supervision is needed. So, these kind of descriptors actually grade jobs into different types higher and lower grades. There are of course, advantages and disadvantages of grading jobs like these.

So, the principle again advantages are in terms of simplicity relative speed of implementation looking at a certain job profile or considered more objective and precise you know, than job ranking schemes and dis disadvantages could be many. For example, you can have difficulties in developing the job grade definitions a lot of it is subjective there can be ambiguity in assigning jobs to grades when certain factors fit one grade, but other factors fit another grade. So, which grade you want to decide in terms of a job classification or placing a job into certain class becomes a problem based on these kind of ambiguities. So therefore, it is also a highly subjective technique and therefore, you know if you really wanted to relate a wage structure to such a technique, just as the paired comparison method. Here also similar kind of challenges would come for designing wage system.

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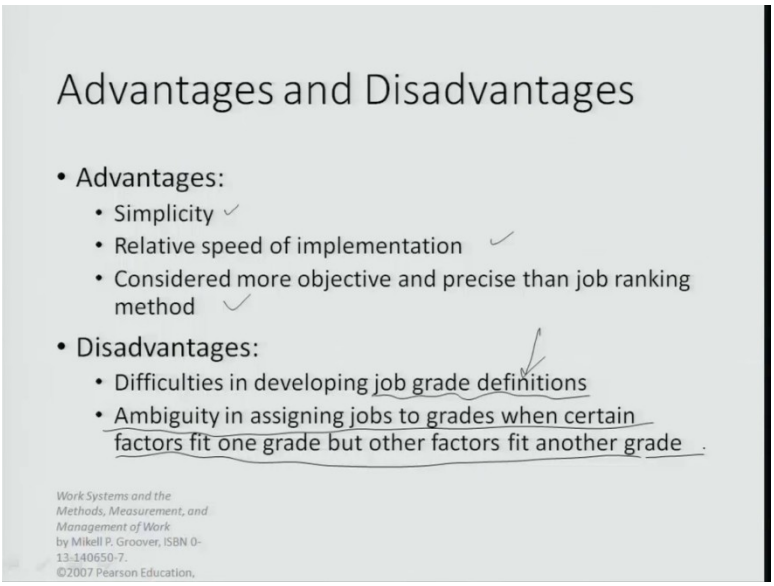

So, what are those other techniques where you could directly associate wage designing or salary designing? And so therefore, we go to the next method which is a factor comparison method which is slightly detailed. It is based on the premise that all jobs would contain certain universal factors, that can be compared separately in terms of rankings again to each jobs and evaluate the total worth of the job.

For example the commonly accepted universal factors which could go into you know go in terms of a human effort to a job could be for example, the skill set, that a person would have the mental demands that the job would take the physical demands, that such a job would take and the responsibility and authority that the job or the responsibility that the job would need and then of course, working conditions. So, based on these commonly accepted universal factors you could map different jobs into the once which needs high skills high mental demands, physical demands, probably higher amount of responsibility or adverse working condition.

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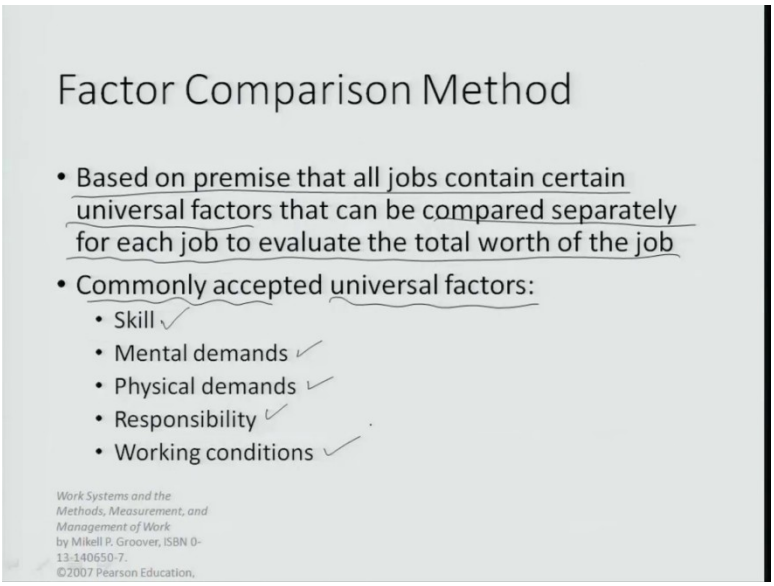

So, based on that you could actually classify and when you split up a job into these factors it requires the selection of sort of a benchmarking strategies.

So, you need to select some criteria for what is called the benchmark jobs so that they can be paid at rates considered for such jobs which exist already in the domain of knowledge, and there can be comparison to the jobs which are benchmarked for generally evaluating or generally preparing a strategy to evaluate the jobs at hand. And So now, after the commonly accepted universal factors are sort of described, we need to sort of you know benchmark jobs and benchmarking can be done on the basis of you know looking at overall what kind of jobs are available in what domain. And they can serve as reference points. And these benchmark jobs then can be used as a sort of a ball park value to rate all the jobs which are there hierarchically in an organization. So, let us look at it how.

So, for example, the first goal here would be to sort of select you know benchmark jobs. And the selection criteria that is used for these benchmark jobs is that they are paid at rates that are considered fair and appropriate. So, this is industry wide this is available across the particular domain. For example, if we had a job of a machinist or a job of an assembler or a job of a welder, they would be paid at a certain wage rate and this is very standard in the industry. So, this can be taken as a benchmark, and then these benchmark jobs can serve as a reference point to compare the other jobs which are there in the

industry. So, I will do one case where we will see that out of these 4, 5 different categories how we can benchmark all the different jobs based on the relative efforts that would be given of the jobs that are in hand with respect these benchmark jobs.

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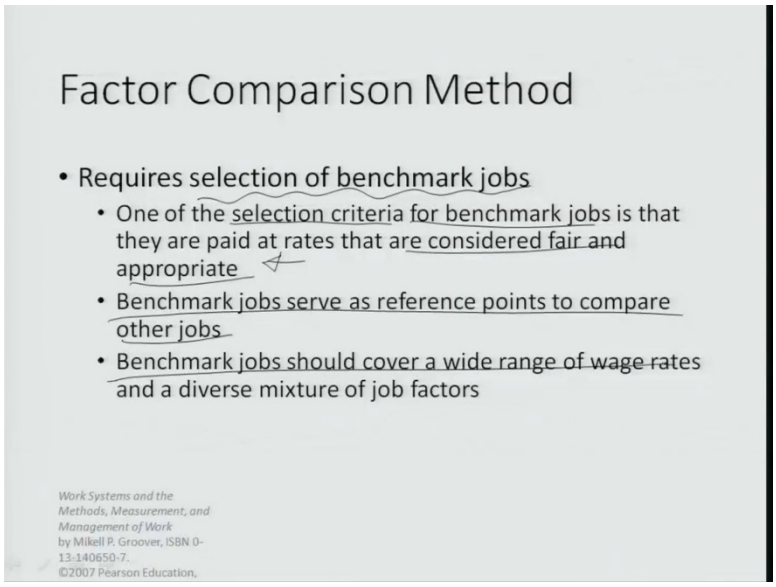

So, by enlarge the benchmark jobs should also cover a wide range of wage rates and a diverse mixture of job factors. Let us look at how you can select let us say for example, you wanted to rank by creating some benchmark jobs here, the jobs that are created here are that of a machinist an assembler a material handler a laborer.

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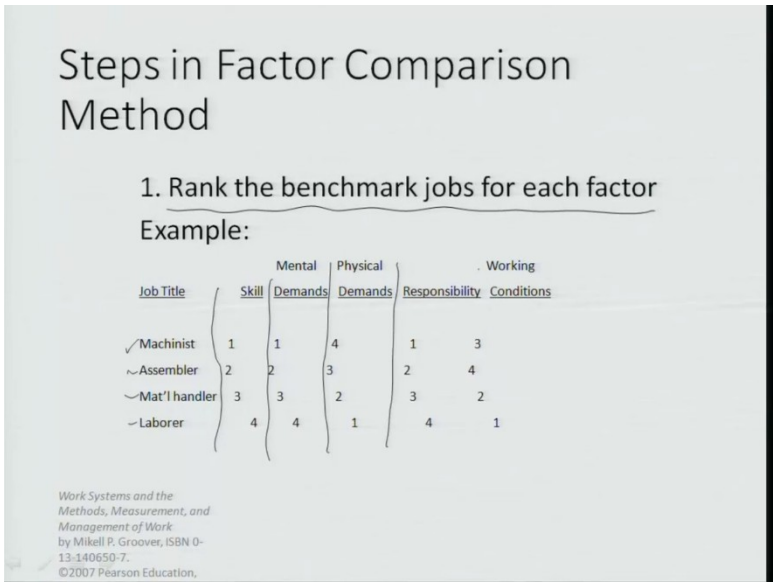

And there are certain requirements in terms of the different factors like skill, mental demand, physical demand, and responsibility and working condition for the different you know benchmark jobs. So, for example, the skill needed for a machinist would be rated the highest. So, we call it number one. Similarly that of an assembler is number two material handler may not need that much skill. So, three and laborer does not at all. So, it is four. So, you are basically ranking it in order of the degree of a factor which is needed for a certain job. And similarly for a mental demand or a physical demand responsibility you have this varied ranking as you can see all constructed here. Which gives you a basis of what would be the relative requirement of a certain factor, for a certain job is as the job changes between the different benchmark jobs.

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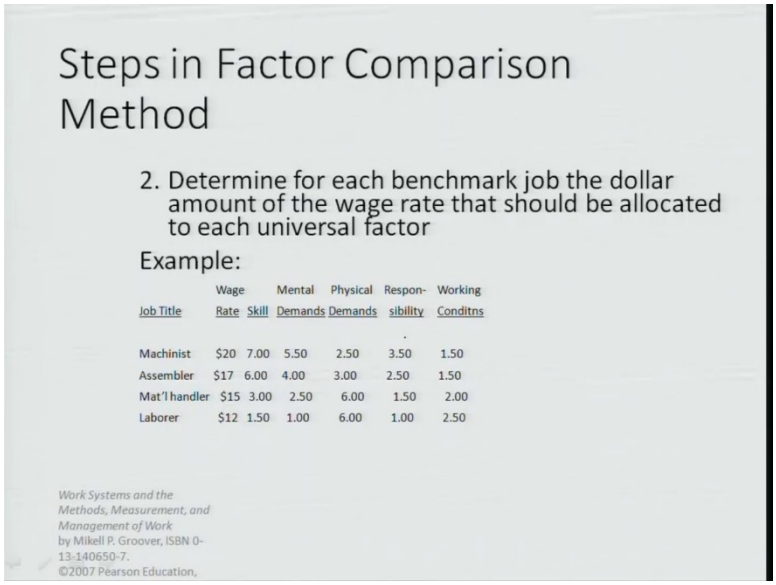

So, once this is done we can arrive at probably a suitable wage rate in terms of the requirement that is there, in terms of skill mental demands, physical demands, responsibility and working condition. For example, we look at the standard you know benchmark jobs and the rates which are available in the industry wide sort of carpet. So, we see that the wage rate of about twenty dollars an hour is common place in the industry for a machinist, seventeen dollars an hour is probably common place for an assembler material handler about fifteen dollars and laborer about twelve dollars. So, you use these rates the dollar rates as sort of universally accepted rates, and then based on what would be the requirement of skill set in order of ranking you split up in a manner so

that these all sum total to be the wage rate per hour. For example, skill as you know from the last side was rated number one for a machinist.

So, let us say the skill component necessitates about seven dollars an hour. Similarly mental demands which are there about five dollars, and five and a half dollars physical demands at two and a half dollars. Responsibility is three and a half dollars, working conditions is one and a half dollars. And So therefore, about 20 dollars in total which is a sum total of all these different job factors account for what a machinist would earn typically in terms of the different factors associated with the machinist job.

Similarly you have a model for the assemblers, now note here that because assembler needed a skill sets which are just lower than machinist. Therefore, we have kept the wage rate slightly lower than that of the machining as regards the skill factor of requirement skill factor requirement of the job. Similarly a material handler would probably need much less skills. And so therefore, there is a change in the wage rate from six dollars an hour of an assembler to almost half about fifty percent for a material handler. So, based on the ranking that has been made for these different job factors you are now splitting up the wage in a manner So, that although the sum total happens to be the wage rate.

The order of ranking which is involved in describing the various factors as used consciously to take a decision about the component of the wage rate which would go into that factor sub factor. So, having said that now these are the benchmark values for a certain set of jobs which are available for let us say generally the industrial carpet now we look at our jobs for example, in an organization. And there are different jobs for example, there can be machinist there can be QC inspector, assemblers, punch operators, material handlers, storage clerks, laborers or janitors who are responsible for different responsibilities different roles within an organization.

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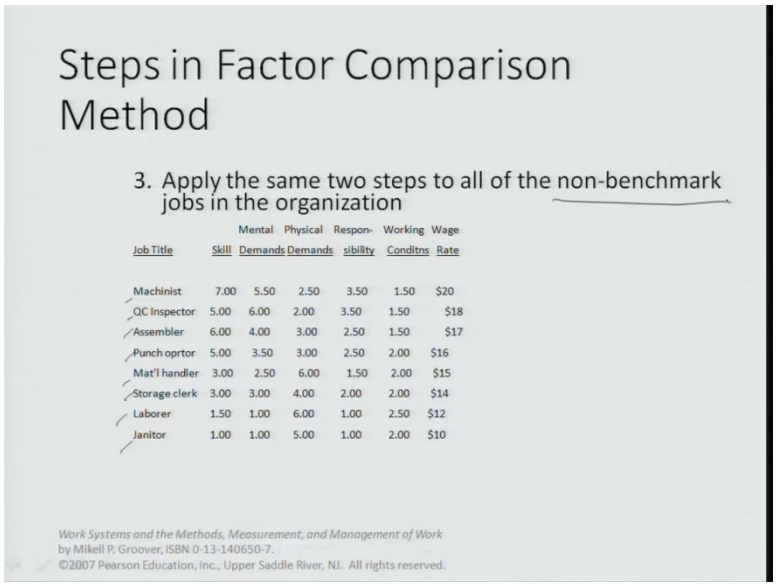

And so, these are all typically the non benchmark jobs which you have to compare with those benchmarks. So, the benchmarks kit embedded here because you have already made list of such jobs, according to the global norm which is available. These four machinist, assembler, material handler and labor is basically provided.

And so now we have to look at the requirements of the various factors of the job which is in question in accordance with these benchmark jobs. For example, a QC inspector or a punch operator who are non benchmark. So, basically they lie somewhere in between, may have skill sets which are little lesser then the assembler and the machinist, but a little higher than the material handler system handler operator. So, you have to now demarket the skill requirements in that ranked manner and proportionately associate a wage rate based on the carpet which has been laid out overall by these no so called benchmarked jobs, and you place that at five dollars per hour.

So, similarly for storage clerk you find that it is probably similar to what a material handler would do, in terms of his skills or let us say, it has a higher little bit higher amount of mental demands or a little bit lower amount of physical demands. So, based on that you generate these wage rates. And so, the total of all such job factor based wage rates, would give you an idea of the total wage rate of these jobs which are actually non benchmark jobs.

So, you take a benchmark to form a reference, and develop these wage rates based on the wage rates globally available for the benchmark jobs. So, so you basically comparing with the existing scenario of the industry the you know the sort of available norm of the industry based on certain benchmarks whatever number of jobs, you have in that manner you could actually rank the importance of the job level you could also associate a wage structure to that job level. And so, you basically create such a system using benchmark to sort of benchmark your, otherwise non benchmarked jobs which are available conventionally within the domain of your organization. So that is one aspect of it So, as you see it is highly quantitative it is a rank based approach, but you are able to sort of generate the quantitative wage rates also with this factor comparison method or technique.

So there are certain advantages and disadvantages of the factor comparison method. So, if you looked at all the advantages we can customize these for different organizations. So obviously, we have to select from the global domain some benchmark jobs which are very specific to a certain organization. And so therefore, customization would be more appropriately defined.

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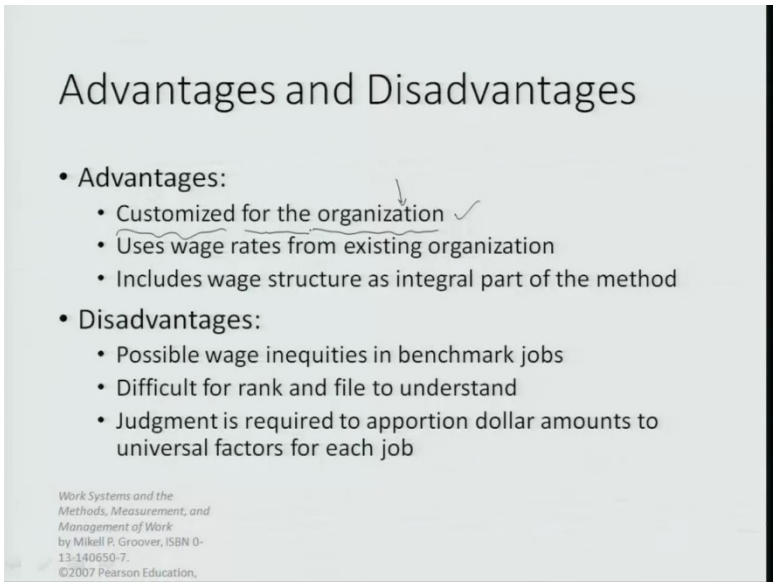

So, when you are looking for jobs related to this say the courier business you would be liking to select the benchmark jobs which are available globally across the courier businesses you know, and then compare your jobs with respect to those jobs in order to

determine a competitive rate. You have to understand that if the wage structure is not globally defined there may be a chance of people migrating from your company because you have low wages in comparison to the others. So, these are some of the issues if scientifically not treated may happen and you may start losing employees, which you definitely do not want to do.

Other advantages are that you use wage rates from the existing organizations which gives you a sort of you know cutting edge, because if you wanted to be more competitive in terms of employee retention or in terms of you know even inducting new employees. You need to be competitive in terms of your wage structure that you are going to offer to the employees, in order to attract the very best you know who can who can productively work for your organization. And as such maintain a good amount of success rate. So, also the advantages are that it includes a wage structure as an integral part of the method which may not be so, in the other method which we did earlier on you know the job grade descriptions or job classifications or paired comparisons so on so forth; however, there are certain disadvantages also of this method.

For example, there can be possible wage in equities in the benchmark jobs themselves. There may be a way there maybe some kind of a slip in you know accurately benchmarking the jobs which are available in the industry in general, or picking up the wrong sort of jobs you know for using and using them as your benchmark. So, these would create wage inequities which maybe a problem. And so therefore, a thorough study of the global scenario in terms of what are the kind of jobs available in the whole industrial domain of certain job switch can be treated as benchmark is needed and very meticulously need to be planned.

So, also sometimes it may be quite difficult to you know rank the various job factors, in doing this you know analysis. For example, in order to find out whether more skill would be needed between a machinist and assembler may quite an easy job, but in order to find out if there is a different skill set requirement. For a QC inspector who is in a machining shop as well as a QC inspector who is in an assembly shop may not be may be quite difficult. So, you know it is really an intuition based ranking that you try to provide to the various job factors we are which are associated to a rank. And this maybe a source of error because, if supposing you are not able rank your skills mental demand, physical demand, responsibility these kind of job factor then there maybe a possibility that you

are not doing a good job in even associating the wage rate or the wage structure to the to develop the overall ranking of the jobs. Also the other disadvantage which is there is basically the judgment sometimes which is needed to apportion the dollar amounts to the various universal factors, which you call job factors for each job.

And so obviously, the first step in doing this comparison is to provide a ranking and the second step is step is to sought of provide a dollar amount. So, as difficult it is to rank the job factor similar kind of difficulty level could be to apportion a dollar amount to a certain job factor. So, because of all these disadvantages it maybe sometimes erroneous on the part of the management to use this step factor method, or factor comparison method for rating the various jobs and creating a salary structure.

There is another method which is which can be used to an advantage which is called the point factor method, which actually is little more objective in terms of scoring. So, in this particular method you assign point values to individual factors that make up a given job. And then sum the points to obtain a total score for the job. So, the total scores are used to organize jobs into series of job hierarchies. And scores are also used to establish the wage structure for the organization.

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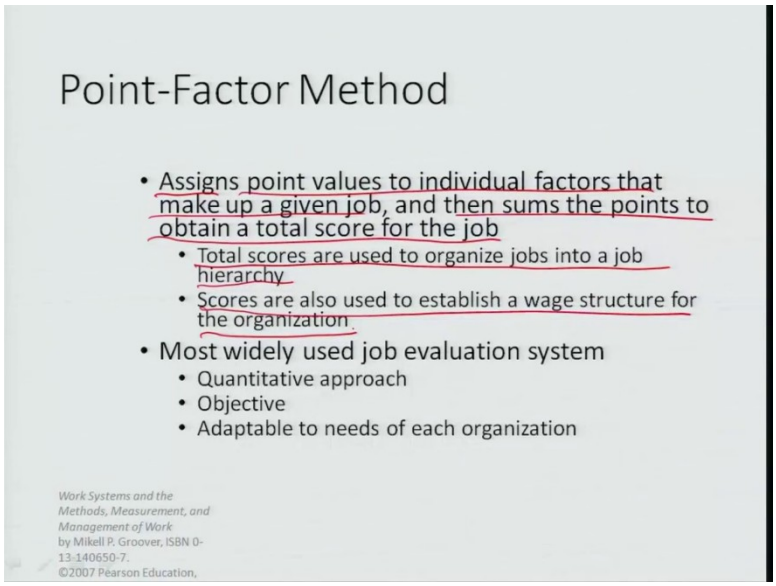

So, incidentally this happens to be one of the most widely used systems for evaluation of different jobs primarily, because it is quite objective in it is approach it has sort of a

quantitative basis remember you are ranking the individual factors and summing them up in order to create a sort of a rank an overall rank for one job with respect to the other.

And you can adapt these to the needs of each organizations because the degree of effort, or degree of ranking that is placed on a certain individual factor defining a job could be different in different context you know for different organization. So there is some variability there, which makes the system adaptable in comparison to let us say, the factor comparison or other methods which have been pointed out before. So, in this the selected common factors which are used to normally describe the jobs are four fold. One is obviously, skill the amount of effort that is needed for a certain job the amount of responsibility associated with the job, and then the working conditions which are there.

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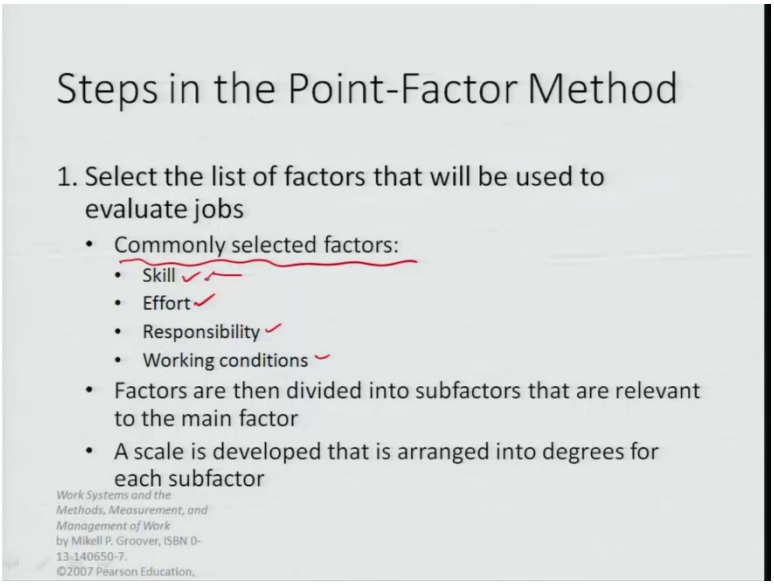

So, these are the selected factors and would divide every job and evaluate this in terms of certain degrees which will associate to these skill factors, and these degrees could be in terms of let us say even splitting them up further into sub factors for example, in case of skill could be there you know skill could be a factor containing several sub factors for example, education could be a very important component of the overall skill. Experience of working in a certain job could be another. And similarly initiative and ingenuity can also be another very important part of the skill.

So, you try to define the common universal factors in terms of various different factors, which you feel is very important for determining the wage structure. So, in a way instead

of just confining yourself as you did in the factor comparison method to only the universal factors you are now going into a domain which makes you have some flexibility in terms of applying this. You know universal ranking mechanism of let us say skill effort responsibility working conditions in terms of sub domains. And sub domains can be more importantly associated with defining a proper wage structure, in comparison to the main domain rather than looking at skill as one envelope you are looking several at several components of the skills and trying to see what fits in what situation; obviously, the overall effort that goes for a person who is working let us say in an assembly plant of an automotive comparison to that you know which is about a courier company they are going to be different.

And therefore, in certain levels again skill in certain different forms or certain sub factors may be more important than others. So, we try to factorize all these universal factors to the last possible extent, and then try to associate degrees with respect to these sub factors and the sub factor degrees which are involved some would some up together to have the rating overall rating for the skill would some up to a gather you know to have the overall rating with all these universal factors with sub factors into question to the overall you know rating structure for the job.

I will just into an example problem after this that how this can be further split up into different sub factors and ranking can be done in a manner so that the overall job can be factored with respect to this basic sub factors you know, according to the suitability or need of a certain job. So, factors are then divided into sub factors. They are relevant to the main factor and the scale is developed that is a range and degrees for each sub factor. Let us look at one example problem.

For example a skill is defined into different sub factors like education, experience, ingenuity. Effort can be in terms of mental and physical effort, also visual effort, responsibility could be in terms of ability to handle equipment. So, process ability to handle materials or products, safety issues or work of others you know. So, this could be associated with directly with a responsibility.

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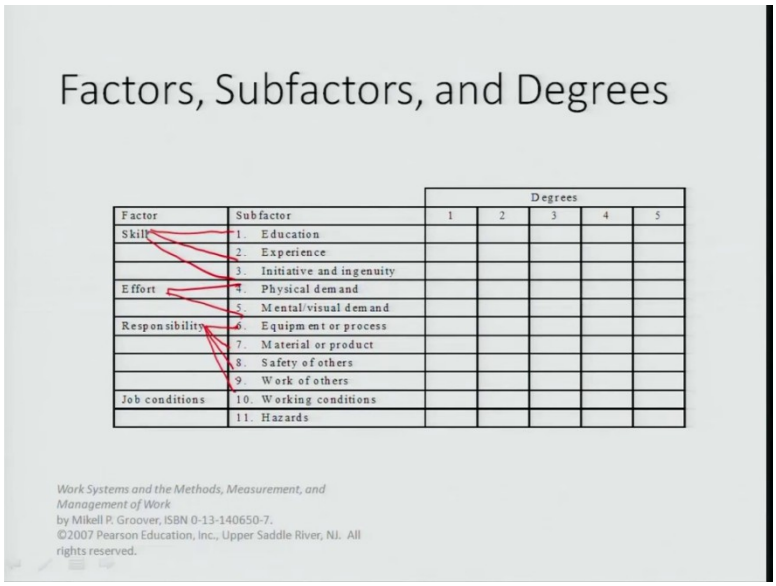

Or similarly in job conditions you could have working conditions as well as hazards, you know. And so, you associate different degrees of these different sub factors, in terms of how much a sub factor will contribute, in terms of certain degrees to the skill. For example, let us say if I wanted to take experience as a sub factor, I would associate experience in the following four degrees you know. So, zero to three months experience could be in one category.

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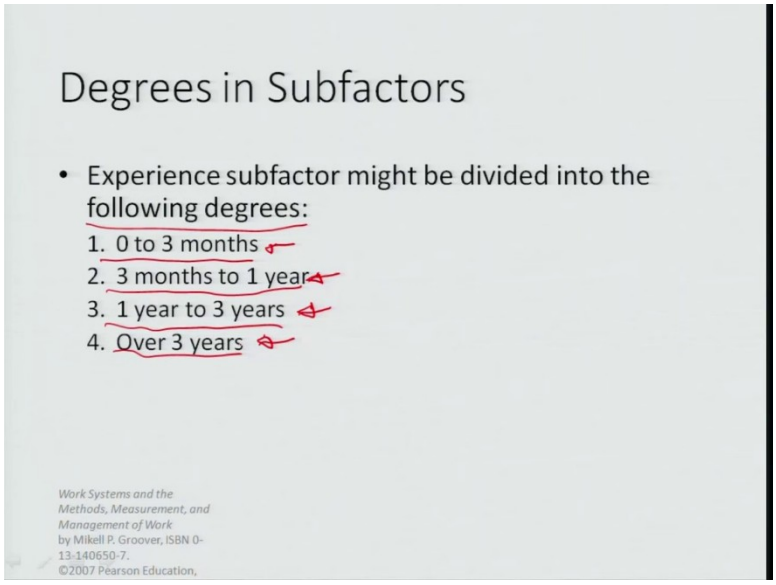

3 to 1 year experience could be in another category. 1 to three year experience could be in a 4 third category. And over three year experience could in a fourth category. So, these are the different degrees now right. And so, what I would typically do is to assign sort of a total waiting value to the jobs of factors, and maybe if I rated this as some number x1 could rate this as probably 2 x or this as let us say 3 x, this as 4 x.

So, you give some objective basis of giving point scores to the various degrees associated with such sub factors. In this particular case let us say if I had a matrix where we, so first point is of course, assigning the total weighting values.

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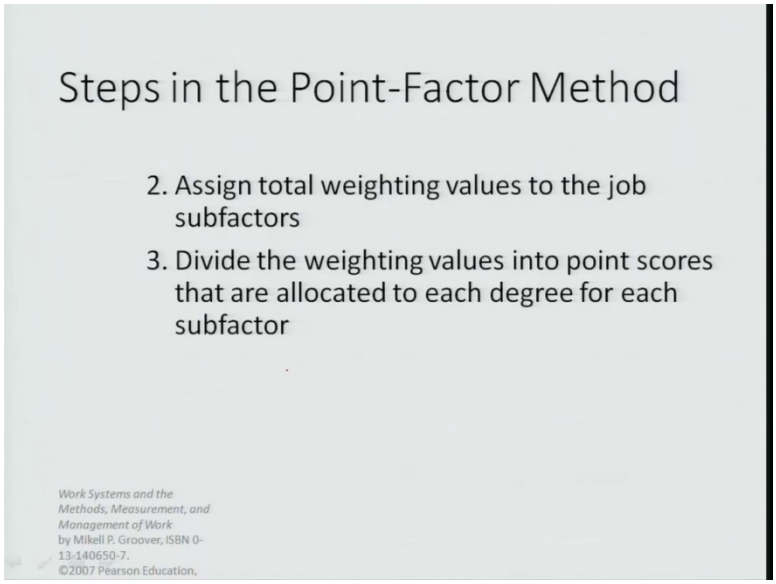

And second is to divide the weighting values into point scores that are allocated to each degree for each sub factor. Let us see how.

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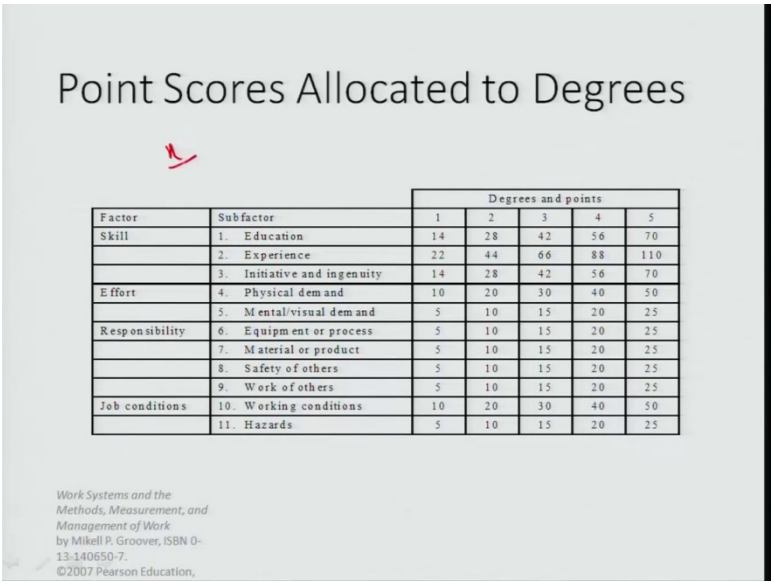

So, in this particular case for a certain job let us say X you know, you are having degrees between 1 and 5 and you can see that a point score of fourteen is associated with let us say education part which is a sub factor of the skill domain. And similarly if you know it changes between degree one and two, the score changes to twice to the third degree the score changes to thrice and so on so forth.

You know to four times five times. And so, in general for all these different sub factors associated a point score and just try to use a weighting value so, that the different degrees are rated accordingly. Now if a job would have a certain level of skill requirement in terms of education something you know, in terms of experience and then again something else in terms of ingenuity till give you a total score by just summing all these up, so that you can have a certain score for the skill and in a similar manner for the effort, the responsibility and the job conditions. And based on this you develop an overall score.

So, for example, there could be a job which needs about you know let us say, which is rated as education requirement in the first category, experience requirement probably in the third category, ingenuity requirement in let us say the 4th category. And so, you have different points scores now associated with each of these systems 14 plus 66 plus 66. So, you have an overall rating of about 126 for the skill factor associated with a certain job x. Similarly you have some other rating for effort responsibility job condition. So, these

total up or add up to find out what is the overall points score that you are giving to certain job.

So, if an industry has various jobs you could categorize everything in terms of these sub factors, and you could have more flexibility to vary the sub factors to suit a certain situation or certain job requirement. So, any kind of job which is there could be described in this kind of factor sub factor manner, and more appropriately the rating could be assigned. So, so a total score for each job would also help you to rank the jobs in a proper manner, and that could also be associated with developing a wage structure in comparison to probably the industry wide norm which is available, in terms of the various point requirements as that job would have with respect to the overall industrial norm.

So, steps in point factor method therefore, how to rate the jobs is determine the degree for each sub factor. For each job based on job descriptions assign point score for each sub factor according to it is degree sum. The point scores of all the sub factors to obtain a total score for each job factor, and that gives you an idea of how you can rate every job in terms of different degrees requirement. So there are different advantages and disadvantages associated with even the you know the point wise factor method. Some of the advantages are is quite exhaustive technique in terms of being very objective or quantitative. It is adaptable to the needs of each organization. It a permits job comparisons across multiple departments and functions, and also comparisons can also be made across companies and industries.

So, it gives you a little more objectivity in your ranking with respect to the general industrial wage structure which is available between different jobs in different organizations and within your organization, as well disadvantages are it is complex and it is not readily understood by all employees. So, if some wage structure evolves based on such rank ranking.

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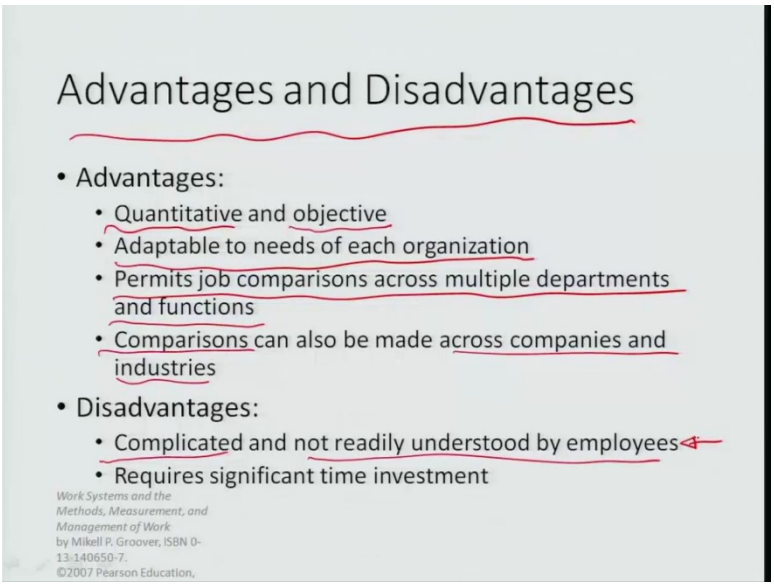

They may not be satisfied by looking at the ranking and say that this only somebody elses idea, and it is very intuitive. And so, that may not work out to be the actual situation some times. And also it requires significant time investment on the part of the management to create such structures with this exhaustive factor point methods. You know, for doing looking at wage structure.

So, in a nutshell what I have done today is to define the various different methods which are needed for creating wage structures and creating a sort of a job rating and a job indexing So, that we could have a high priority job, or low priority job in this manner, so that you know we can develop ultimately the wage associated with such jobs and processes. I think this brings us to the end of this particular module. In the next module I would be interested more to look at directly into the wage structure and some of the factors which effect such structures.

You know, it and also a section would be dedicated to once the job factors are decide decided and the jobs are indexed properly, and a wage structure is associated, how do you do the regular monitoring of who is doing what and the section on performance appraisal based on that. So, this will kind of give you an in the next section about how organizations can be classified in terms of top responsibilities all the way to the most in sort of smallest human factor which is contributing in some way to run an industrial system.

Thank you very much.