FORECASTING LABOR REQUIREMENTS

Organizations need to do workforce planning and optimizing. The essential prerequisites for workforce planning are labor supply and labor demand. Labor demand is defined and controlled differently from organization to organization.

A casino housekeeping department
A hospital intensive care unit
A factory producing cars
A private security company
A 911 communications center
Nursing home care service companies
A department of corrections, sheriffs department, prison, jail or detention center
A casino providing around the clock gaming
Fire / police organizations providing community public safety services

Average Annual Not Deployable and Deployable Hours

Average annual not deployable hours are those hours during a pre-defined period of time (typically annually) that employees are not available for deployment to a position. The reasons for not being available for deployment include being at work but assigned to a task other than those included in position descriptions (being at work but assigned to in-service training) and not being at work due to absenteeism or planned leave. Average annual deployable hours are the difference between annual hours of work for a position and the number of not deployable hours.

The required deployable hours for a position that operates forty (40) hours and five days a week is 2080 (52 weeks times 40 hours per week equal 2080 hours). Using this example, employees typically are not deployable because they are on their regular days off (rest days). Therefore, there are sixteen (16) hours of regular day off time per week for fifty-two (52) weeks that amount to 832 not deployable hours (fifty-two (52) times sixteen (16) equals 832 hours). When 832 regular days off hours are subtracted from 2080 hours, the result is 1,248 hours that an employee assigned to a position is available for deployment.

An employee is otherwise not deployable because they are sick, on vacation, on military leave, on maternity leave, on administrative leave, on leave without pays, are a no show / no call, etc. The average for all these reasons are determined and subtracted from the deployable hours yields the total not deployable hours. The difference between the total not deployable hours and the positions deployable hours are the net deployable hours.

Average annual employee deployable and not deployable hours are a very efficient method of using the workforce. Mathematical methods for forecasting labor demand involves looking at, and using, historical employee deployable and not deployable hours (and the reasons for those hours) are important variables to be considered when making shift design and staffing decisions.

Shift Length: Shift length should be designed to maximize profits!

It is easy to visualize shifts where employees work forty (40) weekly hours using eight (8) hour shifts (five (5) eight-hour shifts per week), or four (4) ten-hour shifts per week. Examples of not so easy to visualize numbers of weekly hours are 39 hours or 36 hours. Weekly shift hours are used to establish shift lengths (eight (8) hours, seven (7) hour, eight and one-half (8.5) hours etc.

The changeover period between shifts can also be important. Shifts on either side of the shift change may be of the same or different lengths (for example, a graveyard shift of nine (9) hours followed by a morning shift of eight (8) hours and preceded by an evening shift of seven (7) hours. When staff share the shifts
equally, the average shift length will be eight (8) hours, however if some of the staff prefer, say, the night shift, then the average shift length is not going to be eight (8) hours.

Why would anyone prefer unequal shift lengths? The typical reason is to have different staffing levels at different times and to be able to match labor to work load (e.g. a call center operating 24 hrs / day might have most calls during the day and requires most of the staff to be available then, but still requires a minimum staffing level at other times). If there are equal numbers of staff in each shift but unequal workloads in each shift, then some employees are paid to do nothing.

Two examples of unequal shift length are:

Example One: Staff contract hours = 37 hours / week and staff is required to work 8 hour shifts. This amounts to 37 shifts every 8 weeks. There is no exact equivalent for annual hours: the closest is 241 shifts of 8 hours.

Example Two: Staff contract hours = 37 hours / week and staff is required to work 7.5 hour shifts. This equates to 72 shifts every 15 weeks. There is no exact equivalent for annual hour: the closest is 257 shifts of 7.5 hours.

In the examples, staff hours are expressed in hours / week and staff are required to work shift lengths that are not exactly divisible into the contract hours. The reason for this inequality is efficiency and to maximize profit. Looking at relative efficiencies, then one can assess the situation in terms of cash. Assuming in example one that the staff work 4×8hrs + 1×5hrs (which = 37hrs) each week, 3 hours of productive labor per person is lost per week (about 7%). In addition, there can be losses from idle production equipment during holiday periods. The problem of continuity of staffing if there is a 3 hour gap every 5 shifts, its possible to cover this by having other staff cover this period with another 5- hour shift and have a 2-hour overlap. This can minimize the production loss by only losing 2-hours for two staff each week, which is about 3% lost production. However, devising an employee schedule that will do this becomes a major need. The best schedule would be to have 10-staff operating 9-machines, but here we are allowing the staffing to dictate our production. From a pragmatic viewpoint, we would choose to close production early on one day. However, we could not do that if the production process had to be continuous, (cannot be shut down) in which case, there would probably be an overtime payment of 3 hours per week to all the staff.

The problem with weekly hours is the inconvenience of having nothing but prime numbers to work with when trying to deal with shifts. That is:

- The number of shifts a person works per day
- The number of daytime shifts
- The number of shifts per 24-hours
- The number of shifts worked per week
- The number of days in a week
- The number of days off whenever someone books a week of leave
- The number of night shift hours
- The number of day shift hours
- The number of days off whenever someone books 2 weeks holiday
- Minimum & maximum days worked per month
- The leap year problems
- The number of days in most months

The problem with prime numbers is that nothing equally divides into them. Solutions to staffing on a week-by-week basis are far from ideal. One answer is to organize staff over a larger length of time hence staff are required to work an annual number of hours, but spread unevenly over smaller time-periods. However, a computer is required to keep track of staff over longer periods.

Let us spend a minute reviewing. Annualized deployable hours become the contract hours per week summed over the year. For example, 40-hours per week yields 2080 hours per year, ignoring leap year. There are 52-weeks and
one day in a real year (52 X 40). Take off any reason an employee is not otherwise deployable (sick, vacation, training, administrative leave, military leave, etc.). Let us use an example that includes five (5) weeks (25 days, or 200 hours). The annual hours to be worked will be 1880 (2080 - 200) hours. Now, you have to change the hours into shifts, i.e. 1880 = 235 8 hour shifts, or 188 10 hour shifts, etc. A part-timer working 30 hours per week would have figures proportional to those above, but with a significant difference. This is the time allowance for holidays. These are individual to each organization.

Let us go back to the full time employee, often they would like to negotiate a reduction in the working week, say to 37.5 hours. The problem of trying to incorporate a reduction in the hours of a shift from 8 hours to 7.5 hours is huge, but reducing the annual number of shifts by the equivalent is simple, we arrive at 220 8-hour shifts, a reduction of 15 shifts over the year.

**Annualized Deployable Hours: How to Start Forecasting**

First, you need to forecast manning requirements. Use the demand forecast to determine how many staff is needed at all times during the day, at what pay grade, work location and scheduling unit. Next, establish shift start and end times including staffing needs per shift. Then shift overlaps (if any) are considered. Shift overlap calculations help determine how many person-shifts require coverage for any period (a day or up to a year ahead).

Next, determine how many staff is required to fill the shifts. Initially, ignore holidays, absenteeism, training days, etc. It helps to convert person-shifts total to hours. Let us assume 100,000 hours. Next, calculate the hours worked per year per staff member. 40 hours/week = 2080 hours.

Now a rule is needed about the additional day each year and two in leap years. One approach is increase yearly hours by eight (8) whenever December 31 is a weekday (2088 hours).

Now divide the person-hours total (100,000) by hours worked per person-year (2080). The result is 47.9. This will round to 50 staff.

Holidays are considered next. (Including absenteeism, etc). These can be separate calculations. If each staff member is allowed 25 days of eight (8) hour leave, including holidays, and there are a total of 50 staff (25 X 8 hours), the result is 10,000 hours, or five (5) extra staff for holidays alone members just to cover holidays. Of course, these new five staff also requires holidays, so we could go to six new staff and have about 1000 hours remainder to cover training, etc., about 2 days/staff.

We now have our shifts and we have the staff, so the next process is to cover the shifts. This process only takes a few hours using Visual Rota, but it would take quite a few days to do by hand. Using the computer to do all the counting reduces the time for this task to a very small fraction of the time it takes manually. Allocating holidays, training days and staff requests is extremely easy. Absenteeism is a problem for all organizations and cannot be overlooked or ignored. All organizations have the option to be short staffed whenever someone is off sick, or to bring someone in to cover the shift. Using annual hours gives you the means to be staffed correctly and have additional staff to cover absenteeism, at the same time. Just as you can forecast demand by looking at past data, you can forecast absenteeism by looking at previous years. If you have 50 staff and they had an average of 5 days off absent, this equates to an extra member of staff for a year.

The reason for annual hours is mainly to maximize some company element such as profit, or to equalize service, irrespective of holidays, etc. hence you will need to form a policy on holidays because it affects the next step. You can allocate holidays equally throughout the year and if there are no requests in the quiet periods, you will need to allocate the holidays irrespective of the staff wishes. The other method is to forecast the main demand periods for holidays and plan accordingly. For the former method, you can have a ‘first come, first serviced’ policy and once the peak holiday periods are fully booked, the rest have to be booked ‘out of season’. This gives an even spread, and in this example, you will have five staff on holiday every day. This has many advantages, but it can lead to bad relations between the staff. The latter method would initially require the peak holiday periods to be over staffed, by
an amount equal to the holiday forecast. Then as requests are made, staffing levels on the shifts falls. There are a maximum number of holiday requests possible, probably about 30% of the staff could be on holiday at any one time without affecting staff levels. However, the down side is that the staff at work have to work more shifts per week as a consequence during peak holiday periods. In our example, the 100,000 hours, based on 8-hour shifts, means that 35 staff out of our 56 staff has to come to work each day. Hence, if 20 staff books a week’s holiday, the rest of the staff have to work 7 days/week. The two methods can also be combined, such that some maximum number of staff is allowed on holiday, say 10, but if not enough staff want a holiday at that time, the holidays are allocated as well.

The next step is to start allocating shifts and this is covered elsewhere, and is as quick as you can type. We have done the math, we know how many staff we want on each shift, and we know that WE CANNOT GO WRONG. I have emphasized that point because, if you stick to the plan, the numbers fall into place like magic. At the end of doing it, all the staff has the right number of shifts and all the shifts have the right number of staff. We can offer advice about the following important items.

- Mixing shifts of different length
- Rules about working over & under annual hours Pay