

The Impact of Employees' Turnover at the Productivity of a Software

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Abstract

The effect of employee turnover has received substantial consideration in software industry and it becomes one of the challenges for organizations. It plays a crucial role in software project cost, performance, efficiency and schedule. Firm Specific Human Capital (FSHC) and Job Matching (JM) are two main theories which can be applied to measure the effect of employee's turnover at the productivity of a software. This paper envisages on the impact of an employee's turnover at the productivity of a software. Furthermore, we show a relationship between the turnover and the productivity and the production efficiency of software industry and the turnover rate of employees by applying different theories.

Keywords: Turnover, Turnover Rate, Production Efficiency, Firm Specific Human Capital (FSHC), Job Matching (JM)

INTRODUCTION

Turnover is the voluntary or involuntary permanent withdrawal of an employee from an organization. The ratio at which an organization drops and gain personnel is merely known as "Turnover". It is implied that if the average level of employees in an organization is smaller as compared to others, the organization will have high turnover. The productivity of an organization decrease if the turnover rate elevates, as the cost of hiring and training of new employee would increase accordingly. Employee turnover has been widely explored over a number of domains, such as psychology, sociology, management and economics. Diverse exploration strategies have been utilized as per emphasis of each discipline [1][2].

As the Information Technology (IT) has confronted a transformation in past decades, consequently it has opened new regions of achievement and opportunities for entrepreneurs worldwide. But in this context retaining a skilled employee becomes a troubled situation. It has been observed that the trend of high turnover is exponentially rising in field of IT. For all sizes of IT organizations the turnover has constantly demonstrated itself problematic and dysfunctional. For employee retention in organization several policies are being followed such as increasing salaries, offering fringe benefits, improved work environment and job security. Failure of retention of highly trained and experienced staff can jeopardize organizational sustenance and lose its clients more over [3][4].

It has been observed in several cases that on leaving an organization the employees not only pull potential customers but also the valuable organizational information. Furthermore, it has been taken to note that high training cost incurs to prepare incoming employees and thus deferrals in customer deliverables. When the firm's employees quit, they take with them their knowledge and experience about how things are done in the firm, their firm-specific human capital. The resulting competence loss can lead to lower efficiency and competence may be costly to reacquire [5].

The effect of employee turnover has received substantial consideration in software industry and it becomes one of the challenges for organizations. It plays a crucial role in software project cost, performance, efficiency and schedule. It has considered as a most costly and apparently difficult human resource challenges facing by the organizations [22][23]. Although FSHC theory and Job Matching theory propose contrary effects of turnover on productivity, one does not necessarily invalidate the other. In this paper we investigate the questions that are related to employee turnover and productivity: FSHC and Job Matching Effects revoke each other, Job Matching Effects dominate when Turnover Rate is less, while FSHC effects dominate when Turnover Rate is high, and there are a number of factors according to the Henry in [9] that contribute to employee turnover. The detail these factors is given below.

a. *Economy:* Economy is the main concern of every employee that is the reasons for leaving a firm when the higher paying job is available.

b. *Performance of Organization:* An organization that is supposed to be in economic difficulty will also raise the turnover rate.

c. *Organizational Culture:* A conducive organizational culture is the dream of every employee with reward system, and the strength of leadership and job satisfaction that lessen the turnover rate.

d. *Characteristics of Job:* Some jobs are naturally more attractive than others. A job's attractiveness will be affected by many characteristics, including competitiveness, risk, perceived importance, and capacity to produce a sense of accomplishment.

e. *Unrealistic Expectations:* The general lack of knowledge and unrealistic expectations of the job applicants have about the job at the time that they accept an offer.

f. *Demographics:* The demographic and biographical characteristics of workers are also related to the turnover [6][7].

Theoretical studies have supported that firm specific human capital and job matching to be the two main, but competing, mechanisms through which turnover affects productivity [8].

Literature Review

The employee turnover affects firms’ productivity is based on two theories namely FSHC and JM.

The pioneer of Firm Specific Human Capital (FSHC) was presented by Becker (1975) [24]. “This asserts that if firms need to bear the cost of training, their incentives to provide staff training will be lowered by high turnover rates”. According to (Lynch 1993), “The incentive will be even weaker when firm specific and general training are less separable, as employees have lower opportunity costs of quitting. Consequently, productivity falls as turnover increases. Even if FSHC is bred through learning-by-doing, its accumulation remains positively related to employees’ tenure. As a result, a higher turnover rate will still lead to lower productivity”. In addition to the direct loss of human capital, there are other adverse impacts of turnover on productivity. The firm resources used in recruitment and training could have been invested in other aspects of the production process. Furthermore, high employee turnover could badly affect the morale of the organization. Using a controlled experiment, Sheehan (1993) records that an employee who quit, change the perceptions of the stayers about the organization and therefore harmfully affect its productivity [10][11]. If we take $p(T)$ as FSHC and T is the employee turnover rate the equation (1) will be:

For all T and $\tau \in \bar{T}$, we can express $p(T)$ around $T = \tau$ using Taylor series expansion:

$$p(T) = p(\tau) + p'(\tau)(T - \tau) + p''(\tau)(T - \tau)^2 / 2 + \dots = a_0 + a_1T + a_2T^2 + \dots \tag{1}$$

On the contrary side Job Matching theory established by Burdett (1978) and Jovanovic (1979a; 1979b) [19]. “The key insight of this theory is that firms will search for employees and job seekers will search for firms until there is a good match for both parties” [12].

However, the conditions for an ideal matching may change over time, leading to continuous reallocation of labour. For instance, a firm warmly welcome the new entrants, who has acquired higher qualifications via education, training, or learning-by-doing may seek a better career opportunity, with ‘new blood’ to provide fresh stimulus to the status quo. Regular employee turnover helps both employers and employees stop being locked in suboptimal matches forever. According to a study by the U.S. Department of Labor (cited in Abbasi and Hollman 2000) [17]. “The estimated cost of a poor hiring decision is 30 per cent of the first year’s potential earning and even higher if the mistake is not corrected within six months”. By (Cooper 2001) [18]. “Another factor that compounds the effect of turnover on productivity is knowledge spillover between firms. Knowledge spillover is more significant if human capital is portable across firms or even industries”. Megna and Klock (1993) find that “Increasing research input by one semi-conductor firm will increase the productivity of rival firms due to resource migration” [20]. Finally, Borland (1997), “suggests that involuntary turnover can be used as a mechanism to maintain employees’ incentives” [21]. In short, matching theory proposes that higher turnover helps productivity [13][14]. If

we take $q(T)$ as Job matching effect and T is the employee turnover rate then equation (2) will be:

Similarly, $q(T)$ can be expressed as a Taylor series:

$$q(T) = q(\tau) + q'(\tau)(T - \tau) + q''(\tau)(T - \tau)^2 / 2 + \dots = b_0 + b_1T + b_2T^2 + \dots \tag{2}$$

MATERIAL AND METHODS

Proposed Productivity-Turnover Model

The integrative perspective of Turnover on productivity is presented in this paper via model. An experiment has been done using a Dynamic model tool “isee_Player_9.1.4” [15][16]. The model is developed on the basis of the prior literature. This model has one system that is showing the software production and factors effecting on production are: Optimal Productivity and Turnover. The proposed model of Productivity-Turnover which impacts on Software Production is depicted in Figure 1.

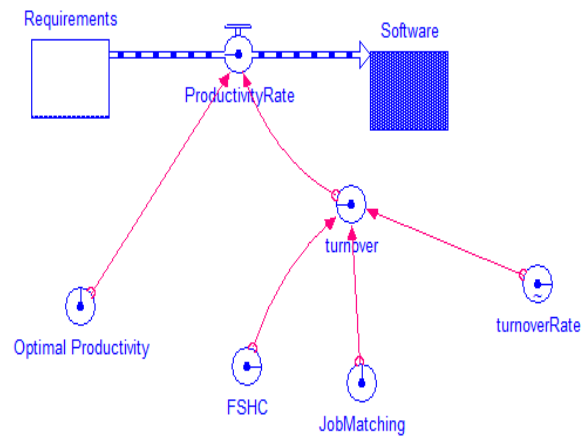


Figure 1. Productivity-Turnover Modeling

The bottom side of model is presenting the Firm Specific Human Capital-FSHC and Job Matching that have an impact on productivity. Therefore, during software production the Optimal Productivity we have taken constant, we have already calculated that Optimal Productivity using brooks law model for 9 resources. Second factor is turnover which is the combination of FSHC, Job Matching Theory and Turnover rate which we are taking as $T > 0$ and $T < 0.60$. Ultimately the productivity of the software depends on the right combination of Firm Specific Human Capital-FSHC and Job Matching.

Mathematical Representation

Mark Harris et al.(2002) describe in [6] this representation. “Suppose a firm’s total factor Productivity is π , its Turnover rate is T and a combination of other variables is Z (such as liquidity) then Productivity of this firm is shown in equation (3)”.

$$\pi = f(Z) + g(T); T \geq 0 \tag{3}$$

“Suppose $g(T)$ is an additive separable function of FSHC and Job Matching Effect”. The equation (4) shows the Turnover.

$$g(T) = p(T) + q(T) \tag{4}$$

By combing equations (3) and (4) from FSHC and job matching effect productivity is shown in equation (5).

$$\pi = f(Z) + (a_0 + b_0) + (a_1 + b_1)T + (a_2 + b_2)T^2 + \dots = f(Z) + c_0 + c_1T + c_2T^2 + \dots \tag{5}$$

Case Studies of Productivity-Turnover

In this section we present five different case studies about the Productivity-Turnover applying the theories discussed in section 2.

Case 1

If both “FSHC and Job Matching Effects cancel the effect of each other” means both exits in same value then ultimately they cancels each other so the graph between productivity and turnover will be horizontal straight line. Here the values of both FSHC and Job Matching are equal and as they are creating no effect we are taking them as zero, i.e. $c_1 = c_2 = 0$. This effect is illustrated in Figure 2.

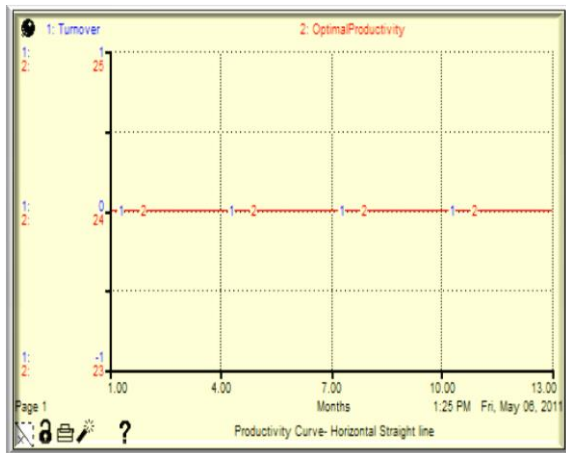


Figure 2. The Graph of Case 1

Case 2

In this case “When turnover is low, the level of FSHC is relatively high, whereas job matching is less likely to be optimal”. According to this case we are taking the values as $c_1 > 0$ and $c_2 < 0$. The effect is demonstrated in Figure 3.

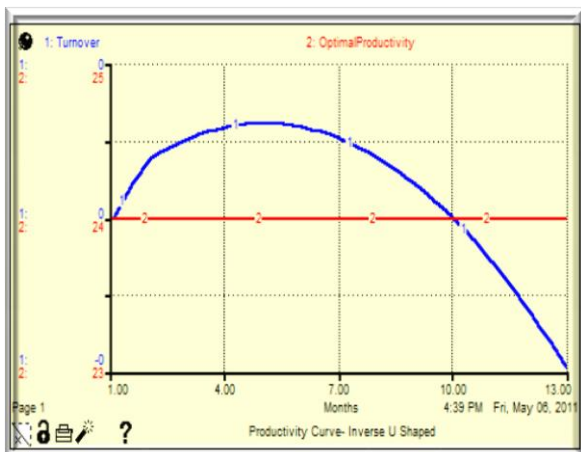


Figure 3. The Graph of Case 2

An Inverse U-shaped curve shows when turnover is low, the level of FSHC is relatively high, whereas job-worker matching is less likely to be ideal. According to the law of diminishing marginal returns, the improvement in productivity diminishes as turnover rises. Eventually the two effects will net out and further increases in turnover will then lead to a fall in productivity as illustrated in Figure 4.

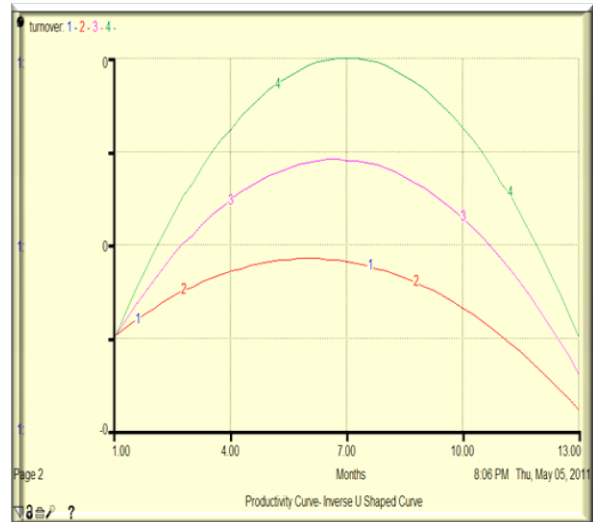


Figure 4. The Graph of Case 2

If we now look at the variation of this inversed U Shaped graph by increasing the value of c_1 , it will rise the productivity with the same level the optimal turnover rate for this scenario is $-c_1/2 c_2$

Case 3

If turnover is small for the employees who are affecting the project’s productivity negatively, secondly turnover is large for the people who leave the company on the basis of Job matching effect theory. It is an ideal case for the company where still increasing productivity and graph is shown as U-shaped. The effect is demonstrated in Figure 5.

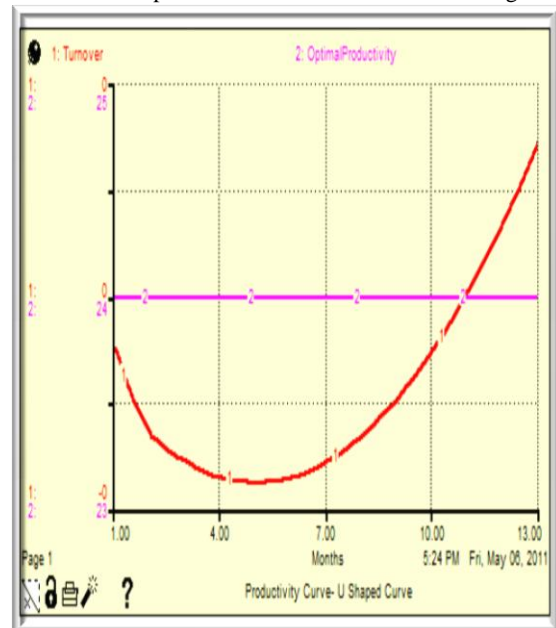


Figure 5. The Graph of Case 3

In Figure 5, the value of $C_1 < 0, C_2 > 0$ where $C_1 =$ FSHC and $C_2 =$ Job Matching. Therefore, in this case the Firm Specific Human Capital-FSHC is minor, while job matching effects is enormous. The productivity increases with the passage of time, this implies that Turnover is not always has a negative effect on productivity, it will increase as the value of Job matching increases. Hence, the Turnover in case of Job Matching is productive.

Case 4

Let take a condition where the Matching effects dominate FSHC that means the reason behind turnover to increase the productivity. Here is the impact of turnover on productivity is positive and graph is upward sloping. The effect is shown in Figure 6.

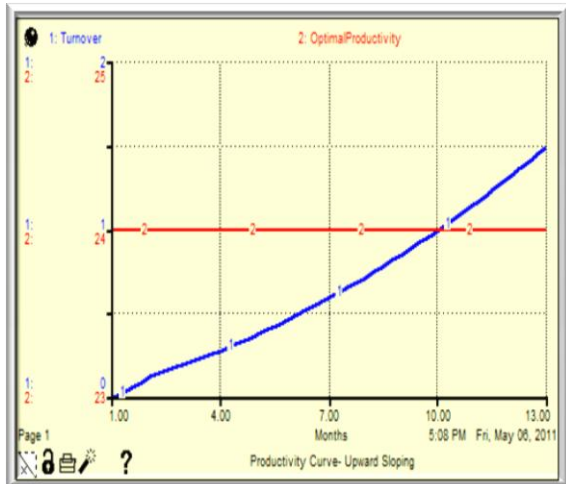


Figure 6. The Graph of Case 4

In Figure 6, the value of “ $C_1 \geq 0, C_2 \geq 0: C_1 + C_2 \neq 0$ where $C_1 =$ FSHC and $C_2 =$ Job Matching”. Therefore, in this case the Job Matching Effects is dominated completely which leads the increase in Productivity. These effects are further illustrated in Figure 7.

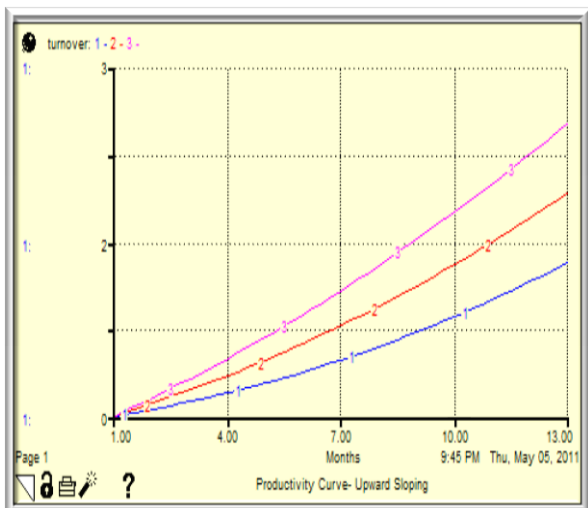


Figure 7. The Graph of Case 4

Case 5

Let take a condition where the FSHC effects dominate Matching effects that means the overhead of expenses cost, training time affecting the productivity. Here is the negative impact of turnover on productivity and graph is downward sloping as demonstrated in Figure 8.

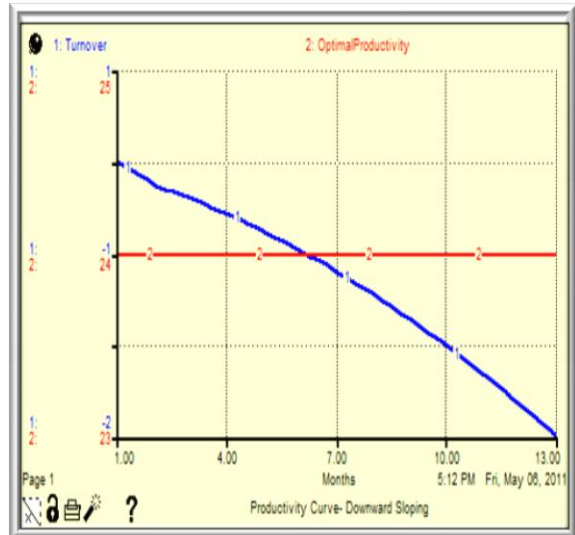


Figure 8. The Graph of Case 5

In Figure 8, the value of “ $C_1 < 0, C_2 < 0: C_1 + C_2 \neq 0$ where $C_1 =$ FSHC and $C_2 =$ Job Matching”. Therefore, in this case the Firm Specific Human Capital-FSHC effects is dominated completely which leads in decrease in the Productivity. These effects are further illustrated in Figure 9.

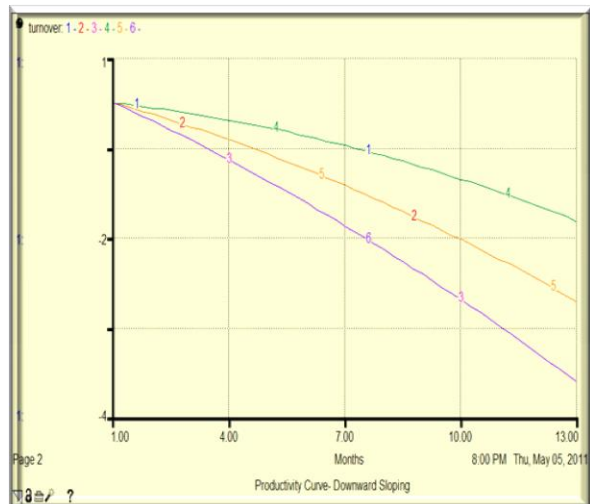


Figure 9. The Graph of Case 5

Table 1 summarizes all five cases discussed above.

Table 1. Summary of Productivity-Turnover

Case #	FSHC/Job Matching Questions	Turnover-Productivity Graph Shape
1.	What if FSHC and job matching effects cancel each other?	Horizontal Straight Line
2.	What if Matching effects dominate when Turnover Rate is small, while FSHC effects dominate when Turnover Rate is large?	Inverse U Shape
3.	What if FSHC effects dominate when Turnover rate is small, while job matching effects dominate when Turnover Rate is large?	U Shaped
4.	What if Matching effects dominate FSHC?	Upward Sloping
5.	What if FSHC effects dominate Matching effects?	Downward Sloping

The result shows that when employee's turnover is at turning point i.e. the turnover rate is below a certain level, software project can receive many new ideas, innovations, new methods that will be very helpful for the project. However, when the turnover rate is higher than a certain level i.e. the turning point, the project faces the serious loss of critical resources. This implies that Turnover is not always has a negative effect on productivity, it will increase as the value of Job matching increases. So turnover in case of Job matching is productive.

CONCLUSION

The paper presents the ongoing research to study the dynamics of Employee's Turnover at the productivity of the software. We discuss the most commonly used theories namely FSHC and Job Matching. It is revealed that these theories suggest the opposite effects of turnover at the productivity of software, it is not necessary that one theory invalidates the other one. The productivity of the firms drops as the turnover rises, even if FSHC is raised through learning-by-doing, its accumulating effect remains positive related to the employees' tenure. Therefore, it is concluded that the higher turnover rate will still indicate the lower productivity. As the Job Matching theory suggests that higher turnover improves the productivity. Using a Mark Haris dataset, it is illustrated that the Productivity is a quadratic function of Turnover. It is illustrated by the inverse U-shaped Productivity-Turnover curve that Job Matching effects dominate while Turnover is low, whereas FSHC effects dominate while Turnover is high. We conclude that these two theories answer the question of how to balance the stability and flexibility of the employee force. It is further suggested that improvements to increase the flexibility of job markets will produce considerable productivity gains for the economy.

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