Building a skill-based system for better employee engagement in a software organization

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Declaration

I declare that this research is my original work and that it has never been presented to any institution or university for the award of Degree or Diploma. In addition, I have referenced correctly all literature and sources used in this work and this work is fully compliant with the Dublin Business School’s academic honesty policy.

Siddarth Nair
January 2019
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Abstract

Skills form an integral part of an organization for its efficient functioning and employees with multiple skill sets are a great asset to any organization. Imagine an organization where everyone talks and thinks about skills; evaluate others, weigh and see others through the glasses of skills. There are systems that collect skills from employees but those are not used as a driving force to create a skills-oriented culture within an organization. Appraisals in organization focus on project level metrics and maybe some personal development objectives, but skills are not used as a driving factor. Also from an organization standpoint, in case of skills deficit, mostly they recruit new employees with the required skill set and experience rather than upskilling existing employees who have bandwidth and are interested to acquire new skills. The aim of the research is to know if we can create a skills-focused climate in a software organization through a software system proposed by the researcher and if such a system will help in utilizing in-house employees for new opportunities rather than hiring new employees. This study proposes a skill-based system with minimum viable features which collects in-depth skills from the employees and provide ways to learn, improve and demonstrate their skills. Apart from encouraging employees to upskill, this system can also be used to promote Corporate Social Responsibility and Hobbies within employees to encourage work-life balance. Feedback was collected on the proposed skill-based system from software processionals and human resource managers through an online survey. Findings reveal that the proposed skill-based system will create a skill-focused climate in a software organization and also help in better utilization of internal employees in case of new skill requirements rather than directly hiring external employees.
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Chapter 1

Introduction

1.1 Background of the research

Employees with multiple skill sets are an asset to any organization. With the changing trends and advent of Artificial Intelligence, Machine Learning, Deep Learning, Blockchain technology etc. it is always better to have employees who are adaptable, flexible and open to embrace new challenges. A software organization in particular, is an embodiment of professionals with technical and non-technical skills. The skills of the employees are used to solve complex real world problems, to come up with new products and services that touch the lives of people, helping them in one way or the other. Skills have always served as tools for the employees to showcase their capabilities and talent; increasing their visibility and improving their self-confidence to learn more, be competitive and more importantly find passion in their work. On the other hand, the organization has a significant part in nurturing and encouraging their employees to develop their skills, which will not only help fulfill their aspirations but also help in better organization functioning with skillful employees. So, we can say skills play an important role for both employees as well as the organization.

Currently there are systems that use gamification for employee engagement, but they do not focus on upskilling employees. There are systems that allow employees to enter/update their skills, but they are not used as a tool to create a skills-focused culture within an organization. Appraisals in organization focus on project level metrics and maybe some personal development objectives, but skills are not used as a driving factor. From an organization standpoint, in case of skills deficit, mostly they recruit new employees with the required skill set and experience rather than upskilling existing employees who have bandwidth and are interested to acquire new skills. Currently, organizations does not provide a common and encouraging platform for employees to showcase their skill sets. Also, employees find it difficult sometimes to understand the required level of skill set for a given
role and how to achieve them in a clear manner. So, it is worth researching if we can figure out a way to come up with a system that focuses on employee skills as an active medium.

1.2 Aim of the project

The aim of the project is to know whether a change in perspective can be brought in a software organization focusing on upskilling employees in an intuitive and an encouraging manner, through the use of a skill-focused software platform.

1.3 Objectives of the project

Following are the objectives of this study:

1. To know whether a skill-based software system can help encourage employees to proactively learn and share knowledge in an organization creating a vibrant, dynamic and enthusiastic leaning climate in a software organization.

2. To know whether a skill-based system will serve as a reliable medium to reach out to the right expert to resolve technical queries.

3. To know whether a skill-based software system will help in effective learning of emerging trends like artificial intelligence, machine learning etc.

4. To know whether a skill-based system can prevent recruiting new employees in case of skill deficit.

1.4 Research Questions

How can you create a skills focused climate in a software organization through a software system?

Imagine a system which will help an organization achieve the following:

- Know the skill set of an employee
- View other’s skills to know who is good at what
- Connect to an employee with required skill set for any query
• Provide a platform for employees to showcase their skills

This system will basically create a skill-focused climate within an organization which will provide an opportunity for employees to learn and improve.

Will a skill-based system help in utilizing in-house employees for new opportunities rather than hiring new employees?

In case of skill deficit, employers prefer to hire new employees with required skill set and experience rather than upskilling existing employees. If an organization has huge bench strength (i.e. employees who are not allocated/billed against project), they can use this system to identify whether any of these employees can be provided an opportunity.
For example, consider there are 50 employees with DOT NET technology as their core skill and they are not allocated to any project and waiting for an immediate opportunity. But, out of these 50 employees, 3 employees have updated “Python” programming language as a secondary skill. Now, if there comes a new requirement for “Python” developers, these 3 employees can be provided an opportunity rather than hiring new employees which would eventually help in saving costs, time and efforts.

1.5 Dissertation Roadmap

The entire document is divided into seven chapters.
Chapter 1 provides the background, aims and objectives of the research followed by the research questions. This chapter also talks about the scope, limitations of the research and the major contributions of the research.
Chapter 2 reviews the existing literature to understand key terminologies and their significance.
Chapter 3 talks about the research plan and the methods used in the study.
Chapter 4 explains the skill-based system in detail. This chapter describes the system features, design and implementation of the system along with project management.
Chapter 5 presents the data analysis and findings generated a part of the research survey.
Chapter 6 talks about the insights gathered after examining the data findings.
Chapter 7 provides the conclusion of the research with respect to the research questions and discusses the future scope of the system.
1.6 Scope and limitations of the research

The main purpose of this research is to see if a skill-based software system can help to create a skill-focused learning climate in a software organization. In a real world scenario, an enterprise system can include a lot of features but considering the time limitations of the project, the software system that is developed is just a proof-of-concept web application with minimum viable features. The focus of the system developed as a part of this research is to realize a simple system that focuses on skills.

1.7 Major contributions of the research

This research focuses on bringing a change in perspective of the employees as well as the organization towards a skill-focused learning climate. This research proposes a conceptual framework of a skill-based system and its features to create a skill-oriented learning climate within the software organization. This study also evaluates the skill-based system from Human Resource managers and software professionals with a diverse range of work experience who are working in a software organization to see whether such a skill-based system will benefit the employees as well as the organization or not. This research will pave way for the software organizations and their employees to create an environment where everyone talks and thinks about skills; evaluate others, weigh and see others through the glasses of skills. Such a skill-based system will benefit the entire organization as a whole, making it an embodiment of skillful resources and the world with more and more skillful professionals.
Chapter 2

Literature Review

2.1 Learning Climate

Eldor and Harpaz (2016b, p. 213) defines the learning climate as "the organization’s beneficial activities in helping employees create, acquire, and transfer knowledge, has also been proposed as an antecedent of employee engagement.". The organization climate plays a significant role in influencing the behavior of the employees (Hahm, 2017, p. 4111). A learning climate provides a platform for the employees to learn and experiment new skills (Tynjälä, 2008, cited in Osagie et al. 2018, p. 892) and enhances employee engagement (Eldor and Harpaz, 2016a, p.228). A learning climate is a key to employees’ effectiveness (Eldor and Harpaz, 2016a, p.214), positively impacts their attitude and work performance (Eldor and Harpaz, 2016a, p.215) and also helps align their work to the organization goals (Eldor and Harpaz, 2016a, p.216). The organization learning climate fosters innovation (Bates and Khasawneh, 2005, p. 106) and makes employees adaptable, making them more equipped to face new challenges in the economy (Eldor and Harpaz, 2016a, p. E26).

2.2 Employee Upskilling

For a sustainable environment with regards to ever-improving technology, the organizations need workforce who are multi-skilled and more importantly employees willing to acquire new skills (Gallivan et al., 2004, cited in Goles et al. 2008, p. 180). Due to the change in technologies and high competition, employees’ ability to adapt to new challenges effectively, significantly affects their performance (Griffin et al., 2007, cited in Eldor and Harpaz 2016a, p. 213). Rather than familiarizing with theoretical concepts and learning different skills, software developers need to develop an attitude that helps them to smoothly transition to
new technologies and practices (Lato, 1997, cited in Seffah 1999, p. 66). Lack of necessary skills is detrimental to employees’ performance in their projects (Jiang et al., 2007, p.41). Ismail (2017, p 96) states that, “Empirical evidence identifies that organizational success hinges on employees with the required knowledge, skills, and abilities and that employees’ effectiveness at learning new skills and knowledge is connected with the kind of learning technique the organization adopts.”. Here, it clearly says that the organization’s learning system plays a crucial role in imparting effective knowledge and skills to the employees. The skills-based system should be intuitive and encouraging enough to make the employees as well as the employers worth to use it.

2.3 Knowledge Management

Kaushik and Xu (2016) describes in detail the importance of knowledge in an organization in the customer relationship management scenario and how customer knowledge can lead to Customer Intelligence. Similarly, in the context of enterprise software organization, deriving insights and intelligence from the skills data obtained from the employees can yield business value adds to the organization. Also, considering an enterprise system focusing on skills will have to deal with skill documents like skill certificates and related resources, effective content management becomes a necessity. Naithani and Kaushik (2016) compares various content management systems which could be used for the principal investigation of our IT based system that can provide us in-depth knowledge of the process of managing the content in the organization. This can enhance the vision and prospective for the skill-based system. These studies (Kaushik and Xu, 2016; Naithani and Kaushik, 2016) lays out a huge potential for the organizations to use the skill-based system for better awareness among the employees and provide them an opportunity to update their technical and non-technical skills.

2.4 Knowledge Sharing

Ozer and Vogel (2015, p. 134) states, “Receiving knowledge from other software developers in the company is positively related to the performance of the knowledge-receiving software developers.” Knowledge sharing leads to innovation (Lee, 2011, p. 267) and helps in employees’ job satisfaction (Malik, 2018, p. 2). As per Hahm (2017, p. 4110), information sharing has a direct relationship with creativity. Hahm points out clearly that, when different people in an organization share different knowledge, the organization becomes diverse in nature. Such diverse thinking allows employees to bring in new perspectives and the
employees become encouraged to learn and acquire knowledge making them dynamic and efficient (Hahm, 2017, p. 4110).

For a skill-based learning, demonstrations can be used as a tool to empower knowledge sharing. According to Salas et al. (2009):

A demonstration is a strategically crafted, dynamic example of partial or whole task performance or of characteristics of the task environment intended to increase the learner’s performance by illustrating (with modeling, simulation, or any visualization approach) the enactment of knowledge, skills, and attitudes (KSAs) targeted for skill acquisition (Salas et al., 2009, p. 2).

So, having a skills focused system that encourages employees to demonstrate their knowledge to other employees will not only help in enhancing their skills, but also create a knowledge sharing culture within the organization encouraging employees to share their learning.

### 2.5 Employee Engagement

Employee engagement is beneficial to both the employees as well as the organization (Eldor and Harpaz, 2016a, p.230). It is a combination of employee well-being and employee motivation (Eldor and Harpaz, 2016a, p.230). Employee engagement helps in employee retention (Kaur, 2017, p. 23). As per Felstead et al. (2010, p 1667), employee involvement is a key factor that determines their upskilling. So, the organization must make measures that the skills-based system has enough features to keep the employees involved. The skills-based system should encourage employees’ self-directedness and Lejeune et al. (2016) clearly says that such employees’ self-directedness helps in their personal development, thereby boosting their workplace performance. Also, recognizing and rewarding employees improves their commitment towards their work and also brings down employee turnover (Salie and Schlechter, 2012, p.2).

### 2.6 Gamification

Getting people engaged in an organization is a challenging task and one of the common problems faced by the organizations (Ergle, 2015, p. 222). Gamification is a tool that helps the organization in creating an exciting and an engaging user experience (Ergle, 2015, p. 223) with a positive change in the employees’ behavior (Oprescu et al., 2014, p. 4) and influences learning in a positive way (Connolly et al., 2012). Deterding et al. (2011) defines
gamification as "the use of game design elements in non-game contexts". In the gamification context, the game elements like points and badges are used to provide feedback, recognize employees’ achievements and to create a competitive workplace motivating employees to go an extra mile to train themselves (Ergle, 2015, p. 223). DuVernet and Popp (2014) describes in detail how these gamification elements of points and badges helps in better employee engagement. Bringing in gamification aspects within an organization helps employees to enhance their knowledge and provides way to monitor their progress in an engaging way (Cook, 2013, p. 55). Also, gamification has been considered as a promising plan of action to create an environment that fosters loyalty, high employee productivity and more importantly to increase both the organizational as well as the employees’ well-being (Oprescu et al., 2014, p. 4). So, keeping in mind this research study deals with coming up with a skill-based system in a software organization, using some of the gamification elements will help to create an encouraging and intuitive experience for the employees which will drive them to upskill themselves at a competitive level.
Chapter 3

Research Methodology

3.1 Research Philosophy

This research aims to bring in a change in perspective towards skills in a software organization. As the research is focused towards promoting a skill-focused system in everyday organizational practice thereby making a difference, Pragmatism is an apt philosophy for this research. As per Saunders (2015, p.143), a pragmatic philosophy is more focused towards providing practical solutions that will help organizations to implement those in future. An interpretivist philosophical approach takes into account people’s beliefs and their experiences (Deanscombe, 2017, p.8) and involves looking at organization from different perspectives (Saunders, 2015, p.140). As this research involves coming up with a skill-based system in a software organization to create a skill-focused climate, the viewpoints from software professionals from diverse range of experience as well as different roles and designation are vital in developing a clear insight on the feasibility of the system in a real world setting. So, from a philosophical point of view, the research follows pragmatism and interpretivism.

3.2 Research Approach

As the research aims to see whether the proposed skill-based system can help the software organizations to create a skill-focused learning climate, the researcher believes that getting feedback on the system from software professionals will help strengthen the research. To meet this, the researcher uses empiricism approach which is the knowledge acquired using inductive reasoning (Walliman, 2017, p.17). An inductive reasoning is a way of developing generalizations from specific observations (Walliman, 2017, p.18) which is also called as a bottom-up approach of inquiry (Shepherd and Sutcliffe, 2011). As per Greenfield and Greener
Research Methodology

(2016, p.9), an inductive approach starts with data collection followed with theorizing to obtain general conclusions. Saunders (2015, p.51) describes an inductive approach as a data driven process where theoretical statements or conclusions are formed based on the data collected and analyzed.

3.3 Time Horizon

Time is an important aspect in a research study. The research is time-constrained and such studies are cross-sectional in nature (Saunders, 2015, p.200). Saunders (2015, p.200) defines cross-sectional research "to be a snapshot taken at a particular time". In a cross-sectional research the data is gathered at a single point of time and inferences are drawn on the basis of that, whereas in the other type of study referred to as longitudinal, the data is collected at multiple points of time and studied (Neuman, 2014, p.44).

3.4 Research strategy

Survey is the research strategy used for this study. A survey is a strategy to collect and view data comprehensively (Deanscombe, 2017, p.11). A survey is a good strategy to adopt if the research requires to reach a wide set of people and if the study is cross-sectional in nature (Deanscombe, 2017, p.12). Also, surveys can be used to collect data related to peoples’ perceptions and opinions (Deanscombe, 2017, p.11).

3.5 Sampling

A research population refers to all the people who can help the research by providing valuable data for the study (Deanscombe, 2017, p.18). The research aims to answer two research questions. Software professionals can be approached to answer the first research question. Just to recall, the second research question aims to understand if the proposed skill-based system can help the software organizations to utilize internal employees rather than directly recruiting externally. To answer this specific research question the researcher believes human resource managers who are working in a software organization are the ideal candidates. So, human resource managers can be contacted to answer both the research questions and software professionals can be approached to answer the first research question. So, for this research, the research population includes software professionals and human resource managers currently working in a software organization. Sampling is a technique where data
is collected from a sub-group of the research population (Saunders, 2015, p.272). Sampling rules out the necessity to collect data from each and every member of the research population to bring out accurate findings (Deanscombe, 2017, p.33). Also, sampling becomes a need due to the time-constrained nature of the project and the impracticability to reach all members of the research population (Saunders, 2015, p.275). The research aims to reach a representative sample of human resource managers and software professionals and employs non-probability sampling techniques such as purposive sampling. Non-probability sampling technique is used as the researcher doesn’t have access to a full list of research population to select random people (Deanscombe, 2017, p.35). A purposive sampling technique helps the researcher to carefully identify subjects or survey respondents who can best answer the research questions (Saunders, 2015, p.301). Non-probability sampling technique can be used if the researcher sees difficulty to obtain large number of data for the study (Deanscombe, 2017, p.35). The researcher finds getting sufficiently large responses from human resource managers a huge challenge considering the time and situation of the research. The researcher aims to get feedback on the skill-based system from as many human resource managers and software professionals as possible but has set a target response count of 5 human resource managers and 30 software professionals.

3.6 Data Collection

Questionnaire is the data collection technique adopted for this study. More specifically, a web-based questionnaire survey was adopted for the research; also called simply as internet survey. A questionnaire is nothing but a set of questions structured to collect data from the intended participants and the data is later analyzed to draw inferences (Deanscombe, 2017, p.183). The research aims to obtain feedback on the skill-based system from software professionals and human resource managers with respect to the practical feasibility of the idea in their organizations to create a skill-focused climate. The researcher aims to collect data, especially the features that the survey participants think can add value to their organization. An Internet survey is a good option to collect data especially from people belonging to a specific category or skill set and more importantly if the time and resources are limited (Deanscombe, 2017, p.25). So, bearing in mind the aims and objectives of the research and the time-constraints, the researcher adopted a web-based questionnaire survey as the data collecting instrument to gather the expected feedback data. Also, surveys are a good medium to collect both quantitative as well as qualitative data (Deanscombe, 2017, p.30). Quantitative data is numeric and objective in nature whereas a qualitative data is non-numerical in nature and deals with the respondents’ beliefs and perceptions (Bell, 2014, p.38). Social networks
are an useful medium to reach out to people with the required skill set to answer the survey (Deanscombe, 2017, p.17). The researcher used LinkedIn\(^1\) as a platform to reach out to human resource managers and software professionals working in a software organization to answer the online questionnaire. Please refer the Appendix B for the snapshot of the request posted in a LinkedIn group for survey inputs.

### 3.7 Questionnaire

As mentioned above, the target population includes software professionals and human resource managers working in a software organization. So, two questionnaires were developed with relevant set of questions. The questionnaires were prepared using Google Forms\(^2\). The questionnaires include a combination of both open as well as closed questions. *Open questions* (or Open-ended questions) encourage the respondents to answer the question taking into account their beliefs and perceptions whereas *closed questions* (or closed-ended questions) require the respondents to select from a set of alternatives options (Saunders, 2015, p.452). At a high level, each questionnaire is divided into three sections as described below:

1. **General** - This section includes a set of questions that inquires on the following aspects:

   (a) *Level of experience* - The researcher believes participant work experience in the software industry is an important aspect to consider while drawing inferences after the data is collected. The researcher believes the responses from the higher experienced bracket will yield more value to the research.

   (b) *Existing skill-based system* - Here, the questions ask for existing skill-based systems in the participant’s organization and also if they are aware of the technical experts in their organization to reach out in case of technical queries.

   (c) *User specific questions* - For software professionals, the questionnaire intends to know about their inclination towards skills. For human resource managers questionnaire, their current recruitment approach in case of skills deficit is inquired.

2. **skill-based system** - The researcher has prepared a short research video presenting the need for a skill-based system, the features of the system and the benefits, if used in a software organization at a high level. The video was uploaded to YouTube\(^3\) and

\(^1\)https://www.linkedin.com/
\(^2\)https://www.google.com/forms/about/
\(^3\)https://www.youtube.com/
the URL was embedded in this section to inform the participants on the need of the proposed skill-based system, its features as well as benefits. The researcher believes presenting such a video about the system will help the survey participants to answer the feedback questions in the following section. Please refer Appendix D for the research video.

3. System feedback - This section includes questions to understand the participants level of agreement with regards to their perceptions about the proposed skill-based system, foreseeing the benefits at an individual level as well as for the organization to create a skill-focused climate. Also, this section includes three open-ended questions; couple of those aligned to the research questions requesting their reasoning on their perception how the system will affect the skill climate in their organization and utilization of in-house employees for new skill requirements. The third open question is to get any other comments or suggestions the participants wish to share. As rating questions are a good way to to obtain participants’ opinion (Saunders, 2015, p.457), a Likert-scale rating scale of 5-point from Strongly agree to Strongly Disagree is used to collect participants’ feedback on the skill-based system. Please refer Appendix B for the questionnaires.

The researcher has given a careful thought while crafting questions keeping in mind the number of questions, the wording of the questions, question types and the possible options for the closed questions. As far as the appearance and layout of the questionnaires are concerned, professional background colors and images were set, and images were added to the questions wherever necessary to provide a pleasing, enriching and an intuitive experience. Both the questionnaires, after developing an initial draft was pilot tested with 3 participants that included one human resource manager and two software professionals. A pilot exercise is a form of preliminary analysis conducted to identify any bugs in the questionnaire and to know if the participants experienced any difficulty in understanding question(s) before it passes to the distribution phase (Bell, 2014, p.225). After the pilot exercise, some amendments had to be made before rolling out the final version to the actual participants.

3.8 Data Analysis Procedure

The researcher has used descriptive statistics to compute the frequency and the percentages of the individual question responses to view graphically and draw inferences. Also, cross tabulations are used to compare variables and identify possible relationships between them to see emerging patterns. The qualitative data generated from the open questions were studied
Research Methodology

to identify themes to group them in distinct sets. The frequencies of these *themes* were used to identify the recurring themes and generate insights holistically.

### 3.9 Research Ethics

The ethics in this research is concerned with the code of conduct to be followed with respect to the rights of the survey participants.

**Informed consent:** The researcher ensured the questionnaire begins with all the information that includes the research objectives as well as the participants rights to let them freely decide to proceed answering the survey questions. Please refer Appendix B for the questionnaire.

**Data Integrity and Objectivity:** The researcher ensured interpreting the data received from the online survey correctly in the best possible manner without any bias or distortion.

**Avoiding harm to participants:** The research involves web survey for data collection. So, the researcher didn’t have face-to-face interactions with the subject. Still, the researcher ensured to refrain from pressurizing participants to complete the survey. Care has been taken to make the participant feel comfortable to help with the survey responses in a polite manner.

**Data Confidentiality and Anonymity:** No personal demographics are collected from the participants as a part of the survey.
Chapter 4

Artefact Design & Development

4.1 System Overview

As the idea is to see if a skill-focused platform can help improve employee engagement through a software system, to prove the possibility practically, a software system is required. The three main actors in the proposed skills-based system are employees, managers and skill experts as shown in the figure 4.1.

![System Actors](image)

**Fig. 4.1 System Actors**

The employee initially will enter his/her skills into the system. Based on the entered skills, the system will then ask more questions to the lowest possible level sub-question, finally presenting the employee with a skills dashboard. Figure 4.2 illustrates the high level conceptual design diagram of the skill-based system. The employee skills dashboard will help with the following information:

- Required role level skills
• Points acquired for each entered skill

• View other employees’ skills

• Ways to improve the existing skills as well as learn new skills via certifications, demonstrations using a proof-of-concept, learning by attending a training/demonstration or resolving technical queries.

The system will follow points and badges system. *Skill points* will be allocated to the employees who do certification and demonstration using a proof-of-concept, whereas *badges* will be assigned to those who attend demonstrations/training and resolve queries. There will be a *skill expert* present at all times to validate the employee’s knowledge of the new skill and will provide feedback as well as update skill points in the system which will then be reflected in the employee’s dashboard. Also, the skill expert needs to feed in to the system, appropriate drill down questions for the respective skills.

Managers have the responsibility to feed into the system required skill points for their projects. Also, they can approve/reject their subordinates’ requests in the system.

### 4.2 System Workflows

At a high level, there are five major workflows in the skill-based system. Each of these are explained in detail below:

#### 4.2.1 Employee dashboard creation

Figure 4.4 shows the dashboard creation activity diagram for an employee at a high level. One of the important and distinctive features of the system is the drill down questions for
4.2 System Workflows

Fig. 4.3 Use case Diagram

each of the entered skill by the employee. If an employee enters a skill initially to the system, he/she will be confronted with an associated set of questions based on that skill to further refine the high-level skill to more specific subject areas within that skill. This is owing to the fact that an employee who claims to know a high-level skill may not know every subject modules within that skill area. So, it is better the system tries to identify and separate what
he/she actually knows and doesn’t know which will lead to better focus for improvement. Consider the following examples:

1. If an employee enters C# as his/her skill, the next drill down question can be to select the knowledge and expertise in Classes, Structures, LINQ, Inheritance, Polymorphism etc. The employee may know only Classes out of these. This increases the reliability of the system in case of query resolution. Now, if someone in future wants to approach for a query regarding C# – LINQ problem, this employee even though he knows C# at a high level won’t be considered in the list of relevant candidates to approach.

2. If an employee enters Scrum as his skill, the first drill down question can be ‘Are you certified?’. If the employee answers ‘Yes’, the next drill-down question can be ‘Are you certified from Scrum Alliance or Scrum.org or other?’. And based on the answer, the next question can be to upload certificate as a proof and so on.

3. If an employee enters ‘Team leading’ as his/her skill, the following drill down question can be ‘How much experience do you have as a team leader?’ and ‘What is the maximum size of team you have lead?’ and so on.

A point to note here is that these drill down questions like mentioned above is to be prepared and uploaded to the system by the respective skill experts. A C# skill expert will prepare and upload drill down questions for C# skill. Similarly, for other skill sets the respective skill expert will feed in the drill down question set to the skill system. Once all the drill down
questions are answered, the employee will be presented a dashboard page which will display visual graphs to indicate all the skills and associated skill points. Each skill will have a range of 0-100 skill points. The dashboard will show the required skill points for the employee for his role and the project so that he or she can focus on ways to meet the lacking skill points. The system can also take an alternate flow where users are initially directed to an empty dashboard and from there they may enter their skills.

![Activity Diagram: Improve skills by Certification](image)

Fig. 4.5 Activity Diagram: Improve skills by Certification

### 4.2.2 Improve skills by certification

Figure 4.5 describes the activity diagram for how the employee can improve his/her skills via certification. Here the skill expert verifies and validates the uploaded certificate on two aspects:

1. The certificate is authorized from the organization policy standpoint. In other words, the organization may consider only certain certification bodies as authorized or trusted.
2. The uploaded certificate for a skill can be considered for the entire 100 skill points for that skill or lesser. All of these will be defined by the skill-expert in compliance with the organization policies.

Once the uploaded certificate has been validated and approved by the skill expert, the associated skill points will be reflected in the employee skill dashboard.

### 4.2.3 Improve skills by demonstration using a proof-of-concept

<table>
<thead>
<tr>
<th>Employee</th>
<th>Manager</th>
<th>Skill Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select skill for demonstration using POC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select sub-skills that will be covered in demonstration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request demonstration</td>
<td>Approve</td>
<td></td>
</tr>
<tr>
<td>Appoint</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform demonstration in front of Skill Expert and other employees</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluate knowledge of targeted skill is it satisfactory?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrated knowledge satisfactory?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Update employee skill points</td>
<td>Share feedback for improvement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Here, system will do the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Skill Expert allocation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Time and space allocation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Send notification to all employees who are interested to attend</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4.6 Activity Diagram: Improve skills by demonstration

Figure 4.6 shows the activity diagram of this work flow. This method involves the presence and feedback of the skill expert for evaluating the targeted skill by the employee. The system will have a functionality to create a demonstration event. The created demonstration event will be displayed as a notification on every employees’ dashboard with an option to select if they are interested or not. The demonstration will be conducted only in the presence of
a skill expert. The employee’s skill will be validated by the skill expert and if satisfactory, appropriate skill points will be updated in the employee’s dashboard. One of the important feedback point can be effective communication. This is an important feature of this skill-based system because this channel focuses on knowledge sharing, leading to creativity and innovation. This knowledge sharing culture will help towards effective communication and the use of a proof-of-concept will bring in practical thinking and application of learning.

### 4.2.4 Improve skills by attending demonstration/training

![Activity Diagram: Improve skills by attending demonstration](image)

**Fig. 4.7 Activity Diagram: Improve skills by attending demonstration**

Figure 4.7 depicts the activity flow for improving the skills by attending a demonstration. The above two methods will help earn skill points to the employees but this method will help earn skill badges. Although skill badge is not in par with skill points, earning multiple and diverse skill badges will encourage employees to help others in need.

### 4.2.5 Resolving queries

Figure 4.8 shows the high level work flow steps. This is a channel to connect to the right person to resolve employees’ queries or to seek guidance. The drill down questions helps in better reliability of the filtered candidates to approach for query resolution. Please note that this skill system won’t have a feature to post the query details like a forum and wait for responses. This platform will help to identify people who are better fit to resolve the query based on sub-skills. For a query related to skill X, on search, the system may show lots of employees who have that skill knowledge, but those can be sorted, in terms of experience and
availability to connect to the best of the lot. The system can have a feature to help employees to set their availability to 'Unavailable', if they don’t want to be contacted.

Here, once the query is resolved, the resolving employee will be assigned a skill badge as a reward or appreciation. An employee can accumulate different skill badges which will be shown in the employee skill dashboard. This will inculcate encouragement and proactiveness within employees to earn as many badges as possible.

In a general sense, all these above workflows go through manager approval and validation of each skill improvement method involves the approval of the respective skill expert.
for the concerned skill. Please note, this is just a basic safeguard added to this system. Additional and more sophisticated safeguards can be added on top of this system to ensure proper utilization of the system that suits the organization.

## 4.3 System Benefits

Below are the benefits of the skill-based system along with some extended features if implemented will further enhance the employee engagement:

1. **Reliable system for query resolution:** Rather than showing high level skills which many of the enterprise systems does, this system will store skills drilled down to the lowest possible level making it more reliable for query resolution.

2. **Encouraging work-life balance:** This system can be used to promote *Corporate Social Responsibility (CSR)* and *Hobbies* within employees to encourage work-life balance. For example, a mandate can be put across through this skill-based system that employees have to gather at least 10 skill points per performance cycle by taking part in hobbies and extra-curricular activities in the organization.

3. **Platform for new project requirements:** This system can also be used for attracting free employees to new projects with required skills on the basis of skill points. Say, the organization is in need for a resource with some background in Python programming language. Here, a notification can be pushed through this system something like ’New project starting MM/DD/YYYY - Skills required: PYTHON with minimum 20 skill points’. This notification will be shown to all employees in the organization. The employees who are not allocated to any project or in bench and interested to get that opportunity can go for it. If the employee has already accumulated those required skill points, he/she can apply right away for this opportunity. For employees who doesn’t have the required skill points and interested to grab that opportunity to work in that project can collect the skill points either by learning and uploading a valid certificate of Python or conducting a live demonstration in front of the skill expert to prove his/her knowledge and avail required skill points.

4. **Platform for hackathon/programming contest:** This system can be utilized to attract right resources for a programming contest. For example, a notification can be put across through the skill system like below: ’Team Programming contest: Skills required - C# 25 points, SQL 50 points, HTML5 35 points’. The employees who satisfy either of the skill points criteria can apply to be a part of the contest.
5. **Change in perspective:** If such a skill-based system is enforced by the organization making it an everyday activity, a skill focused learning culture will be nurtured. Such a skill-based system will benefit the entire organization as a whole, making it an embodiment of skillful resources and the world with more and more skillful professionals.

### 4.4 Minimum Viable Product

Keeping the above mentioned features and workflows of the proposed skill-based system and also respecting the time constraints for this research, the researcher decided to focus on some specific features for the implementation of the software product rather than implementing the whole aforementioned features. As per Münch *et al.* (2013, p.1), a Minimum Viable Product (MVP) is "an artefact that may be incomplete in functionality or quality, but displays characteristics that allows determining its customer value". The researcher selected the features to implement that will best depict the product vision of a system that will create a skill-focused climate. These features were subjected to modifications while development to come up with a simple skill-based system. From implementation point of view, the researcher has restricted the scope of the drill-down questions and notifications section to the following:

1. The drill down questions will have only one level to extract sub-skills.
2. User to be directed to empty dashboard post login/registration and can enter primary skills which will ask drill-down questions.
3. Notifications panel to show list of upcoming demonstrations without action buttons.

### 4.5 Development technologies and tools

Table 4.1 lists the development tools and technologies used in the project. *Highcharts* is used for showing charts in dashboard. *Log4Net* is used for logging system exceptions to a text file under Logs folder in the project folder. *jQuery Easy Ticker* is used for sliding notifications and *Animate.css* is used to animate onscreen elements for better user experience.
4.6 Software Development Methodology

The researcher has used Agile software development approach of incremental development using the framework of Scrum. As shown in figure 4.9, incremental development involves developing small increments based on priorities rather than delivering directly the whole product (Sommerville, 2015, p.50). Figure 4.10 shows the agile scrum methodology. In a Scrum framework, the whole requirements (often called as Epic) is divided into user stories which are later prioritized and considered for the respective sprints. The development follows Prototyping as a way to change management, bearing in mind the time constraints of the project and the enterprise level features of the skill-based system described in detail above. The artefact developed as a part of the research is a prototype. As per Sommerville (2015, p.62), "A prototype is an early version of a software system that is used to demonstrate concepts, try out design options and find out more about the problem and possible solutions". Figure 4.11 shows the prototype development process. Figure 4.12 shows the development process map followed by the researcher using the Scrum framework to develop a prototype.

4.7 MOSCOW Prioritization

MoSCoW is a prioritization technique coming from Dynamic System Development Methodology (DSDM). MoSCoW is an acronym for Must have, Should have, Could have and Won’t

---

1https://marvelapp.com/
2https://github.com/
3https://trello.com/
4https://www.highcharts.com/
5https://www.nuget.org/packages/log4net/
6https://plugins.jquery.com/easyticker/
7https://daneden.github.io/animate.css/
This technique involves prioritizing all the stories in the product backlog into one of the four categories below (Stapleton, 2013, p.85):

**Must Have**: These include the functionalities/stories, if not implemented will cause the project to fail.

**Should Have**: These include those functionalities/stories which are needed for the customer satisfaction. These features if not implemented won’t cause the project to fail.

**Could Have**: These cover those functionalities/stories which provide value to the system and are more like a nice-to-have features.
4.7 MOSCOW Prioritization

Fig. 4.11 Prototype development from Sommerville (2015, p.63)

Fig. 4.12 Development Process Map
Won’t Have: These are functionalities/stories which doesn’t add value from a functionality point of view and can be kept for the next release.

4.8 Wireframing and Rapid Prototyping

The researcher used Marvel, a rapid prototyping tool design user interface mockups and page navigations to create a realistic desktop experience within minutes. This digital prototyping process helped the researcher to get a good understanding of the end-to-end user experience for the yet-to-be developed system and also to refactor the user interface by restructuring or adding more screen elements. This digital prototyping tool helped the researcher to bring his ideas to life quickly which helped to identify the minimal viable features. Please refer Appendix A for the prototype and screenshots.

4.9 Project Management

The researcher used Trello for agile project management using Scrum framework. The researcher chose the sprint duration of one week. The entire project went through ten sprints. As shown in the process map (see figure 4.12), The researcher created a trello board organized into four main lists. Each list is a container of cards. Each card represented a story which was either a simple application functionality or system setup tasks. Each of the four lists are explained below:

1. Product Backlog: This is a list of all possible stories or system features that are to be considered for artefact development. Based on the Marvel prototype, the researcher
created sections page-wise to logically create and group the stories. Please refer figure 4.13 for the screenshot of the initial trello board. After the possible stories were added to the product backlog, MoSCoW prioritization was done for each of the story cards. Figure 4.14 shows how MoSCoW prioritization was done for stories in Trello using the Labels.

![Fig. 4.14 MoSCoW prioritization for a story in Trello](image)

2. **Sprint Backlog:** This list is for all the stories selected for the development in the upcoming week. The Sprint planning was done every Sunday for the upcoming sprint. In the sprint planning stage, stories from the product backlog are selected and moved to the sprint backlog. Only those stories are selected for the sprint which are prioritized as *Must Have* and *Should Have*. Also, the other criteria that the researcher kept in mind while populating the Sprint Backlog list is the stories are selected that can be completed in a week (Sprint length).

3. **Development Queue:** This list comes into attention at the start of the sprint (every Monday of the week). The researcher picked stories from the Sprint backlog, one story at a time and moved to the Sprint backlog. Thereafter, the researcher worked on implementation of the feature. This story development phase involved coding and unit testing.

4. **Completed Sprint(s):** Once the development of the story is completed, the story is moved to the completed sprint list. The researcher named each completed sprint list starting with the Sprint start date (Mondays). The *Definition of Done* for moving the story to this completed sprint involved integration and system testing after integrating the newly developed feature code with other modules in the project solution.

For the defects encountered while system testing, cards were created tagged as ’Observation’ and moved to the Sprint Backlog for consideration. Figure shows the screenshot of the
these lists in the middle of development. The figure 4.15 shows the 'UI Wireframes' story completed for the running sprint started on '22.10.18' and the researcher working on couple of the stories listed in the development queue (DEV). Each sprint was followed by a sprint review where initially the sprint backlog was checked for any pending items which was by default considered for the next sprint. The product backlog was revisited and new stories were selected by the researcher and added to the Sprint backlog for the next sprint. Figure 4.16 depicts the screenshot of all the completed sprints.

Fig. 4.15 Product Backlog, Sprint Backlog, Development Queue and Completed Sprint

Fig. 4.16 Completed Sprints
4.10 Project Architecture

The researcher has followed 3-tier architecture (also known as layered architecture) along with Model-View-Controller (MVC) architectural pattern. Figure 4.17 shows the project architecture and figure 4.18 shows the project code structure designed as per the project architecture.

Fig. 4.17 Project architecture

- **Presentation layer:** The user directly interacts with this layer. This layer interacts with the Web API layer by accessing the REST API services. From the code level, the project SkillsDashboard.Web corresponds to presentation layer. This project is basically a ASP.NET MVC Web application project.

- **Web API layer:** This layer incorporates REST API objects and interacts with the Presentation layer and Business Logic layer. From the code level, the project SkillsDashboard.API corresponds to this layer. This project is basically a ASP.NET Web API project.

- **Business Logic layer:** This layer implements the business rules of the system and interacts with the Data Access layer and the Web API layer. From the code level, the project SkillsDashboard.BLO corresponds to this layer.

- **Data Access layer:** This layer directly interacts with the SQL Server database. From the code level, the project SkillsDashboard.DAL corresponds to data access layer.
• **Business Entities:** These include business objects used as transport careers across the presentation, business logic and Web API layers. From the code level, the project `SkillsDashboard.BusinessEntities` corresponds to business entities.

• **Common Utilities:** These include application constants and common functionalities, if any to be used across all the layers. From the code level, the project `SkillsDashboard.Utilities` corresponds to the common utilities used in the solution.

Figure 4.19 shows the interaction of various objects involved in the user request scenario. Please refer Appendix C for the application and the database code.
4.11 Database Diagram

Figure 4.21 shows the database diagram and figure 4.20 shows the database SkillsDB, tables and stored procedures view.

![Database Diagram](image)

(a) Database and Tables

(b) Stored procedures

Fig. 4.20 Database, tables, stored procedures and functions
Fig. 4.21 Database diagram
4.12 Web APIs

4.11.1 Error Logging

Table Tbl_ErrorLogs is used to log back-end errors as shown in figure 4.22.

![Fig. 4.22 Database Error logging table](image)

4.12 Web APIs

Table 4.2 lists all the Web APIs developed for the skill-based system.

<table>
<thead>
<tr>
<th>API</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GetAllSkills?argLoggedInUser={argLoggedInUser}</td>
<td>GET</td>
<td>Get all employee skills available</td>
</tr>
<tr>
<td>GetAllSubSkills?argLoggedInUser={argLoggedInUser} &amp;argSkillID={argSkillID}</td>
<td>GET</td>
<td>Get all subskills for a particular skill</td>
</tr>
<tr>
<td>CreateInitialSkillRequest?argLoggedInUser={argLoggedInUser}</td>
<td>POST</td>
<td>Submit initial primary skills by the employee</td>
</tr>
<tr>
<td>ImproveSkills?argLoggedInUser={argLoggedInUser}</td>
<td>POST</td>
<td>Improve skill request by employee</td>
</tr>
<tr>
<td>Employee Badge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>API</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>GetUsersByName?argLogInUser={argLogInUser} &amp; argNamePrefix={argNamePrefix}</td>
<td>GET</td>
<td>To fetch all employees who know the respective skill and subskill</td>
</tr>
<tr>
<td>GetBadges?argLogInUser={argLogInUser} &amp; argBadgeType={argBadgeType}</td>
<td>GET</td>
<td>To fetch the badge information</td>
</tr>
<tr>
<td>SaveBadgeForUser?argLogInUser={argLogInUser}</td>
<td>POST</td>
<td>To give a badge to an employee</td>
</tr>
<tr>
<td>ApproveBadge?argLogInUser={argLogInUser}</td>
<td>POST</td>
<td>Badge approval request for the manager</td>
</tr>
<tr>
<td>Dashboard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GetDashboardData?argLogInUser={argLogInUser} &amp; argUserID={argUserID}</td>
<td>GET</td>
<td>To fetch dashboard details like required and acquired skills, badge count, user profile details, etc.</td>
</tr>
<tr>
<td>Query results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GetQueryResults?argLogInUser={argLogInUser} &amp; argSkillID={argSkillID} &amp; argSubSkillID={argSubSkillID}</td>
<td>GET</td>
<td>To fetch all employees who know the respective skill and sub-skill</td>
</tr>
<tr>
<td>Employee Requests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GetUserRequests?argLogInUser={argLogInUser} &amp; argType={argType}</td>
<td>GET</td>
<td>To fetch the request history for the employee</td>
</tr>
<tr>
<td>Skill Expert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GetSkillExpertApprovals? argLogInUser={argLogInUser} &amp; argType={argType}</td>
<td>GET</td>
<td>To get all pending employee requests for approval</td>
</tr>
<tr>
<td>SaveSkillExpertActionable? argLogInUser={argLogInUser}</td>
<td>POST</td>
<td>To approve or reject employee requests by Skill Experts</td>
</tr>
<tr>
<td>ScheduleDemo?argLogInUser={argLogInUser}</td>
<td>POST</td>
<td>To schedule demonstration of skills</td>
</tr>
<tr>
<td>Sync Required skill points</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 4.13 Authentication and Authorization

The skill-based system makes use of *Forms authentication*. The system has a role-based access. The user will be presented with the screen elements and associated features based on their role (Employee/Manager/Skill Expert). For example, Skill Expert approval page will be visible to the user who is in the role of skill expert. This skill expert page will not be accessible to logged-in users with other roles (Employee/Manager). Even if they try to access the unauthorized URL, they will be redirected to the login page. This has been implemented using ASP.NET MVC framework’s `[Authorize]` attribute.

### 4.14 Application Dashboard

Figure 4.23 shows the dashboard of the proof-of-concept skill-based system. The web application is responsive. As per the dashboard, the employee has met the required skill points for Java and require just 25 points for C#. Also, skills Python and SQL are required with 50 skill points each, but the employee hasn’t acquired any at the moment. The employee has earned 4 badges after attending demonstrations and 1 query badge after helping someone with their query. The notifications section to the bottom of the screen shows the upcoming demonstrations. Please refer Appendix E for the screenshots of the proof-of-concept web application.
Fig. 4.23 Skill Dashboard
Chapter 5

Data Analysis/Findings

5.1 Introduction

The main motive of the survey was to gather feedback on the skill-based system with respect to its ability to create a skill-focused climate in a software organization. The questionnaire was distributed online to 50 software professionals and 30 human resource managers. Out of 50 software professionals, 48 participated in the survey, whereas out of 30 human resource managers, only 11 participated in the survey. So the response rate was 96% from software professionals, whereas only 37% from human resource managers. For responses to the software professional questionnaire, the researcher contacted software developers, senior software developers, technology architects, project managers and delivery managers working in software organizations across Ireland, United Kingdom, Germany, India and United States of America. For responses to the human resource manager questionnaire, the researcher approached human resource managers working in software organizations across Ireland, United Kingdom and India.

5.2 Findings

5.2.1 General

Size of the organization

Figure 5.1 shows that almost 92% of software professionals who participated in the survey are from large software organizations, around 6% from small organizations and around 2% from medium sized organizations. As far as human resource managers who participated in
the survey are concerned, almost 55% of them are from large software organizations, around 27% from small organizations and around 18% from medium sized organizations.

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<th>Count</th>
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<td>Medium (101 - 1000 employees)</td>
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<td>Large (1001 and above)</td>
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<table>
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<th>Count</th>
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</thead>
<tbody>
<tr>
<td>Small (less than 100 employees)</td>
<td>27.27%</td>
<td>3</td>
</tr>
<tr>
<td>Medium (101 - 1000 employees)</td>
<td>18.18%</td>
<td>2</td>
</tr>
<tr>
<td>Large (1001 and above)</td>
<td>54.55%</td>
<td>6</td>
</tr>
</tbody>
</table>

(a) Software Professionals                     
(b) Human Resource Managers

**Fig. 5.1 Organization Size - Response Summary**

**Work experience**

Figure 5.2 shows the response distribution of the participant’s work experience in the software organization. Around 35% of the software professionals are in the bracket of 0-4 years of experience, around 29% from 6-10 years bracket, almost 21% from 4-6 years and almost 15% with more than 10 years of work experience. As far as the Human resource managers who responded to the survey are concerned, around 45% are in the experience range of 6-10 years followed by around 36% from 0-4 years of work experience and around 18% from 4-6 years of experience as shown in the figure.

**Existing skill-based system**

As showed in figure 5.3, around 52% of the software professionals and almost 55% of the human resource managers who participated in the survey have said they have a skill-focused
5.2 Findings

(c) Software Professionals

<table>
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<tbody>
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<td>0-4 years</td>
<td>35.42 %</td>
<td>17</td>
</tr>
<tr>
<td>4-6 years</td>
<td>20.83 %</td>
<td>10</td>
</tr>
<tr>
<td>6-10 years</td>
<td>29.17 %</td>
<td>14</td>
</tr>
<tr>
<td>10+ years</td>
<td>14.58 %</td>
<td>7</td>
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</table>

(d) Human Resource Managers

<table>
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<th>Count</th>
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</thead>
<tbody>
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<td>36.36 %</td>
<td>4</td>
</tr>
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<td>4-6 years</td>
<td>18.18 %</td>
<td>2</td>
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<tr>
<td>6-10 years</td>
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</tr>
<tr>
<td>10+ years</td>
<td>0.00 %</td>
<td>0</td>
</tr>
</tbody>
</table>

Fig. 5.2 Work Experience - Response Summary

system in their organization that encourages employees to learn and share knowledge. Almost 46% of the human resource managers and around 31% of the software professionals have answered their organizations doesn’t have any skill focused system. Also, almost 17% of the software professionals are not sure if they have any skill systems in their organizations.

Figure 5.4 present the cross tabulation analysis for existing skill system with respect to the organization size. As per the figure, 80% of the software professionals who said they don’t have any existing skill-based systems in their organization are from large organizations and 20% from small organizations. 96% of the software professionals who said they have existing skill-based software systems in their organization are from large organizations and the remaining 4% from medium sized organizations. From the organization’s standpoint, almost 55% of the large organizations have a skill-based software system and around 27% of them doesn’t have skill focused systems in their organizations that motivate employees to learn skills and share their knowledge. Also all the software professionals who said they are not sure if their software organizations have any skill-based systems, all of them are from large organizations.

Similarly, from the human resource managers side, out of the total responses who said they
Fig. 5.3 Does your organization have any skill-focused software system that encourages employees to learn and share knowledge? - Response Summary

Don’t have any skill systems in their organizations, 20% are from large organizations, 40% from medium organizations and the remaining 40% are from small organizations. Around 83% of the human resource managers who said they have existing skill-based software systems in their organization are from Large organizations and the remaining 17% are from small organizations. From the organization’s standpoint, around 83% of the large organizations have a skill-based software system and almost 17% of them doesn’t have skill focused systems in their organizations that motivate employees to learn skills and share their knowledge.

Organization’s focus towards upskilling employees through skills demonstration

As shown in figure 5.5, almost 48% of the software professionals say their organization focuses on upskilling employees through knowledge sharing by demonstration of skills. Around 33% say their organization doesn’t focus on that and almost 19% of the respondents are not sure. As far as human resource managers are concerned, around 36% of them say their organization focuses on upskilling employees by knowledge sharing through demonstration of skills and almost 64% say their organization doesn’t focus on that.
5.2 Findings

(a) Software Professionals

![Cross Tabulation Analysis](image)

Figure 5.4 Existing skill-based system - Cross Tabulation Analysis

...and so on...
Data Analysis/Findings

(a) Software Professionals

<table>
<thead>
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(b) Human Resource Managers

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<tr>
<td>Not sure</td>
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</tbody>
</table>

Fig. 5.5 Does your organization focus on upskilling employees through knowledge sharing by demonstration of skills? - Response Summary

17% of the large organizations focus on demonstration of skills to upskill employees and around 83% of them doesn’t focus on that.

Awareness of technical experts in the organization

Figure 5.7 clearly indicates that almost 42% of the software professionals and around 45% of the human resource managers are not aware of the technical experts of various domains in their software organization. Also, around 33% of the software professionals and 18% of the human resource managers are not sure. Figure 5.8 present the cross tabulation analysis for the participant responses to the question with respect to their organization size. Out of the 42% of the software professionals who is not aware of the technical experts of various domains in their organization, 95% are from the large organizations. Also out of the 33% of the software professionals who are not sure, almost 94% are from large organizations. From the human resource managers side, out of the 45% who said they are unaware of the technical experts in their organization, 60% is from large organizations and remaining from medium organizations. And out of the 18% of the Human resource managers who are not sure, all of them are from large organizations.
5.2 Findings

(a) Software Professionals

Fig. 5.6 Organization’s focus towards upskilling employees through skills demonstration - Cross Tabulation Analysis

Bench policy of the organization

Figures 5.9 vividly highlights that almost 55% of the respondent organizations follow the bench policy where some employees are not billed to a project or they are waiting for project to be allocated to them. Around 18% of the human resource managers are not sure and the remaining 27% have said their organizations doesn’t follow bench policy. By cross tabulation as shown in figure 5.10, out of 55% of the organizations who follow the bench policy majority (around 83%) are from large organizations.
Data Analysis/Findings

(a) Software Professionals

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<tr>
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<td>33.33%</td>
<td>16</td>
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(b) Human Resource Managers

<table>
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<tbody>
<tr>
<td>Yes</td>
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<tr>
<td>No</td>
<td>45.45%</td>
<td>5</td>
</tr>
<tr>
<td>Not Sure</td>
<td>18.18%</td>
<td>2</td>
</tr>
</tbody>
</table>

Fig. 5.7 Are you aware of the technical experts of various domains within your organization?
- Response Summary

**Organization’s approach towards acquiring required skill set in case of skills deficit**

As shown in figure 5.11, almost 64% of the human resource managers say that they directly recruit new employees with the required skill(s) and around 18% say they provide opportunity to in-house employees first, especially who are not allocated to any projects to learn and reach the required skill level knowledge before hiring new employees.

The remaining 18% include two responses; one of them says they provide opportunity to internal employees first as well as directly recruit new employees and the other one says this is not feasible, as at times, the requirements are time-bound so allocating some time for the internal employees to upskill cannot be relied upon.

**Software professional’s interest towards acquiring new skills**

Figure 5.12 clearly says that majority of the software professionals, to be precise almost 98% are interested to learn new skills apart from the existing skill set.

The cross tabulation as shown in figure 5.13 shows that software professionals across all experience groups are interested to acquire new skills.
5.2 Findings

(a) Software Professionals

<table>
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<th>Frequency</th>
<th>Organization Size</th>
<th>Response</th>
</tr>
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<tbody>
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(b) Human Resource Managers

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<td>Medium (101 - 1000 employees)</td>
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<td>2</td>
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<tr>
<td>Grand Total</td>
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Fig. 5.8 Awareness of technical experts in the organization - Cross Tabulation Analysis

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</tr>
<tr>
<td>No</td>
<td>27.27%</td>
<td>3</td>
</tr>
<tr>
<td>Not Sure</td>
<td>18.18%</td>
<td>2</td>
</tr>
</tbody>
</table>

Fig. 5.9 Does your organization follow a bench policy? - Response Summary
Fig. 5.10 Bench policy of the organization - Cross Tabulation Analysis

Fig. 5.11 In case of skills deficit or new skill requirements, what does your organization usually do? - Response Summary

Fig. 5.12 Software professional’s interest towards acquiring new skills - Response Summary

Software Professional’s awareness of required role level skills

Figures 5.14 says that around 62% of the software professionals are aware of the required skills for their role but around 6% of them have admitted directly that they are not aware and
5.2 Findings

![Cross Tabulation Analysis Table]

Almost 31% of the software professionals are not sure. The cross tabulation in figure 5.15 shows that out of the 31% of the software professionals who are not sure or not aware of the required role level skills, are from large and medium sized organizations.

![Response Summary Graph]
5.2.2 System feedback

System attractions

Figure 5.16 shows the specific features the participants liked in the proposed skill-based system. Majority of the software professionals and the human resource managers liked the feature of knowledge sharing through demonstration of skills more than the rest. This corresponds to around 28% of the software professionals and around 29% of the Human resource managers. The rest of the features are all in close proximity to each others as far as participants level of interest is concerned.

Ability of the skill-based system to direct employees’ focus towards skills

As shown in figure 5.17, around 52% of the software professionals strongly believe that this proposed skill-based system will make them more focused towards their skills. At a high level, majority of the software professionals believe this system will help them to focus on their skills. A point to note here is there is no disagreement from any participant.

As shown in figure 5.17, similar to the software professionals’ responses, human resource managers also agree at a high level that this proposed skill-based system will help employees to focus more on their skills.

System’s reliability for query resolution

As shown in figure 5.18, majority of the software professionals strongly believe that this proposed skill-based system will help them in effective query resolution as the system helps
5.2 Findings

(a) Software Professionals

<table>
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<tr>
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<td>Use of skill points to assess each skill</td>
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<td>Role of skill experts in this skill based ...</td>
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(b) Human Resource Managers

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<th>Count</th>
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</tr>
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<td>Knowledge sharing through d...</td>
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<tr>
<td>Use of skill points to assess each skill</td>
<td>23.53 %</td>
<td>8</td>
</tr>
<tr>
<td>Role of skill experts in this skill based ...</td>
<td>23.53 %</td>
<td>8</td>
</tr>
</tbody>
</table>

Fig. 5.16 System attractions - Summary

(a) Software Professionals

![Fig. 5.16 System attractions - Summary](image1)

Please rate to what extent do you agree to the below statements. [I think this system will make me more focused on my skills]

- Neutral: 3%
- Agree: 46%
- Strongly Agree: 52%

(b) Human Resource Managers

![Fig. 5.16 System attractions - Summary](image2)

Please rate to what extent do you agree to the below statements. [I think this system will make employees more focused on their skills]

- Strongly Agree: 23.3%
- Agree: 72.7%
- Neutral: 4%

Fig. 5.17 Ability of the skill-based system to direct employees’ focus towards skills - Response Summary

them to reach out to technical experts who are reliable due to the consideration of sub-skills apart from the high level skills. Around 8% of the software professionals have stated a neutral position but at a high level there is majority agreement and no disagreement.
Also as shown in the figure, every human resource participant have agreed that this proposed skill-based system is more reliable because of considering the sub-skills apart from the high level skill.

**Ability of the skill-based system to create an encouraging learning environment**

As shown in figure 5.19, majority of the software professionals strongly believe this proposed skill-based system will encourage them to learn new skills.

Also, all the human resource participants have agreed that this proposed skill-based system will create an encouraging environment for the employees to learn new skills.
5.2 Findings

Ability of the skill-based system to create a knowledge sharing climate in the organization

As shown in figure 5.20, majority of the software professionals strongly agree that this proposed skill-based system will create a knowledge sharing environment in their organization.

Also, majority of the Human resource managers agree that this proposed skill-based system will create a knowledge sharing environment in their organization.

Skill-based system’s likelihood to be beneficial to the employees and the organization

As shown in figure 5.21, majority of the software professionals tend to strongly agree that this proposed skill-based system will be beneficial to them in enhancing their skills. Also as shown in figure 5.22, majority of the software professionals tend to strongly agree that this system will even benefit the organization to create skilled employees.
Fig. 5.22 System’s likelihood to be beneficial to the organization - Response Summary

From an human resource managers’ point of view, as shown in figure ??, almost 82% tend to agree and the rest tend to strongly agree that, this skill-based system will benefit their organization to create skilled workforce.

Ability of the skill-based system to create a skill-focused climate

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(a) Software Professionals

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<tr>
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<td>9.09</td>
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</table>

(b) Human Resource Managers

Fig. 5.23 Ability of the skill-based system to create a skill-focused climate - Response Summary
5.2 Findings

As shown in figure 5.23, more than 90% of the software professionals as well as the Human resource managers who participated in the survey thinks this proposed skill-based system will create a skill-focused learning climate in the software organization. Three software professionals (around 6%) and one human resource manager (around 9%) were not sure if this system will help the organization to create a skill-focused climate. The cross

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<td>Response</td>
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<td>37.50%</td>
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<td>Grand Total</td>
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<td>20.83%</td>
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</table>

(a) Software Professionals

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<th>4-6 years</th>
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<th>Response</th>
</tr>
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<td>5</td>
<td>11</td>
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<table>
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<tr>
<th>Percent by Response</th>
<th>Experience</th>
<th>0-4 years</th>
<th>4-6 years</th>
<th>6-10 years</th>
<th>Grand Total</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not sure</td>
<td>0.00%</td>
<td>0.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>40.00%</td>
<td>20.00%</td>
<td>40.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td>36.36%</td>
<td>18.18%</td>
<td>45.45%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent by Experience</th>
<th>Experience</th>
<th>0-4 years</th>
<th>4-6 years</th>
<th>6-10 years</th>
<th>Grand Total</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not sure</td>
<td>0.00%</td>
<td>0.00%</td>
<td>20.00%</td>
<td>9.09%</td>
<td>100.00%</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>100.00%</td>
<td>100.00%</td>
<td>80.00%</td>
<td>90.91%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Human Resource Managers

Fig. 5.24 Ability of the skill-based system to create a skill-focused climate - Cross Tabulation Analysis
Data Analysis/Findings

Tabulation as shown in figure 5.24 shows that out of the 94% software professionals who said this system will help create a skill-focused climate in their organization, 38% comes from 0-4 years of experience, 29% from 6-10 years, 21% from 4-6 years and the remaining 15% from over 10 years of experience. Similarly, out of the 91% human resource managers who said this system will help create a skills-focused climate in their organization, 45% comes from 6-10 years of experience, 36% from 0-4 years and the remaining 18% from 4-6 years of experience. Figures 5.25 and 5.26 describes the thematic analysis done by the researcher on the open-ended question, to identify from the participant responses, the factors in the skill-based system that contributed towards creating a skill-focused climate. The responses to the open-ended question were run through thematic analysis to identify

<table>
<thead>
<tr>
<th>THEME</th>
<th>FREQUENCY</th>
<th>PROPORTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Query Resolution</td>
<td>6</td>
<td>8.82%</td>
</tr>
<tr>
<td>Focus towards skills</td>
<td>15</td>
<td>22.06%</td>
</tr>
<tr>
<td>Learn/Improve skills</td>
<td>8</td>
<td>11.76%</td>
</tr>
<tr>
<td>Employee motivation</td>
<td>6</td>
<td>8.82%</td>
</tr>
<tr>
<td>Skills demonstration</td>
<td>11</td>
<td>16.18%</td>
</tr>
<tr>
<td>Focus on required skills</td>
<td>3</td>
<td>4.41%</td>
</tr>
<tr>
<td>Skill points to assess skills</td>
<td>2</td>
<td>2.94%</td>
</tr>
<tr>
<td>Interactive learning experience</td>
<td>1</td>
<td>1.47%</td>
</tr>
<tr>
<td>Better control to upskill</td>
<td>1</td>
<td>1.47%</td>
</tr>
<tr>
<td>Holistic skill system</td>
<td>5</td>
<td>7.35%</td>
</tr>
<tr>
<td>Upskill inhouse employees</td>
<td>2</td>
<td>2.94%</td>
</tr>
<tr>
<td>Usage of skill points</td>
<td>3</td>
<td>4.41%</td>
</tr>
<tr>
<td>Rewards and recognition</td>
<td>1</td>
<td>1.47%</td>
</tr>
<tr>
<td>Intuitive system</td>
<td>2</td>
<td>2.94%</td>
</tr>
<tr>
<td>Result-oriented</td>
<td>1</td>
<td>1.47%</td>
</tr>
<tr>
<td>Organization access to skill pool</td>
<td>1</td>
<td>1.47%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>68</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

(a) Software Professionals

<table>
<thead>
<tr>
<th>THEME</th>
<th>FREQUENCY</th>
<th>PROPORTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive learning experience</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>Focus towards skills</td>
<td>4</td>
<td>33%</td>
</tr>
<tr>
<td>Skills demonstration</td>
<td>5</td>
<td>42%</td>
</tr>
<tr>
<td>Employee motivation</td>
<td>2</td>
<td>17%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>12</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

(b) Human Resource Managers

Fig. 5.25 Thematic Analysis - Frequency and Proportion
common themes and computing the basic statistics of frequency and proportion. As far

(a) Software Professionals

(b) Human Resource Managers

Fig. 5.26 Thematic Analysis - Pareto diagram

as software professionals’ responses were concerned, the most recurring top two themes
emerged to be *Focus towards skills* with 22% followed by *Skills demonstration* with 16%. Others include *Learn/Improve skills, Effective Query Resolution, Employee motivation, Holistic system, Focus on required skills, Usage of skill points, Skill points to assess skills, Upskill in-house employees, Intuitive system, Interactive learning experience, Better control to upskill, Rewards and recognition, Result-oriented and Organization access to skill pool. As far as human resource managers’ responses were concerned, the most recurring top two themes emerged to be *Skills demonstration* with 42% followed by *Focus towards skills* with 33%. Others include *Employee motivation* and *Interactive learning experience.*

Below are some of the participant comments highlighting the reasons why they think this system will create a skill-focused climate in the organization:

"The system you have will force employees to think in terms of skills which should automatically drive them towards upskilling. Demonstrating skills using a proof-of-concept is certainly needed rather than just theoretical knowledge. Also, utilizing gamification concepts in your system will encourage everyone to use it."

"The system is all about employee skills and how to acquire new skills. I believe knowledge sharing by demonstration will help in effective employee communication skills. The organization will have to make it a necessary system for all, only then will this system create a skill focused climate in the organization."

"Employees will focus more on subskills instead of just broad level skills. This focus towards subskills will make them more skill-focused. I liked demonstrations using proof-of-concept applications - it would be inspiring to see an environment in the company where employees are demonstrating AI, Robotics and other advanced technology. It will definitely create a skill focused learning climate."

"It is an innovative system focused on skills. Employees will be encouraged to learn skills if rewards like badges are given. Also knowledge sharing through demonstration of skills will nurture a culture focused on skills."
Ability of the skill-based system to utilize internal employees for new skill requirements

As shown in figure 5.27, over 90% of the human resource managers believe that this proposed skill-based system will help in better utilization of internal employees rather than directly hiring new external employees.

![Fig. 5.27 Ability of the skill-based system to utilize internal employees for new skill requirements - Response Summary](image)

The cross tabulation in figure 5.28 shows that out of the 91% response population who tend to think that this system will help in better utilization of internal employees for new skill requirements, 40% each comes from the human resource managers who have 6-10 years and 0-4 years of experience.

Below are some of the actual responses answered by the human resource managers:

"[This skill-based system] will allow employers to staff projects with existing resources. [This skill-based system] Gives advancement and engagement opportunities to staff. [This skill-based system] Identifies skills deficits for staff who have expressed interest in career progression into a certain role and allows time for up-skilling to bridge those gaps. [This skill-based system] Saves the organization money and time in recruitment of external hires. [This skill-based system] Saves money by potentially removing the need for third party vendors/consultants/agencies. The organization has a comprehensive database of the skills of its employees. [This skill-based system] Show’s the company as an employer who is pro-actively interested in retaining and advancing existing staff by offering training and growth opportunities."

"Employees in bench can keep a watch for upcoming projects and upskill to meet the project requirements. Again this can be tough for urgent project requirements where time is constrained. But, this system has the potential in better utilization of in-house employees for
"This system can be used to bring bench employees to attention for new projects. If they learn and demonstrate the required skill, the project managers can take a call to allocate them to their projects rather than directly hiring from outside."

"This skill-based system will encourage employees to learn and acquire new skills. When new project requirements come, the organization can allocate some time to see interested employees reach the expectations. It is always better to have in-house employees to save hiring costs. At the same time for urgent requirements, we will be forced to hire external folks due to lack of time, if we think practically. But this aspect can be thought of and incorporated in your system through some innovative ways. Because this skill-based system has features to attract employees who are not billed to a project and interested to learn and showcase new skills in order to get allocated to the new project. "

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Experience</th>
<th>0-4 years</th>
<th>4-6 years</th>
<th>6-10 years</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response</td>
<td></td>
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<tr>
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<td>1</td>
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<tr>
<td>Yes</td>
<td></td>
<td>4</td>
<td>2</td>
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<td></td>
<td>4</td>
<td>2</td>
<td>5</td>
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<table>
<thead>
<tr>
<th>Percent by Response</th>
<th>Experience</th>
<th>0-4 years</th>
<th>4-6 years</th>
<th>6-10 years</th>
<th>Grand Total</th>
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<tbody>
<tr>
<td>Response</td>
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<tr>
<td>Not Sure</td>
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<tr>
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<td>40.00%</td>
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<td>Grand Total</td>
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<td>36.36%</td>
<td>18.18%</td>
<td>45.45%</td>
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<table>
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<th>Percent by Experience</th>
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<th>0-4 years</th>
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<tbody>
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<td>Response</td>
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<td></td>
</tr>
<tr>
<td>Not Sure</td>
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<td>80.00%</td>
<td>90.91%</td>
</tr>
<tr>
<td>Grand Total</td>
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<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>100.00%</td>
</tr>
</tbody>
</table>
"Notifications for upcoming new projects with the required skills and skill points can help to attract free resources to pursue the opportunity. Such employees can be rewarded badges to encourage other free resources to learn and demonstrate skills for new projects. "

One of the human resource manager was not sure if this system will really help in better utilization of in-house employees for new skill requirements as they want to see this system practically implemented and studied in a large organization.

**Participant comments/suggestions**

Below are some of the suggestions and comments received by the software professionals about this skill-based system:

"This is an excellent system which will give employees an opportunity to showcase their skills."

"Idea looks good and promising. Future scope - Learning progress of an employee can be tracked. This data can also be used as input to annual goal setting and appraisal system of an organization."

"I think this system will be very beneficial to the organization to classify its resources based on various skills and re-skill them based on upcoming projects and latest industry trends."

"This approach is very well thought out and will actually help the organization achieve it’s goals and promote a skill worthy environment."

"Use data mining technologies to derive observations on entered skills."

"A must have system for software organizations."

"You must try this practically in a company and study to make this a reality. Software developers should love such atmosphere of knowledge demonstrations."

"It looks to me like a complete system that will help employee to grow professionally as well as socially due to work-life balance features."
"Good system for software developers."

Below are some of the comments and suggestions given by the Human resource managers:

"You need to bring this system to practice in a large software organization and evaluate. Your system in truly innovative and interesting..."

"I know this is just a proof-of-concept skill-based system but if you build it for large enterprise organizations, add in online learning, employee can teach skills online so that interested employees can learn from their desk."

"Bring this idea to reality, if possible. I liked your thinking. You can add data analytics to mine skills from entered skill pool to generate skill insights."

"Can be extended to add new features like technical blogs and discussion forums."

"Lots of potential in large software organizations. "
Chapter 6

Discussion

6.1 General perspectives

Majority of the responses received are from software professionals and human resource managers who are working in a large software organization. Also, majority of the software professional respondents are in the bracket of 0-4 years of experience. On the human resource managers side, majority of the respondents were from 6-10 years experience range. The survey received a good distribution of software professionals over all the four experience bracket ranges but for human resource managers, the survey received participants over all experience ranges except over 10 years experience. The findings after data analysis reveal the following:

1. There are large organizations that doesn’t follow skill-based systems to encourage employees to learn and share knowledge.

2. Not all organizations focus on knowledge sharing by demonstration of skills to upskill their employees. Majority of the software professionals as well as human resource managers who said their organization doesn’t focus on employee upskilling through knowledge sharing by demonstration of skills are from large organizations.

3. Almost half of the participants of the survey are not aware of the technical experts of various domains in their organization and majority of them are from large organizations.

4. Majority of the large organizations followed the bench policy. Also, majority of the human resource managers said they directly recruit new employees with the required skill set rather than upskilling existing employees.

5. There are software professionals who are not aware of the required skills for their role.
6.2 System Feedback

The participants liked all the below four main features of the skill-based system, but both the software professionals as well as human resource managers liked the feature of demonstrating skills to share knowledge more than the others.

1. Drill down questions extracting the sub skills apart from the skills
2. Knowledge sharing through demonstration of skills
3. Use of skill points to assess each skill
4. Role of skill experts in this skill-based system

Based on the findings from the participants, majority of the survey participants tend to agree to each of the below points:

1. This skill-based system will make the employees more focused on their skills.
2. This skill-based system is more reliable for query resolution.
3. This skill-based system will create an encouraging learning environment in the organization to learn new skills.
4. This skill-based system will create a knowledge sharing environment in the organization.
5. This skill-based system will be beneficial to the employees in enhancing their skills.
6. This skill-based system will be beneficial to the organization in creating skilled employees.

6.3 Answering the research questions

An overwhelming majority of software professionals as well as human resource managers have agreed that this proposed skill-based system will help to create a skill-focused climate in the organization. The system’s focus towards skills and demonstration of skills has emerged as top two reasons in creating a skill-focused climate in the software organization. The system’s focus towards skills includes the role of sub-skills considered in the system apart from the high level skills. The skills demonstration theme includes knowledge sharing through demonstration of skills using a proof-of-concept application. Also, majority of the human resource managers tend to agree that this proposed skill-based system will help in utilizing in-house employees for new opportunities rather than hiring external employees.
6.4 Limitations of the research

Firstly, the proposed skill-based system is an enterprise wide application suited for software employees. Respecting the time constraints, the researcher tried to fit in minimum viable features in the skill-based system. In a real-world scenario, a skill-based system can encompass a huge volume of skills and features. Also, the survey received only 37\% response rate from Human resource managers. If more human resource managers had participated in the survey, it may have brought in new perspectives, thereby adding more value to the research.
Chapter 7

Conclusions and Recommendations

7.1 Conclusions

This research has shown that a skill-focused climate can be created in an organization using a software system. The proposed skill-based system will help a software organization to create a skill-focused climate. The system’s ability to make the employees focused towards their skills and an ability to help them demonstrate their skills are the two key factors that makes the system skill-oriented. This skill-based system will be highly beneficial not only to the employees but also the organization as a whole improving employee engagement. This skill-based system will encourage employees to learn and share their knowledge by demonstrating their skills leading to innovation in the organization. This skill-based system will also help in effective query resolution by reaching out to right technically sound employees to resolve their technical queries. Also, this system will help in better utilization of their in-house employees for new opportunities instead of hiring external candidates. This skill-based system will become a driving force for both the employees as well as the organization towards upskilling and more importantly will lead to a change in perspective towards skills thereby creating a skill-focused learning climate within the software organization.

7.2 Recommendations and future scope

The suggestions given by the software professionals and the human resource managers can be implemented to the skill-based system. Technologies like data analytics and data mining can be introduced into the system to derive interesting information on employee skills and their learning progress trends. Also, apart from the minimal viable features implemented in the
skill-based system the rest of the features can be implemented along with the aforementioned suggestions.
Bibliography


Deanscombe, M. (2017) The good research guide for small scale research projects


Appendix A

Wireframe and Prototype

Fig. A.1 Rapid Prototyping using Marvel - Set 1
Fig. A.2 Rapid Prototyping using Marvel - Set 2

Below is the link of the prototype developed using Marvel:
https://marvelapp.com/37dbfae
Appendix B

Questionnaire

B.1 Start page - Information and Consent

![Fig. B.1 Information and Consent](image-url)
# B.2 Section 1 - General

Figures B.2 and B.3 shows the general questions to software professionals and human resource managers respectively.

<table>
<thead>
<tr>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the size of your organization?</td>
</tr>
<tr>
<td>- Small (less than 100 employees)</td>
</tr>
<tr>
<td>- Medium (101 - 1000 employees)</td>
</tr>
<tr>
<td>- Large (1001 and above)</td>
</tr>
<tr>
<td>How many years of experience do you have working in a software organization?</td>
</tr>
<tr>
<td>- 0-4 years</td>
</tr>
<tr>
<td>- 4-6 years</td>
</tr>
<tr>
<td>- 6-10 years</td>
</tr>
<tr>
<td>- 10+ years</td>
</tr>
<tr>
<td>Does your organization have any skill-focused software system that encourages employees to learn and share knowledge?</td>
</tr>
<tr>
<td>- Yes</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- Not sure</td>
</tr>
<tr>
<td>Does your organization focus on upskilling employees through knowledge sharing by demonstration of skills?</td>
</tr>
<tr>
<td>- Yes</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- Not sure</td>
</tr>
<tr>
<td>Are you aware of the technical experts of various domains within your organization?</td>
</tr>
<tr>
<td>- Yes</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- Not sure</td>
</tr>
<tr>
<td>Are you interested to learn and acquire new skills apart from your existing skill set?</td>
</tr>
<tr>
<td>- Yes</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- Not sure</td>
</tr>
<tr>
<td>Are you aware of the required skills for your role?</td>
</tr>
<tr>
<td>- Yes</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- Not sure</td>
</tr>
</tbody>
</table>

Fig. B.2 General questions - Software Professionals
Fig. B.3 General questions - Human resource managers
B.3 Section 2 - Skill based system

As shown in figure B.4 a video was embedded to questionnaire explaining in brief about the proposed skill based system with respect to its need, features and benefit to the employees as well as the organization.

Fig. B.4 Skill based system

B.4 Section 3- System Feedback

As shown in figure B.5 the features what the participants liked about the system were asked initially followed with their views about the system as shown in figure B.6, B.7
System Feedback

The following questions are related to my proposed skill based system to get your valuable feedback.

Which aspect(s) of the system did you like?

- Drill down questions extracting the sub skills apart from the skills
- Knowledge sharing through demonstration of skills
- Use of skill points to assess each skill
- Role of skill experts in this skill based system
- Other:

Fig. B.5 System Attractions
Please rate to what extent do you agree to the below statements. *

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think this system will make me more focused on my skills</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I think this system will help me reach to reliable technical experts for resolving my queries</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I think this skill-focused system will encourage me to learn new skills</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I think this skill-focused system will create a knowledge sharing environment in my organization</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I think this skill-focused system will be beneficial to us in enhancing our skills</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I think this skill system will be beneficial to my organization in creating skilled employees</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Do you think this skill based system will create a skill focused climate in the organization? *

- ○ Yes
- ○ No
- ○ Not sure

Fig. B.6 System Feedback - Software Professionals
### B.4 Section 3- System Feedback

#### Fig. B.7 System Feedback - Human Resource Managers

**Please rate to what extent do you agree to the below statements.**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think this system will make employees more focused on their skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think extracting the skill is apart from the skill will help in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>improving reliability of the system, especially while acquiring resolution.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think this skill-focused system will create an environment in which</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the organization is more likely to learn new skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think this skill-focused system will create a knowledge sharing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>climate in your software organization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think the skills-focused system will be beneficial to the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>employees to enhance their skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think the skill system will be beneficial to my organization in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>creating skilled employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Do you think this skill based system will create a skill focused**
**climate in the organization?**

- [ ] Yes
- [ ] No
- [ ] Not Sure

#### Utilization of in-house employees for new skill requirements

**Do you think this skill-focused system will help in better utilization of in-house employees for new skill requirements?**

- [ ] Yes
- [ ] No
- [ ] Not Sure
Yes - This system will create a skill focused climate

Why do you feel this system will create a skill focused climate in the organization? *

Your answer

No - This system will not create a skill focused climate

Why do you feel this system will not create a skill focused climate in the organization? *

Your answer

Not sure - This system may or may not create a skill focused climate

Why do you feel unsure, if this system may create a skill focused climate or not? *

Your answer

Fig. B.8 Followup questions in support for Research question 1
Yes - This system will help in better utilization of in-house employees for new skill requirements

Why do you think this skill-focused system will help in better utilization of in-house employees for new skill requirements? *

Your answer

No - This system will not help in better utilization of in-house employees for new skill requirements

Why do you think this skill-focused system will not help in better utilization of in-house employees for new skill requirements? *

Your answer

Not sure - This system may or may not help in better utilization of in-house employees for new skill requirements

Why do you feel unsure, if this skill-focused system may help in better utilization of in-house employees for new skill requirements or not? *

Your answer

Fig. B.9 Followup questions in support for Research question 2
Hello Everyone,

I am currently working on a post-graduate #research on building a skill based system for better employee engagement in a software organization. My research study is innovative in the sense it focuses on changing the perspective of software organizations towards skills. I have come up with a conceptual framework of a skill based system that if used by the organization can create a skill-focused learning climate.

I would like to invite HR professionals/recruiters currently associated to a software organization to participate in my online #survey. Your valuable inputs will help me generate insights on whether my idea and the proposed skill based system will help the software organizations or not.

Your inputs will help my research in a significant way.
The link to the survey is below:

[https://goo.gl/forms/vfPvqfFRIaEmPUYc2](https://goo.gl/forms/vfPvqfFRIaEmPUYc2)

The survey link will remain open till 24th December 2018.

Please note all responses to this survey will remain strictly confidential and anonymous. Neither your name nor your company’s name or any other personal demographic details are collected as a part of this survey. Responses you provide will be used only in combination with those of other survey respondents.

Thank you for your valuable time!

---

**Fig. B.10 LinkedIn Request**

**B.5 Responses**

**B.5.1 Software Professionals**

https://goo.gl/forms/vfPvqfFRIaEmPUYc2
B.5 Responses

B.5.2 Human Resource Managers

https://goo.gl/forms/MCew5woE5el6ykYI3
Appendix C

Source Code

Both the application and the database code are available in the below GitHub repository.

https://github.com/onssiddarth/skilldashboard.git
Appendix D

Research Video

The below research video presentation describes in brief about the research idea with respect to the problem being solved, necessity of a skill based system, its features and benefits.

https://www.youtube.com/watch?v=Lps_VeNJHy4
Appendix E

Application Screenshots

Fig. E.1 View other’s dashboard
Fig. E.2 Employee Request History - Example 1

<table>
<thead>
<tr>
<th>Requested Date</th>
<th>Request Type</th>
<th>Skill</th>
<th>Sub-skill</th>
<th>Badge Given For</th>
<th>Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>06-01-2019</td>
<td>Initial Skill Request</td>
<td>CW</td>
<td>Inheritance</td>
<td></td>
<td>SkillExpert Approved</td>
<td>Ok</td>
</tr>
<tr>
<td>05-01-2019</td>
<td>Initial Skill Request</td>
<td>CW</td>
<td>Polymorphism</td>
<td></td>
<td>SkillExpert Approved</td>
<td>Okay</td>
</tr>
<tr>
<td>06-01-2019</td>
<td>Initial Skill Request</td>
<td>C#</td>
<td>LINQ</td>
<td></td>
<td>SkillExpert Rejected</td>
<td>You will have to resubmit by demo or certificate request.</td>
</tr>
<tr>
<td>06-01-2019</td>
<td>Demonstration</td>
<td>C#</td>
<td>LINQ</td>
<td></td>
<td>SkillExpert Approved</td>
<td>Good demonstration. Keep it up!</td>
</tr>
<tr>
<td>06-01-2019</td>
<td>Demonstration</td>
<td>Python</td>
<td>OOPS</td>
<td></td>
<td>SkillExpert Approved</td>
<td>Ok</td>
</tr>
<tr>
<td>06-01-2019</td>
<td>Demonstration</td>
<td>Python</td>
<td>Django</td>
<td></td>
<td>SkillExpert Approved</td>
<td>Ok</td>
</tr>
<tr>
<td>06-01-2019</td>
<td>Demonstration</td>
<td>SQL</td>
<td>DDL</td>
<td></td>
<td>Demo scheduled by skill expert</td>
<td>Please prepare a presentation alongwith ppc demo</td>
</tr>
<tr>
<td>06-01-2019</td>
<td>Demonstration</td>
<td>SQL</td>
<td>DML</td>
<td></td>
<td>Manager Approved</td>
<td>Ok</td>
</tr>
</tbody>
</table>

Fig. E.3 Employee Request History - Example 2

<table>
<thead>
<tr>
<th>Requested Date</th>
<th>Request Type</th>
<th>Skill</th>
<th>Sub-skill</th>
<th>Manager</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>06-01-2019</td>
<td>Badge</td>
<td>Siddarth Nair</td>
<td></td>
<td>Manager Approved</td>
<td>Thanks Siddarth for helping George. Please accept my badge of appreciation.</td>
</tr>
<tr>
<td>07-01-2019</td>
<td>Initial Skill Request</td>
<td>Python</td>
<td>Django</td>
<td>SkillExpert Approved</td>
<td>ok</td>
</tr>
<tr>
<td>07-01-2019</td>
<td>Badge</td>
<td>Siddarth Nair</td>
<td></td>
<td>Resolving with Manager</td>
<td>Helped me with C# query</td>
</tr>
</tbody>
</table>
**Fig. E.4** Employee gives a query badge

**Fig. E.5** Manager Pending Approvals screen
Fig. E.6 Drill-down questions - Add Primary Skills screen

Fig. E.7 Manager Badge Approval screen
Fig. E.8 Manager Certificate Approval screen

Fig. E.9 Skill Expert Certificate Approval screen
Fig. E.10 Manager Initial Skill Request Approval screen

Expert Give Badge screen
Fig. E.11 Employee Certificate Upload screen

Fig. E.12 Employee Demonstration Request screen
Fig. E.13 Skill Expert Pending Approvals screen

Fig. E.14 Skill Expert Demonstration Approval screen
Fig. E.15 Skill Expert Approval screen for employees initial skill request

Fig. E.16 Skill Expert scheduling demonstration screen

Fig. E.17 Error page