Artificial Intelligence and Blockchain Technology Adaptation for Human Resources Democratic Ergonomization on Team Management.

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Abstract. The integration of advanced technology in management and decision making is a continuous effort for organizational optimization. This paper focuses on developing a teaming requirements elicitation process using AI and Blockchain technologies under the democratic knowledge management perspective. AI will be primarily addressed via Machine Learning, Deep Learning, Expert Systems and Fuzzy Logic, but also through the integration of cognitive sciences that can contribute effectively on the selection of team members in team building. Furthermore, Blockchain maximizes the company's potential through personnel growth and diversity by supplementing AI on understanding deeper the capacity and competence teams have on responding to changes through continuous learning from each experience. This integration of AI and Blockchain in corporate teaming will be driven through the Company Democracy Model as the base framework for co-evolutionary processes development allowing an essential mutation from autocratic to liberal democratic leadership, and from skill-based to knowledge-based human capitalization.

Keywords: Team · Teaming · Artificial Intelligence · Blockchain Technology · Company Democracy · Intellectual Capital · Leadership · Management

1 Introduction

Advancements in Artificial Intelligence (AI) impact the way organizations utilize exponential data creation and data flow growth. This affects the management processes applied for the increase of operations optimization, performance and efficiency. In an ever-blending globalized world, companies' diversity, in both competencies and background, can be seen as a synonym of companies' potential. Consequently, reaching companies' optimum development can be best achieved through specific, measurable, attainable, realistic and timely (SMART) implementation and adaptation of AI to understand opportunities, projects and initiatives. In the same sense, the use of AI can be extended on perceiving the capacity, potentiality, skills, ability, capability, competence,

and maturity of the organizations' human resources to respond immediately and successfully to the opportunities given. Effective responses demonstrate the readiness and the optimization of the corporate human intellectual capital via effective teaming and team management per case and instance.

The dilemma between technology driven management and human driven managements does not really exist, and actually never existed. The evolution of the technology offers significant advantages but the human judgment and interference shall not be neglected either. It is a co-evolutionary relationship that human decision becomes better with the use of technology, and technology can deliver better results when properly used by humans. The co-existence of artificial and emotional intelligence with any form of automated or human analytics and judgment brings more precise results and decisions. The enhanced democratic teaming model with artificial intelligence and blockchain technology is a natural evolution of the X-management type of teaming process based on the employee's qualifications, to the Y-management type of teaming based on the project requirements regardless the employee's qualifications, seniority or rank.

Therefore, to preserve, support and safeguard the democratization element and Y-thinking approach on teaming and team management it is important to maximize its success, reduce its risk and eliminate its failure. The integration of AI and Blockchain in the democratic teaming model aims not only to optimize team efficiency but more than that to protect the democratic thinking in organizations and democracy itself.

2 The comeback of AI in the global industry

By the beginning of 1950s, Alan Turing set on his book, entitled Computing Machinery and Intelligence, the question on whether or not machines can think, and if computers can be personified so realistically, as to interact intelligently as a human [1]. His interrogations were the premises of a long path of research and innovations in the field of technologies, rousing engineers around the world on forging intelligent machines and programs. The inauguration of the 'Machine Learning' era began by the 1980s, when Kunihiko Fukushima schemes the neo-cognitive machineries under the concept of "learning without a teacher", by presuming the capacity of machines to set stimulus of learning patterns to achieve conventional cognition [2]. Throughout this era, AI infiltrated numerous industries, such as military and academia. The win of Deep Blue, the chess-playing computer developed by IBM, against the world champion Garry Kasparov in 1996, brought constant debate on the capacity of machines to overthrown human cognitive abilities. With the enhancement of technologies of the 21st century, Deep Learning as an amplification of the human neural brain work, further inspired deep networking of programs, such as Siri and autonomous vehicles (shown in Fig. 1).

Owing to this complex history of AI's development, various misconceptions on the topic emerged, especially on the concept of Machine Learning and Business Intelligence. Originally classified under the term "Machine Learning", the capacity of a systems to refine its analytical process as it received data, is nowadays identified as "Self-Programming".

Another misconceived notion is Business Intelligence, which is the process of translating historical data into "actionable intelligence" [3] that could help in predicting and strategizing future business operations.

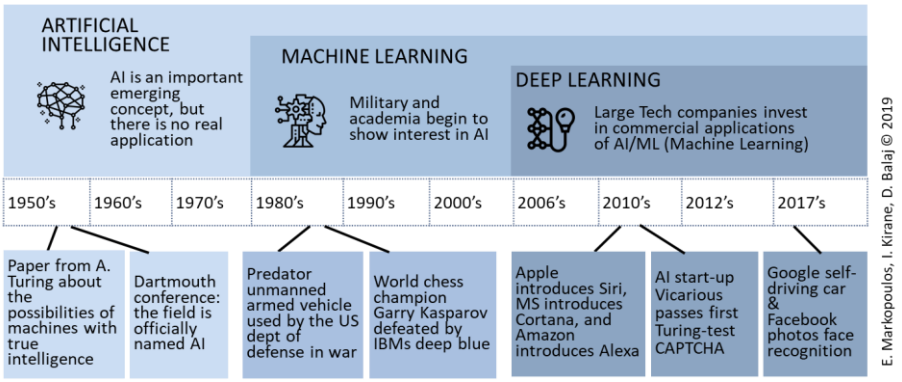

Fig. 1. Timeline of the Artificial intelligence evolution eras

Those misconceptions have been facilitated by the dystopian popular culture, which merely portrayed Artificial intelligence as "evil" humanoid robots. Actually, emerging technologies in the business world is one of the most disruptive domains, due to the impact of AI in corporate management.

AI technologies are nowadays an essential part of modern management since the technology driven workplace management perspective (mid 1990s) is not only relying on Machine Learning, Deep Learning, Cognitive systems, Business Intelligence, but also on Expert Systems and Fuzzy Logic that impact tremendously managerial decision making and cooperate strategy formation. Fuzzy Logic Systems in particular, through their usage of semantic methods on knowledge processing, control effectively automatic response systems from the household appliances up to advanced robotics [4].

3 Blockchain Technology and AI in a Business Context

In 2018, Forbes Global 2000 has emphatically stated that at least 50 of the greatest public companies, such as ICBC, JP Morgan Chase & Co, Apple, and IBM, have explored and homogenized blockchain into their technologies, especially after being inspired by the Bitcoin movement [5]. Blockchain, being exploited after the establishment of cryptocurrencies, is defined as the system where data among computers is "linked in a peer-to-peer" network. Blockchain consists of data chain sets (blocks) that encompass multiple transactions, and thusly create "a complete ledger of the transaction history", which is further used for internal operations and analysis [6]. Due to a complex evolution and an intellectual effervescence around the subject, the blockchain technology has nowadays a myriad of applications on all kind of sectors. Governmental services, human contributions, contracts, and technology are the domains where corporations can find ideas in running their projects through SMART-strategies (Specific, Measurable, Attainable, Realistic, and Timely).

In this context, block chain can be combined with various emerging technologies in order to run human oriented tasks as well. Teaming for example, can use block chain

for effective team building based on unbiased democratic principles that can maximize the team's project implementation performance.

Through Artificial Intelligence and its deep learning capacities, blockchain can improve its implementation, automation, and securitization of the data transacted, or analyzed. Further more with the 'Internet of Things', blockchain can also collect and secure data transactions between users, digital platforms, and amongst users themselves, through inter-corporate and intra-digital transactions. Blockchain practically acts as a Cloud Storage, allowing extra security, due to its decentralized network, low transaction cost, and unused space available [6]. The advantages of Blockchain (decentralized, verifiable, and durable), with the combination of flexible AI can empower companies to develop artificial general intelligence (AGI) platforms. The evolution of blockchain (shown in Fig. 2), and its combination with Artificial Intelligence creates new potential for advancements and applications in business management through smoother data management, document identification, and transaction verification among others.

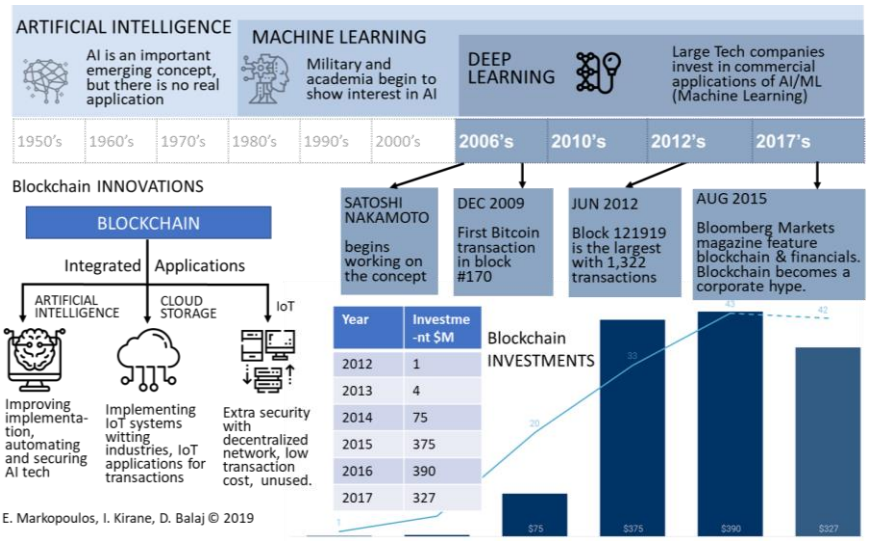

Fig. 2. Blockchain evolution timeline and integrated applications with AI.

4 The challenge of team building and team management

A major challenge in the history of management has been the team building and the team management process. Teams are groups of individuals working together towards a common goal, but the degree of understanding the goal, the degree of commonality on the goal and the degree of expertise to provide valuable and meaningful contributions towards reaching the common goals is a barometer for project and individual success. Effective teaming is an essential democratic management and leadership practice, which helps managers shape the entity of their organization and generate valid knowledge among those who have it on behalf of those who need it. [7]. Most well-established corporations are heavily relied on hierarchical structured teams, often set

for a period of time. On the contrary startups, through their organic structure, rely more on their project as the framework space to compose their teams.

Thusly nowadays, teaming and team management has become binary, having the company structures either be formally driven or project driven. In either case understanding the project requirements is the initial step for team creation, regardless the size, the level of the company, or the teaming approach selected.

One way to address this challenge, is by using the Democratic Teaming Model, a project-driven evolutionary approach that allows managers to tailor agile team structures according to the project needs, for optimal performance and improved results.

The Democratic Teaming Model (DTM), is an alteration of the Company Democracy Model (CDM) [8], [9], which emphasizes on a democratic selection of the human resources to work effectively in a project and evolve though it in a co-evolutionalty, co-operative, and co-development way. The Company Democracy Model is based on the values and principles derive from the Delphic Maxims [10] and the ancient Hellenic knowledge to achieve a philosophy driven management and leadership [11]. Both CDM and DTM utilize organizational human intellectual capital through co-evolutionary knowledge-based democratic cultures [12]. Using ontologies and taxonomies for knowledge recording and analysis [13] the model continuously transforms organizational tacit knowledge into explicit. [14].

Based on the CDM the Democratic teaming model maintains the six levels which in this case evolve the effectiveness of a team and its team members from the proper team selection at level 1, up to the maturity of the team to sustain the organization's competitive advantage globally at level 6 (Fig. 3).

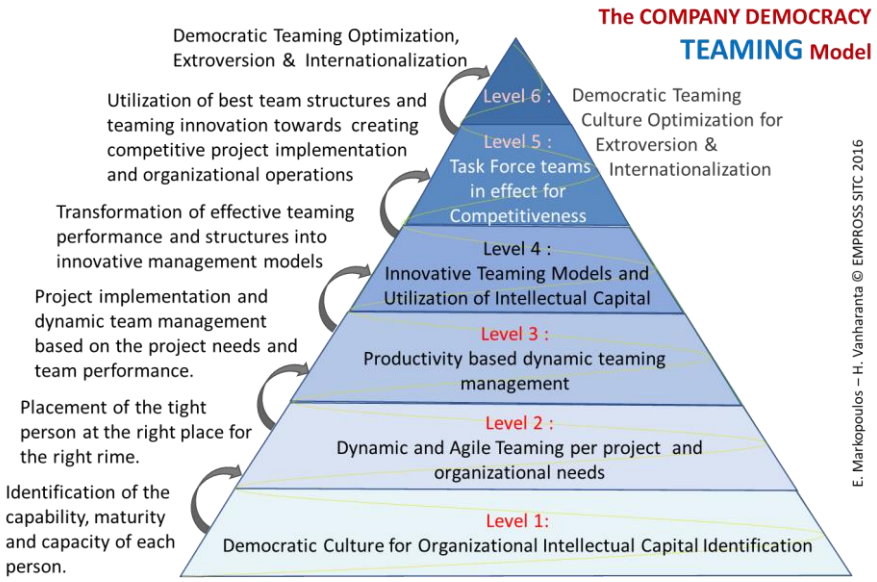

Fig. 3. The company democracy model for teaming.

The first level of the Democratic Teaming Model is the most significant one as the quality of the team selected to support a project is a catalyst in both the success of the

project and the evolution of the team members in it. One of the innovative elements of the democratic team build is the role of the team builder and the way it operates on team formation and management (shown in Fig. 4). The teem builder is the controller of the team building process, an expert on understanding project needs and requirements but also one with deep knowledge on the organization's human resource's skills, abilities, weaknesses, limitations and drives.

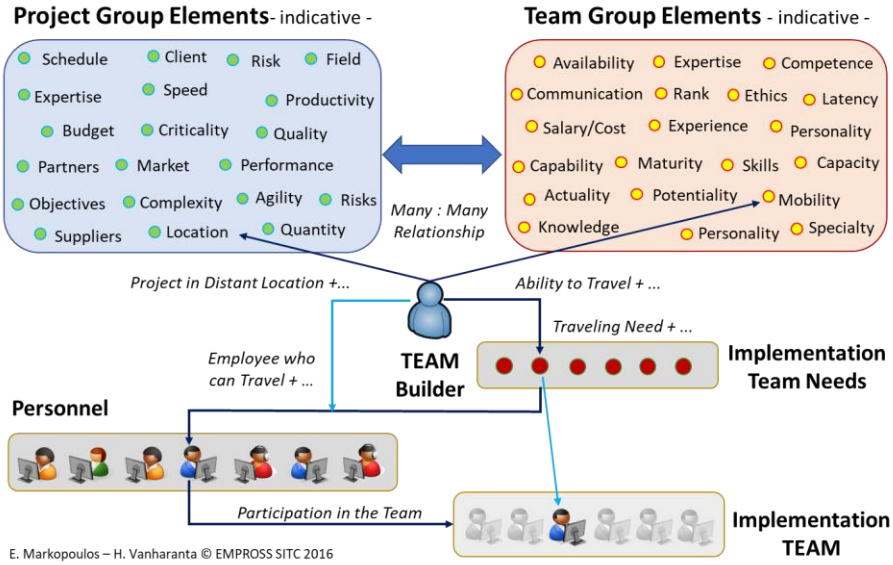

Fig. 4. The role of the team builder in the democratic project context.

The process begins after the team builder reads the project requirements and creates the project team positions to fulfil them. Each project need must be matched by at least one team member which derives from the total employees of the organization based on their skills and availability. The team builder takes into consideration not only the technical or formal qualifications of the available personnel to form a team for the specific project, but also creates various combinations for the best fit in order to reduce the size of the team without losing effectiveness and compliance to the project requirements.

The democratic element in this teaming model is based on the fact that the search for the most suitable team members is not restricted to the academic skills, seniority or popularity of an employee. The team builder uses the entire pool of employees to come up with the best matches unbiased from the profiles of each employee.

5 Approaching teaming with AI and BC

The Y-theory management approach of the Democratic Teaming Model (DTM) transforms the teaming process through which companies perform more effective and innovative project implementation management. However, the model relies very much on the capability, maturity and capacity of the team builder as the sole decision maker

in the team formation process. Lack of advanced processed information that could have been provided through the use of AI and blockchain restricts the teaming effectiveness on identifying the right person for the right place and for the right time.

This challenge can be addressed with the enhancement of the DTM and the integration of available advanced technologies to optimize teaming by reducing the associated risks on team member selection and project requirements understanding.

By integrating AI through expert systems, the organization can be receiving teaming recommendations deriving from the continuous monitoring of the data feed from the employee's activities, behavior, interests, experiences, etc. This can be supported by a blockchain system that secures the data feed and transactions to optimize its analytic output to the expert system. By providing a clear secured space for data storage outside the company's structure (ie. cloud), the artificial intelligence expert system can continuously and Socratically question its analysis and refine it as the project evolves within the implementation and management requirements (shown in Fig. 5).

In this case and in the enhanced version of the DTM, AI precedes the team formation and the team builder by performing the first matching process leading to several propositions of possible team compositions (team version propositions, v_1, v_2, … v_n etc.). Owing to its unique emotional intelligence capabilities, professional experience and expertise, the team builder takes control after this to select the final project team.

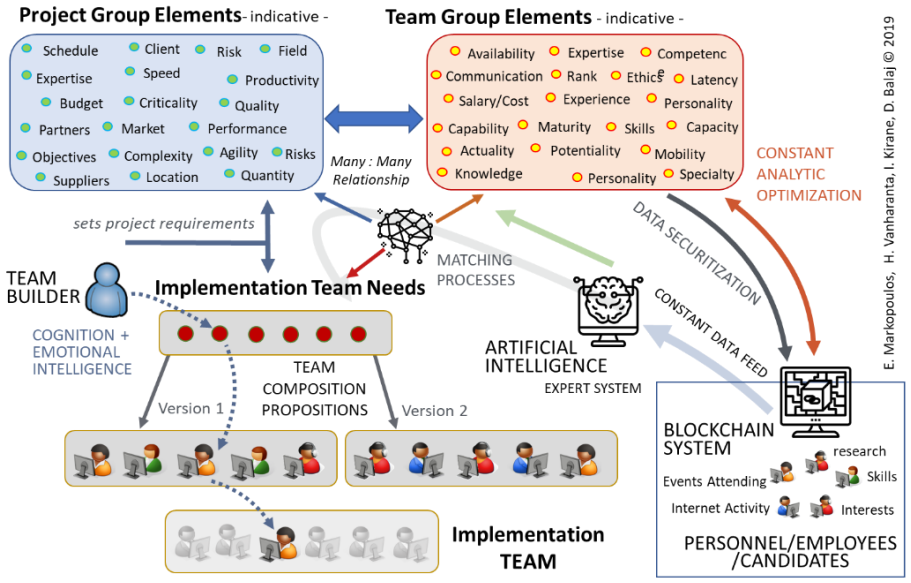

Fig. 5. AI & Blockchain in democratic project context

The use of AI expert systems is one of the AI dimensions that could optimize the Democratic Teeming Model effectiveness, but it is not the only one as other AI technologies such as machine learning, pattern recognition, case based reasoning and other,

can form a wider AI infrastructure supported by Blockchain technology to act as a core decision making support mechanism for the team builder in the selection process.

6 The Intelligent Dynamic Democratic Ergonomization Teaming Model

The AI-Blockchain integrated teaming process is a step toward optimal objective accomplishment and project performance. Indeed, managers should constantly question the adequacy of the team composed in terms of skills, knowledge, interpersonal relationships, time/space, organization, etc. The tech-based teaming ergonomization under the democratic philosophy is a Socratic strategy. The three team coordinators (team builder, artificial intelligence, and blockchain technology) are co-working on refining the team composition and management as the company's project changes. The company's project is symbolized by the pyramid and can be of various degree of complexity, from a new product launch in an existing line of business, to a new market penetration, and even the actualisation of a business itself. From Level 1 to Level 6, the team is initiating actions toward blue-ocean innovations, extroversion, and internationalization. This growth is relying on the collegial management of the coordinators (AI, BC, DTM) which are democratically adjusting the teams parameters on the evolving project needs and circumstances.

This triadic team building approach is characterized also by the degree of democracy, complexity and understanding the teaming process shall have. The degree of democracy is controlled by the team builder to make the final team composition providing the opportunity to all employees be part of a successful team. The degree of understanding is supported by AI Expert System which starts from a wide understanding of the project and ends up to the precise understanding. The same applies on the degree of criticality where in the early project levels are high risk, while at the lower levels the risk is eliminated due to the data gathered and analysis performed through the Blockchain technology.

In this relationship the lower levels of the pyramid indicate, the early stages of the project where democracy is used widely on team selection (many options to be considered) with a wide risk of uncertainty (unstable project requirements) from a wide criticality on prorperly understanding the project space (fuzzy project definition). As the levels evolve and the project becomes more complicated, the degree of risk, uncertainly and complexity are minimized due to the utilization of the knowledge gathered in the evolution of the project or from the company's projects databases, for a more precise project description and implementation management strategy. Figure 6 presents this tech-based Teaming Ergonomization under the Democratic philosophy.

The proposed approach also resolves the DTM limitations on the selection of skills and competence according to standardized employee evaluations, based on experience, education, rank, availability, etc., that neglects personal characteristics and emotional intelligence values such as motivation, willingness, interest, loyalty, etc. Despite the proposed team selection by AI and the DTM' limitations, possible errors could happen when selecting team members with very similar skills and competences, or when the personnel does not perform as expected due to the uncertain level of the synthetic match

by AI. Thusly, the DTM suggests changeable team structures and synthesis if teams indicate low performance.

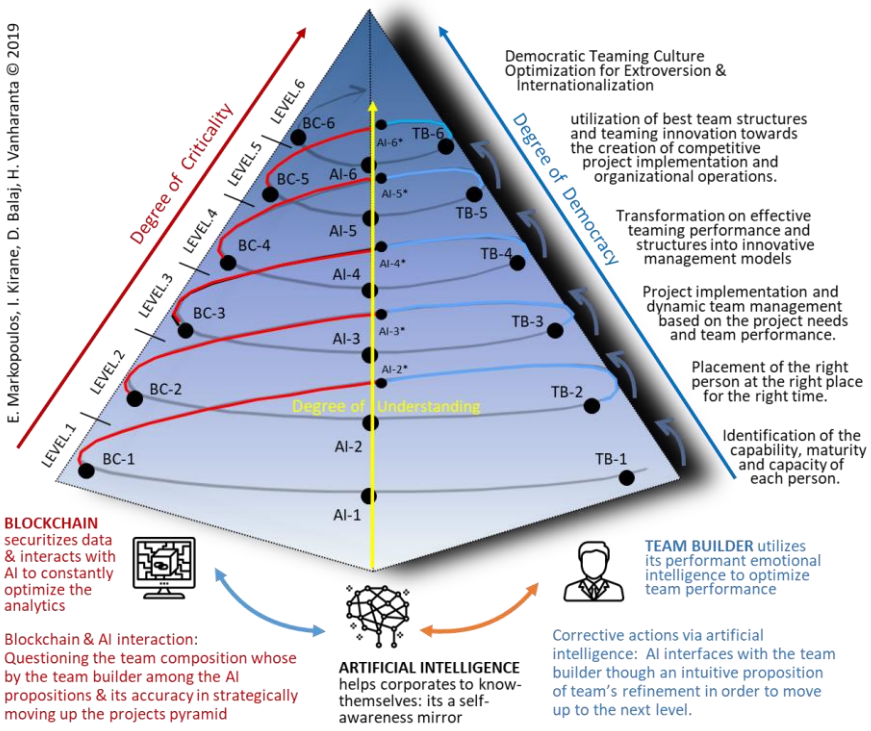

Fig.7. Democratic co-evolutionary spiral process for intelligent team performance.

In the process of evaluating the effectiveness of the team, it is crucial to have a break-off analysis on the value a team member, and especially an expert, can provide at a given time. This agile approach in team management composition can only be addressed via AI and blockchain that constantly monitors the performance of a team member on any instance, record deficiencies, and suggests corrective actions.

7 Conclusions

The proposed framework can be used to suggest alternative options to teaming challenges and to instruct and assists managers in justified decision making predictions on teaming with certainty or uncertainty factors based on a continuous data utilization from the personnel's past and current activities, behaviour and decisions. Furthermore, the combination of AI and Blockchain systems can contribute on creating, storing and transmitting such data to centralized knowledge bases that allows dynamic analytic optimization on the personnel's performance and effectiveness by composing the best possible teams that can satisfy long and short-term project teaming requirements.

This holistic approach, under the perspective of democratic management and leadership concepts, integrates AI to achieve organizational self-awareness with respect to metron-ariston for the creation of corporate ethos, by providing unbiased equal opportunities in companies' value creation to all employees and at all times. The proposed holistic approach on integrating democratic management and artificial intelligence can make significant improvements in critical sectors such as the pharmaceutical, medical, finance, and the defense/military industry. The paper introduced the integration of AI and Blockchain technologies within a democratic team requirement elicitation process, but also an evolutionary operations model that can potentially reshape the definitions of teaming and team management.

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