The Hiring-Overtime Decision and The Working Time Arrangement

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Abstract.
This paper deals with the decision making process towards working time arrangement. It is focusing on the situation when a company is confronted with an extra workload and the management has to decide whether to hire people or work overtime. The paper introduces quantitative approach of E. F. Lundgren and J. V. Schneider to this decision problem, which is based on cost minimization and assumes a known increase in demand. The main aim of this paper is to suggest an analytical tool as an aid in the decision process involving the hiring-overtime decision.

Keywords: Working Time Arrangement, Decision, Decision Making Process, Working Time, Overtime, Hiring, Cost analysis

1. Introduction

Working time arrangement defines where, when and how work gets done. The changes of external or internal conditions can cause that actual working time arrangement will not meet new requirements. In this case the management of company has to design an adjustment of actual working time arrangement, which will be more suitable to changed conditions.

According to the Slovak Labour Code the labour relation between employer and employee can be characterized by several characteristics. These characteristics represent individual employer decisions towards certain working time arrangement. They involve the form of a labour law relation, the duration of a labour law relation, the working time per week, the distribution of working time, the basic working time per day, the time account balancing period, the overtime work, the alternation of employees at the same workplace and the workplace. [1, 4]

The adjustment of working time arrangement can be provided because of different reasons, but the most frequent is the change of workload. In the case an extra workload occurs, the management of company has to make certain decision that will enable effective processing of this work. It can be solved by hiring new employees or by overtime work.

In general a solution of this problem depends on an extent of a extra workload. The large extent is solved by hiring new employees and short extent is solved by overtime work. However management of a company has to determine a boundary between large and short extent of a extra workload.

The cost model designed by E. F. Lundgren and J. V. Schneider can be helpful in a process of the determination of this boundary.
2. The Cost Model for the Hiring-Overtime Decision

Authors E. F. Lundgren and J. V. Schneider designed a model for the hiring-overtime decision, which represents quantitative approach to this decision problem. They assume that a decision to hire new people or to work overtime has to be made, when a number of expected time hours needed to complete production is larger than the total available time hours. [2]

They distinguish two major cost areas – hiring costs and costs of overtime. Hiring costs include direct and indirect costs. The direct costs represent wage costs of new employees required to completion of a required production. The indirect costs represent costs of personal department, accounting cost to place a person on the payroll and training. Then the equation of the hiring costs is following:

\[ C_1 = h \times w + K \]  

(1)

Where
- \( h \) - an excess workload in time hours
- \( w \) - wage cost per hour
- \( K \) - total indirect hiring costs

Costs of overtime include wage costs and the overtime premiums. Then the equation of the overtime costs is following:

\[ C_2 = h \times (w + w_p) \]  

(2)

Where
- \( h \) - an excess workload in time hours
- \( w \) - wage cost per hour
- \( w_p \) - overtime premiums per hour

In the case when different rates of the overtime premiums are distinguished, the equation of the overtime is following:

\[ C_2 = h_1 \times (w + w_1) + h_2 \times (w + w_2) \]  

(3)

\[ h = h_1 + h_2 \]  

(4)

Where
- \( h \) - an excess workload in time hours
- \( h_1; h_2 \) - a number of hours worked during week; a number of hours worked during weekend
- \( w \) - wage cost per hour
- \( w_1; w_2 \) - overtime premiums per hour for week; overtime premiums per hour for weekend

The objective function of this model is to minimize total cost subject to a fixed production output or demand at the end of some time span:

\[ f = h_1 \times w + K + h_2 \times (w + w_1) + h_3 \times (w + w_2) \]  

(5)

Subject to:

\[ h_1 + h_2 + h_3 \geq h \]  

(6)

Where
- \( h \) - an excess workload in time hours
- \( h_1 \) - a number of hours worked by new employee
- \( h_2 \) - a number of hours worked during week
- \( h_3 \) - a number of hours worked during weekend
The cost minimization will cause that alternative with the lowest cost will be chosen. Authors wanted to design practical model that will be able to provide a relatively quick and easy analysis and they made following assumptions in designed model:

− The demand increase is known
− The time span is finite
− No capital expenditures for new equipment will be necessary if new personnel are hired.
− There are no differences in efficiency between employees and newcomers.
− No additional supervision will be needed to handle any required number of new employees or overtime hours.

3. The Hiring-Overtime Boundary

The cost model designed by E. F. Lundgren and J. V. Schneider can make easier the hiring-overtime decision. The management of a company is able to determine an exact boundary between an extent of the extra workload, which should be solved by overtime work and an extent of the extra workload, which should be solved by hiring new people. The main condition consists in comparison of overtime costs and hiring costs. The overtime should be chosen when overtime cost are lower and the new employee should be hired when hiring costs are lower.

From equations (1) a (2) the hiring-overtime boundary can be calculated.

\[ C_1 = C_2 \]  \hspace{1cm} (7)
\[ h \times w + K = h \times (w + w_p) \]  \hspace{1cm} (8)
\[ h = \frac{K}{w_p} \]  \hspace{1cm} (9)

The comparison of overtime and hiring costs can be made also graphically (Fig. 1). In the case we will assume that new employee has the same wage per hour as employee working overtime, the function of overtime costs is steeper. The function of hiring costs is starting at a level of total indirect costs.

![Fig. 1. The Hiring-Overtime Boundary, source: author](image)

We can see that hiring new people will be more effective in the case the extra workload will be longer than \( h^* \) time hours.

4. Extensions of the Cost Model for the Hiring-Overtime Decision

Although the approach of authors E. F. Lundgren and J. V. Schneider to hiring-overtime decision is very practical and enables easy and quick analysis, it does not encompass different working efficiency.
The working productivity differs between employees and is also reduced because of the extended hours. [3]

Another extension of previous model can be made by assumption that a wage rate isn’t identical for all employees. For example new employee mostly doesn’t have the same wage rate as permanently employed employees working overtimes.

If these assumptions will be included into a previous model, the hiring-overtime boundary can be expressed in units of production:

\[ C_1 = C_2 \]  
\[ \frac{P}{p_1} \times w_1 + K = \frac{P}{p_2} \times (w_2 + w_p) \]  
\[ P = \frac{K}{w_2 + w_p} - \frac{w_1}{p_1} \]

Where

\( P \) - an excess workload in units
\( w_1; w_2 \) - wage cost per hour of newcomer; wage cost per hour of permanently employed employee
\( w_p \) - overtime premiums per hour
\( p_1; p_2 \) - productivity of newcomer; productivity of permanently employed employee

The graphical expression is similar as in previous case, only the extra workload is expressed in units. The gradient of curves depends on basic wage rates, overtime premium and working productivity. Generally a newcomer makes spoilages and his/her working productivity is lower. In the case where this assumption is true, the gradient of hiring costs is higher. On the other hand newcomer has mostly the lower basic wage rate. Then the gradient of hiring costs is lower. The final gradient of these functions depends on quotient of wage rate and working productivity.

5. Conclusions

In the case where a given demand increase over a finite time span is known and exceeds current production capacities, a total cost analysis can provide decision criteria for working time arrangement adjustments. In the case where overtime is worked, one can also determine the type of overtime. The cost model for the hiring-overtime decision facilitates a quantitative approach to the hiring-overtime decision. However it does not encompass differences in wage rates and working productivity. This paper suggests extension of this model, which can be used as an analytical tool for the hiring-overtime decision.

References