-RESEARCH ARTICLE-

INDUSTRY 4.0 AND AGILE PROJECT MANAGEMENT: EVOLUTION OF LEADERSHIP CONCEPTS AND ROLES

Hamit Metin ÖRNEK[1] & Alper CAMCI[2]

Abstract

This study explores the impact of Industry 4.0 on leadership approaches, with a particular focus on how leadership roles have evolved in agile project management. The research aims to compare leadership theories before and after the advent of Industry 4.0 and to identify the most effective leadership styles for managing agile teams. The research utilizes literature review and qualitative methods, including two focus group studies conducted through online and face-to-face sessions with executives from companies that have mature project management offices in Turkey. Data were collected by transcribing the discussions from these focus groups and comparing them with researcher notes. The analysis reveals that leadership styles such as visionary, organizing, relational, and social leadership are particularly effective in agile project management. Furthermore, the study identifies specific leadership personality traits associated with these styles. The study emphasizes the necessity of redefining traditional leadership approaches to meet the challenges of the digital era. It highlights how technological competencies have become critical for organizations and the importance of fostering flexible and innovative organizational structures to succeed in this environment. In addition, the research suggests that leaders involved in digital transformation processes must have the skills to facilitate employee adaptation to new technologies and methods. By linking the characteristics of leadership styles with their impact on agile teams and comparing them to the existing literature, the study contributes valuable insights for future leadership research and practice. It underscores the ongoing need for leadership development, particularly in the context of Industry 4.0, to ensure that leaders can drive innovation and adaptability in their organizations.

---

[1] PhD Student, Bahçeşehir University Faculty of Engineering and Natural Sciences Engineering Management Department, İstanbul/TÜRKİYE, hamit.ornek@bahcesehir.edu.tr, https://orcid.org/0000-0003-4836-1799

[2] Assist. Prof., Bahçeşehir University Faculty of Engineering and Natural Sciences Engineering Management Department, İstanbul/TÜRKİYE, alper.camci@bau.edu.tr, https://orcid.org/0000-0001-6537-1695

ENDÜSTRİ 4.0 ve ÇEVİK PROJE YÖNETİMİ: LİDERLİK KAVRAMLARININ VE ROLLERİNİN EVRİMİ [3]

Öz

Bu çalışma, Endüstri 4.0'ın liderlik yaklaşımları üzerindeki etkisini ve özellikle çevik proje yönetiminde liderlik rollerinin nasıl evrildiğini incelemektedir. Araştırmanın temel amacı, Endüstri 4.0'ın ortaya çıkmasından önceki ve sonraki liderlik teorilerini karşılaştırmak, çevik ekipleri yönetmede en etkili liderlik stillerini belirlemek ve bu bağlamda liderliğin nasıl dönüştüğünü anlamaktır. Bu amaçla, literatür taraması ve nitel araştırma yöntemleri bir arada kullanılmıştır. Özellikle, Türkiye'de olgunlaşmış proje yönetim ofislerine sahip şirketlerin yöneticileriyle gerçekleştirilen iki odak grup çalışması (çevrimiçi ve yüz yüze oturumlar) yapılmıştır. Veriler, bu odak gruplarındaki tartışmaların transkripsiyonları yapılarak ve araştırmacı notları ile karşılaştırılarak toplanmıştır. Bulgular, vizyoner, düzenleyici, iletişimde ve sosyal liderlik gibi liderlik tarzlarının çevik proje yönetiminde önemli rol oynadığını göstermektedir. Ayrıca, bu liderlik stillerine özgü belirli kişilik özellikleri de tanımlanmıştır. Sonuçlar, Endüstri 4.0'ın proje yönetimi üzerindeki etkilerini ve liderlik yaklaşımlarının yeniden tanımlanması gerektiğini ortaya koymaktadır. Çalışma, dijital çağın getirdiği zorluklara uyum sağlamak için geleneksel liderlik yaklaşımlarının yeniden tanımlanması gerektiğini vurgulamaktadır. Teknolojik yetkinliklerin önemi gün geçtikçe artmakta, dolayısıyla esnek ve yenilikçi organizasyon yapılarının oluşturulması, bu yeni ortamda başarı elde etmek için hayati bir gereklilik haline gelmektedir. Araştırma ayrıca, dijital dönüşüm süreçlerinde yer alan liderlerin, çalışanlarının yeni teknolojilere ve yöntemlere uyum sağlamalarını kolaylaştıracak becerilere sahip olmaları gerektiğini belirtmektedir. Liderlik stillerinin özelliklerini çevik ekipler üzerindeki etkileriyle ilişkilendiren çalışma, bu bulguları mevcut literatürle karşılaştırarak gelecekteki liderlik araştırmalarına hem akademik literatüre hem de çalışma dünyasına değerli katkılar sunmaktadır. Özellikle Endüstri 4.0 bağlamında, liderlerin organizasyonlarında inovasyonu ve uyumu teşvik edebilmesi için liderlik gelişimine yönelik sürekli bir ihtiyaç olduğu vurgulanmaktadır. Bu çalışma, liderlik araştırmaları ve uygulamaları için önemli bir referans niteliğindedir.

Anahtar Kelimeler: *Endüstri 4.0, Liderlik, Çevik Proje Yönetimi, Odak Grup Çalışması, Dijital Dönüşüm.*

JEL Kodları: *M10, M14, M15.*

"Bu çalışma Araştırma ve Yayın Etiğine uygun olarak hazırlanmıştır."

---

[3] Genişletilmiş Türkçe Özet, makalenin sonunda yer almaktadır.

1. INTRODUCTION

The technological advancements brought by Industry 4.0 represent a profound revolution that will fundamentally reshape leadership definitions and management approaches. Industry 4.0, not only transforms production processes but also completely transforms management and leadership concepts. Traditional leadership models are inadequate in the dynamic and complex work environments of this new era, thus requiring more flexible, adaptive, and participatory leadership approaches. Agile project management enables project teams to adapt more swiftly and effectively to changing conditions, prompting a need to reassess leadership approaches in this context.

Throughout world history, transformations in social, economic, and technological area have sparked revolutions leading to profound changes for humanity. Revolution is defined as radical changes in society and encompasses a wide range of areas, such as agriculture and industry (Yoder, 1926). Industrial revolutions have had a major impact on shaping the contemporary world. These revolutions typically leverage prior technological advancements and accumulated knowledge. An industrial revolution occurs when multiple disruptive innovations come together to produce new creations. The cumulative effects of these innovations can exceed the impact of any individual innovation. (Wilenius, 2014).

Projects have been essential in human history for creating solutions to meet diverse societal needs. A project is a planned, unique endeavor aimed at achieving specific goals. Project management has always been a significant phenomenon, albeit the term is relatively new. As technology becomes more complex, the outcomes of projects become more uncertain, and the discipline of project management evolves accordingly. Each industrial revolution is shaped by the complex interaction of technological advancements and societal changes, facilitated through projects (Camci and Kotnour, 2019).

1.1. First Industry Revolution

During the late 18th century, the development of water and steam-powered machines led to significant transformations in the textile industry and later in other sectors, resulting in notable increases in productivity. Profound changes occurred in the economic and social structures of societies. In addition to infrastructure initiatives like railways, this revolution established the groundwork for industrial production and the modern economy. From the perspective of project management, first engineering schools are established and the demand for expertise in large-scale infrastructure projects became apparent (Kozak-Holland, 2011).

1.2. Second Industry Revolution

The revolution from the late 19th to the early 20th century was characterized by new technologies such as electricity and internal combustion engines. Innovations like mass production and assembly lines revolutionized production processes and guided large-scale industrial activities.

These activities involve breaking work into small tasks, using time and motion studies, and performing them on a moving assembly line with single-purpose machines and unskilled labor (İşler, 2021). The implementation of major projects triggered economic growth, and as financing and management of large-scale projects became increasingly complicated. New methodologies based on deterministic scientific management principles like the Gantt chart gained importance during this period (Kozak-Holland, 2011). Shaped by the Great Depression of the 1930s and later World War II, major projects like the Manhattan Project highlighted resource challenges and leadership requirements.

The renowned network planning techniques, CPM and PERT, were developed in the late 1950s. CPM was created for stable industrial applications at DuPont, while PERT was designed for the complex Polaris Project (Packendorff, 1995). The Project Management Institute (PMI) was established in 1969 with the goal of creating a new organization where project managers could connect, share information, and discuss common challenges (Piper, 2001).

1.3. Third Industry Revolution

The Third Industry Revolution started with the widespread adoption of computer technologies and digital communication in the 1970s. This transformation has increased automation and accelerated global trade. Methods such as lean production systems have emphasized principles of continuous improvement and waste reduction. Information technologies have driven transformations in the field of project management, fostering the development of agile methods. With the evolution of computer-based systems and agile methodologies, the field of project management has acquired a more dynamic and adaptable framework. Beginning in the 1980s, project management began to extend beyond its traditional applications in engineering and technology, becoming a tool for organizational change and improvement. Another significant development during this decade was the introduction of iterative project management approaches, as opposed to traditional sequential methods, which eventually evolved into the agile methodologies we recognize today (Boehm, 1986). (Takeuchi and Nonaka, 1986) proposed an iterative approach to product development projects like rugby game as opposed to traditional sequential approach. Agile methods, such as Rapid Application Development (RAD), Scrum, and Extreme Programming (XP) are developed in 1990s. In 2001, Agile Manifesto published to define values and basic principles for better software development (Beck et al., 2001; Hohl et al., 2018).

1.4. Fourth Industry Revolution

Since its first manifestation at the industrial fair in Hannover, in April 2011, the Fourth Industrial Revolution or Industry 4.0 has emerged as a central theme in academic discussions across various disciplines. This revolution signifies the integration of digital technologies such as the Internet of Things, cyber-physical systems, and artificial intelligence into manufacturing processes (Camci and Kotnour, 2019).

This revolution is designed to enhance flexibility, efficiency, and customer-centricity in production processes. Human-machine and machine-machine interactions aim to make production processes smarter and more connected, supporting the use of big data and facilitating rapid decision-making processes while ensuring sustainability. In this era, project management is undergoing remarkable evolution through the adoption of agile methodologies and big data analytics (Roblek et al., 2016).

Each industrial revolution has led to changes in project management discipline alongside technological advancements, allowing for the development of new methods. The widespread adoption of agile methodologies and the proven applicability in large-scale projects are particularly reflective of the evolution in project management. This new industrial revolution demands radical changes not only in new information and communication technologies but also in business models and processes (Xu et al., 2018). Nevertheless, literature on projects and project management during the Industry 4.0 era is scarce and typically concentrates on specific aspects.

1.4.1. The Necessity of New Skill Sets

In the context of Industry 4.0, the necessity of new skill sets for project teams and managers is emphasized (Cerezo-Narváez et al., 2017). During this period, knowledge and experience in digital competencies, data analytics, artificial intelligence, and machine learning became crucial. It is crucial that project managers possess the capability to effectively leverage technology and adjust to dynamic conditions.

1.4.2. Increasing Complexity and New Organizational Models

Industy 4.0 brings increased complexity for businesses. Managing this complexity necessitates the development of new organizational models and designs (Semolic and Steyn, 2017). Instead of traditional hierarchical structures, more flexible, network-based, and collaborative organizational structures are preferred. These structures are designed to facilitate rapid decision-making, encourage innovation, and foster agility (Carvalho et al., 2015; Kharabe et al., 2013; Perera and Fernando, 2009).

1.5. Evolution of Leadership Concepts in the Industry 4.0 Era and New Leadership Approaches in Agile Projects

The influence of Industry 4.0 on project management requires strategic consideration of how to effectively handle technological transformation. Traditional project management methodologies might require updates and enhancements to align with this evolving landscape (Svejvig, 2021). For instance, agile project management principles can provide an optimal solution for accommodating swiftly evolving requirements (Daraojimba et al., 2024).

Moreover, integrating emerging technologies like big data analytics and artificial intelligence into project management can improve decision-making processes and boost the chances of project success (Taboada et al., 2023). In conclusion, the impact of Industry 4.0 on project management presents new opportunities and challenges for project professionals. To succeed in this era, it is important to develop technology-focused competencies and organize organizational structures in a flexible and innovative manner.

Industry 4.0 not only transforms production processes but also redefines management and leadership paradigms. Traditional leadership models are inadequate in the dynamic and complex business environments brought by this new era, necessitating more flexible, adaptive, and participatory leadership approaches. Agile project management, in this context, facilitates project teams to adapt more quickly and effectively to changing conditions, thereby requiring a reassessment of leadership approaches.

For more than 30 years, agile project management has gained importance due to the necessity of being flexible and adaptive in the new business environment shaped by digital technologies (Wiechmann et al., 2022). Digitalization has led industries to become data-driven and to respond instantly to rapidly changing customer demands Agile project management meets these needs by adapting to new dynamics such as real-time problem-solving, personalization, and remote access (Hannila et al., 2022). Moreover, the integration of technologies like big data analytics, artificial intelligence, and the Internet of Things enables projects to be managed with more innovative and data-driven strategic decisions. In this context, the flexibility of agile methods ensures success in continuously changing project environments, making it an ideal solution for managing the complexities brought by the Industry 4.0 revolution (Babkin et al., 2022).

In today's agile world, unlike the hierarchical structures of the past, leadership has evolved into a more dynamic framework where various team members assume leadership roles, rather than relying solely on single-leader models (Hunt and Fedynich, 2019). The success of agile projects depends on team members' superior capabilities, talents, and initiative-taking skills. Strong leadership qualities exhibited by individuals in this context enable agile teams to function effectively. Research indicates that natural leaders positively influence team performance and that the adoption of different leadership roles within teams is encouraged (Przybilla et al., 2020).

"One of the myths of Agile Development is that self-organizing teams do not need direction" (Anderson, 2003, p.276). The agile software development movement asserts that while programmers do their work, everyone should support them. In these self-managing teams, the person wearing the managerial hat (such as the project manager, Scrum Master, or Product Owner) is expected not to directly engage in daily project activities or provide direction, but instead to assume a facilitating role.

This situation has created a debate within agile methods regarding the concept of management: Are classic management techniques such as planning, budgeting, team building, problem-solving, decision-making, and control not applicable to agile environments? It is evident in the software development world that classic management techniques are necessary for order and consistency. However, when this facilitation role is approached not as a manager but through leadership, it tends to be more successful (Anderson et al., 2003).

Leadership is the ability to direct a group towards achieving their goals by influencing them to behave in a certain way (Dubinsky and Hazzan, 2010). Research literature on agile software development teams is not unanimous on effective leadership (Modi and Strode, 2020). In Scrum teams, leadership roles are typically divided among the Product Owner, Scrum Master, and the self-organizing team (Yang et al., 2009). In small, naturally formed Scrum teams, it is recommended to adopt an adaptive leadership approach supported by a guiding vision (Augustine et al., 2005). Using the right leadership style is valuable in helping teams succeed (Ralston, 2008).

Greenleaf (2003) defines servant leadership, which can aid in agile development projects, facilitating team empowerment and motivation, and expanding boundaries between the organization and the team (Modi and Strode, 2020). In the concept of servant leadership, the leader is not within the team, and although softened, there still exists a hierarchical distinction.

For agile projects to succeed, specific competencies are expected from both teams and individuals. Teams are expected to self-manage, be flexible, collaborate effectively, communicate well, and engage in continuous improvement. Individuals are expected to take initiative, assume responsibility, propose solutions, develop new ideas and approaches, possess technological knowledge and skills, have a desire for continuous learning, and be flexible and adaptable to changing roles and tasks (Dess and Picken, 2000).

In the Industry 4.0 era, creating an environment where every individual can contribute as a leader is crucial for success. The fundamental issue is that many existing leadership theories inadequately guide agile teams in their project development efforts. Most leadership theories adopt a person-centric approach, assuming that leadership is a quality inherent in a single individual. This research is crucial for understanding how leadership has evolved in the era of Industry 4.0 and how leadership roles are redefined in agile project teams. The impact of these theories on such teams has been relatively underexplored in the existing literature (Acharya and Colomo-Palacios, 2019; Przybilla et al., 2019).

Leadership and project management are critical elements for the success of organizations, and innovative approaches in these areas play a significant role in gaining competitive advantage. Organizations must embrace agility and redefine leadership to effectively adapt to this new paradigm shift. Considering that agile

methods enhance team performance, especially in technology-focused projects, and enable leaders to guide more effectively, the findings of this study will provide valuable contributions to both academic literature and business practice.

2. METHODOLOGY

This study began with a literature review aiming to examine the development of leadership theories before Industry 4.0. A comprehensive literature review was conducted to identify the characteristics of leadership schools and prominent researchers in the field.

A further literature review is conducted on collective leadership theories, which emphasize shared leadership responsibilities within teams or organizations. Subsequently, a research model was formulated and evaluated through an initial focus group comprising subject matter experts. Based on these evaluations, essential revisions were implemented in the model. After that, a final version of the model was validated by a second focus group comprising senior executives.

Lastly, a literature review was conducted on the variables proposed in the new model, detailing the study's emerging concepts by contextualizing them with previous research. The flowchart of the method used in the study is presented in Figure 1.

Figure 1. Flowchart of the Method Used in the Study
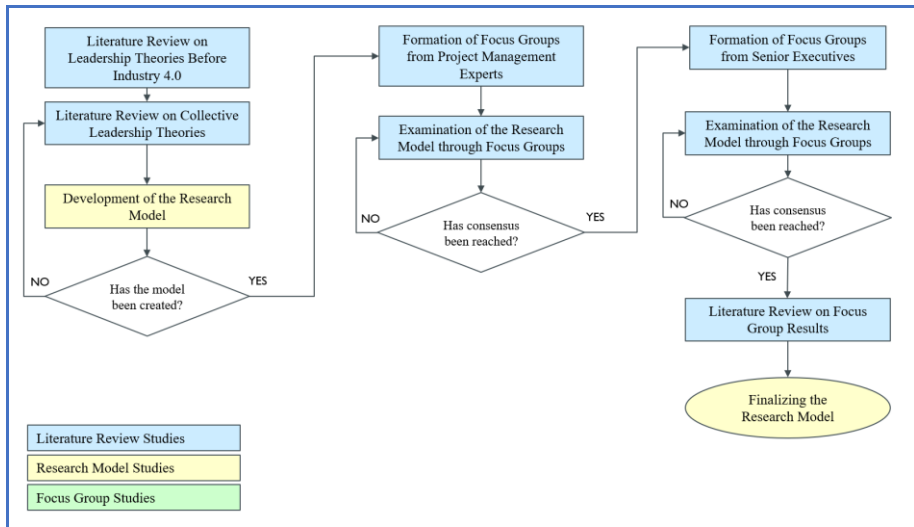
2.1. Evolution of Leadership Theories Before Industry 4.0

Throughout human history, numerous leaders have emerged and influenced societies, shaping world history. From the Great Man Theory to the pre-Industry 4.0 era, leadership theories have been categorized into six main schools (Turner and Müller, 2005). The names of these schools, their characteristic features, and the studies conducted by notable researchers are presented in Table 1.

Table 1. Leadership Schools and Researchers' Studies

School	Researchers' Studies
The Trait School asserts that leaders are born with certain innate qualities and that leadership skills are limited by a person's natural abilities.	There is not much consensus on fundamental traits and that the characteristics of a successful leader should be relevant to specific challenges faced and the abilities, hopes, values, and concerns of followers (Stogdill, 1948). Intelligence, masculinity, adaptability, dominance, extraversion, and conservatism traits can be used to distinguish leaders from non-leaders (Mann, 1959). Intelligence, masculine-feminine traits, and dominance are significantly associated with perceptions of leadership (Lord et al., 1986). Leadership traits include perseverance, leadership motivation, honesty and integrity, self-confidence, cognitive ability, and business knowledge (Kirkpatick and Locke, 1991).
The Behavioral or Style School argues that effective leadership can be learned by adopting specific behaviors.	Various academics at Iowa, Ohio State, Michigan, Harvard, and Texas Universities have developed theories on the behavioral approach. Leaders should be sensitive to people's emotions and needs, balance authority, involve team members in decision-making processes, and exhibit behaviors that maintain internal balance while flexibly adhering to rules. Likert's (1932) methodological studies on measuring personal traits, McGregor's (1966) Theory X and Theory Y, and Yukl and Van Fleet's (1992) leadership studies in organizations have garnered significant attention not only in academia but also in the business world (Üzüm and Uçkun, 2019).
The Contingency School argues that effective leadership depends on specific circumstances and that leadership style and behavior can vary depending on the situation.	In the Leadership Continuum Model by Tannenbaum and Schmidt (1973), situations between authoritarian and democratic leaders are scaled. Fiedler (1978) distinguishes leadership as task-oriented and participative leadership. He states that leadership situation is related to leader-member relations, task structure, and position power. Hersey and Blanchard (1969) approach maturity level of subordinates as a situation in their Life Cycle Approach. Evans (1970) and House (1971) in the Path-Goal Theory address the leader's role in determining the best way for followers to reach goals and helping them follow this path. They define Supportive, Directive, Participative, and Achievement-Oriented Leadership. Vroom and Yetton (1973) analyze decision quality, acceptance, and time pressure factors, offering a roadmap for leaders to choose an appropriate decision-making style (Üzüm and Uçkun, 2019).

The Visionary or Charismatic school argue that successful leaders possess vision and transformational power to direct their organizations towards change.	(Burns, 1978) and later continued by (Bass, 1990) explore transformational and transactional leadership styles, seeking answers to how leaders inspire and create transformation. Transactional leadership rewards followers when they achieve performance goals and applies sanctions when things do not go as planned. On the other hand, transformational leadership exhibits charisma that influences followers, inspires respect, trust, and pride with its created vision. It provides personal attention to individuals, stimulates intellectually, and allows for new ideas
The Emotional Intelligence School argues that the leader's emotional intelligence has a significant impact on the team's performance.	(Boyatzis et al., 2002) define six leadership styles: Visionary, Democratic, Coaching, Results-oriented, Affiliative, and Commanding leadership. They argue that the first four leadership styles promote team harmony and lead to better performance under appropriate conditions, while the last two leadership styles may cause discord among people even under favorable circumstances, emphasizing the need for careful use.
The Competency School emphasizes identifying the competencies of effective leaders.	This approach, while similar to the trait approach, argues that competencies are learnable, suggesting that leaders are not only born but also made through development. Competencies could be technical, cognitive, or emotional. Different combinations of competencies lead to the emergence of leadership styles that are appropriate in different situations (Dulewicz and Higgs, 2005; Goleman, 1998).

2.2. Collective Leadership Theories

The sharing of leadership is not a completely new idea (Ziegert, 2005). Mary Parker Follett (1924) emphasized that in specific circumstances, individuals with essential and critical knowledge should be followed rather than relying solely on formal leadership (Ağlargöz, 2018). Having multiple leaders depending on the situation positively affects group outcomes (Bowers and Seashore, 1966). Researchers developed the shift in leadership from the I to the We concept (Avolio and Bass, 1995).

2.2.1. Collective Leadership

The concept of collective leadership is fundamentally different from traditional leadership paradigms. In collective leadership, the focus is not on the role of a formal leader but on team members interacting with each other to share leadership responsibilities and manage the team (Hiller et al., 2006). These interactions lead to adaptive outcomes such as knowledge sharing, learning, innovation, and adaptation (Uhl-Bien et al., 2007).

Leadership traits, skills, and behaviors remain crucial in collective leadership as they empower individuals to adopt leadership thinking and actively contribute to leadership initiatives. However, collective leadership is not an individual attribute; it

encompasses interactions and relational processes within a team (Avolio et al., 2009). Collective Leadership is a dynamic process where team members effectively distribute the leadership role by alternately using their skills and expertise based on the situation or problem encountered (Friedrich et al., 2009).

In collective leadership, leadership influence is evenly distributed among team members. However, due to varying levels of cognitive abilities among individuals, equal distribution does not always yield the desired results. Therefore, in our study, we concluded that collective leadership may not be a suitable leadership model for agile project teams.

2.2.2. Shared Leadership

(Pearce and Sims, 2001) developed a model that demonstrates how shared leadership, emerging from team characteristics, task qualities, and environmental factors, impacts team processes and effectiveness. (Carson et al., 2007) define shared leadership as a process where team members influence each other, take on mutual responsibilities, and work together towards common goals. (Srivastava and Jain, 2017) argue that shared leadership, where individuals with the knowledge and skills for problem-solving and decision-making take turns leading, is beneficial in large-scale agile projects with multiple scrum masters. Nevertheless, it is essential to clarify what aspects are shared within this leadership framework (Aycan, 2021): Is it strategic or operational matters? How will planning, implementation, control, and accountability be distributed? Moreover, how will resistance to shared leadership be overcome without reducing the fear of failure and ensuring psychological safety? Answers to these questions are critical in establishing an effective leadership structure. Misconfiguring shared leadership during implementation, such as involving an incompetent individual in crisis decision-making, can lead to adverse outcomes. Therefore, our study concludes that shared leadership may not be suitable for agile project teams due to these reasons.

2.2.3. Distributed Leadership

Distributed leadership research examines various leadership structures where tasks are divided among multiple actors, emphasizing that effectiveness can occur both vertically and horizontally (Bolden, 2011). (Gronn, 2002, p.431) argues that the value of collective leadership units, termed "conjoint agency," comes not from the aggregation of individual actions but from their integrated collective movement. (Barry, 1991) notes that self-managed team members often struggle with group process skills and without training, these teams tend to be unstable and prone to fragmentation (fision) rather than cohesion (fusion).

2.2.4. Emergent Leadership

Emergent leadership is a form of horizontal leadership where the team structure is flattened (Hanna et al., 2021). A team member with specific qualities is seen or accepted as an effective leader within the team. In the team environment, multiple individuals can take on this leadership role simultaneously, leading to the emergence

of multiple leaders at the same time. This type of leadership suggests a different organizational structure from traditional formal leadership, where leaders naturally emerge from within the group without necessarily holding a formal position or authority. Acceptance of a team member as a leader means they lead based on specific talents, knowledge, expertise, or style.

2.2.5. Leadership Styles in Self-Managed Teams

(Barry, 1991) categorizes the necessary leadership styles for self-managed teams into four types: (1) Envisioning leadership, (2) Organizing leadership, (3) Spanning leadership, and (4) Social leadership. These leadership styles often exclude each other. Specializing in one area can hinder skill development in others. On the other hand, each leadership style plays a critical role in maintaining team dynamics; if any of these clusters are underrepresented or overly represented, the overall performance of the team can suffer.

(Hoda et al., 2013) propose six roles that enable the self-organization of Agile Software Development teams: (1) Mentor, who helps team members gain confidence in using agile methods; (2) Co-ordinator, who manages customer expectations along with the team; (3) Translator, who facilitates effective communication between the business language used by the customer and the technical terminology used by the team; (4) Champion, who explains and advocates for agility to upper management to support the team; (5) Promoter, who ensures collaboration with the customer to support the team's efficient operation; (6) Terminator, who identifies and removes members threatening the team's functioning and productivity with the support of upper management.

2.2.6. Characteristics of Leadership Styles

Various leadership characteristics and their corresponding descriptions, as identified in the literature are outlines in Table 2 as shown. Each characteristic highlights a unique aspect of leadership, ranging from creativity and communication styles to adaptability and emotional resilience. The references provide a basis for understanding these traits in different contexts, emphasizing their importance in project management and team dynamics.

Table 2. Characteristics of Leadership Styles in the Research Model

Characteristic	Description	Researcher
Adaptive to Change	An adaptable leader with a flexible mindset.	(Augustine et al., 2005)
Adaptive to Change	Quickly adapts to changing conditions, motivates the team towards new goals.	(Çınar and Kaban, 2012)
Agreeableness	A leader with a gentle and polite personality, harmonious with people. Gets along well with other team members.	(Cogliser et al., 2012)
Appreciative	A leader who praises and appreciates achievements.	(Gauglitz, 2019)

Attention-grabbing	A leader who stands out, can be the center of attention, and is influential.	(Jonason and Webster, 2010)
Attention-grabbing	Enjoys capturing the attention of others.	(Paulhus and Jones, 2015)
Change-oriented Communicator	A leader who persuades change, provides motivation, and encourages participation. Listens to people's ideas regarding change and persuades them to participate in the change.	(Gerpott et al., 2019)
Collaborative	Efforts to foster collaboration and coordination among team members.	(Luria and Berson, 2013)
Conciliatoriness	A leader who manages conflicts effectively, is a problem solver, and facilitates compromise.	(DeRue et al., 2015; Lord et al., 1984)
Conscientiousness	A disciplined, responsible, and systematic leader. Provides guidance on determining methods for the team in the project process.	(Cogliser et al., 2012)
Creative	A solution-oriented leader with a creative and innovative mindset. Focuses on identifying the causes of the problem and offers creative solutions.	(Guastello, 1995)
Diplomatic	A leader who balances differing viewpoints, manages conflicts, and fosters interpersonal harmony. In communication with people from different cultures, uses a respectful and understanding language.	(Barry, 1991)
Dominant Task Ability	A business management expert, strategy developer, and guiding leader. Smooth operation of tasks is important; does not approach people empathetically.	(De Souza and Klein, 1995)
Emotionally Resilient	A composed leader who provides calmness and manages crises.	(Cogliser et al., 2012)
Emotionally Resilient	Stays calm in situations of panic, fear, or anxiety.	(Liang et al., 2012)
Empathy	A leader who is empathetic, has high emotional intelligence, and builds relationships with sensitivity.	(Boyatzis, 1997; Boyatzis and McClelland, 1982; Wolff et al., 2002)
Extravert	A leader with strong communication skills, social competence, energetic, and adept at building rapport.	(Lanaj and Hollenbeck, 2015)
Facilitator	A leader who guides communication, fosters team interaction, and promotes collaboration.	(Barry, 1991)
Facilitator	Emphasizes individuals' strengths for collaboration and encourages focusing on common goals.	(DeRue et al., 2015)
Generous	A leader open to sharing knowledge, sharing their experiences, and exchanging information.	(Luria and Berson, 2013)
Innovative	An innovative, creative-thinking, opportunity-seeking leader.	(Ensari et al., 2011)
Knowledgeable	A knowledgeable leader respected in their field.	(Tabassum et al., 2023)
Meticulous	A detail-oriented leader who values specifics.	(Tabassum et al., 2023)

Openness to Experience	An open-minded leader with a visionary and adventurous spirit.	(Judge et al., 2002)
Persuasiveness	A leader who influences ideas and is persuasive.	(Bao, 2010)
Productivity-focused	Plans tasks, prevents distractions, and ensures the team uses time efficiently.	(Cogliser et al., 2012)
Reflectiveness	A leader who self-critiques, self-develops, objectively evaluates, knows their strengths and weaknesses, and can transform attitudes and behaviors.	(Cronshaw and Ellis, 1991; Dobbins et al., 1990; Lennox and Wolfe, 1984; Snyder, 1979)
Relationship-oriented Communicator	A leader who fosters respectful and understanding relationships with individual and organizational cultural differences. Values interpersonal relationships and approaches others empathetically.	(Gerpott et al., 2019)
Self-confidence	A confident leader who believes in their values and trusts themselves.	(Andrews, 1984; Kwok et al., 2018; Sharma and Sharma, 2016; Stake, 1979)
Stability	A leader who maintains emotional balance, copes with challenges, and shows resilience against adversity.	(Li et al., 2012)
Supportive Communicator	A leader open to collaboration, evaluates ideas, and promotes teamwork. Encourages others' ideas and critical thinking, presents new ideas, offers solutions, and supports change.	(Liang et al., 2012)
Task-oriented Communicator	A leader with high communication skills focused on purpose. Establishes clear, concise, purposeful, and effective communication for the successful execution of project tasks.	(Gerpott et al., 2019)
Visionary	Boldly focuses on potential future innovations, opportunities, and goals.	(Çınar and Kaban, 2012)

2.3. Research Model

Empirical studies have shown that distributing leadership tasks does not always lead to shared agency, and institutional or organizational conditions can result in unidirectional influence processes. These studies have demonstrated that conflicting institutional logics can cause one actor's dominance over another, leading to resistance from the dominated actor (Kortantamer, 2023). Therefore, in our study model, distributed leadership is not considered in isolation but is evaluated alongside emergent leadership. When developing our research model, the distributed leadership styles proposed by (Barry, 1991) were considered alongside emergent leadership in self-organizing agile teams to create the Distributed Emergent Leadership model. This model includes four leadership styles.

1. **Visionary Leadership:** Visionary leaders have a strategic outlook towards the future and inspire team members, increasing their motivation. These leaders focus on the overall goals of projects, setting the direction for the team and encouraging the emergence of innovative ideas.

2. **Organizing Leadership:** Organizing leaders ensure that projects are completed on time and efficiently by organizing processes and workflows. These leaders pay attention to details and continuously monitor the team's performance, making necessary adjustments.
3. **Communicative Leadership:** Communicative leadership strengthens team communication and promotes information sharing. These leaders establish clear and effective communication, enhancing collaboration among team members and ensuring the successful execution of projects.
4. **Social Leadership:** Social leadership supports team spirit by maintaining high morale and motivation among team members. These leaders pay attention to the individual needs of team members and strive to increase their job satisfaction.

The research question of this study is "what are the essential characteristics of distributed emergent leadership". Organized focus group studies to find the answers for this research question is explained in the following sections.

2.4. Focus Group Study

In this study, the qualitative research method of focus group study was chosen to deeply determine the approaches of managers from Turkish companies with mature project management offices. The aim of this study is to foster a healthy discussion environment to gather rich content from diverse perspectives, opinions, experiences, and evaluations related to the research topic. While focus group studies reach fewer people compared to surveys, they offer a broader perspective by capturing participants' attitudes and views through their unique expressions and definitions. (Tozkoparan and Vatansever, 2011). The answers to the interview questions are shaped by the interactions among the group members. This process is important as it results in a rich data set from the interview.

The reason for choosing the focus group study method in this study is to gain insights from direct practitioners in the business world on how to organize teams and the place of leadership roles in teams, especially in agile projects that have been intensely applied in recent years in our country and yet lack a universally accepted clear definition. Given that the chosen topic is shaped by perceptions, it is anticipated that the focus group study will be more effective in discovering perceptual variables in managers who have had the opportunity to observe many agile teams.

2.4.1. Focus Group Design

In this study, information and invitation letters were sent via email to 23 individuals selected according to the following criteria from 45 companies registered with the PMI (Project Management Institute) Turkey chapter, which has more than 1,000 members. Focus group candidate selection criteria are (1) Experience in top-level company management, (2) Experience in information technology management, (3) Experience in project management office (PMO) management, and (4) Experience in academia.

Ten managers expressed their willingness to participate in the study. Six of them have experience in PMO, project management, and IT management. The remaining four are Deputy General Managers at a bank with over fifteen thousand employees and have extensive experience in managing large groups. Due to the diversity in interest and influence areas, two focus groups were formed.

The first focus group consists of 2 company owners and 4 senior IT and PMO managers. Four of these individuals also have academic backgrounds, and 2 have served as presidents of PMI Turkey chapter. The average experience duration is 29.6 years. The companies where they are employed specialize in project management consultancy, training, corporate payment systems, and transportation sectors. The rationale for seeking academic experience in the selection of participants is to enhance the quality of the research and ensure the validity of the data obtained. Academic experience enables participants to possess in-depth knowledge on a specific topic and provide more informed and consistent feedback by utilizing scientific thinking methods.

The second focus group includes the Deputy General Manager of Human Resources, the Deputy General Manager of Information Technology, the Head of Risk Management, and the Head of the Inspection Board from a large corporate bank with over fifteen thousand employees. The average experience duration for this group is 26.2 years.

The suitable number of participants for focus group typically falls between 4 and 10 individuals (Çokluk et al., 2011). Therefore, within the scope of this study, having two groups of 6 and 4 participants each aligns with the ideal group size.

2.4.2. Conducting Focus Group Process, Data Collection, and Analysis Method

Focus group studies were conducted in April 2024. Participants were contacted via phone and email before the discussion day to provide them with preliminary information about the topic. The first focus group was conducted online, while the second focus group was held face-to-face in a meeting room.

The online discussion with the first focus group took place in two separate sessions totaling 1.5 hours. All participants kept their cameras on during the online meetings, ensuring visual contact among all participants. The physical meeting with the second focus group was conducted in a meeting room and lasted for 1 hour.

During the focus group studies, participants were asked questions about their own leadership styles and leadership personality traits. These questions were designed to encourage participants to share their leadership experiences as well as discuss the leadership behaviors they observed in themselves and others. The questions were structured to gather in-depth insights into how leadership styles influence teams, particularly in self-organizing teams, and the roles leaders play in these contexts. During the discussions, participants shared their personal experiences and observations related to leadership styles through group interactions, which allowed

for a deeper analysis of leadership behaviors as the discussions unfolded. Additionally, various questions were posed regarding how different leadership styles emerge in different situations and how these styles contribute to project success. Throughout this process, the leadership styles and personality traits of the participants were analyzed to reach the study's conclusions.

During the focus group studies, participants were asked questions such as:

1. "Can you describe your own leadership style when managing agile project teams? How do you think it affects team performance?"
    o This question aimed to understand how participants perceive their leadership approach and its impact on the team's dynamics and outcomes.
2. "In your experience, which leadership personality traits do you consider essential for leading a self-organizing team?"
    o This was designed to explore the traits participants believe are critical for effective leadership in agile environments.
3. "Can you provide an example of a situation where your leadership style helped resolve a challenge within your team?"
    o The goal of this question was to encourage participants to share real-life instances that illustrate how their leadership methods contribute to problem-solving.
4. "How do you adapt your leadership style when facing uncertainty or change within your team?"
    o This aimed at exploring the flexibility of leadership styles in dynamic project environments.
5. "How do you foster collaboration and communication within your team, especially in remote or hybrid working conditions?"
    o This question targeted the role of communicative leadership and its influence on team cohesion and collaboration, particularly in non-traditional work settings.

The researcher took on the role of a moderator during the meetings, refraining from intervening in the discussions and supporting mutual interaction among participants. With participants' permission obtained prior to the meetings, conversations during the online session using Microsoft Teams were recorded. The moderator also took notes during both meetings.

At the end of the discussions, voice recordings were transcribed into text using computer software. These transcriptions were compared with the notes taken by the researcher during the meetings, and all discussions were evaluated together. Throughout this process, leadership styles and characteristics were identified, and the impacts of each style on self-organizing teams were analyzed in detail. The evaluation led to the findings of the research and a refinement of the research model.

3. RESULTS

Literature review results in identified leadership style characteristics and researchers working in this area are presented in Table 2 as shown. The characteristics of leadership styles were presented to focus group studies.

In the focus group sessions, participants were prompted to discuss their personal leadership styles and the traits that define their leadership personalities. The data obtained were analyzed to identify four leadership styles and the corresponding leadership personality traits applicable to each style.

According to the study results, leadership in agile projects has evolved into a dynamic and collective structure where different team members assume leadership roles, distinct from classical single-person leadership models. The success of agile projects relies on team members' high capabilities, talents, and initiative-taking skills, while strong project leadership ensures the effective functioning of agile teams.

As a result of focus group discussions, the proposed research model included four accepted leadership styles: visionary leadership, organizing leadership, communicative leadership, and social leadership. In addition to the research model presented to the focus groups, the 'leadership personality traits' valid in these four leadership styles were also identified.

Visionary leaders contribute to project success by inspiring team members and providing motivation; organizing leaders ensure efficient team operation by organizing processes and workflows; communicative leaders strengthens intra-team communication, enhances information sharing, and promotes collaboration, while social leaders supports team spirit by boosting team members' morale and motivation.

Based on literature review presented in Table 2, characteristics of visionary leadership are creative, change-oriented communicator, visionary and adaptive to change; characteristics of organizing leadership are conscientiousness, task-oriented communicator, dominant task ability and productivity-focused; characteristics of communicative leadership are attention-grabbing, relationship-oriented communicator, facilitator and diplomatic; and characteristics of social leadership are agreeableness, supportive communicator, emotionally resilient and collaborative.

The 'leader personality traits' expected from each of these four leadership styles were also identified in the studies. It is important for a leader to be consistent, confident, reflective, empathetic, conciliatory, and persuasive.

The literature review and focus group meetings resulted in the identification of distributed emergent leadership styles in agile teams, as depicted in Figure 2.

Figure 2. Distributed Emergent Leadership Styles Emerging in Agile Teams
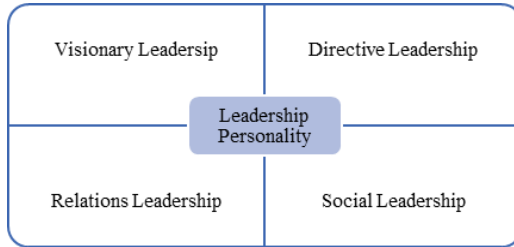
The characteristics determined for the four leadership styles and leadership personality in focus group studies have been supported by additional literature review in Table 2. Sample statements made by the person during the focus group meeting for different leadership styles in the research model are exhibited in Table 3.

1. **Visionary Leadership:** Visionary leaders possess a strategic outlook towards the future and inspire team members to enhance their motivation. These leaders focus on the overall goals of projects, determine the direction of the team, and encourage innovative ideas. Their characteristics are openness to experience, being innovative, adaptive to change, being creative, and change-oriented communicator.

2. **Organizing Leadership:** Organizing leaders ensure processes and workflows are organized, enabling projects to be completed on time and efficiently. They prioritize details and continuously monitor team performance to make necessary adjustments. Their characteristics are conscientiousness, dominant task ability, being meticulous, knowledgeable, and task-oriented communicator.

3. **Communicative Leadership:** Communicative leadership strengthens intra-team communication and promotes information sharing. These leaders enhance collaboration among team members by fostering clear and effective communication, thereby ensuring successful project execution. Their characteristics are extravert, attention-grabbing, facilitator, diplomatic, and relationship-oriented communicator.

4. **Social Leadership:** Social leadership supports team spirit by maintaining high morale and motivation among team members. These leaders pay attention to individual needs within the team and strive to enhance job satisfaction. Their characteristics are agreeableness, being appreciative, emotionally resilient, generous, and supportive communicator.

Table 3. Sample statements made by the person during the focus group meeting for different leadership styles in the research model

Leadership Style	Characteristics	Focus Group Member's Statement
Visionary Leadership	Experience	*During a challenging project, our leader's experience came into play. Having managed a similar project before, she anticipated the risks we faced and helped us take preventative measures. Thanks to her experience, we navigated through the process without major setbacks.*
	Innovative	*Our leader realized that traditional methods were no longer effective and proposed a new approach. By integrating digital tools into our project management process, he accelerated our workflow and increased our efficiency. This innovative mindset encouraged the team to push boundaries and come up with more creative solutions.*
	Adaptive to Change	*When an unexpected change hit the industry, our leader quickly adapted to the new conditions and guided the team accordingly. He revised our strategy swiftly and encouraged the team to embrace the new situation. His flexibility prevented the project from failing and kept the team motivated.*
	Creative	*When the project hit a deadlock, our leader turned the situation around by suggesting a creative solution. By using an approach no one had thought of, we saved time and reduced costs. Her creative thinking allowed us to successfully complete the project.*
	Change-oriented Communicator	*Our leader broke down the team's resistance to change by maintaining clear and transparent communication throughout. He thoroughly explained why the change was necessary and showed how everyone could contribute to the process. Through this change-oriented communication, the team not only accepted the change but also took ownership of it.*
Organizing Leadership	Conscientiousness	*Our leader always approaches work with seriousness and a strong sense of responsibility. Throughout the project, she closely monitored every stage and provided the necessary support to ensure the team met their deadlines. Thanks to her conscientious approach, we didn't encounter any delays in the project.*
	Dominant Task Ability	*Our leader's dominant task ability really shines in complex situations. He breaks the project into manageable parts and efficiently manages each task. This ability allows us to complete even the most complicated projects smoothly.*

	Meticulous	*Our leader pays great attention to detail and works meticulously to ensure perfection. She reviews every page of the reports carefully and corrects even the smallest mistakes. Her meticulous approach ensured the project met the highest quality standards.*
	Knowledgeable	*Our leader's vast knowledge enables him to guide the team correctly in every challenging situation. Especially in technical issues, his deep understanding helps us find quick and effective solutions. The team trusts him completely because of his expertise.*
	Task-oriented Communicator	*Our leader ensures everyone understands their responsibilities by clearly communicating task assignments. When explaining what needs to be done and when, he highlights the most critical parts of the process. Thanks to his task-oriented communication, the team always knows what to focus on, and productivity increases.*
Communicative Leadership	Extravert	*Our leader's extraverted personality creates a lively atmosphere within the team. When starting new projects, he engages with everyone energetically and keeps motivation high. His social nature also helps build strong bonds among team members.*
	Attention-grabbing	*In meetings, our leader always manages to grab attention. His talks are compelling, both in content and in presentation style. Thanks to his attention-grabbing leadership, the team consistently focuses on his words and follows his directions closely.*
	Facilitator	*Our leader is always there to make things easier for the team members. He removes obstacles in projects, ensuring everyone can perform their tasks smoothly. His role as a facilitator enables the team to work more efficiently and cohesively.*
	Diplomatic	*During team conflicts, our leader's diplomatic approach comes into play. He calmly listens to both sides and helps them develop mutual understanding. His balanced and diplomatic attitude allows us to resolve conflicts quickly within the team.*
	Relationship-oriented Communicator	*Our leader focuses not just on the work but also on strengthening relationships with the team members. He is always sensitive to the feelings and needs of others in his communications. His relationship-oriented approach increases trust and loyalty within the team.*
Social Leadership	Agreeableness	*Our leader always works in harmony with the team members. When different opinions or perspectives arise, he focuses on finding a common solution rather than fostering conflict. His agreeable nature creates a peaceful and collaborative atmosphere within the team.*

Appreciative	*Our leader always appreciates the team's efforts and expresses it openly. When a team member delivers outstanding performance, he doesn't hesitate to highlight it and motivate them further. His appreciative attitude boosts employee morale and commitment.*
Emotionally Resilient	*During tough times, our leader's emotional resilience sets an example for the whole team. Even under pressure, she maintains her calm and makes rational decisions. Her composure helps the team handle stress and stay focused.*
Generous	*Our leader is always generous with his time and knowledge. He doesn't hesitate to go the extra mile to help team members grow and supports their professional development. His generosity contributes to making the team stronger and more capable.*
Supportive Communicator	*Our leader consistently communicates in a supportive manner with everyone on the team. When someone faces a problem, she encourages them to find solutions and reassures them that she's there every step of the way. This supportive approach helps the team feel secure and act with confidence.*

3.5. Leadership Personality

In studies conducted, significant personal characteristics expected from each of the four leadership styles have been identified. Firstly, it is essential for a leader to be stable; meaning, they should not allow negative emotions such as stress, anxiety, or depression to affect their work performance when faced with challenges or pressure. Secondly, self-confidence in a leader is crucial. A leader who trusts their abilities, values, and decisions can instill confidence in team members and provide effective guidance. Thirdly, leadership requires reflectiveness. This entails knowing one's strengths and weaknesses and adjusting attitudes and behaviors based on this knowledge. Empathy is also a critical trait; a leader should be sensitive to others' feelings and situations, reflecting this understanding in their management practices. Additionally, leaders are expected to be conciliatory, effectively resolving conflicts and fostering collaboration among parties. Lastly, persuasive leadership is important; the ability to influence others' thoughts and behaviors allows a leader to effectively convey their determination and leadership vision to others. Characteristics required in such leaders and researchers working on these issues after focus group studies are stability, self-confidence, reflectiveness, empathy, conciliatoriness, persuasiveness. Examples from focus grup members recorded in the meeting are exhibited in Table 4.

Table 4. Sample statements made by the person during the focus group meeting for leadership personality

Characteristic	Focus Group Member's Statements
Stability	*When we faced a major crisis in the project, our leader managed the stressful situation with great composure. While other team members were in panic, he gathered everyone together and quickly developed an effective solution. His calmness helped the team stay motivated and meet the deadline.*
Self-confidence	*During the meeting, while everyone was hesitating, our leader took charge with strong determination. Her confidence in her own abilities allowed her to make a swift and accurate decision on a controversial issue. This approach strengthened the team's trust in her and helped everyone move in the same direction.*
Reflectiveness	*When reflecting on the mistakes in the last project, our leader didn't shy away from criticizing himself. By acknowledging his own weaknesses, he openly discussed where he needed to improve. This level of self-awareness helped instill a culture of self-evaluation and continuous improvement within the team.*
Empathy	*One of our teammates was going through a tough time with his family, and our leader noticed the situation. She took the time to speak with him individually, offering support and lightening his workload during that difficult period. This empathetic approach not only boosted his morale but also increased the team's overall loyalty and trust.*
Conciliatoriness	*When a major disagreement erupted between two teammates, our leader stepped in and listened to both sides. He identified the underlying issues and offered a solution that respected everyone's interests. This quickly diffused the tension within the team and allowed everyone to refocus on the project.*

4. DISCUSSION

In the first stage of the study, the research model developed through literature review was largely supported following focus group sessions. For Visionary Leadership, characteristics such as 'Creative', 'Change-oriented Communicator', and 'Adaptive to Change' were highlighted; for Organizing Leadership, characteristics like 'Conscientiousness', 'Task-oriented Communicator', and 'Dominant Task Ability' were identified; for Communication Leadership, qualities such as 'Attention-grabbing', 'Relationship-oriented Communicator', 'Diplomatic', and 'Facilitator' emerged as significant; and for Social Leadership, traits like 'Agreeableness', 'Supportive Communication', and 'Emotional Resilient' were emphasized in focus group studies.

Some features included in the research model were further detailed and discussed during focus group sessions. For Visionary Leadership, 'Visionary' was replaced with characteristics like 'Openness to Experience' and 'Innovative'; for Organizing Leadership, 'Productivity-Oriented' was substituted with traits such as 'Meticulous' and 'Knowledgeable'; and for Social Leadership, 'Collaborative' was replaced with 'Generous' and 'Appreciative' qualities.

Additionally, the trait of 'Extraversion', not initially included in the model, was considered significant. Moreover, 'Leadership Personality' traits such as Stability, Self-confidence, Reflectiveness, Empathy, Conciliatoriness, and Persuasiveness emerged as important during focus group discussions, despite not being present in the initial model.

Further literature review conducted based on these recommendations supports the insights from the focus groups. Table 3 presents the newly added features to the model and researchers working in this area.

CONCLUSION

This study analyzes the new opportunities and challenges faced by project management in the Industry 4.0 era. During this period, digital competencies and technological transformation have become fundamental elements of project management. Traditional project management approaches have proven inadequate for rapidly changing and complex environments. Therefore, modern approaches such as agile project management are critical to enhancing project success.

Industry 4.0 not only transforms production processes but also management and leadership paradigms. It necessitates the adoption of more flexible, adaptive, and participatory leadership approaches. The study explores the impact of leadership theories on managing agile project teams, emphasizing the importance of developing technology-focused competencies for success in this era. It also highlights the importance of self-managing or self-organizing agile software development teams, pointing out gaps in the literature on this topic. The article provides a detailed examination of the evolution of leadership concepts and their role in agile project teams, particularly in teams capable of self-organization.

In conclusion, the Industry 4.0 era requires a redefinition of project management and leadership paradigms. Success in this period hinges on organizing organizational structures flexibly and innovatively, developing technology-focused competencies, and fostering an environment where every individual can contribute as a leader.

ENDÜSTRİ 4.0 VE ÇEVİK PROJE YÖNETİMİ: LİDERLİK KAVRAMLARININ VE ROLLERİNİN EVRİMİ

1. GİRİŞ

Endüstri 4.0 çağının dinamik ve karmaşık çalışma ortamında geleneksel liderlik modelleri yetersiz kalmaktadır. İş dünyası daha esnek, uyumlu, katılımcı liderlik yaklaşımlarına ihtiyaç duyulmaktadır. Proje takımlarının değişen koşullara daha hızlı ve etkili bir şekilde uyum sağlamasını mümkün kılan çevik proje yönetiminde liderlik yaklaşımı Endüstri 4.0 bağlamında yeniden değerlendirilmelidir.

Bu çalışmada, Endüstri 4.0 öncesi ve sonrası liderlik teorileri incelenmiş, çevik proje ekiplerinde liderlik rollerinin evrimi ve bu ekiplerde etkili olan liderlik tarzları ortaya çıkartılmıştır. Çalışma, literatür taraması ve odak grup çalışması nitel araştırma yöntemi kullanılarak iki ana aşamada yapılmıştır. Bulgular, vizyoner, düzenleyici, iletişimde ve sosyal liderlik liderlik tarzlarının çevik proje yönetiminde önemli rol oynadığını ortaya çıkartmıştır. Makale, liderlik tarzlarının karakteristiklerini literatürle ilişkilendirerek gelecekteki liderlik araştırmalarına ve iş uygulamalarına katkı sağlamaktadır.

2. YÖNTEM

Bu çalışmada, Endüstri 4.0 öncesi ve sonrası liderlik teorilerinin gelişimini araştıran iki literatür taraması gerçekleştirilmiştir. İlk literatür taraması, Endüstri 4.0 öncesi liderlik okullarının ve bu alandaki önde gelen araştırmacıların özelliklerini belirlemeyi hedeflemiştir. İnsanlık tarihi boyunca birçok lider toplumları etkilemiş ve dünya tarihini şekillendirmiştir. Büyük Adam Teorisi'nden Endüstri 4.0 öncesine kadar liderlik teorileri altı ana okulda kategorize edilmiştir. Özellikler Okulu, Davranış Okulu, Durumsallık Okulu, Vizyoner veya Karizmatik Okul, Duygusal Zekâ Okulu, Yetkinlik Okulu. Literatür taramasında bu okulların karakteristik özellikleri ve önde gelen araştırmacıları araştırılmıştır. İkinci literatür taraması kollektif liderlik teorileri üzerine yapılmıştır. Kolektif liderlik, geleneksel liderlik paradigmasından temelde farklıdır; odak, resmi bir liderin rolünde değil, ekip üyelerinin birbirleriyle etkileşime girerek liderlik sorumluluklarını paylaşmalarında ve ekibi yönetmelerindedir. Kolektif liderlik, paylaşılan liderlik, dağıtılmış liderlik ve ortaya çıkan liderlik teorileri araştırılmış, çevik proje yönetimi bağlamında kullanılma durumları irdelenmiştir.

Daha sonra iki odak grup oluşturulmuştur: Çevik proje yönetimi uzmanlarından oluşan birinci grup ile online olarak, büyük bir kurumsal bankanın üst düzey yöneticileri ile oluşturulan ikinci grup ile de yüz yüze toplantılar gerçekleştirilmiştir. Odak grup çalışmaları Nisan 2024'te gerçekleştirilmiş ve toplantılarda elde edilen veriler detaylı bir şekilde analiz edilmiştir. Bu analizler sonucunda liderlik stilleri ve özellikleri belirlenmiş ve her stilin kendini organize eden takımlar üzerindeki etkileri incelenmiştir. Odak grup çalışmalarında araştırma modeli değerlendirilmiş ve bu değerlendirmelere dayalı olarak modelde gerekli revizyonlar yapılmıştır.

3. BULGULAR

Çalışma sonuçlarına göre, çevik projelerde liderlik klasik tek kişilik liderlik modellerinden farklı olarak dinamik ve kolektif bir yapıya evrilmiştir. Odak grup tartışmalarının sonucunda, önerilen araştırma modeli dört kabul edilen liderlik tarzını içermiştir: vizyoner liderlik, düzenleyici liderlik, iletişimde liderlik ve sosyal liderlik. Odak gruplarına sunulan araştırma modeline ek olarak, bu dört liderlik tarzında geçerli olan 'lider kişilik özellikleri' de tanımlanmıştır.

Vizyoner liderler, projelerin başarısına ilham vererek ve motivasyon sağlayarak katkıda bulunur; düzenleyici liderler süreçleri ve iş akışlarını düzenleyerek etkin bir şekilde ekip operasyonunu sağlar; iletişim liderleri takım içi ve dışı paydaşlarla iletişimi güçlendirir, bilgi paylaşımını artırır ve işbirliğini teşvik ederken, sosyal liderler ekip üyelerinin moralini ve motivasyonunu artırarak takım ruhunu destekler. Her bir liderlik tarzı için beklenen 'lider kişilik özellikleri' de çalışmalarda tanımlanmıştır. Bir liderin kararlı, kendine güvenen, reflektif, empatik, uzlaşmacı ve ikna edici olması önemlidir.

4. TARTIŞMA

Bulgular, Endüstri 4.0'ın proje yönetimi üzerindeki etkilerini ve liderlik yaklaşımlarının yeniden tanımlanması gerektiğini ortaya koymaktadır. Çalışma, liderlik tarzlarının karakteristiklerini ve bu tarzların çevik takımlardaki etkilerini literatürle ilişkilendirerek gelecekteki liderlik araştırmalarına ve iş uygulamalarına katkı sağlamaktadır.

İlk aşamada, literatür taraması ile geliştirilen araştırma modeli, odak grup oturumlarında geniş ölçüde destek bulmuştur. İlk modelde yer alan pek çok kavram odak grup çalışmalarında da önemli bulunmuştur. Vizyoner Liderlik için 'Yaratıcı', 'Değişim odaklı iletişimci' ve 'Değişime uyum sağlayabilen'; Düzenleyici Liderlik için 'Sorumluluk alan', 'Görev odaklı iletişimci' ve 'Baskın görev yeteneği'; İletişimde Liderlik için 'Dikkat çekici', 'İlişki odaklı iletişimci', 'Diplomatik' ve 'Kolaylaştırıcı'; Sosyal Liderlik için ise 'Uyumlu', 'Destekleyici iletişim' ve 'Duygusal dayanıklı' nitelikleri odak grup tarafından öne çıkartılmıştır.

Araştırma modelinde yer alan bazı özellikler, odak grup oturumları sırasında daha detaylı olarak tartışılmıştır. Vizyoner Liderlik için 'Hayalperest' özelliği 'Deneyime Açık' ve 'Yenilikçi' nitelikleriyle; Düzenleyici Liderlik için 'Verimlilik odaklı' özelliği 'Detaycı' ve 'Bilgili' nitelikleriyle ve Sosyal Liderlik için 'İşbirlikçi' niteliği 'Paylaşımcı' ve 'Takdir edici' özellikleriyle değiştirilmiştir.

Ayrıca, ilk modelde bulunmayan 'Dışa dönüklük' özelliği de önemli görülmüştür. Ayrıca yine ilk modelde ayrı bir değişken olarak ele alınmayan 'Liderlik Kişiliği' de kararlı, kendine güvenen, reflektif, empatik, uzlaşmacı ve ikna edici özellikleri ile modele dahil edilmiştir.

SONUÇ

Bu çalışma, Endüstri 4.0 döneminde proje yönetiminin karşılaştığı yeni fırsatlar ve zorlukları analiz etmektedir. Geleneksel proje yönetimi yaklaşımlarının, hızlı değişen ve karmaşık ortamlar için yetersiz kaldığı bu yeni dönemde, çevik proje yönetimi gibi modern yaklaşımlar, proje başarısını artırmak için kritik öneme sahiptir.

Endüstri 4.0, sadece üretim süreçlerini değil, aynı zamanda yönetim ve liderlik anlayışlarını da dönüştürmektedir. Daha esnek, uyumlu ve katılımcı liderlik yaklaşımlarının benimsenmesi gerekmektedir. Çevik proje takımlarının yönetiminde liderlik teorilerinin etkileri incelenmiş ve bu dönemde başarılı olmanın, teknoloji odaklı yetkinliklerin geliştirilmesi ile mümkün olduğu vurgulanmıştır. Çalışma, çevik yazılım geliştirme ekiplerinin kendi kendine yönetmesi veya organize olabilmesinin önemini ve bu konuda literatürdeki bilgi eksikliğini ortaya koymaktadır. Makalede, liderlik kavramının evrimi ve çevik proje takımlarındaki rolü detaylı bir şekilde ele alınmıştır. Özellikle kendi kendini organize edebilen çevik proje takımlarının yönetiminde liderlik tarzlarının etkileri analiz edilmiş ve çevik proje takımlarında dağıtılmış ortaya çıkan liderlik araştırma modeli oluşturulmuştur.

Sonuç olarak, Endüstri 4.0 döneminde proje yönetimi ve liderlik anlayışlarının yeniden tanımlanması gerekmektedir. Bu dönemde, başarılı olmak için organizasyonel yapıların esnek ve yenilikçi bir şekilde düzenlenmesi, teknoloji odaklı yetkinliklerin geliştirilmesi ve her bireyin lider olarak katkıda bulunabileceği bir ortam oluşturulması büyük önem taşımaktadır.

REFERENCES

Acharya, B., and Colomo-Palacios, R. (2019). A Systematic Literature Review on Autonomous Agile Teams. 2019 19th International Conference on Computational Science and Its Applications (ICCSA), 01-04 July 2019, St. Petersburg, Russia, 146–151. https://doi.org/10.1109/ICCSA.2019.00014

Ağlargöz, O. (2018). Mary Parker Follett'ın Yönetim Düşüncesi. *Amme Idaresi Dergisi*, 51, 1–26.

Anderson, L., Alleman, G. B., Beck, K., Blotner, J., Cunningham, W., Poppendieck, M., and Wirfs-Brock, R. (2003). Agile management - an oxymoron? Who needs managers anyway? OOPSŞA '03: Companion of the 18th Annual ACM SIGPLAN Conference on Object-Oriented Programming, Systems, Languages, and Applications, October 26–30, 2003, Anaheim, California, USA, 275–277. https://doi.org/10.1145/949344.949410

Andrews, P. H. (1984). Performance-self-esteem and perceptions of leadership emergence: A comparative study of men and women. *Western Journal of Speech Communication*, 48 (1), 1–13. https://doi.org/10.1080/10570318409374137

Augustine, S., Payne, B., Sencindiver, F., and Woodcock, S. (2005). Agile project management: *Steering from the edges. Communications of the ACM*, 48 (12), 85–89.

Avolio, B. J., and Bass, B. M. (1995). Individual consideration viewed at multiple levels of analysis: A multi-level framework for examining the diffusion of transformational leadership. *The Leadership Quarterly*, 6 (2), 199–218. https://doi.org/10.1016/1048-9843(95)90035-7

Avolio, B. J., Walumbwa, F. O., and Weber, T. J. (2009). Leadership: Current Theories, Research, and Future Directions. *Annual Review of Psychology*, 60 (1), 421–449. https://doi.org/10.1146/annurev.psych.60.110707.163621

Aycan, Z. (2021). Yeni Nesil İçin Liderlik: Güç Kültüründen Güçlendirme Kültürüne Dönüsüm. İstanbul: CEO Plus.

Babkin, A., Safiullin, A., Tronin, V., and Alexandrov, A. (2022). Transformation of Software Project Management in Industry 4.0. D. Rodionov, T. Kudryavtseva, A. Skhvediani, M. A. Berawi, M.A. (Eds.), *Innovations in Digital Economy* in, (p. 159–170). SPBPU IDE 2021. Communications in Computer and Information Science, vol 1619. Springer, Cham. https://doi.org/10.1007/978-3-031-14985-6_11

Bao, S. (2010). The Principles of Persuasion in Executive Leadership [CMS Senior Theses, 25, Claremont McKenna College]. https://scholarship.claremont.edu/cmc_theses/25

Barry, D. (1991). Managing the bossless team: Lessons in distributed leadership. *Organizational Dynamics*, 20 (1), 31–47. https://doi.org/10.1016/0090-2616(91)90081-J

Bass, B. M. (1990). From transactional to transformational leadership: Learning to share the vision. *Organizational Dynamics*, 18 (3), 19–31. https://doi.org/10.1016/0090-2616(90)90061-S

Beck, K., Beedle, M., van Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., Grenning, J., Highsmith, J., Hunt, A., Jeffries, R., Kern, J., Marick, B., Martin, R. C., Mellor, S., Schwaber, K., Sutherland, J., and Thomas, D. (2001). Manifesto for Agile Software Development. Manifesto for Agile Software Development. https://agilemanifesto.org/

Boehm, B. (1986). A spiral model of software development and enhancement. *AGM SIGSOFT Software Engineering. Notes*, 11 (4), 14–24. https://doi.org/10.1145/12944.12948

Bolden, R. (2011). Distributed Leadership in Organizations: A Review of Theory and Research. *International Journal of Management Reviews*, 13 (3), 251–269. https://doi.org/10.1111/j.1468-2370.2011.00306.x

Bowers, D. G., and Seashore, S. E. (1966). Predicting organizational effectiveness with a four-factor theory of leadership. *Administrative Science Quarterly*, 11, 238–263. https://doi.org/10.2307/2391247

Boyatzis, R. (1997). Book Review: Management: A Sociological Introduction By Keith Grint. 1995. *Human Relations*, Cambridge: Polity Press, 277 pp., 50, 13–95. https://doi.org/10.1023/A:1016963029588

Boyatzis, R., and McClelland, D. (1982). Leadership motive pattern and long term success in management. *Journal of Applied Psychology*, 67, 737–743.

Boyatzis, R., McKee, A., and Goleman, D. (2002). Reawakening Your Passion for Work. *Harvard Business Review*, April 2002, 5–11.

Burns. (1978). Leadership by James MacGregor Burns. New York City: Harper Torchbooks.

Camci, A., and Kotnour, T. (2019). How to Manage Projects in Industry 4.0 Environment: Aligning Management Style With Complexity. H. Bolat, G. Temur (Eds.) *Agile Approaches for Successfully Managing and Executing Projects in the Fourth Industrial Revolution* in, (p. 20–39). IGI Global. https://doi.org/10.4018/978-1-5225-7865-9.ch002

Carson, J. B., Tesluk, P. E., and Marrone, J. A. (2007). Shared Leadership in Teams: An Investigation of Antecedent Conditions and Performance. *Academy of Management Journal*, 50 (5), 1217–1234. https://doi.org/10.5465/amj.2007.20159921

Carvalho, F., Costa, J., and Amaral, D. (2015). Envisioning Products To Support The Agile Management Of Innovative Design. 20th International Conference on Engineering Design (ICED 15) Vol 3: Organisation and Management, 27-30 July 2015, Politecnico Di Milano, Italy, 1–10.

Cerezo-Narváez, A., Otero-Mateo, M., and Pastor, A. (2017). Development of professional competences for industry 4.0 project management. 7th IESM Conference, October 11 – 13, 2017, Saarbrücken, Germany, 487–492.

Çınar, F., and Kaban, A. (2012). Conflict Management and Visionary Leadership: An Application in Hospital Organizations. *Procedia - Social and Behavioral Sciences*, 58, 197–206. https://doi.org/10.1016/j.sbspro.2012.09.993

Cogliser, C. C., Gardner, W. L., Gavin, M. B., and Broberg, J. C. (2012). Big Five Personality Factors and Leader Emergence in Virtual Teams. *Group & Organization Management*, 37 (6), 752–784. https://doi.org/10.1177/1059601112464266

Çokluk, Ö., Yılmaz, K., and Oğuz, E. (2011). A Qualitative Interview Method: Focus Group Interview. *Journal of Theoretical Educational Science*, 4 (1), 95–107.

Cronshaw, S. F., and Ellis, R. J. (1991). A process investigation of self-monitoring and leader emergence. *Small Group Research*, 22, 403–420. https://doi.org/10.1177/1046496491224001

Daraojimba, E. C., Nwasike, C. N., Adegbite, A. O., Ezeigweneme, C. A., and Gidiagba, J. O. (2024). Comprehensive Review of Agile Methodologies in Prroject Management. *Computer Science & IT Research Journal*, 5 (1), Article 1. https://doi.org/10.51594/csitrj.v5i1.717

De Souza, G., and Klein, H. J. (1995). Emergent Leadership in the Group Goal-Setting Process. *Small Group Research*, 26 (4), 475–496. https://doi.org/10.1177/1046496495264002

DeRue, D., Nahrgang, J., and Ashford, S. (2015). Interpersonal Perceptions and the Emergence of Leadership Structures in Groups: A Network Perspective. *Organization Science*, 26, 1–18. https://doi.org/10.1287/orsc.2014.0963

Dess, G. G., and Picken, J. C. (2000). Changing roles: Leadership in the 21st century. *Organizational Dynamics*, 28 (3), 18–34. https://doi.org/10.1016/S0090-2616(00)88447-8

Dobbins, G. H., Long, W. S., Dedrick, E. J., and Clemons, T. C. (1990). The role of self-monitoring and gender on leader emergence: A laboratory and field study. *Journal of Management*, 16 (3), 609–618. https://doi.org/10.1177/014920639001600306

Dubinsky, Y., and Hazzan, O. (2010). Ad-hoc leadership in agile software development environments. 2010 ICSE Workshop on Cooperative and Human Aspects of Software Engineering, May 3 - 4, 2010, Cape Town South Africa, 32–38. https://doi.org/10.1145/1833310.1833316

Dulewicz, V., and Higgs, M. (2005). Assessing leadership styles and organisational context. *Journal of Managerial Psychology*, 20 (2), 105–123. https://doi.org/10.1108/02683940510579759

Ensari, N., Riggio, R. E., Christian, J., and Carslaw, G. (2011). Who emerges as a leader? Meta-analyses of individual differences as predictors of leadership emergence. *Personality and Individual Differences*, 51 (4), 532–536. https://doi.org/10.1016/j.paid.2011.05.017

Friedrich, T. L., Vessey, W. B., Schuelke, M. J., Ruark, G. A., and Mumford, M. D. (2009). A framework for understanding collective leadership: The selective utilization of leader and team expertise within networks. *The Leadership Quarterly*, 20 (6), 933–958. https://doi.org/10.1016/j.leaqua.2009.09.008

Gauglitz, R. E. (2019). Feedback and Appreciation at Work [Inaugural-Dissertation]. Technische Universität Darmstadt.

Gerpott, F., Lehmann-Willenbrock, N., Voelpel, S., and Vugt, M. (2019). It's not just what is said but also when it's said: A temporal account of verbal behaviors and emergent leadership in self-managed teams. *The Academy of Management Journal*, 62 (3), 717–738. https://doi.org/10.5465/amj.2017.0149

Goleman, D. (1998). Working with Emotional Intelligence. Random House Publishing Group.

Gronn, P. (2002). Distributed leadership as a unit of analysis. *The Leadership Quarterly*, 13 (4), 423–451. https://doi.org/10.1016/S1048-9843(02)00120-0

Guastello, S. J. (1995). Facilitative Style, Individual Innovation, and Emergent Leadership in Problem Solving Groups. *The Journal of Creative Behavior*, 29 (4), 225–239. https://doi.org/10.1002/j.2162-6057.1995.tb01397.x

Hanna, A. A., Smith, T. A., Kirkman, B. L., and Griffin, R. W. (2021). The Emergence of Emergent Leadership: A Comprehensive Framework and Directions for Future Research. *Journal of Management*, 47 (1), 76–104. https://doi.org/10.1177/0149206320965683

Hannila, H., Kuula, S., Harkonen, J., and Haapasalo, H. (2022). Digitalisation of a company decision-making system: A concept for data-driven and fact-based product portfolio management. *Journal of Decision Systems*, 31 (3), 258–279. https://doi.org/10.1080/12460125.2020.1829386

Hiller, N., Day, D., and Vance, R. (2006). Collective enactment of leadership roles and team effectiveness: A field study. *The Leadership Quarterly*, 17, 387–397. https://doi.org/10.1016/j.leaqua.2006.04.004

Hoda, R., Noble, J., and Marshall, S. (2013). Self-Organizing Roles on Agile Software Development Teams. *IEEE Transactions On Software Engineering*, 39, 422–444. https://doi.org/10.1109/TSE.2012.30

Hohl, P., Klünder, J., van Bennekum, A., Lockard, R., Gifford, J., Münch, J., Stupperich, M., and Schneider, K. (2018). Back to the future: Origins and directions of the "Agile Manifesto" – views of the originators. *Journal of Software Engineering Research and Development*, 6 (1), 1–27. https://doi.org/10.1186/s40411-018-0059-z

Hunt, T., and Fedynich, L. (2019). Leadership: Past, Present, and Future: An Evolution of an Idea. *Journal of Arts and Humanities*, 8 (2), Article 2. https://doi.org/10.18533/journal.v8i2.1582

İşler, H. (2021). The effects of the first and second industrial revolutions on vocational and technical education systems. *Studies in Educational Research and Development*, 5 (1), 72–84.

Jonason, P. K., and Webster, G. (2010). The Dirty Dozen: A Concise Measure of the Dark Triad. *Psychological Assessment*, 22 (2), 420–432. https://doi.org/10.1037/a0019265

Judge, T. A., Bono, J. E., Ilies, R., and Gerhardt, M. W. (2002). Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology*, 87 (4), 765–780. https://doi.org/10.1037/0021-9010.87.4.765

Kharabe, A., Lyytinen, K., and Grover, V. (2013). Do Organizational Competencies Influence How Enterprise Systems Foster Organizational Agility? Thirty Fourth International Conference on Information Systems, December 15-18, 2013, Milan.

Kirkpatick, S. A., and Locke, E. A. (1991). Leadership: Do traits matter? *Academy of Management Perspectives*, 5 (2), 48–60. https://doi.org/10.5465/ame.1991.4274679

Kortantamer, D. (2023). Distributed Leadership in Projects: The Contributions of Stakeholders. *Project Management Journal*, 54 (2), 179–193. https://doi.org/10.1177/87569728221143049

Kozak-Holland, M. (2011). The History of Project Management. Oshawa, Ontario: Multi-Media Publications.

Kwok, N., Hanig, S., Brown, D. J., and Shen, W. (2018). How leader role identity influences the process of leader emergence: A social network analysis. *The Leadership Quarterly*, 29 (6), 648–662. https://doi.org/10.1016/j.leaqua.2018.04.003

Lanaj, K., and Hollenbeck, J. R. (2015). Leadership Over-Emergence in Self-Managing Teams: The Role of Gender and Countervailing Biases. *Academy of Management Journal*, 58 (5), 1476–1494. https://doi.org/10.5465/amj.2013.0303

Lennox, R. D., and Wolfe, R. N. (1984). Revision of the Self-Monitoring Scale. *Journal of Personality and Social Psychology*, 46 (6), 1349–1364. https://doi.org/10.1037/0022-3514.46.6.1349

Li, Y., Hui, C., Ashkanasy, N., and Ahlstrom, D. (2012). A multi-level study of emergent group leadership: Effects of emotional stability and group conflict. *Asia Pacific Journal of Management*, 29, 351–366. https://doi.org/10.1007/s10490-012-9298-4

Liang, J., Farh, C. I. C., and Farh, J.-L. (2012). Psychological Antecedents of Promotive and Prohibitive Voice: A Two-Wave Examination. *Academy of Management Journal*, 55 (1), 71–92. https://doi.org/10.5465/amj.2010.0176

Lord, R. G., de Vader, C. L., and Alliger, G. M. (1986). A meta-analysis of the relation between personality traits and leadership perceptions: An application of validity generalization procedures. *Journal of Applied Psychology*, 71 (3), 402–410. https://doi.org/10.1037/0021-9010.71.3.402

Lord, R. G., Foti, R. J., and De Vader, C. L. (1984). A test of leadership categorization theory: Internal structure, information processing, and leadership perceptions. *Organizational Behavior and Human Performance*, 34 (3), 343–378. https://doi.org/10.1016/0030-5073(84)90043-6

Luria, G., and Berson, Y. (2013). How do leadership motives affect informal and formal leadership emergence? *Journal of Organizational Behavior*, 34 (7), 995–1015. https://doi.org/10.1002/job.1836

Mann, R. D. (1959). A review of the relationships between personality and performance in small groups. *Psychological Bulletin*, 56 (4), 241–270. https://doi.org/10.1037/h0044587

Modi, S., and Strode, D. (2020). Leadership in Agile Software Development: A Systematic Literature Review Completed research paper. Australasian Conference on Information Systems, ACIS 2020, December 1-4, 2020, Wellington, New Zealand. 55.

Packendorff, J. (1995). Inquiring into the temporary organization: New directions for project management research. *Scandinavian Journal of Management*, 11 (4), 319–333. https://doi.org/10.1016/0956-5221(95)00018-Q

Paulhus, D., and Jones, D. (2015). Chapter 20 - Measures of Dark Personalities. G. J. Boyle, D. H. Saklofske, G. Matthews (Eds.) *Measures of Personality and Social Psychological Constructs* in, (p. 562–594). Academic Press, https://doi.org/10.1016/B978-0-12-386915-9.00020-6

Pearce, C., and Sims, H. (2001). Shared leadership: Toward a multi-level theory of leadership. *Advances in Interdisciplinary Studies of Work Teams*, 7, 115–139. https://doi.org/10.1016/S1572-0977(00)07008-4

Perera, G. I. U. S., and Fernando, M. S. D. (2009). Rapid Decision Making For Post Architectural Changes In Agile Development–A Guide To Reduce Uncertainty. *International Journal of Information Technology and Knowledge Management*, 2(2), 249–256.

Piper, R. (2001). Introduction to PMI. Offshore Technology Conference, April 30–May 3, 2001, Houston, Texas. https://doi.org/10.4043/13298-MS

Przybilla, L., Präg, A., Wiesche, M., and Krcmar, H. (2020). A Conceptual Model of Antecedents of Emergent Leadership in Agile Teams. SIGMIS-CPR'20: Proceedings of the 2020 on Computers and People Research Conference, June 19 - 21, 2020, Nuremberg, Germany. 164–165. https://doi.org/10.1145/3378539.3393844

Przybilla, L., Wiesche, M., and Krcmar, H. (2019). Emergent Leadership in Agile Teams—An Initial Exploration. SIGMIS-CPR'19: Proceedings of the 2019 on Computers and People Research Conference, June 20 - 22, 2019, Nashville TN USA. 176–179. https://doi.org/10.1145/3322385.3322423

Ralston, L. (2008). Agile Project Leadership My Top 10 Value Driven Principles. Agile 2008 Conference, 04-08 August 2008, Toronto, ON, Canada. 417–422. https://doi.org/10.1109/Agile.2008.47

Roblek, V., Meško, M., and Krapež, A. (2016). A Complex View of Industry 4.0. *Sage Open*, 6 (2), 1–11. https://doi.org/10.1177/2158244016653987

Semolic, B., and Steyn, P. (2017). Industry 4.0 Virtual Value Chains and Collaborative Projects. PM World Journal, VI (IX), 1–20. https://doi.org/10.1108/MBR-05-2017-0028

Sharma, S., and Sharma, S. K. (2016). Team Resilience: Scale Development and Validation. *Vision: The Journal of Business Perspective*, 20 (1), 37–53. https://doi.org/10.1177/0972262916628952

Snyder, M. (1979). Self-Monitoring Processes. *Advances in Experimental Social Psychology*, 12, 85–128. https://doi.org/10.1016/S0065-2601(08)60260-9

Srivastava, P., and Jain, S. (2017). A leadership framework for distributed self-organized scrum teams. *Team Performance Management: An International Journal*, 23 (5/6), 293–314. https://doi.org/10.1108/TPM-06-2016-0033

Stake, J. E. (1979). The Ability/Performance Dimension of Self-esteem: Implications for Women's Achievement Behavior. *Psychology of Women Quarterly*, 3 (4), 365–377. https://doi.org/10.1111/j.1471-6402.1979.tb00686.x

Stogdill, R. M. (1948). Personal Factors Associated with Leadership: A Survey of the Literature. *The Journal of Psychology*, 25 (1), 35–71. https://doi.org/10.1080/00223980.1948.9917362

Svejvig, P. (2021). A Meta-theoretical framework for theory building in project management. *International Journal of Project Management*, 39 (8), 849–872. https://doi.org/10.1016/j.ijproman.2021.09.006

Tabassum, M., Raziq, M. M., and Sarwar, N. (2023). Toward an overarching multi-level conceptualization of emergent leadership: Perspectives from social identity, and implicit leadership theories. *Human Resource Management Review*, 33 (2), 100951. https://doi.org/10.1016/j.hrmr.2022.100951

Taboada, I., Daneshpajouh, A., Toledo, N., and de Vass, T. (2023). Artificial Intelligence Enabled Project Management: A Systematic Literature Review. *Applied Sciences*, 13 (8), Article 8. https://doi.org/10.3390/app13085014

Takeuchi, H., and Nonaka, I. (1986). The new new product development game. *Harvard Business Review*, 64 (1), 137–146.

Tozkoparan, G., and Vatansever, Ç. (2011). Farklılıkların Yönetimi İnsan Kaynakları Yöneticilerinin Farklılık Algısı Üzerine Bir Odak Grup Çalışması. *Akdeniz IIBF Dergisi*, 11 (21), 89–109.

Turner, J. R., and Müller, R. (2005). The Project Manager's Leadership Style as a Success Factor on Projects: A Literature Review. *Project Management Journal*, 36 (2), 49–61. https://doi.org/10.1177/875697280503600206

Uhl-Bien, M., Marion, R., and McKelvey, B. (2007). Complexity Leadership Theory: Shifting leadership from the industrial age to the knowledge era. *The Leadership Quarterly*, 18 (4), 298–318. https://doi.org/10.1016/j.leaqua.2007.04.002

Üzüm, B., and Uçkun, S. (2019). Liderlik Yeni Yaklaşımlar (1st ed.). İzmit-Kocaeli: Umuttepe Yayınları.

Wiechmann, D. M., Reichstein, C., Haerting, R.-C., Bueechl, J., and Pressl, M. (2022). Agile management to secure competitiveness in times of digital transformation in medium-sized businesses. *Procedia Computer Science*, 207, 2353–2363. https://doi.org/10.1016/j.procs.2022.09.294

Wilenius, M. (2014). Leadership in the sixth wave—Excursions into the new paradigm of the Kondratieff cycle 2010–2050. *European Journal of Futures Research*, 2 (1), Article 1. https://doi.org/10.1007/s40309-014-0036-7

Wolff, S. B., Pescosolido, A. T., and Druskat, V. U. (2002). Emotional intelligence as the basis of leadership emergence in self-managing teams. *The Leadership Quarterly*, 13 (5), 505–522. https://doi.org/10.1016/S1048-9843(02)00141-8

Xu, L., Xu, E., and Li, L. (2018). Industry 4.0: State of the art and future trends. International *Journal of Production Research*, 56 (8), 1–22. https://doi.org/10.1080/00207543.2018.1444806

Yang, H., Huff, S., and Strode, D. (2009). Leadership in Software Development: Comparing Perceptions of Agile and Traditional Project Managers. AMCIS 2009: Proceedings of the Fifteenth Americas Conference on Information Systems, August 6th-9th 2009, San Francisco, California, 184. https://aisel.aisnet.org/amcis2009/184/

Yoder, D. (1926). Current Definitions of Revolution. *American Journal of Sociology*, 32(3), 433–441. https://doi.org/10.1086/214128

Ziegert, J. C. (2005). Does More Than One Cook Spoil the Broth? An Examination of Shared Team Leadership [Dissertation, University of Maryland]. https://drum.lib.umd.edu/handle/1903/2718

KATKI ORANI / *CONTRIBUTION RATE*	AÇIKLAMA / *EXPLANATION*	KATKIDA BULUNANLAR / *CONTRIBUTORS*
Fikir veya Kavram / *Idea or Notion*	Araştırma hipotezini veya fikrini oluşturmak / *Form the research hypothesis or idea*	Hamit Metin ÖRNEK Alper CAMCI
Tasarım / *Design*	Yöntemi, ölçeği ve deseni tasarlamak / *Designing method, scale and pattern*	Hamit Metin ÖRNEK Alper CAMCI
Veri Toplama ve İşleme / *Data Collecting and Processing*	Verileri toplamak, düzenlenmek ve raporlamak / *Collecting, organizing and reporting data*	Hamit Metin ÖRNEK Alper CAMCI
Tartışma ve Yorum / *Discussion and Interpretation*	Bulguların değerlendirilmesinde ve sonuçlandırılmasında sorumluluk almak / *Taking responsibility in evaluating and finalizing the findings*	Hamit Metin ÖRNEK Alper CAMCI
Literatür Taraması / *Literature Review*	Çalışma için gerekli literatürü taramak / *Review the literature required for the study*	Hamit Metin ÖRNEK Alper CAMCI