

# Talent management in agile software development: The state of the art

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**Abstract**—With increasing competition in the software market, software companies are using new management strategies to increase their competitiveness. In recent years, with the prevalence of agile methodologies in software development, paying attention to human resources, and selecting and managing talented human resources have become inevitable. This should be achieved by adopting appropriate talent management processes. However, in software engineering, talent management has not yet been seriously considered. Due to the critical role of agile methodologies in human resources, and the authority and freedom of individuals in agile teams, the benefit of talent management in these methodologies is vital. As a starting point, this article tries to provide a concise overview of talent management in agile software development and address the ambiguities and research gaps facing software researchers in this regard. The initial results of this study show that several ambiguities such as appropriate models of talent management applicable in agile methodologies, how to use them, effective factors in talent assessment, and the relationship between talent management and the quality of teamwork are some of the most noticeable research gaps in this area.

**Keywords**—Agile software development, talent management, human capital, agile team management, research trends

## I. INTRODUCTION

In recent years, the software environments have expanded rapidly in the global market, and the rate of this increase is expected to continue its upward trend in the coming years. The need for high quality software products and the increasing number of companies developing these products, in turn, increase competition among software companies. In the meantime, software methodologies and product development processes will play an outstanding role in this competition. Currently, software companies use agile methods and processes as the central choice for software development [1].

Software methodologies in general and agile software methodologies, in particular, pay significant attention to

human resources and their role in product development. Human resources (both the development team and customer team) are the main factor in the success or failure of a project in agile software methodologies. The main reason for this is the human-centered view defined in the agile manifesto that prioritizes the human resources development processes over the development processes themselves.

The main issue in agile companies and teams is the characteristics of human resources. According to the literature review, agile methodologies require employing experienced, motivated, and committed people. Besides the lack of a formal project management role in these methodologies, this requirement is often one of the concerns of senior managers of software companies [2].

Considering the role of human resources in these methodologies, the utilization of appropriate methods and processes in the management, improvement, and development of human resources has made the role of talent management in these teams more vital than ever. However, some previous studies only mention the role of efficient manpower, some human characteristics of the team members, and the personality and cultural barriers that complicate agile software development [3], [4]. Some cases have only addressed the role of talents and agile heroes or identifying them in agile development [5], [6].

Given the importance of talent management in agile software development, several issues are ignored, and there are still many open questions in this field. Accordingly, the present article attempts to demonstrate the importance of using talent management in agile software development and presents unanswered questions and problems in this area to provide a starting point for researchers in this field. The rest of the article is organized as follows. In Section 2, talent management is summarized. Section 3 provides some of the most famous talent management models. Section 4 deals with the role of talent management in agile software development. Section 5 addresses some open questions and research gaps in

talent management in agile software development. Finally, Section 6 concludes the paper.

## II. TALENT MANAGEMENT

Talent management is one of the most important management issues in modern organizations. It is considered by senior managers of organizations because paying attention to human resources is the most important organizational capital. The question that arises is, "what is talent, and what are the characteristics of talented people"? A review of the literature shows that defining the concept of "talent" is not as straightforward as expected, because organizations or human resource professionals have their attitudes and opinions about talent. Therefore, there is no common understanding of the definition of "talent" [7]. However, some studies have provided definitions about the concept of talent management [8]–[10]. For example, in a study, talent is defined as the outstanding maturity in competencies (including knowledge and skills) and individual activities that puts an individual among the top ten percent of colleagues working in the same field [10].

Since organizations will face increasingly competitive challenges in the future, the mere employment of highly talented manpower cannot guarantee the success of the company against its competitors. Organizations need to adopt proper talent management processes in organizational management so that, in addition to retaining talented people in the organization, they could identify other employees' weaknesses and develop their potentials. Numerous definitions have also been proposed about talent management, most of which address activities such as human capital forecasting, recruitment, retention, motivation, and development of human resources [11]–[15]. Due to the special role of talent management processes in modern organizations, employing these processes is focused by forthcoming managers [16].

In general, talent management describes organizational management strategies in hiring, managing, developing, and retaining talented employees [17]. Employing talent management processes helps organizations train the motivated workforce they need and increase their organizational commitment. From this perspective, talent management plays a strategic role in the organization's business and strongly affects the quality of products, competitiveness and productivity of organizations. Talent management is of particular importance in filling the gap between the required talents and the existing talents in the organization [11].

## III. TALENT MANAGEMENT MODELS

Literature review shows various talent management models, each of which contains different processes. The most important models are provided as follows.

Lewis and Heckman [18] proposed a conceptual framework for talent management containing several components of selection, employment, performance management, and service compensation. This framework begins with identifying strategies and competitive advantages. The next phase is to identify strategic concepts related to talent management, and then detect the talent pool. Finally, talent classification is carried out.

Another model was proposed by Armstrong [19]. This model tries to address and identify different dimensions of the talent management process. This model emphasizes creating

a talent pool including skilled, committed, and expert workers. Three major components were provided in this model including recruitment, talent retention, and talent development management.

Another model was proposed by Barlow [20] containing three major components of readiness, transition, and development. Moving to the new role is the first step in this model. The next step is the transition and assignment of employees to the new job in coordination with senior managers. The development of the employees in new roles is the third step of this model. The organization's support is critical for the development of talented personnel. Considering proper training is necessary as well.

Another model was proposed by Gandz [21] in which the goals and objectives of an organization are the basis of designing cultural and strategic priorities. In this model, five components of identification, readiness assessment, growth acceleration, selection and development, and performance of focal stimulus are provided.

In another study, Oehley [22] proposed a talent management model containing analysis, design, development, recruitment, and retention. This model emphasizes continuous evaluation and feedback.

Phillips and Roper [23] proposed a talent model to manage talented individuals. This model provides five major elements including attracting, selecting, engaging, developing, and retaining employees. This model was proposed by focusing on competencies and values in organizations. This model also emphasizes that having a strong culture and background is the key success factor in all organizations.

Another model was proposed by Collings and Mellahi [24]. This model mainly focuses on talent strategic management. This model tries to identify critical roles, and then assign individuals to these roles by the development of a talent pool.

Another approach is Sweem's model [25] to achieve the highest performance in organizations. This model is focused on reforming communication, performance management, reward and appreciation, employee development, and organizational culture. Employees are the central to the above factors and underpin the infrastructure of successful talent management.

Ooi [26] proposed another model containing three major components of talent identification, development, and retention. Talented individuals may be acquired, qualified and available.

Altinöz, Cakiroglu & Cop et al. [11] proposed another talent management model based on the use of talents within the organization. This model prefers to train the talents in the organization instead of recruitment of new talents from outside the organization. This model contains eight components of defining goals and strategies of the organization, determining key positions, creating talent profiles, choosing the best talents, designing and using development programs of organization's talents, analyzing the gap between the organization's and existing talents, talents performance evaluation, and promotion of processes.

Mensah [27] proposed a conceptual framework including talent management output, talent management, and employee performance.

#### IV. TALENT MANAGEMENT IN AGILE SOFTWARE DEVELOPMENT

Talent management plays a critical role in all industries generally and in IT companies particularly [28] because, individuals in IT companies and teams are considered as the main capital of the company. As a result, these companies are trying to maintain their superiority in the competitive market by managing their manpower through employing proper talent management processes [28], [29].

As mentioned earlier, due to the human-centered nature of agile software development, the issues related to human resources in agile software teams are highly regarded by companies and software teams. Since the role of senior and project managers in agile teams in managing software teams is insignificant, team members are required to participate in team management active [2]. On the other hand, the members of agile teams must be multitasking and have appropriate skills in technical specialties related to software development. That is why team self-organization is one of the bases of agile software development.

Moreover, the interaction between the members of agile software teams should be maximized, because, in these teams, informal and face-to-face communication has replaced official communications. From this perspective, in addition to technical skills, the team members should have other competencies in social and cultural context. That is why much attention is paid to the cultural, social, and human issues of the team members in creating agile teams. Besides, the software engineering industry pays special attention to knowledge and talent management in software teams [30].

The importance of talent in software teams is manifested in areas such as improving the productivity of software teams, improving software development processes, decreasing time and costs of development, increasing software product quality, or better decisions and generally in increasing their competitiveness [31].

A few works have been done on talent management and its processes in software development. In a study, using the Myers-Briggs Type Indicator [32], the software engineering types are discussed as one of the aspects of talent management [33]. In another study, the use of Scrum by talented and elite personnel is studied while neglecting the process of talent management [5]. However, the results of this study showed that probably due to ignoring a proper talent management process, the elite members of this team also had many problems and challenges in adapting to Scrum. Another point is that in agile development, special roles such as Scrum Master and product owner are defined that play a particular role in the development process. However, very few studies have been conducted on choosing, promoting and managing these individuals.

On the other hand, some of the studies insist on proposing new and dynamic talent management models to handle human-oriented engineering processes such as software engineering and their fast-changing environments [34], [35]. Also, it seems that in the Internet era, it is necessary to consider new talent processes to provide a new cultivation pattern in software engineering [36]. This would be more critical in agile software teams and organizations, as mentioned previously.

It seems that despite the vital role of talent management in agile software development, not only no serious study been done in this regard, but many aspects of this process and related concepts are still unclear. Consequently, agile software teams do not enjoy the benefits of talent management in practice. Maybe that is why the software engineering industry should consider talent management in software development and especially agile software development to reduce the human challenges of this industry [37]. To achieve these goals, first, the ambiguities, questions, and research trends associated with agile software teams need to be identified, and appropriate studies should be done on each one. Some of these ambiguities are presented in the next section.

#### V. RESEARCH TRENDS AND GAPS IN TALENT MANAGEMENT IN AGILE METHODOLOGIES

As mentioned earlier, software researchers should focus on several issues in the field of talent management in agile software development. The most important ones are as follows:

- Why software teams have paid so little attention to talent management and its benefits in their efficiency so far [38] ?

Answering this question helps software teams to identify the main barriers to employ talent management and its related concept in practice. Particularly, agile teams are constantly looking to improve team performance by applying agile practices and modern management processes.

- Which model(s) are applicable for talent management in agile software development? Is it possible to create a dynamic model for this purpose to adapt to environmental changes and software development technology?

Although several talent management models have been proposed, no proper studies have been conducted on how to use them and their effectiveness. Indeed, proposing a talent model is the first step in such studies. The most important part is to employ such models in practice and compare their impacts on team performance, organizational competitiveness, employee job satisfaction, and employee retention.

- What are the factors for measuring and identifying a talented person, and how can a talented person be identified using quantitative tools [39]?

Numerous studies have addressed some factors for identifying talented persons. However, there is not a well-developed and practical factor list. Another issue is that such factors have to be weighed against each other. This helps software teams to focus on the most important factors to gain better results in employing the talent management models. Moreover, identifying talented employees is a major concern for managers. Most often, there is no quantitative approach identify and classify team members. This issue is critical in agile software teams where all team members must be cross-functional, self-organized, and committed. Also, the payment mechanism in most software and agile software teams depends on classifying the personnel. Therefore, better personnel classification helps the managers to have a more equitable payment system.

- What are the organizational and technological factors that affect talent management, and how can they be measured [40], [41]?

Addressing the organizational and technological factors that enhance or reduce personnel performance is very crucial for software managers. This is mainly important because most talented persons leave software teams and companies lack such factors. It is why in the real environment software experts leave their teams despite receiving good salaries. Moreover, measuring such factors is a complex problem.

- How is it possible to develop a framework for determining talent management in organizations of different sizes [42]?

An organization's size is a major factor in proposing a proper talent model. In small teams, managing employees is not a serious issue, while this process would be so hard in larger teams. In a large organization with multiple management layers, the talent management process plays a great role in employee job satisfaction and retention.

- What is the relationship between talent management and organizational performance [43]–[45]?

As mentioned before, team and organization performance depends on the quality of employees and organizational management processes. Since, talent management directly affects the process of personnel recruitment, promotion, and retention, it has a deep impact on the team and organizational performance. Thus, clarifying the relationship between the team and organizational performance, and talent management would be beneficial.

- What factors should be considered for the successful management of organizational talent? To answer this question, we must know that the proposed strategy must be in line with organizational goals [46], [47].

Proposing and employing a talent management model depends on the company's vision, goals, objectives, and strategies formulated by the top management. In the absence of items, employing a talent management process would not be successful as expected.

- What is the role of encouragement and career advancement in the talent process in software teams [48]?

Personnel encouragement and promotion play a significant role in improving organizational competitiveness in software teams in general, and agile software teams in particular. However, it is necessary to study different aspects of this item in detail.

- Which psychological models are more applicable in talent management in software teams?

Many studies in the literature have addressed some psychological models when discussing talent management models. It seems that psychologists focus on talent management models based on human and cultural characteristics, while management and software scientists mainly focus on the process of talent management models. Considering human and cultural factors, as psychologists defined, when proposing a talent management model would be necessary.

A review of the above questions shows that many of the basic concepts and aspects of talent management in development need to be studied more closely. Answering these questions can clarify the dimensions of talent

management in agile development and increase team efficiency in these agile methodologies.

## CONCLUSION

The agile software development methodologies are profoundly dependent on the individuals and their role in software development. In such situations, people are the ones to determine the success or failure of the project. As people and their roles is more crucial, dealing and managing becomes more complicated and needs precise management. Talent management is one of the considered solutions in the industrial world to improve the quality of human resource management. However, this process has not been considered in the software development and agile methodologies in detail. A review of the literature shows that there are numerous questions about talent management in agile software development, some of which address the nature of the talent management process and the rest of them focus on the factors influencing talent management and its success areas in software teams. Moreover, paying attention to psychological issues in talent management and identifying and classifying talented people is another suggested research field.

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