When and Who Leaves Matters

Emerging Results from an Empirical Study of Employee Turnover

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ABSTRACT

Background: Employee turnover in GSD is an extremely important issue, especially in Western companies offshoring to emerging nations. **Aims**: In this case study we investigated an offshore vendor company and in particular whether the employees' retention is related with their experience. Moreover, we studied whether we can identify a threshold associated with the employees' tendency to leave the particular company. **Method**: We used a case study, applied and presented descriptive statistics, contingency tables, results from Chi-Square test of association and post hoc tests. **Results**: The emerging results showed that employee retention and company experience are associated. In particular, almost 90% of the employees are leaving the company within the first year, where the percentage within the second year is 50-50%. Thus, there is an indication that the 2 years' time is the retention threshold for the investigated offshore vendor company. **Conclusions**: The results are preliminary and lead us to the need for building a prediction model which should include more inherent characteristics of the projects to aid the companies avoiding massive turnover waves.

CCS CONCEPTS

• **Social and professional topics** → **Software management**; • **Project and people management**;

KEYWORDS

Software Engineering, GSD, Turnover, Project management

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1 INTRODUCTION

Global Software Development (GSD) [8] is software work undertaken at geographically separated locations across national boundaries in a coordinated fashion involving real time (synchronous) and asynchronous interaction. In other words, while teams are not co-located, they are still working towards a common goal with a commercially viable product . GSD usually comes with a number of benefits and risks, and despite the many challenges, has become a common practice in large international software companies as well as in small and medium, which often team up to work together in large otherwise inaccessible projects.

One of the challenges Western companies usually face in offshoring projects to emerging nations is high employee turnover [20][3]. Even though turnover is a natural part of a company, high rates usually have an impact on the overall efficiency [9][21]. Yet, turnover phenomenon in the field of software engineering has not received much attention. For example, turnover is often confused with attrition [8]. When attrition occurs, vacancies remain unfilled, when turnover happens the lost employees are replaced. Employee turnover can be external, when employees leave the company, or internal, when employees leave the current job and move within the company. Turnover can also happen voluntarily, when employees leave willingly, or involuntary, when the company terminates the employment. The turnover rate for a period of time is calculated by dividing the number of the employees who left during that period, by the average number of employees in that period [5]. In practice, however, detailed turnover data, including the reasons for leaving, and when and where employees left or moved, is not always recorded. Such data is of prime importance for better understanding the strategies that companies can apply to conquer or at least address the turnover problems in their offshoring projects.

The purpose of this paper is to dive into available turnover data recorded by an offshore vendor company and investigate whether the employees' retention, i.e. their decision to stay in the company, is related with their experience (number of years that an employee has been working for the company). In particular, we studied whether we can identify a threshold associated with the employees' tendency to leave the company and therefore propose an empirical method which can aid companies in predicting employee behaviors. For this purpose, we used a case study, applied and present descriptive statistics and post hoc tests. The results are preliminary and therefore not yet completely evaluated. More parameters should be taken into consideration while building a prediction model.

The rest of the paper is structured as follows: Section 2 outlines the related work, Section 3 provides the design of the study, while in section 4 the results are presented and discussed. Finally, in Section 5 conclusions and future work are provided.

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2 RELATED WORK

2.1 Employee Turnover

Employee turnover has been studied both from academics and practitioners for decades and still remains an important and extremely topical issue [2]. However, the majority of the turnover research has been done in the phycology field i.e. examinations of various individual-level predictors of turnover, employee demographics, job satisfaction, organizational commitment, embeddedness theory etc. [10][15][14]. According to [16] the employee turnover research is divided into a timeline of six epochs (totally covering almost 100 years) where each has been a key transition to turnover research. The same authors foresee that in the future we should *investigate post turnover implications for employees and organizations* [23] and also *study distinct forms of–and motivations for–leaving and staying mindsets* [17].

2.2 Turnover in Software Engineering

Since high turnover rates are often linked with disruption of the normal operations of an organization and organizational performance [11], turnover has a major impact in software industry, which is highly dependent on the intellectual capital and every new hire may require significant time to become productive [26][6]. Thus, when employees leave (quit or are fired) and require a replacement, it often has economic, operational and behavioral implications. This is why, understanding the phenomenon of employee turnover for software companies is of paramount importance. At the same time, the topic of turnover in software engineering has taken a backseat. While research focusing on individuals' motivation to quit or stay exists [11][12][13][4], there is no clear analysis of whether software industry or particular workplaces experience higher turnover rates than others and why.

2.3 Turnover in Global Software Development

Global software development (GSD) has become a common practice [27], with a number of benefits and risks. It allows companies to call upon a global talent pool to supplement a locally scarce resources [28]. The acquired specialized skills can have a positive impact on productivity and quality of the produced software, while the very assistance of the offshore alies can help companies focus on strategic business functions while day-to-day operations are offloaded [19].

Employee turnover in GSD research has gain attention as one of the major challenges, especially in Western companies offshoring to emerging nations [19][8][25]. Different turnover rates are reported that warn companies of associated offshoring risks. For example, Indian job market has been recognized for the high levels of employees' turnover [20][3]. The average yearly turnover reported in India ranges between 20-30% and 25-40% [9][21]. The growth of the Indian software industry, lead us to believe that these numbers have not changed for the good in the past decade. However, the reasons and the contexts of the companies reporting different turnover rates is often unclear, since turnover is not the primary focus of research investigations. Furthermore, while complaints about certain countries demonstrating high turnover rates are reported [20][3][9][21], there is little if any insight into the peculiarities of workplaces within the same region and the differences in employee behaviors across different regions and cultures (e.g. Asia vs East Europe).

3 RESEARCH METHODOLOGY

3.1 Research question

Our work is driven by the following research questions:

RQ1: Does experience of an employee in the company influence their decision to stay or leave their job?

RQ2: Is there a threshold, which determines the likelihood of the employees to leave their job?

The above RQs are the starting point in our investigation and will help us drive our research and gain further understanding of the reasons behind employee behaviors.

3.2 Description of the Data set

The data were gathered from an Indian vendor which for confidentiality reasons we will refer to as InVend. InVend provides software development services and has established collaboration with many companies worldwide. The data gathered from InVend covers the time period 2011-2017. The total number of employees analyzed is 458, of which 240 have already left the company and 218 are still working with InVend (See Table 2).

3.3 Data Analysis

In order to test if there are any associations between retention and employee experience we used the Chi-Square test of association. To prevent Type I errors, we used exact tests, and more specifically, the Monte-Carlo test of statistical significance based on 10 000 sampled tables and assuming (p = 0.05) [18]. To examine the strength of associations we use Cramer's V test. Cramer's V is a measure of the strength of association of a nominal by nominal relationship. Cramer's V ranges in value from 0 to +1 with a value of 0 indicating no association to a value of 1 indicating complete association. A value more than 0.5 indicates strong association. Cohen [7] suggested guidelines for interpreting Cramer's V [1].

Finding an association, however, did not provide us with further details about this association (e.g., which cases are 'responsible' for this association). Therefore, following up our statistical significant results, we performed post hoc testing using adjusted standardized residuals [1][24]. By analyzing these values, we had a cell-by-cell comparison of the expected versus observed frequencies which helped us understand which cases where deviated from the independence. We consider an adjusted residual significant if the absolute value is above 1.96, as suggested by [1].

3.4 Validity threats

The validity threats are distinguished between four aspects of validity according to [22]:

Construct validity reflects the extent to which the operational measures represent study subject. In the present study, employees experience is measured on a nominal scale. No subjective measures were used, such as the ones elicited through interviews or surveys.

Internal validity refers to the examination of causal relations, which is the intended outcome of our investigation. In our case

study, we focused on the relationship between two factors: retention and employee experience in the company. Our results are preliminary and further comprehensive investigation is needed. We have not included other factors that could potentially influence or mediate the results. Further study of potential impact factors is needed to build the resulting prediction model.

Regarding *external validity*, the study is clearly empirical and by no means can the findings be generalized to an isolated company offshoring to India. In fact, we believe that project and company characteristics may influence the company ability to retain employees. For example, product and work assignment complexity is one factor that might significantly influence the employee behaviors and differ between different companies and projects within the same company. Additional factors could also potentially influence behavioral impacts of turnover.

Regarding *reliability*, this aspect is concerned with to what extent the data and the analysis are dependent on the specific researchers. Hypothetically, if another researcher later on conducted the same study, the result should be the same. Again, the data gathered are quantitative and independent from the influence of different research subjects or researchers' interpretation.

4 RESULTS

4.1 Descriptive statistics

The results of the relation between employee retention and experience in the company showed that almost 90% of the employees are leaving the company within the first year in the company (see Figure 1 and Table 2). We also found that the possibility of an employee to leave or stay in the same company within the second year is 50-50%. We may claim that the 2 years' time is the retention threshold for InVend. After the second year the percentages of employees leaving the company are radically decreasing.

In Figure 1 we visualize the relative employee retention (green curve) and attrition (red curve) trends. We can see that the percentage of employees that continue working in InVend in the third year has increased to almost 70%, while 30% decided to leave. The longer employees work for InVend, the less likely they seem to quit. The retention rate in the fourth year increased to 77%, and in the fifth year to 80%. Aggregated average retention rate for employees with more than 5 years of experience was 75%.

4.2 Validity of Association

After the descriptive statistics, a chi-square test of independence was conducted between retention rate and the experience of the employees in the company. The null and the alternative hypothesis of our study were:

Ho: There is no association between *Retention* and *Company experience*, and

H1: There is an association between *Retention* and *Company experience*.

We have found a statistically significant association between the retention and the company experience ($p<0.05$). The association of the relationship is strong [7], Cramer's V= 0.510. Therefore, based on our results, we reject the null hypothesis and accept the alternative hypothesis, i.e. retention is associated with company experience.

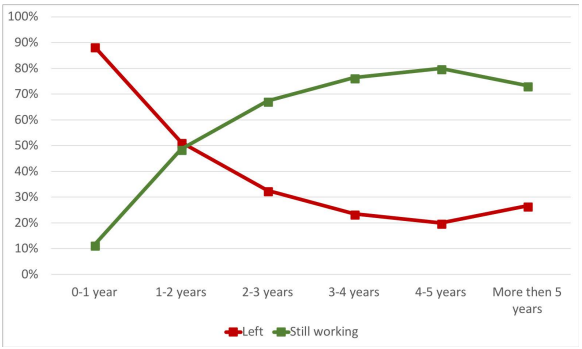

Figure 1: Descriptive Statistics

The Chi-Square test of association provides further evidence against the null hypothesis (i.e., the p-value for this test describes the strength of evidence against the null hypothesis of independence). We used this result to determine whether there is an association between our two variables. However, in order to test which categories, deviate from independence, we follow up our statistical significant results with Post hoc testing using Adjusted Standardized Residuals.

The contingency table (see Table 2) summarizes the results from the Adjusted Standardized Residuals. The values with bold indicate the categories that differ from the independence. The results show that the largest adjusted standardized residuals are for the employees who have left InVend in the first year (9.8). In other words, InVend can expect employees to leave in the first year of employment. Similarly, InVend can expect that employees completing two years are more than likely to stay (adj. residuals > 2.9)

5 CONCLUSIONS-FUTURE WORK

The present empirical study focuses on employee turnover and in particularly in the investigation of whether the employees' retention is related with their experience. More specifically, we explored whether a threshold associated with the employees' tendency to leave the company, exists.

The emerging results showed that the relation between employee retention and experience in the company is statistical significant i.e. retention and company experience are associated. In particularly, almost 90% of the employees are leaving the company within the first year, where the percentage within the second year is 50-50%. Thus, we may claim that the 2 years' time is the retention threshold for the investigated offshore vendor company where after the second year the percentages of employees leaving the company are radically decreasing.

However, inherent characteristics of the project i.e. complexity of a project, in different cases, even within the same company, might significantly differ. Moreover, many additional factors, including work distribution strategies, cultural differences, temporal

Table 1: Contingency table

		Employees' Experience						
Left or	Still Working	0-1 year	1-2 years	2-3 years	3-4 years	4-5 years	More than 5 years	Total
Left	Count	116	72	28	12	4	8	240
	% within Experience	88.5%	51.4%	32.6%	23.5%	20%	26.7%	52.4%
	Adjusted Residual	**9.8**	-0.3	**-4.1**	**-4.4**	**-3.0**	**-2.9**	
Still Working	Count	15	68	58	39	16	22	218
	% within Experience	11.5%	48.6%	67.4%	76.5%	80%	73.3%	47.6%
	Adjusted Residual	**-9.8**	0.3	**4.1**	**4.4**	**3.0**	**2.9**	
Total	Count	131	140	86	51	20	30	458
	%within Experience	100%	100%	100%	100%	100%	100%	100%

dispersion, local leadership approaches and contractual agreements, could potentially influence behavioral impacts of turnover.

The results are preliminary and lead us to the need of building a prediction model to aid the companies avoiding massive turnover waves. The prediction model should include more inherent characteristics of the projects, i.e. complexity of a project, number of employees working, programming languages, number of different sites etc.

As a future work, we aim to propose an empirical methodology which can aid companies in predicting employee behaviors. We intend to collect more in depth qualitative data i.e. interviews and working groups in order to reveal background information and deeper insights since the measurement of experience needs triangulation and data going beyond working years. Our research and empirical findings will continue to focus on providing support to companies which offshore projects to emerging nations by improving their decisions regarding offshoring and to taking turnover impacts into account. We plan to continue research and work towards turnover phenomenon in the field of software engineering.

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