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Innovative Behaviour of Employees in Organizations: A Mapping Study

Vasanthapriyan S.

Department of Computing & Information Systems, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka

ABSTRACT

Innovative behaviour can be referred as the introduction and application of new ideas, products, processes, and procedures to a person's work role or an organization. The aim of this mapping study is to investigate the areas regarding innovative behaviour of employees in software companies and also to find the research gap by using existing studies from 2008 to 2017. Aspects such as publication year and source, research type, factors affecting innovations and employee innovative behaviour and technologies have been concerned. The study was done by searching five electronic databases. Then the initial result ended up with 487 studies. After applying selection criteria to that result, a total number of 11 studies were selected. In the next stage snowballing and direct search was done to publications of researchers and research groups that accomplished these studies. This resulted in adding 6 more papers. Finally, 17 studies were identified addressing the research topic and answering research questions. A lot of studies were found regarding innovations in organizations and there were few studies about innovative behaviour of employees, but mapping study clearly shows an increase in the interest of the research topic in the recent years. Thus employees are the driving forces of innovations, most of the research papers discussing about innovations have also focused on the employee innovative behaviour. Besides, papers have discussed the factors affecting the employee innovative behaviour. Some of those papers have proposed innovative models to improve innovations. So as the conclusion, the findings show that innovative behaviour of employees is a very important area to consider to enhance innovations in organizations and also more studies should be done regarding the research topic.

KEYWORDS: *Innovative behaviour, Innovations, Knowledge sharing*

Corresponding author: Vasanthapriyan S., Email: priyan@appsc.sab.ac.lk

1. INTRODUCTION

Along with the advancement of technology, software companies have shown rapid growth since the last decades (Ranasinghe, 2011). Because of this many local and global investors are willing to invest in this sector. All these software organizations have to operate in a global market where there is a huge competition (Balasooriya 2010). Innovations are known as a strategic weapon to face this competition. The word "innovation "refers to "something freshly introduced". Innovation is about putting in ideas to make new results. This result may be a new product, a new approach or even a new application of an old product or approach. Innovation emerges due to new competitive demands (Baragde and Baporikar, 2017). Therefore, to survive in the modern economic climate, organizations must seek innovation to change processes, create different and more effective processes, or improve existing processes. Organizations may go for different types of innovations such as product innovation, process innovation, service innovation, business innovation and all contribute to strengthening the competitive advantage of a certain company (Gamal D, 2011).

Employees are the main driving force of innovation in the industry (Xiangyin Li and Yishuang Zheng, 2014). Accordingly, the employee innovative behaviour is very crucial, which can be defined as an act of generating, promoting and application of innovative thinking in the organization for the purpose of personal and organizational performance (Xiangyin Li and Yishuang Zheng, 2014; Chatchawan1 et al. 2017; Jong and Hartog, 2010). Innovative behaviour enables to use innovative ways of thinking, quickly and accurately respond to customer demand changes. Influence on employee innovative behaviour can be divided mainly into two categories as internal and external factors (Lukes and Stepahan, 2017; Xiangyin Li and Yishuang Zheng, 2014; Smith et al. 2012). Internal factors refer to innovative personal traits and ability to participate in innovation, and external factors including the team environment (technology, culture, resources and etc.) and the support of leaders (Smith et al., 2012; Chatchawan1 et al. 2017; Monteiro et al. 2016).

Software companies are constantly evolving to create long-term success. Therefore, it is important to know how a companies' ability to innovate can be improved. All innovation activity can be traced back to the behaviour of employees. This absolutely makes the employee the center point of attention, if you want to improve your company's innovation ability. It is noted that innovation is a result of cooperation and teamwork. It is difficult for innovation to be forged by an individual alone. As a result, a great deal of attention is paid to the factors affecting innovative work behaviour. (Chatchawan1 et al. 2017). In order to understand the innovative behaviour of employees it is important to understand the difficulties and obstacles which employees meet (Edison et al. 2013). For that, we should consider the barriers in both internal and external factors regarding employees. Therefore, the organizations have to take measures to stimulate the innovation willingness of employees and promote their innovation behaviour. (Kabasheva et al. 2015).

Considering the importance of employee innovative behaviour towards innovations in software companies, this paper aims to identify the current literature and factors affecting the innovative behaviour of employees in organizations by means of a mapping study. Furthermore, the impact of those factors on employee innovative

behaviour is also examined. This study provides a broad overview of the research in order to determine whether there is past research evidence on the topic. And also this helps to identify the research gaps for future improvements and provide direction for new research activities.

This study is used to identify publications discussing the innovative behaviour of employees in software companies. Because there are a few past researches regarding the innovative behaviour of employees in software companies, studies that have been done for other organizations also have been examined. Using those papers, the following aspects were investigated: innovative behaviour of employees, factors affecting the innovative behaviour of employees, barriers to improving employee innovative behaviour, innovative measurements and strategies used in software companies. And also to collect more information research papers have been searched under the topics of innovations in software companies, metrics in innovations, enhancing innovations in organizations, factors affecting innovations in organizations, how successful organizations drive innovation and etc. Moreover, new studies were selected by means of snowballing the primary study references. Snowballing 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.

This paper is organized as follows. Section 2 discusses the innovations, innovative behaviour of employees and factors affecting innovative behaviour in software companies. Section 3 discusses the research method used to perform the mapping study. Results are represented in Section 4. And results, implications and limitations are discussed in Section 5. Finally, Section 6 includes the summary and the conclusion of this study for future work.

2. BACKGROUND

2.1 Innovations in software companies

The current economy is based on information technology so we can clearly see the information technology dominates the business world (Edison et al. 2013; Baragde, 2017). There is a big change in the industrial economy, which has created a huge competition. To compete well, innovations become important and crucial (Baragde, 2017). Software companies are required to develop their knowledge in various fields to face the competition (Bermejo et al., 2016; Gourova and Toteva, 2012). Therefore, software companies should have the ability to identify and understand latent needs in areas that go beyond the boundaries of software knowledge and development technologies (Bermejo et al., 2016). Nowadays innovation has become the core pillar of achievement for every organization in the current business world (Shahzad et al., 2017; Ikeda and Marshall, 2016; Rose and Furneaux, 2016). Therefore, innovations directly help organizations to gain large market share but if they fail to consistently innovate over time they will lose their position to emerging firms that have innovative offerings (Linder et al. 2017; Muller et al. 2005). When we talk about innovation in software companies, it is not just software innovations, it also engages in the voluntary and intentional generation, promotion, and realization of new ideas for the benefit of individual performance, group effectiveness, or the organization (Monteiro et al. 2016; Westerski and Iglesias, 2011). Edison has stated that sustained innovation is very important in any business, so the problem is not

innovation, but rather making it continuously on a regular basis. (Edison et al. 2013). Innovation mechanisms have been evolved continuously with the change in technology and business needs. These innovation mechanisms of software companies have shifted from a linear and static model to a systematic and dynamic one with full of complex interactions (Dai, 2011). Usually, innovations involve in improving existing products and processes, finding new ways and abandoning the old, or regularly reviewing each product, service, technology, market and channel (Baragde, 2017). In considering innovation, organizations are required to capitalize on employees' innovative behaviour which is interested subject and consideration of both practitioner and researchers (Hakimian, 2016).

2.2 Innovative behaviour of employees

Innovative Work Behaviour is defined as the intentional behaviour of an individual to introduce or apply new ideas to their assigned work role (R. Chatchawan et al. 2017). Successful innovation requires both generation and implementation of novel ideas. Employees in organizations are rarely able to implement ideas on their own and often have to receive permission from their managers to implement them. Lukes has stated that an important aspect of innovative behaviour is to communicate the idea to colleagues and managers to receive their feedback (Lukes, 2016). Nadin in his research has explained that employees' innovative work behaviour is very crucial in many contemporary management principles, such as continuous improvement in corporate entrepreneurship and suggestion programs. Therefore, innovative firms consider their employees to be an important source of innovation (Nadin, 2012). Chatchawan has stated that there are four main factors that affect the innovative behaviour of an employee as opportunity exploration, idea generation, championing (sharing) and application (R. Chatchawan et al. 2017). Not only the individual factors but also organizational factors have a big influence on the employee innovative thinking.

The motivation of employee's innovative behaviour can be divided into two factors as internal and external factors (Li and Zeng, 2014). Internal factors refer to innovative personal characteristics and ability to engage in innovation, and external factors including the organizational atmosphere, the support of leaders. Mutual working of the above internal and external factors, the confidence and creative willingness of employees have been improved (Li and Zeng, 2014).

If we consider individual factors, organizational commitment is a kind of mental state in which employees are willing to maintain membership in organizations, showing the purposes of the employees why to stay working. According to these purposes and the interests, the targets of the organization are consistent, it can be divided into positive emotional commitment and negative continual commitment. (Xiangyin Li and Yishuang Zheng, 2014). The added value of such employees is that they tend to be more determined in their work, show relatively high productivity and are more proactive in offering their support. There are three types of organizational commitment they are as follows. (1) Affective Commitment refers to the employee's emotional behaviour, identification, attachment and involvement with their organization. (2) Continuance Commitment refers to the employee's commitment based on the value associated their organization. (3)

Normative Commitment refers to the employee's responsibility for the job and thus makes them stay with the same organization (Shankar Chelliah et al. 2015).

Psychological Capital means employees are willing to take the risk of innovation failure and actively participate in innovation within the organization. These are closely related to their psychological characteristics. (Xiangyin Li and Yishuang Zheng, 2014). Psychological capital focus on personal psychological sources with their basic four components as mentioned below. (1) Self-efficacy (confidence). (2) Hope. (3) Optimism (positive attitude). (4) Resiliency (capacity of recovery). (Çavus M and Gokcen A, 2015). When we consider the above four components, self-efficacy is the foundation and key individual factors to promote employees' innovative behaviour, and it can affect the level of effort of individual activities. Innovation could not achieve the outcomes or high rates of return desired, so it does require not only strong willpower but also optimistic attitude, full of expectation for innovation and firm determination. Individuals having positive self-expectations have often had the feeling of controlling over their own destiny, and they can generate innovative behaviours are easy than others. Hopeful employees also often have independent, free thought and strong creativity. Tough workers would have a stronger stress tolerance, and they would not simply give up in an uncertain environment and solve the problems creatively (Xiangyin Li and Yishuang Zheng, 2014).

The organizational innovation atmosphere can be defined as the degree of supporting creativity and innovation felt by members of the organization in the work environment. It considers the perception of the individual about whether the organization provides an environment which is conducive learning and innovation, and its degree (Xiangyin Li and Yishuang Zheng, 2014). This includes the concept of advocacy, market guidance, evaluation and incentive, training, communication and cooperation, resource availability, model, authorization. This will directly affect the employee's innovative behaviour, capability and performance organization (Pratoom and Savatsomboon, 2010; Xiangyin Li and Yishuang Zheng, 2014). Considering the above factors organizational innovation atmosphere can be subdivided into organizational strategy, organizational support, rewards (incentives) and resource availability (Smith et al. 2012; R. Chatchawan et al. 2017).

And the relationship between culture and strategy is highly complex and it is often difficult to separate the effects strategy and culture have on each other. (Smith et al. 2012). The organizational strategy can be considered one of the key component in boosting innovation. Therefore, a lot of strategies are used to acquire and manage innovative ideas from employees. Using Simple and agile structures have a positive impact on innovation while on the other side, heavy and hierarchical structures have a negative impact on innovation (Hamdy, 2015). This also can be referred to aspects of the corporate and innovation strategies of the organization and how they impact on the management of innovation (Smith et al. 2012).

Organizational factors are related to the internal organizational culture. Following factors directly related to the employees' idea generations such as the reward system, management support, culture of trust and risk-taking, allocation of resources and especially the free time and finally the organizational structure and the related centralization of the decision. And

also work characterizes which includes work experience and job characteristics also have a great influence on employee innovative behaviour.

2.3 Related work

A secondary study was used to identify and classify all research related to innovative behaviour of employees. This mapping study was done based on analyzing past research papers. The intention of this was to provide an overview of the research topic and to identify sub-areas where more investigations are needed. Before completing the second study mentioned above, a tertiary study was done to find secondary studies related to innovative behaviour of employees in software companies and innovations in software companies respectively. Table 1 and Table 2 shows how search strings were applied in the following electronic databases: IEEE Xplore, SpringerLink, ScienceDirect, EmeraldInsight and ResearchGate. However, search strings were checked for software companies in the first time and the results included were related to other organizations as well. They were examined further to get more information. To find more research paper regarding innovations, search string was modified as in Table 2.

Table 1: Search term of the tertiary study on innovative behaviour of employees in software companies

Areas	Search terms
Employee innovative behaviour	"innovative behaviour of employees", "innovative work behaviour"
Software companies	"software companies", "IT industry"
Review	"systematic literature review", "systematic review", "mapping study"
Search string	("Innovative behaviour of employees" OR "Innovative work behaviour") AND ("software companies" OR "IT industry") AND ("literature review" OR "systematic review", "mapping study")

Table 2 Search term of the tertiary study on innovations in software companies

Areas	Search terms
Innovations	"innovations"
Software companies	"software companies", "IT industry"
Review	"systematic literature review", "systematic review", "mapping study"
Search string	("Innovations) AND ("software companies" OR "IT industry") AND ("literature review" OR "systematic review", "mapping study")

3. RESEARCH METHOD

Mapping study for this research was done according to the guidelines given by Kitchenham and Charters which includes three main phases as planning, conducting and reporting (Kitchenham and Charters, 2007). Planning includes establishing review methodology, defining research questions, inclusion and exclusion criteria, sources, search string and mapping procedures. Conducting includes in selecting the appropriate studies and extracting data from them. Reporting includes the documenting the results. Snowballing was done to identify additional studies and further searching was done to remove duplicates from the list of the papers found using previously mentioned search strings. Apart from early mentioned databases, a search was done in the google search engine to find more studies relevant to the topic.

3.1 Research questions

The main aim of this mapping study was to provide a detailed view of the current state of the research topic of innovative behaviour of employees in software companies. Table 3 shows the research questions that this study is focused on.

3.2 Study selection

The selection process was done addressing the following aspects: terms and search string definition, sources used, inclusion and exclusion criteria and way of storing data.

3.2.1 Terms and search strings

Search string has covered two areas - innovative behaviour of employees and innovations in software organizations. And this was applied in following metadata fields: title, abstract and keywords. In some cases, search string has been syntactically changed according to each source's topics. (Table 4)

3.2.2 Sources

The search was done in the following five electronic databases. Also, some other papers were found from journals related to innovations and employee innovative behaviour.

i. IEEE Xplore (http://ieeexplore.ieee.org).
ii. Emerald Insight (http://www.emeraldinsight.com)
iii. ResearchGate (http://www.researchgate.net)
iv. SpringerLink (http://www.springerlink.com).
v. ScienceDirect (http://www.sciencedirect.com).

3.2.3 Inclusion and exclusion criteria

The selection criteria was done with the help of one inclusion criterion (IC) and five exclusion criteria (EC). The inclusion criterion was: (IC1) study discusses the innovative behaviour of employees in software companies. The exclusion criteria are: (EC1) study does not contain an abstract; (EC2) study just published as an abstract, (EC3) study not written in English, (EC4) study that is an older version of other study already considered and (EC5) study that does not belong to a primary study, such as editorials, summaries of keynotes, workshops, and tutorials.

Table 3 Research questions and their Objectives

No	Research question	Objectives
RQ1	When and where have been the studies published?	The research topic seems to be broad and new. This research question's objective is to give an understanding on whether there are specific publication sources and when they have been published
RQ2	From an innovation perspective, what areas have been focused in the research?	This one is to investigate all the areas regarding the innovation in software companies
RQ3	From employee innovative behaviour perspective, what areas have been focused on the research?	This one is to investigate all the areas regarding the employee innovative behaviour in software companies
RQ4	What are the types of researches have been done?	This one is to find out the types of researches have been done yet such as solution proposal, validation researches, experience papers, opinion paper and evaluation researches. This is very important because this gives the current status of the research topic
RQ5	What are the factors that affect innovative activities in software companies?	This provides all the factors affecting the innovative activities in software companies. They can be considered under two areas as industrial factors and individual factors (internal and external factors)
RQ6	What are the factors that affect the innovative behaviour of employees in software companies?	This is the same as the above question. This provides all the factors affecting the innovative behaviour of employees in software companies. They can be considered under two areas as industrial factors and individual factors
RQ7	What are the technologies and strategies used to improve the innovative behaviour of employees?	This highlights the technologies and strategies used inside the software companies to enhance the innovative behaviour of employees
RQ8	What are the main conclusions reported regarding the innovative behaviour of employees in software companies?	This includes the main conclusions reported on the studies regarding employee innovative behaviour in software companies. This information is useful to evaluate all other questions mentioned in this table

Table 4 Search term of the tertiary study on innovative behaviour of employees and innovations in software companies

Areas	Search terms
Employee innovative behaviour	"innovative behaviour of employees", "innovative work behaviour", "innovations"
Software companies	"software companies", "IT industry"
Search string	("Innovative behaviour of employees" OR "Innovative work behaviour"

	OR “innovations”) AND (“software companies” OR “IT industry”)

3.2.4 Data storage

The publications returned related to the searching phase were cataloged and stored appropriately. All relevant data were gathered from the identified studies (e.g., id and bibliographic reference). This catalog can be used to group relevant publications for further analysis process.

3.2.5 Assessment

Mapping protocol was tested before conducting the mapping. This test was done to verify its feasibility and adequacy, considering a pre-selected set of studies considered relevant to the research topic. By changing search term positions and some modifications more relevant studies were found.

3.3 Data extraction and synthesis

The search process was done, considering the studies published until December 2017. It returned 487 publications out of which 221 from EmeraldInsight, 23 from ScienceDirect, 24 from IEEE Xplore, 186 from ResearchGate and 33 from SpringerLink.

In the first stage, the selection criteria (inclusive and exclusive criteria) over the title, abstract and keyword was applied and it resulted in reducing studies up to 74 papers because they were not satisfying IC1(studies discussing employee innovative behaviour in software companies). This approximately reduced 90 percent of the studies. Then in the second stage removal of duplicates is applied and it resulted in reducing the studies up to 52 papers. From that 3 papers were removed because studies with no abstracts (EC1) another 2 removed because they were just published as abstracts (EC2) and another 2 studies were removed because they were not written in English (EC3). And also another 2 papers were removed because they were an older version of the studies that we have already considered. Another one paper was removed because the study was not a primary study. Then in the next stage (third stage) selection criteria was applied considering the full text, resulting in reducing studies up to 11 papers. These papers were all relevant papers with the research topic and then snowballing was performed as the fourth stage which resulted in adding another 5 papers. And then after applying inclusion and exclusion criteria to those 5 papers, two papers were removed because those studies were not primary studies (EC5) and another paper was removed because that study was not satisfying IC1 (studies discussing employee innovative behaviour in software companies).

Finally, 13 papers selected until the 5th stage. Then some other journals, digital libraries, online and research groups were searched to find more relevant papers to the topic directly. As a result, 3 more papers were added satisfying to all selection criteria. Therefore finally 17 papers were selected to be analyzed (11 from the sources, 2 from snowballing and 4 from direct search to digital libraries, researches and research groups). Figure 1 shows the flow of the steps used to extract studies from databases. Table 5 represents how the research papers have been selected from the sources. Table 6 shows bibliographic reference of the selected studies of each paper with an identifier (#id) for each paper.

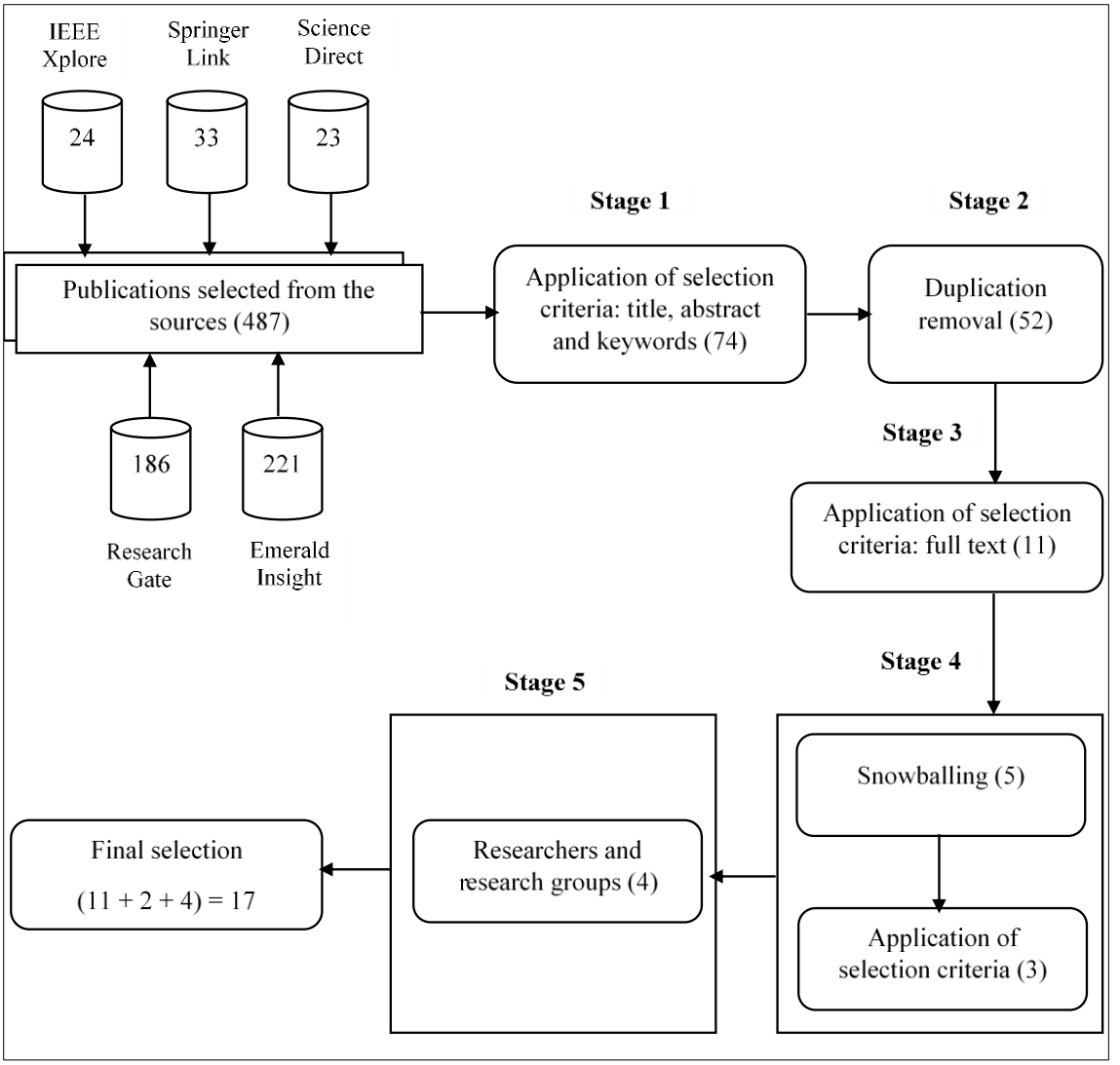

Figure 1. Search selection process

Table 5 Results from selection stages

Stage	**Applied Criteria**	**Analyzed content**	**The initial number of studies**	**The final number of studies**	**Reduction (%)**
1st	IC1	Title, abstract and keywords	487	74	84.8
2nd	Duplicate removal	Title, abstract and keywords	74	52	30.0

3rd (a)	EC1, EC2, EC4, and EC5	Full text	52	42	19.2
3rd (b)	IC1	Full text	42	11	73.8
4th(a)	Snowballing EC5	Title, abstract and keywords	5 (added by snowballing)	3 (added by snowballing)	-
4th(b)	Snowballing, IC1	Full text	3 (added by snowballing)	2 (added by snowballing)	-
5th	Research groups	Full text	3 (added by research groups)	3 (added by research groups)	-
Final Result			487 (sources) + 5 (snowballing) + 4 (research groups) = 496	11 (sources) + 2 (snowballing) + 4 (research groups) = 17	96.5

Table 6: Selected studies

ID	Bibliographic reference
#1	Chatchawan R, Trichandhara K and Rinthaisong I (2007) Factors Affecting Innovative Work Behaviour of Employees in Local Administrative Organizations in the South of Thailand. International Journal of Social Sciences and Management 4(3): 154-157.
#2	Li X and Zheng Y (2014) The Influential Factors of Employees' Innovative Behaviour and Management Advice. Journal of Service Science and Management 7: 446-450.
#3	Baragde D and Baporikar N (2017) Business innovation in Indian software industries. Journal of Science and Technology Policy Management 8(1): 62-75.
#4	Shahzad F, Xiu GY and Shahbaz M (2017) Organizational culture and innovation performance in Pakistan's software industry. Internal Journal of Technology in Society 51: 66-73.
#5	Vasanthapriyan S, Xiang J, Tian J and Xiong S (2017) Knowledge synthesis in software industries: a survey in Sri Lanka. In: IEEE International Conference on

	Industrial Engineering and Engineering Management (IEEM).
#6	Monteiro C, Silva FQ and Capretz LF (2016) The Innovative Behaviour of Software Engineers: Findings from a Pilot Case Study. 10th International Symposium on Empirical Software Engineering and Measurement (ESEM).
#7	Lukes M and Stephan U (2017) Measuring employee innovation A review of existing scales and the development of innovative behaviour and innovation support inventories across cultures. International Journal of Entrepreneurial Behaviour & Research 23(1): 136 – 158.
#8	Smith MA, Busi MO, Ball P and Ibrahim RVDM (2008) Factors Influencing an Organizations ability to Manage Innovation: a Structured Literature Review and Conceptual Model. International Journal of Information Management.
#9	Çavus MF and Gokcen A (2015) Psychological Capital: Definition, Components and Effects. British Journal of Education, Society & Behavioural Science 5(3): 244-255.
#10	Edison H, Ali NB and Torkar R (2013) Towards innovation measurement in the software industry. The Journal of Systems and Software 86: 1390-1407.
#11	Gourova E and Toteva K (2016) Enhancing knowledge creation and innovation in SMEs. Embedded Computing (MECO) Mediterranean Conference.
#12	Ikeda K and Marshall A (2016) How successful organizations drive innovation,.Journal of Strategy & Leadership 44(3): 9-19.
#13	Pratoom K and Savatsomboon G (2010) Explaining factors affecting individual innovation: The case of producer group members in Thailand, Asia Pacific Journal of Management 29(4): 1063–1087.
#14	Hamdy H, Aziz A and Rizkallah A (2015) Effect of organizational factors on employees' generation of innovative ideas. EuroMed Journal of Business, 10(2): 134 – 146.
#15	Turek AW (2013) Innovative Work Behaviour and Psychological Capital – Analysis of Relationships. ResearchGate publication.
#16	Seba, Rowley J Lambert S (2008) Factors affecting attitudes and intentions towards knowledge sharing in the Dubai Police Force. International Journal of Innovation Management, 12(4): 655-676.

#17	Gamal D (2011) How to measure organization Innovativeness, An overview of innovation measurement framework and innovation audit / Management tools. Technology Innovation and Entrepreneurship Center (TIEC).

3.4 Classification scheme

The classification scheme was defined to conduct a systematic mapping. Different areas of each question have been considered during this process. All the main findings and most related finding were examined and identified the aspects, factors, categories and other related areas.

3.4.1 Research focus from the innovation perspective (RQ2)

Different aspects have been considered about the innovation in software companies. Based on those studies we can categorize them into below areas.

i. Barriers to innovation: focusing on the barriers that obstruct innovations in organizations
ii. Factor affecting innovations: focusing on the factors affect innovations in organizations.
iii. Innovation related to software companies: focusing on innovations related to software companies
iv. Innovation models: a conceptual model that help to identify factors that affect innovations and the solution that can be taken to improve innovations.

3.4.2 Research focus from the employee innovative behaviour perspective (RQ3)

Following areas have been considered. Same as the in RQ2

i. Barriers to employee innovative behaviour: focusing on the barriers that obstruct employee innovative behaviour in organizations
ii. Factor affecting employee innovative behaviour: focusing on the factors affect to employee innovative behaviour in organizations.
iii. Employee innovative behaviour related to software companies: focusing on employee innovative behaviour related to software companies
iv. Innovation models: a conceptual model that help to identify factors that affect employee innovative behaviour and the solution that can be taken to improve innovations.

3.4.3 Research type (RQ4)

There are a lot of research types, but the main following types have been considered. Most of the studies were done as evaluation researches or validation researches. Some of the researches have proposed or implemented solutions regarding that particular research topic.

• Solution proposal: the solution must be novel, or at least it must be an improvement of the existing one. There should be proof to say your solution works.
•Evaluation research: Novel research is not necessary for this type. Just you can evaluate the previously done researches. But you can do the same. And also study should be practically applicable to a real-world project.

3.4.4 Research focus on the factors that affect innovative activities (RQ5)

In this area, two types of factors are considered. They are:

i. Individual

ii. Industrial

Both of these factors have a great influence on innovative activities within the company. Most of the researched have been focused on organizational or industrial factors rather than individual factors.

3.4.5 Research focuses on the factors that affect employee innovative behaviour (RQ6)

This is also the same as RQ5, here also two types of factors are considered. As in RQ5, there is lack of studies about the individual factors that affect employee innovative behaviour rather than industrial factors.

3.4.6 Research focuses on the technologies and strategies in innovations (RQ7)

In this area research focus on innovation models, strategies technologies are discussed. Few studies have been focused on strategies and models.

4. RESULTS

Mapping study was performed according to the steps in Section 3. And the research question and answers are also represented in Section 3.1. To answer those questions research papers were used as represented in Table 5 with the id of the paper and the bibliographic reference.

4.1 Classification by publication year and source

17 research studies were selected as mentioned in Section 3 and figure 2 shows how they have been selected over the years. Most of the research papers selected were new ones and over 2008. As in figure 2 you can see that 4 papers are from 2017. Therefore, it is clear that studies are new and consist of current information. The selected papers were published mainly in four vehicles: Journal, Conferences and Online Articles and E-Books. Journals have been the main sources of studies. As you can see 13 out of 17 are from International Journals, which is approximately 76%. Figure 2 clearly represented the research paper using its #ID, type and the source.

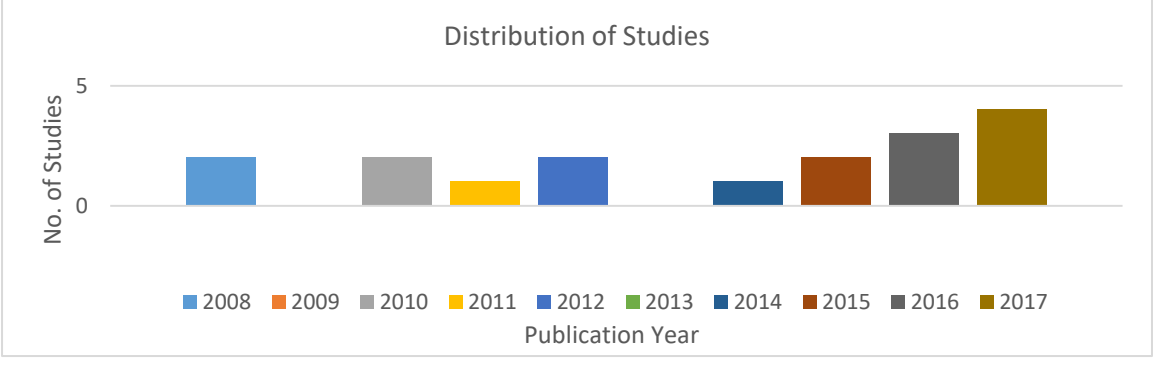

Figure 2 Distribution of selected studies over years

Table 7: Publication sources

Publication source	**Type**	**#ID**
The Journal of Systems and Software	Journal	#10
International Journal of Social Sciences and Management	Journal	#1
IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), 2017	Conference	#5
International Journal of Service Science and Management	Journal	#2
Internal Journal of Technology in Society	Journal	#4
Journal of Science and Technology Policy Management	Journal	#3
Cornell University Library, 10th International Symposium on Empirical Software Engineering and Measurement (ESEM)	Journal	#6
International Journal of Entrepreneurial Behaviour & Research	Journal	#7
International Journal of Innovation Management	Journal	#16
International Journal of Information Management	Journal	#8
British Journal of Education, Society & Behavioural Science	Journal	#9
Embedded Computing (MECO), 2012 Mediterranean Conference	Conference	#11
Journal of Strategy & Leadership	Journal	#12
Asia Pacific Journal of Management	Journal	#13
EuroMed Journal of Business	Journal	#14
ResearchGate Digital Library	Online Article	#15
Technology Innovation and Entrepreneurship Center (TIEC)	E-Book	#17

4.2 Research focus from the innovation perspective

Table 8 shows how the studies focus from an innovative perspective have been distributed along with years. There were 10 papers out of 17 papers, it was 58.8% of all studies. Distribution over aspects was as follows: Barriers for innovation (2), Factors affecting innovation (4), Innovation related to software companies (1), Innovation models (3) and in general there were another 3 papers that were related to knowledge management and innovation. Some studies found common with more than one aspects. All are represented in table 8 below.

Table 8: Research focus from the innovation perspective along years

Research Focus	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Barriers for innovations			#10	#17							2
Factor affecting innovations	#8			#17					#12	#4	4
Innovation related to software companies										#3	1
Innovation models	#8			#17						#1	3
General	#16				#11					#5	3

4.3 Research focus from the innovative behaviour perspective

Table 9 show how studies related to innovative behaviour along with their year of publication. 11 papers out of 17 were related to this area. Some of the papers were common with innovation perspective also. As a percentage, it was 64% out of all studies (17). Distribution over aspects was as follows: Barriers for innovative behaviour (4), factors affecting innovative behaviour (6), innovative behaviour related to software companies (2) and generally 3 papers were used same as in the innovative perspective that was related to knowledge management and innovation.

Table 9: Research focus from the innovative behaviour perspective along years

Research Focus	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Barriers to innovative behaviour			#13		#15		#2			#1	4
Factor affecting innovative behaviour			#13		#15		#2	#9 #14		#1	6
Innovative behaviour related to soft. companies									#6 #7		2
General	#16				#11					#5	3

4.4 Research type

Table 10 shows how researches have been categorized according to their type. There were two main types as I observed they were solution type and evaluation type. Out of 17 papers, 6 were found as solution type and 11 were evaluation typed researches.

Table 10: Distribution over research type

Research Type	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Solution proposal	#8 #16		#10	#17					#6 #7		6
Evaluation research			#13		#11 #15		#2	#9 #14	#12	#1 #3 #5 #4	11

4.5 Research focus on the factors that affect innovative activities

Table 11 represents the researches considering the factors that affect innovative activities. And they were categorized as individual and industrial factors. As you can see in the table shows that most of the researched have been done considering the organizational factors. It means there is a lack of study about the individual factors that affect innovative activities in organizations.

Table 11: Research focus on the factors that affect innovative activities

Type of factors	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Individual	#8		#10	#17							3
Industrial/ organizational	#8		#10	#17					#12	#4 #3	6
All factors	#8		#10	#17							3

4.6 Research focus on the factors that affect employee innovative behavior

Table 12 shows the researches considering the factors that affect employee innovative behaviour. And they were categorized as individual and industrial factors. Three papers have been found containing both these factors. Most of the researched have covered the

organizational factors and there was a lack of study about individual factors.

Table 12: Research focus on the factors that affect innovative behaviour

Type of factors	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Individual			#13		#15		#2	#9	#6		5
Industrial or organizational			#13				#2	#14	#6	#1 #7	6
All factors			#13				#2		#6		3

4.7 Research focus on the technologies and strategies in innovations

Less number of researches have discussed the technologies used in innovation because it wasn't related to the topic. But some researches have discussed the strategies used in innovations and in improving innovative behaviour of employees. Table 13 shows how those research papers with their year of publication.

Table 13: Research focus on the factors that affect innovative behaviour

Strategies or Technologies	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Strategy	#8		#10	#17						#4	4
Technology	#8									#3	2
All	#8										1

5. DISCUSSION

The software development is playing a considerable and increasing filed in the world economy also even now in the Sri Lankan economy. It is essential to develop new solutions to survive in this industry. As we know employees are the main driving forces of innovations, it is important to consider factors that affect employee innovative behaviour and also it is essential to focus on the difficulties and obstacles which employees meet when going for innovative activities. For that, we should consider the barriers in both internal and external factors regarding employees (Kabasheva et al. 2015, Bermejo et. al 2016, Balasooriya 2010). Therefore, in this research lot of mapping studies related to employee innovative behaviour are considered. But before talking about innovative behaviour we should focus on innovations in the organization. That is the reason why the researches regarding innovations are also examined in this study.

10 out of 17 papers directly discussed the innovation in organizations or software companies. Barriers for innovations, factor affecting innovations have discussed in these

papers in detail with diagrams. Surveys have done to get information from employees and analyzed that data and represented in graphs or tables. Moreover, innovation models are also included in these studies to understand the innovation processes and factors affecting innovation within organizations.

11 out of 17 papers discussed the innovative behaviour of employees. Barriers to innovative behaviour and factors affecting innovative behaviour are common points discussed in these studies. Most of the studies were discussing the organizational factors that affect employee innovative behaviour. Few papers have discussed the influence of individual factors in employee innovative behaviour.

Most of the papers were evaluation papers and there were solution papers also. Their models have been implemented to improve innovative behaviour of employees. All these papers were examined well to get a clear idea of the research topic. During this mapping study, it was possible to get good knowledge related to innovative behaviour of employees.

6. CONCLUSION

Kitchenham has stated that a mapping study gives an idea in the early phases and shortcomings or gaps in existing evidence, which becomes the basis for future research studies. So this mapping study gives an idea of how past studies have been collected according to different criteria. That means this paper gives a systematic mapping on employee innovative behaviour of organizations and software companies. 8 research questions were defined and addressed investigating the following aspects. (1) Distribution of selected papers over years, (2) research focus from the innovation perspective, (3) research focus from the employee innovative behaviour perspective, (4) research type, (5) research focus on factors that affect innovations in organizations, (6) research focus on factors that affect employee innovative behaviour, (7) research focus on technologies and strategies used in innovative activities, (8) main conclusion of the study. Apart from those aspects, some other important studies were also undertaken to study regarding the individual innovative factors like psychological capital and organizational commitment. And also studies which include innovative model diagrams were also examined to understand the relationship between the factors affecting innovative behaviour and to draw future conclusions regarding the research topic. Most of above-related studies were extracted via the snowballing process. So at the end of the process, 17 studies were selected as primary studies to support the research study.

The main aim of this mapping study is to making evident on aspects associated with employee innovative behaviour of employees in software companies. This will help to drive future work in this area. In this context following conclusions can be highlighted. They are, factors affecting employee innovative behaviour, the impact of those factors on the innovative activities, also the strategies used to improve employee innovative behaviour and the barriers to improving them. Therefore, by going through this mapping study clear idea of the studies that should follow to gather information related to the research topic.

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