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A Mix Model approach for identifying occupational stress among the Information Technology employees: A Case Study

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Abstract The aspiration of involving the growth, maintenance, and the use of computer systems, software, and networks for the processing and diffusion of data can be identified as information technology. Being a much useful field of knowledge in storing, retrieving, manipulating, and communicating information, IT has grown as a commercial industry today, where millions are actively engaged as a labor force in companies globally. Employee training and adoption in the industry is a time-consuming task, which affects the employee turnover of the industry. When the turnover rate goes high, it affects the company profit. Here we are focusing on mapping reasons that are affecting turnover and suggest a solution. This paper reports the results of Systematic Literature Review (SLR) related to software and systems. This SLR is a preliminary one that only analyzed articles in ACM digital library and IEEE computer society digital library that shows interesting trends about employee turnover research conducted the SLR published between 1999 to 2019, which formulated and applied specific inclusion and exclusion criteria to determine the most relevant studies for the research goal. Planning, conducting, and reporting three main phases used in this study as guidelines were given by Kitchenham and Charters. Research questions were created to find out answers about the employee turnover rate. Research articles were analyzed the filtered according to the year, country, and type of research such as journals, conference papers, or paradigm papers. This literature review will be useful to design the questionnaire. The factors that should consider were gained from the literature review.

Keywords Occupational stress, IT industry, Employee turnover, systematic literature review, IT personnel

Introduction

After reaching the independence, the economy of Sri Lanka was opened to free trade, and agriculture is mainly influenced it. In 1977 the new liberal economic policies were adopted. After that, the new industries have been created and the export structure has become diversified. The IT industry is one of such emerging industries. The emerging economy, in which services, communications, and information technologies play a significant role has created new avenues for skilled workers. Liberalization has also been heading towards globalization (Agarwal and Mehta, 2014a).

The Computer Society of Sri Lanka was started in 1976 for promoting information and communication technology and professionalism among those engaged in the field. In the 1980s the Software Industry has started in Sri Lanka. After the mid-1990s, the IT industry has started to setting-up operations for the international market and then the industry has been expanded (Jinadasa and Wickramasinghe, 2005). Since then a lot of people are interested in this field and so many of them tend to work in this

industry. It is rapidly developed over the past two decades. It has happened with globalization and economic liberalization. The Information Technology Society of Sri Lanka has started in 2019 to enhance the IT knowledge of the Sri Lankan people. IT companies build knowledge workers by absorbing qualified employees. This is considering the reasons for the increasing employee turnover rate in the IT industry. The World web dictionary defines employee turnover as the ratio of the number of workers replaced in a given time period to the average number of workers.

A lot of government universities and private universities are bring-forth new IT qualified employees every year. Most of them work in Software Companies and others are working at IT-related professions. After graduation, they start their careers. They should continue it until the end of their career life. But today there is employee turnover in the IT industry as same as the foreign countries. A lot of them are changing their career paths in the middle of life. They involve different kinds of jobs after resigned from the company. The major challenge for present-day organizations is employee turnover. It is an important threat and formidable challenge for managers. Employees leave their jobs for a variety of reasons. According to the Branham's study (1995), he mentions that this turnover happens because of the older employees at the top will incur high expenses, but new employees bring fresh ideas, approaches, abilities, and they have new attitudes and keep the organization from becoming stagnant (Chauhan and Patel, 2013). There are a lot of factors that cause employee turnover. Most IT organizations conduct Performance Appraisals (PA) to assess and compensate employee performance (Sethunga and Perera, 2018)

According to the Information & Communications Technology (ICT) Manpower survey (1999), 43.6% of ICT professionals are working on software development companies. Further, the study says that the annual growth rate of software development manpower is 14.7%. Due to the recent increase in demand for IT Knowledge workers, demand for qualified computer professionals, especially university graduates, is high and retention is a problem. Leading companies in the field snap up fresh computer science graduates. This situation has led the IT industry to a competitive edge (Jinadasa and Wickramasinghe, 2005). There are advantages as well as disadvantages for employee turnover. On one side, low-quality employees can replace them. According to that the creativity, flexibility, and adaptability of the company can be developed(Zhang, 2016). Tett and Mayer have done research related to this topic. They have work considering the relationships among job satisfaction, turnover intention, and organizational commitment. It has been stated that all of these things are performed independently in employee turnover(Meyer and Tett, 1993).

Methodology

Perhaps the easiest way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it. When using this as a template, you do not need to worry about page layout, fonts, etc. The main body of the paper should be organized into sections, as Introduction, Methodology, and Experimental design, Results, Discussion and Conclusion, Acknowledgement, and References. The abstract (already accepted) should be included at the beginning. Papers, excluding the abstract portion, shall not exceed **six** (06) pages in length.

A. Systematic Literature Review

The review carried out in our research consists of three main phases: Planning: participating in online databases such as IEEE Explorer, Springer, and ACM Digital

Library, etc., defining the study questions, defining the search terms to be used to obtain the studies, and finally the mapping procedure; Conducting: scan the selected electronic repositories with relevant search terms and pick the studies concerned, reviewing the selected studies and finalizing the mapping study; and Reporting: a final stage that aims to document all the necessary results prioritizing the retrieved studies and circulating them, and answering the relevant research questions which were defined in the planning phase. The above mapping procedure was based on the guidelines provided by Kitchenham and Charters (De Souza, Falbo, and Vijaykumar, 2015).

Planning: Initially, the search terms to be provided to the electronic databases were identified to retrieve any research papers related to our interest in the research. The search strings have to be specifically described with the awareness of the keywords identified in the research concerned. We are doing pre-review activities, and the objective is to develop a review protocol to identify the research problem, inclusion and exclusion criteria, source studies, search string, and mapping procedures.

Conducting: In this phase, we search and select studies, in order to extract and synthesizes data from them. The identified terms of search have been placed in the electronic databases and the results obtained have been analyzed.

Reporting: This is the final phase. This aims at writing up the results and circulating them to potentially interested parties. The findings of the systematic mapping studies are used to answer the research questions in this phase. All the summarized and filtered research papers were fed into a tabular form with the contents. Title, Abstract, Keywords, and Research Objectives Defined, Research Questions, Methodology Used, and Summary of the Results, Threats to Validity / Barriers and Future Perspectives. They were all produced into three structured documents: a systematic literature review (SLR), a research summary, and a literature review. All the received research papers from various databases were entered into the SLR document. Finally, a detailed overview of the mapping research was presented in the literature review paper.

B. Research Questions

The basic center of a mapping analysis is research questions. This table review aims at addressing the following Research Questions (RQs). It helps to identify the research gaps in the existing literature:

Table -1 Research Questions

No	Research Question
RQ1	What types of research have been done? There are researches related to this topic and all of them are done in foreign countries. It means they also have the same problem. They have found some reasons for this problem such as stress, unsatisfied job, etc.
RQ2	Does this research propose a new idea or enhance existing ideas? The related researches have been done earlier in the other countries and they are also not given a solution to the problem. But this is new to Sri Lanka. There are very few researches conducted and not given any solution to this real-world problem.
RQ3	What kinds of artifacts have covered from this research? We will analyze two aspects of artifacts. They are academic and occupational reasons. There are academic problems that cause this problem. It can be course content, having less practical content, etc. The occupational reasons may be unsatisfying staff, stress, leisure time problems, etc. Therefore we should have to determine the representation method of artifacts from its content. It can categorize the contents of the artifacts and analyze the data.
RQ4	Does research show whether research will contribute to achieving its intended purposes? This is related to the evaluation of research. If the purpose of this research is

	improving the accuracy of the impact analysis, making a comparative experiment with or without the research outcome. It shows the contribution of the research.
RQ5	What are the methodologies used? According to studies researches, most of them have been done by using the mail survey and interviews. And used the data analysis tools for analyze the collected data.

C. Study Selection

To retrieve articles as many as possible, using the word "Employee Turnover" for the search page libraries. The authors then examined the abstract manually to exclude articles in step with the factors. The selection process for the related studies concerned the following essential factors: Definition of Search String, Sources of Searching, and Definition of inclusion and exclusion criteria, Data Storage.

a) Terms and search strings

The search string considers into two areas. It was applied in three metadata fields: title, abstract, and keywords. The search string went through syntactic adaptations according to the particularities of each source

This paper presents a second study which is based on analyzing primary studies. At the beginning of this study, I have studied a lot of primarily related work under this topic. They all have done within a mail survey and interviews. Survey data were collected by using a Software Company and the selected number of workers to collect data. The search string has been applied in the following electronic databases: IEEE Xplore, ACM Digital Library, Springer Link, Science Direct, Emerald Insight, and Research Gate.

Table 2 Search terms of the tertiary study on text data mining

Areas	Search terms
Text data mining	"text mining", "data mining",
Employee Turnover Or IT Industry	"Employee Turnover", "IT industry"
Review	"Systematic Literature Review", "Systematic Review", "systematic mapping", "mapping study", "systematic literature mapping"
Search string	("text mining" OR "data mining") AND ("Employee Turnover" OR "IT industry")

Table 3 Search terms of the tertiary study on Occupational Stress or Employee Turnover

Areas	Search terms
Occupational or Turnover algorithms	"Occupational Stress", "Employee Turnover"
Text data mining	"text mining", "data mining"
Search string	("Occupational Stress" OR "Employee Turnover") AND ("text mining" OR "data mining")

Table 4 Search terms of the tertiary study on IT Industry in data mining

Areas	Search terms
IT Industry	"IT Sector", "IT Industry"
Text data mining	"text mining", "data mining"
Search string	"IT Sector" OR "IT Industry") AND ("text mining" OR "data mining")

Research can be performed in the following seven electronic databases. Below electronic databases are used to retrieve the articles.

•IEEEXplore (https://ieeexplore.ieee.org/Xplore/home.jsp)

•ACM Digital (https://dl.acm.org/)

•Springer Link (https://link.springer.com/)

•ScienceDirect (https://www.sciencedirect.com/)

•Emerald (https://www.emerald.com/insight/content/doi/10.1108/09593841011087798/full/html)

•Researchgate.net (https://www.researchgate.net/)

Inclusion and Exclusion criteria

I have used the following inclusion and exclusion criteria for SLR

1. The articles that need to be review were downloaded and shared by authors.

2. Articles in ACM digital library and IEEE computer society digital library were included.

3. Articles published in June 2006 to September 1999 were included, and other articles were excluded. Note that this research was started at the end of September 2019.

4. Employee turnover related to software and software-intensive systems was included, and others were excluded.

5. Articles in magazines such as CACM or IEEE computer were excluded.

6. If the same article contains in both libraries, one of them was excluded.

c) Data Storage

All searching phase were cataloged and stored appropriately. Data extraction was developed and gather all relevant data from referred studies. As an example, Search terms, Title, Keywords, Abstract, Outcomes, Future works, URL, and other data were collected and input into an excel sheet.

d) Data extraction and Synthesis

During this study, publications from 1993 to 2019 were assessed. The below steps are followed for extracting and synthesize them. Then, the selection process parameters are continued on the chosen Publications identifying and extracting the research most linked.

Articles to be reviewed are downloaded and shared by authors.

- An author prepares a form for analyzing each article.
- For each article, two authors fill the form respectively by reading the contents of the article.
- Another author examines two filled forms for each article. If there are some inconsistencies in these forms, the author examines the contents of the article and fixes the inconsistencies.

All the results are arranged and sorted for answering the RQ's.

Table 5 Finalize the research articles

Source	IEEE Xplore	Research Gate	Springer Link	Science Direct	Emerald Insight	ACM Digital Library	Other	Total
Number of Articles	8	9	1	6	3	15	2	44

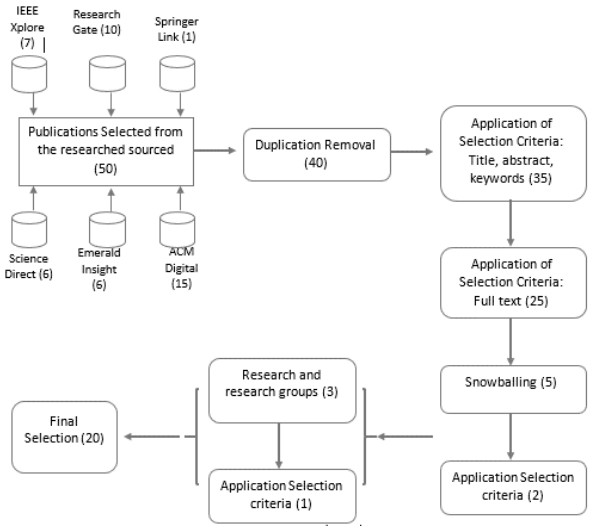

Figure 2-Data Extraction and Synthesize process

Table 6 Results of the selection stages

Stage	Criteria	Analyzed Content	Initial no of studies	Final no of studies
1st	IC1, EC1, EC2	Title, Abstract, Keywords	50	40
2nd	IC1, EC3, EC5	Title, Abstract, Keywords	40	35
3rd	IC1, Snowballing, EC4	Full text, Title, Abstract, Keywords	35	25
4th	Research group, IC1, EC4	Full text	5(added by snowballing)	2 (added by snowballing)
5th	IC1, EC1, EC3, EC4	Full text	3(added by research group) 1(added by snowballing)	1(added by research group) 1(added snowballing)
Final			50(source)+ 5(snowballing)+3(research group) =58	25(source)+ 3(snowballing)+2(research Group) = 20

The data extraction criteria are doing as the above diagram. The snowballing means the primary study references, as well as by directly searching publications from researchers and research groups of the studies previously selected. And it checks if the selected studies cite other relevant studies, retrieve those studies, and continue this process until no more relevant studies are found. It is a process that checks if the selected studies cite other relevant studies, retrieve those studies, and continue this process until no more relevant studies are found.

When conducting this process, publications from 1999 to 2019 were considered. As a result of it, there were 50 research articles were selected from the electronic digital libraries (. Then after removing the duplications it filtered into 40 articles.

Table 7 References of selected studies

ID	Reference
#1	V. S. Chauhan and D. Patel, "Employee turnover: A factorial study of IT industry," J. Strateg. Hum. Resour. Manag., 2013.
#2	C. Mofulatsi, "IT PROFFESSIONAL PREMATURE TURNOVER IN INFORMATION TECHNOLOGY TRANSFORMATION PROGRAMMES IN THE TELECOMMUNICATION INDUSTRY," no. November, pp. 1–86, 2015.
#3	V. K. G. Lim and T. S. H. Teo, "Occupational stress and IT personnel in Singapore: Factorial dimensions and differential effects," Int. J. Inf. Manage., 1999.
#4	R. N. Agarwal and A. Mehta, "Impact of Performance Appraisal and Working Environment on the Job Satisfaction and Attrition Problem in the Indian IT Industry," Paradigm, vol. 18, no. 1, pp. 73–85, 2014.
#5	J. Yuan, "Predicting Employee Turnover from Network Analysis," in Journal of Physics: Conference Series, 2019.
#6	D. S. Raharjo and S. Sulistiasih, "THE MODEL OF MANUFACTURING INDUSTRIES EMPLOYEE PERFORMANCE," Int. Rev. Manag. Mark., vol. 9, no. 5, pp. 82–86, Sep. 2019.
#7	M. Elçi, İ. Şener, S. Aksoy, and L. Alpkan, "The Impact of Ethical Leadership and Leadership Effectiveness on Employees' Turnover Intention: The Mediating Role of Work Related Stress," Procedia - Soc. Behav. Sci., vol. 58, pp. 289–297, 2012.
#8	L. Jinadasa and V. Wickramasinghe, "IT Industry Labour Turnover : The Reality," 10th Int. Conf. Sri Lanka Stud., no. December 2005, pp. 0–10, 2005.
#9	J. Quan and H. Cha, "IT certifications, outsourcing and information systems personnel turnover," Inf. Technol. People, vol. 23, no. 4, pp. 330–351, 2010.
#10	Q. Weng and J. C. McElroy, "Organizational career growth, affective occupational commitment and turnover intentions," J. Vocat. Behav., 2012.
#11	S. Sethunga and I. Perera, "Impact of performance rewards on employee turnover in Sri Lankan IT industry," in MERCon 2018 - 4th International Multidisciplinary Moratuwa Engineering Research Conference, 2018.
#12	A. Mohammad Esmaieeli Sikaroudi and A. EsmaieeliSikaroudi, "A data mining approach to employee turnover prediction (case study: Arak automotive parts manufacturing)," J. Ind. Syst. Eng., 2015.
#13	Y. Zhang, "A Review of Employee Turnover Influence Factor and Countermeasure," J. Hum. Resour. Sustain. Stud., vol. 04, no. 02, pp. 85–91, 2016.
#14	L. Firth, D. J. Mellor, K. A. Moore, and C. Loquet, "How can managers reduce employee intention to quit?," J. Manag. Psychol., 2004.
#15	M. Purohit, "A Study on-Employee Turnover in IT Sector with Special Emphasis on Wipro and Infosys," J. Bus. Manag., 2016.
#16	J. H. Westover, A. R. Westover, and L. A. Westover, "Enhancing long-term worker productivity and performance: The connection of key work domains to job satisfaction and organizational commitment," Int. J. Product. Perform. Manag., 2010.
#17	J. P. Meyer and R. P. Tett, "Job Satisfaction, Organizational Commitment, Turnover Intention, and Turnover: Path Analyses Based on Meta-analytical Findings," Pers. Psychol., 1993.
#18	J. B. Thatcher, Y. Liu, L. P. Stepina, J. M. Goodman, and D. C. Treadway, "IT Worker Turnover: An Empirical Examination of Intrinsic Motivation1," Data Base Adv. Inf. Syst., 2006.
#19	P. Ampomah and S. K. Cudjor, "The Effect of Employee Turnover on Organizations (Case Study of Electricity Company of Ghana, Cape Coast)," Asian J. Soc. Sci. Manag. Stud., 2015.

Table 8 Datamining Perspective

Year	Number of Researches	Country
1993	#1	Canada
1999	#1	Singapore
2004	#1	Australia
2005	#1	Sri Lanka
2006	#1	USA
2010	#2	USA, USA
2012	#2	Turkey, China
2013	#1	India
2014	#1	India
2015	#3	South Africa, Iran, Ghana
2016	#2	China, India
2018	#1	Sri Lanka
2019	#2	USA, Indonesia
Total	20	

Results and Findings

Articles to be reviewed are summarized. And most articles are journals, conferences, workshops, or symposium papers. There are different kinds of researches have done for this Occupational stress and IT personnel. But in Sri Lanka, there are a few types of researches that have been done under this topic.

Most of the researches are proved the causes of this problem. The training, openness, and flexibility are considered while leaving the organization(Chauhan and Patel, 2013). Growth opportunities, financial rewards and benefits, job satisfaction, and study highlights(Mofulatsi, 2015). The stress arising from a lack of support(Lim and Teo, 1999). Competition, fluctuating demand for the software services, project management challenges, nature of work requirements are cause for this problem(Agarwal and Mehta, 2014b). The healthy relationships, if people at the periphery receive less information and may feel less committed to the organization, and the lack of commitment may cause the employee to leave the company(Yuan, 2019a). Leadership style, organizational commitment, work motivation, employee performance is caused for employee turnover(Raharjo and Sulistiasih, 2019).

Ethical leadership and work-related stress affect employee turnover intention(Elçi et al., 2012). And also the employees who are having a low alary are tended to leave the company(AR, Mitra and Umesh, 2018). A better job, personal commitments, higher studies, leave the country, doesn't fit with their level of expectations are cause for employee turnover in the IT industry(Jinadasa and Wickramasinghe, 2005). And also turnover intention of IT professionals is significantly influenced by the variables at the individual, firm, and environmental levels(Quan and Cha, 2010).

RQ1: Research Type

Used mapping is as following that used for categorizing:

Propose a solution: the research has come up with the solution for a problematic area without any top to bottom examination.

Validation research: examine the properties of the proposed clarification without any practical implementation. It could be an existing one somewhere.

Evaluation research: here it inspects the implementation of the technique in practice, and what are the outcomes of the implementation in terms of benefits and drawbacks.

RQ2: Does this research propose a new idea or enhance existing ideas?

This is still novel to Sri Lanka through the problem is common. This problem is taking a dominant place in the IT industry. It is affecting the development of the world and the novel inventions. If more people work in the industry, it will invent novel things combined with technology. This will cover up a broad area of the problem.

RQ3: What kinds of artifacts have covered from this research?

Most of them cover occupational artifacts. They have proved that the reasons for the problem such as flexibility, unsatisfying staff, stress, leisure time problem, flexibility, financial rewards, and benefits, etc. Most fo the researches have been highlighted the common problems. Such as soft productivity factors, involuntary and voluntary resigning, etc

RQ5: Does research show whether research will contribute to achieving its intended purposes?

The articles specified the purpose. Here it analyzes how to confirm whether the purpose is achieved in each article. It shows the ratio of whether the authors of an article provide the means for confirming that the purpose is achieved. And also it is provided by more than 80% of articles. This result is reasonable because articles are rarely accepted today without any kind of evaluation. Then we focus on the types of evaluation. The types are very few. Although a rigorous case study is hard to be performed. The evaluation means is a little bit weak in more than 60% of articles.

RQ6: What are the methodologies used?

Data was collected from a self-designed questionnaire that was administered on the respondents working on the IT industry. The collected data were analyzed in two stages using the statistical package for social science(Chauhan and Patel, 2013).

A combination of mail surveys and interviews was used to collect data. The questionnaire was mailed to a selected sample of workers(Mofulatsi, 2015).

Data were collected via a combination of mail surveys and interviews. Survey data were collected from 257 IT personnel employed in an organization dealing with IT-related services and products(Lim and Teo, 1999).

Two data sets are included: dataset1 involves 104 employees from a market-listed Chinese company dataset2 regards 20 employees from one of the departments of a large multinational corporation in Chengdu. The following four indicators are selected: in-degree (Ki), out-degree (KO), degree (K), and k-shell (Ks). Logistic regression analysis is performed for each network indicator on employee turnover. Two networks are considered: the action network and friendship network(Yuan, 2019a).

The descriptive and explanatory survey with sample size is 450 employees, as the method analysis used the path analysis(Raharjo and Sulistiasih, 2019).

Most of them are used reliability analysis, demographic analysis, correlation analysis (AR, Mitra and Umesh, 2018), Logistic regression analysis (Yuan, 2019b) (Quan and Cha, 2010) as data analysis techniques (Sethunga and Perera, 2018).

The correlation technique uses to determine the degree of association between two variables or to determine how strongly two variables are related to each other. And also the questionnaire was structured to be very accurate and descriptive as possible.

Conclusion

Datamining analyzing methods and techniques have been proposed and evaluated in the literature. When conducting this study I have gathered, classified, and analyzed the research articles. And also analyzed the techniques, considered the mail

survey questionnaires. Viewed the related articles and filtered the most suitable articles among them. Finally selected nearly 20 research articles that are most suitable and most related to this research topic. The research questions (RQ) are based on previous bias mention in the introduction. It helps to have an overall idea regarding the research.

These all of the researches are analyzed in this literature review and this helps to understand the overall domain about all of the researches which have been done under the employee turnover topic. And also gathered the factors that can affect the problem. There are several kinds of factors but they don't cover all types of factors. They are summarized in this systematic literature review. The knowledge will be applied to conduct this research in the future. Most of them are reveal that training, openness, flexibility, job satisfaction, competition, financial rewards, lack of support, project management challenges, nature of work requirements are caused for this stress and the employee turnover. Considering this the questionnaire can be designed in the research.

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