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Management Methods in Distributed Work Environments: Human vs Smart IT

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Abstract

This study examines managerial preferences in the transition of work environments from a traditional hierarchical structure to decentralized autonomous forms as in decentralized autonomous organizations (DAO). In recent years, this transition has been shown to improve innovation, efficiency, and profitability, through empowering employees and encouraging market growth. These work environments function as complex adaptive systems (CAS), characterized by functional autonomy, resource and knowledge sharing, and organizational integration. A key social and managerial challenge in such environments is creating an organizational culture and management method that can synchronize the personal capabilities of autonomous workers with the overall systemic mission. This article reports about an empirical study that examines the preferences of workers in work environments with regards to management method that is appropriate for managing interactions, work processes, and decision-making in a decentralized work environment.

The research question of the study: What is the preferred method for managing in a decentralized work environment, and how does this affect employee behavior and organizational culture?

The dependent variable: synchronization of employee interactions in a distributed work environment characterized as CAS

Two main independent variables were studied:

1. A human management method that fosters collaborative behavior and emphasizes an organizational culture of shared values and synchronization of activities.

2. A management method that leverages "smart" information technologies. The term "smart" implies powered by artificial intelligence [based on Blockchain), capable of performing automatic synchronization without human contact, while employing advance support of decision-making

The data were collected through surveys and analyzed using statistical methods.

The key findings reveal a significant advantage of smart technologies (especially those based on smart contracts) over human management (even one that emphasizes a culture of shared values and synchronization of activities) for the effective management of interactions and work processes in distributed work environments. Workers in distributed environments with CAS characteristics tend to express a negative perception of human management methods, which emphasize personal needs even if they are for the common good. On the other hand, they demonstrate a clear preference for smart information systems and smart contracts capable of automatically synchronizing scheduled human activity. This indicates a desire for the work processes and organizational decision-making to occur automatically and decentralized without human influences that may emphasize personal needs. Regression models highlighted a significant negative relationship between human management that may emphasize personal benefit for the common good (as a management approach) and activity in a distributed work environment with CAS characteristics. In contrast, a management method based on the support of smart technology showed a strong positive relationship (B = 0.588) for workers in a distributed work environment. Another finding [although based on a relative minority of respondents] highlights this significant relationship among workers in operational roles (regression coefficient B = -0.733). Similarly, the predictive ability of the perception of smart technology among management employees for operating in a distributed work environment was also high (R^2 = 0.957). The study's conclusions emphasize the preference for smart technology for synchronizing and managing work processes, decision-making, and information sharing, while seeing technology as essential for process management itself, and emphasizing a clear preference for stable and accurate automated management over human-centered approaches. In conclusion, this study strongly suggests that investing in distributed information technologies, such as blockchain and artificial intelligence, is essential for organizations that strive to improve innovation, efficiency, and profitability, and switch to a more autonomous and distributed work environment model, one that can promote innovation, efficiency, and future profit. These systems provide a transparent and impartial management framework that fosters collaboration and knowledge sharing while reducing human intervention—potentially accelerating work processes and reshaping certain managerial roles. This transition has a profound impact on organizational culture and necessitates attention to employees' negative perceptions of certain human management approaches, even those intended for the common good, when planning the shift to smart technologies.

Keywords: *Complex adaptive systems, Distributed work environments, Functional autonomy, Extensive resource, Knowledge sharing, Organizational integration.*

Background

Organizations today are undergoing a significant transformation, moving from traditional hierarchical structures to decentralized autonomous forms. This transition is not only expressed in structural configuration, but also in actual functional change while empowering employees. This change has the potential to improve innovation, efficiency and profitability. The effectiveness of these distributed work environments can be understood as complex adaptive systems (CAS), which enable a distributed environment and are naturally characterized by functional autonomy, extensive resource and knowledge sharing, and deep organizational integration. However, within these CAS environments, a key management challenge arises: the need to effectively synchronize the personal needs and benefits of autonomous workers with the requirements of the overall organizational systemic mission and goals. Indeed, the transition to a decentralized environment changes the motivation of employees to synchronize towards a single goal and the ability of managers to create a cultural environment suitable for managing autonomous workers. This study aims to address that challenge by investigating how interactions, workflows, and decision-making can be effectively managed in such distributed work environments.

To this end, the study specifically examines two key independent variables:

1. A human management approach rooted in an organizational culture that emphasizes shared values and collaboration to foster collective behavior.
2. A management approach that leverages "smart" information technologies, including automation capabilities, AI-driven decision support, and smart contracts using blockchain technology.

The findings from this study are essential for understanding the effective management of these advanced organizational structures.

The Workplace as a Complex Adaptive System (CAS)

Research suggests that human organizations equipped with dynamic information coordination and monitoring systems can function as swarms, like those found in nature [1]. Studies indicate that collective intelligence using adaptive information systems develop effective interactions, collaborative knowledge-sharing, and decentralized decision-making, enhancing overall performance [2]. Further research reveals that when organizations operate according to CAS principles, traditional hierarchies dissolve, and employees exhibit increased autonomy. The availability of appropriate management and control tools fosters a flat organizational structure, where employees function more efficiently [3]. Employees working in CAS work environments report higher autonomy, environmental awareness, and access to necessary resources. They engage in continuous networking, share knowledge, and update information systems dynamically [4]. These employees demonstrate a stronger inclination toward technological innovation and are more likely to leverage digital platforms to optimize their work [5]. Further research suggests that project teams operating as CAS units achieve superior effectiveness in implementing work outcomes and adapting flexibly to client needs [6].

The Transition to Distributed Work Environments

Northfield Information Services and later Bloomberg conducted an in-depth analysis of 60 companies from the LAMP (Living Asset Management Performance) index, developed by Bragdon [7]. The index identifies companies structured to mimic natural adaptive behavior, emphasizing flexibility, shared values, and an organizational culture aligned with natural processes. Over 19 years, LAMP-indexed companies significantly outperformed leading financial benchmarks. These organizations were classified as *DISTRIBUTED WORK ENVIRONMENTS* (DWE) represent a novel organizational and business structure that optimizes time efficiency, task focus, resource utilization, and simultaneous engagement in multiple projects [8]. Within DWEs, "work circles" are defined, wherein employees collaborate on specific tasks as equal contributors. Each circle is delineated both by its members and by its interactions with other circles (Rikke, Janssen, & Kwee, 2019). DWE work circles have been found highly effective in achieving common goals, provided that the work environment includes synchronized information-sharing mechanisms, task-tracking systems, and data management tools [9]. These features facilitates the distribution of information among the DWE's employees.

A DWE mirrors CAS characteristics, fostering a unified dynamic system. The ability of human collectives to function as CAS depends on a shared purpose and robust information management systems [10]. One of the important characteristics of the interaction between employees in a DWE such as CAS organization is that employees with functional autonomy establish the relationship between them on an ongoing basis, making personal use of the resources of the whole group, while integrating into the systemic/organizational process. As such, it can be assumed that the manager who drives this interaction towards effective execution of the work processes will also have the characteristic of an autonomous perception and personal benefit that integrates with the general benefit of the employees. This personal characteristic is called: human management method shared values and collaboration. [11]. Organizational activity in DWE such as CAS tends to be decentralized, autonomous, and task focused. The task leads employees to joint activity, but there is still a need for a factor that motivates, organizes, and integrates employees into activity based on "collective" behavior. A charismatic manager who motivates employees based on the personal benefit of each person [including himself] will likely be able to get employees to reduce their need for individualism [12]. In DWE such as CAS organizations, employees exercise significant discretion, act autonomously, and group for joint activity when a significant common goal is found. Therefore, a clear set of rules of conduct, organized control, regular updating, and synchronization between employees are required to bring about the free flow of information, a high level of connectivity, and data synchronization. There should be an ability to analyze data, information, and feedback within and outside the company. It seems that a combination of personal benefit and benefit for the common good is required for the manager whose mission is to synchronize employees in the CAS organization. Human management method shared values and collaboration has become a leading value.

The Value of Human Management Method Shared Values and Collaboration

The definition of human management method shared values and collaboration assumes that the activity of the individual employee has value not only for the employee himself or herself, but for the group as a whole and vice versa. That is, the employee's action has a contribution to the group, but at the same time, the individual's personal interest is realized. Management assumes that individuals will not perform an activity that is not beneficial also to themself, nor an activity that does not contribute to the whole. Therefore, an action of an individual will be measured by the result or contribution to the whole group, so that in order to create the contribution, the individual must first accurately define the personal needs, and at the same time must understand and accept the value of the contribution to the whole group, so that these needs are synchronized [13]. As a result, the motivation for an employee's activity lies in those who are able to explain or demonstrate the convergence between the needs of the individual and the needs of the organization, and between the interest of the individual and the requirements of the organization. These are essentially the managers who advocate human management method shared values and collaboration. The variable we have chosen is based on human management method that shares values and collaboration. Studies have shown that in a work environment where there is a manager according to the concept of human management method shared values and collaboration, will inevitably lead to collective behavior based on the personal benefit of each employee and the organizational benefits.

In the context of DWE, where autonomous employees use collective resources and integrate into systemic processes, there is still a need for a factor that motivates, organizes, and integrates employees into "collective" behavior. The theoretical framework suggests that a manager capable of driving this interaction towards effective execution will likely possess the characteristic of an autonomous perception and personal benefit that integrates with the general benefit of the employees. It seems that a combination of personal benefit and benefit for the common good is required for the manager whose mission is to synchronize employees in the DWE organization. The theoretical approach suggests that managers who can explain or demonstrate the convergence between the needs and interests of the individual and the organization are essentially managers who advocate human management method shared values and collaboration. It is assumed that utilitarian managers capable of performing this combination will be able to constructively lead the distributed and autonomous activity in the DWE organization. According to this perspective, a manager's decision or instruction is based on their personal benefit, but is perceived to inevitably lead to collective behavior based on each employee's personal benefit and willingness to perform the activity. Therefore, it can be assumed that utilitarian managers who are able to perform this combination will be able to constructively lead the distributed and autonomous activity in the DWE organization.

Smart IT Technology in DWE

The importance of IT in today's organizations continues to increase. Institutions' ability to function is highly influenced by technology. Organizations that implement contemporary advanced information systems and technologies (e.g., AI tools) can achieve synchronization of information between employees according to needs, management of work processes and even the use of "smart contracts" to automatically manage complex interactions between employees, as found in blockchain systems [14]. Such technologies allow for the establishment of a permanent and procedural, synchronized and transparent interaction through the automatic execution of a series of smart contracts that bind each of the individual members of it [15]. The integration between employees is performed through ownership of a "block" and the creation of a chain of blocks, and the activity is conducted by activating those smart contracts according to a fixed or variable trigger. The trigger can be chosen according to organizational needs or requirements [16]. The blockchain system allows each employee's personal interests to be preserved in parallel with the needs of the system [17] as required in an organization with CAS characteristics such as a DWE organization. All this without human managerial intervention that could disrupt the process due to personal needs of managers [18]. It has also been shown that updated information systems can help save time and reduce employee workload while controlling errors and fraud [19]. Other studies have found that information systems allow organizations to manage work processes in a more rational, more accurate and more synchronized way between employees, more than managers can do without information systems. For example: Synchronizing banking activities in order to provide excellent customer service requires constant updating and precise work with data, and therefore it has been found that the more a bank adopts sophisticated and comprehensive information systems, the more it will be able to increase employee performance, monitor the efficiency of organizational processes, and thus, increase the level of service to users and establish a competitive advantage [20].

Research Question

What is the preferred approach to effectively managing a distributed work environment?

Decentralization allows employees to operate mostly autonomously. The challenge is to synchronize personal needs with the demands of the overall task. So, is it necessary to continue with a human management method that will require supporting, synchronizing, and controlling the production activities of autonomous workers in a distributed organization based on collaborative and collective activity? Or is there a need for a completely different method that emphasizes intelligent, rational capabilities for synchronizing and sharing information and resources without much human control?

Variables

Dependent Variable: Work Environment Characterized as CAS

A distributed work environment where autonomously functioning employees tackle complex tasks.

Measurement method of the depended variable: A questionnaire containing four questions for each dimension [total of 3 dimensions as found in the factor analysis], each question contains five options according to a Likert scale. The questions are taken from the research findings of Hasgall (2015), Hasgall and Ahituv (2019).

Background Variables

Each background variable is examined by a nominal value scale that describes the status of the employee or the type of organization he or she works for a number of variables describing the work environment were examined, in order to understand whether it effects the correlation: Seniority, organizational field, position.

Independent Variable 1: A Human Management Method Emphasizes Shared Values and Collaboration

Measured by "Oxford" questionnaire [21]

Independent Variable 2: Smart IT Support

Examined by a questionnaire including 9 questions that explore the position of employees in a distributed work environment regarding the use of "smart" technologies as a basis for managing work processes [22].

Hypotheses

There are three main hypotheses derived from the analysis of the activities of employees in relation to organizational requirements in distributed work environments such as CAS organizations.

Hypothesis 1: Autonomous workers in a decentralized organization will express a negative perception towards a human management method that emphasizes shared values and collaboration to foster individual contribution for the collective good. Therefore, a positive correlation will not exist between this management method and the perception of a work environment as a Complex Adaptive System (CAS). In fact, a particularly strong negative correlation is expected between the emphasis on individual benefit for the collective good (as a management approach) and the perception of CAS in operational roles (Regression Coefficient B = -0.733).

Hypothesis 2

Autonomous workers in a decentralized organization will work towards achieving common goals and will demonstrate a critical dependence on integrated support systems based on smart information and communication technologies (such as AI and smart contracts utilizing blockchain technology). Therefore, there will be a strong positive correlation between support for smart information technologies and the dimensions of a CAS work environment (Regression Coefficient B = 0.588), with employees preferring to rely on these systems for managing interactions, work processes, decision-making, synchronization, and information sharing.

Hypothesis 3

Management methods – encompassing both the human method emphasizing shared values and collaboration, and the management method utilizing smart information technologies – significantly predict and explain the perception of the work environment as a CAS in decentralized organizations. These methods possess strong explanatory power in the variance of CAS perception, highlighting their critical role in shaping how employees perceive their work environment.

Methodology

This is a quantitative study, based on a survey in which 166 participants responded to all the parts of the questionnaire.

Sample and Sampling

Sample size: The responses of 16 out of 166 participants were methodologically inconsistent. So only 150 participants were taken into account.

Sampling method: Stratified sample; UN accordance with the following variables: type of organization [business, government, academic, education, trade], position of the employee [management, technology, operations].

150 responded to the questionnaire in parts. Table 1 demonstrates the distribution of participants according to personal and occupational characteristics; it appears that: 21% are employed in technological organizations, 54% in educational organizations, 8% in commercial organizations and 17% in government organizations. In addition, 46.6%% of the employees in Professional positions in the organization were tested, 25.3% managers at various levels and 28% operations personnel.

Research Tools

Questionnaire: "human management method shared values and collaboration values" (independent variable)

Measured by a questionnaire that inquires the extent to which an individual agrees with utilitarian ethical principles. The scale consists of 11 statements, each rated on a seven-point scale ranging from "strongly disagree" to "strongly agree" (Oxford Human management method shared values and collaboration Scale). The scale consists of 11 statements, each rated on a seven-point scale ranging from "strongly agree" to "strongly disagree." A higher score on the Oxford Human management method shared values and collaboration Scale indicates a higher level of agreement with utilitarian ethical principles. The scale has been shown to have reliability and validity above 0.7 in various studies and has been used to investigate individual differences in decision-making and moral behavior.

Questionnaire: 'Technological support' (independent variable)

Tested by a questionnaire including nine questions on smart automated technological, which can support the activity of employees in a distributed organization

Questionnaire: 'Work environment as CAS' [dependent variable].

Tested by a questionnaire containing 16 questions. Each question

Table 1: Distribution of study participants (n=150) according to personal and occupational characteristics.

Employee's Position		Organization Type	
46.6%	Professional	21%	Technological
25.3%	Management	54%	Educational
28%	Operation	8%	Commercial
		17%	Government

has 5 answer options (from very high to very low). Based on research findings on complex systems: Hasgall (2015), Hasgall and Ahituv (2019):

Data Analysis

1. Cronbach's alpha significance of each of the questionnaires was performed
2. Factor analysis for the dependent variable - work environment as CAS.
3. Descriptive statistics for the findings were presented, including significance.
4. Inferential statistics: correlation between variables, correlation between dimensions

- the relationship between work environment as CAS and human management method shared values and collaboration values
- the relationship between work environment as CAS and human management method shared values and collaboration values and technological support
- the relationship between work environment as CAS and technological support

5. Regression tests were performed to explain the variation in the dependent variable: work environment as CAS by the independent variables: human management method shared values and collaboration values and technological support. Later, a background variable "position of the employee" was found to be significant, and it also entered the explanatory variables.

Analysis of the Variables

This is a study of DWE such as CAS organizations, which are unique organizations even if they are based on the CAS structure. In order to test the suitability of the "work environment as CAS" sub-item for this study, a "confirmatory" factor analysis was conducted for the variable CFA (Confirmatory Factor Analysis) using the Varimax method, conducted on the working environment by a CAS questionnaire. The factor analysis demonstrates a theoretical structure of 12 items out of 16 questions included in the questionnaire; 4 items were omitted from the statistical processing as recommended by the statistical procedure (averaging the ratings for the relevant items in the questionnaire). The results show three clusters in the composition of the items as indicated in Table 2.

According to this factor analysis, the dependent variable was updated: Work environment characteristics as a CAS

From the factor analysis, the following dimensions were defined:

Component 1 = Organizational integration [Sharing resources and knowledge]

Component 2 = Functional autonomy [Organization-employee relationship]

Component 3 = Personal benefit

Analysis of the Research Hypotheses

The study examined three main hypotheses

1. A positive correlation exists between all dimensions of a CAS working environment and individual human management method shared values and collaboration values.
2. A positive correlation exists between all dimensions of a CAS working environment and the use of smart information technologies (algorithm, blockchain system, smart contract).
3. The management method preferred by employees in the CAS working environment is explained by both human management method shared values and collaboration values, and the use of smart information technologies.

Correlations between the Research Variables and the Dimensions of Each Variable

The research variables, human management method shared values and collaboration and technological support were calculated.

First, the descriptive statistics of the variables were calculated (see Table 3). All the variables range from 1 to 5, indicating low (1) to high (5):

Pearson correlation between the independent variables:

The main hypothesis—that there is a relationship between shared values of the human management approach, cooperation, technological support, and the perception of the work environment as a Complex Adaptive System (CAS)—was tested using the Pearson correlation analysis, as shown in Table 4.

The findings presented in Table 4 indicate that there is no significant correlation between the shared values of the human management method and collaboration, and the dependent variable—'Work Environment as a Complex Adaptive System (CAS)'. This finding is not consistent with Hypothesis 1. These Findings indicate negative correlation between human management methods shared values and collaboration and the dependent variable - 'Working environment as CAS'.

Table 2: Confirmatory factor analysis CFA for the research questionnaire on the topic of "work environment as CAS"

Component			Variable name
1	2	3	
.837			Organizational integration (Sharing resources and knowledge)
.808			
.774			
.768			
	.854		Functional Autonomy
	.820		
	.718		
		.771	Personal benefit
		.737	
		.675	

Table 3: Descriptive statistics of the variables.

M	SD	M	SD	M	SD	M	SD	M	SD	
3.5	0.5	3.6	0.0	3.2	0.2	3.5	0.6	3.6	0.3	Work environment as a CAS
3.4	0.7	3.7	0.4	3.0	0.4	3.3	0.8	3.7	0.3	Share resources and knowledge **
3.8	0.7	3.8	0.4	3.6	0.2	3.9	0.9	3.7	0.5	Functional Autonomy
2.9	0.7	2.6	0.4	3.5	0.3	2.8	0.8	3.1	0.4	Personal benefit **
2.7	0.5	2.8	0.6	2.8	0.3	2.6	0.6	3.0	0.4	Manager Human management method shared values and collaboration *
3.9	0.7	3.5	0.4	4.2	0.3	4.0	0.8	4.0	0.6	Technological support **

*p<0.05, **p<0.01

Table 4: Pearson correlation matrix between 'human management method shared values and collaboration ' and 'technological support' and 'Working environment as CAS' and Cronbach's alpha indices.

		1	1.1	1.2	1.3	2	SD	Cronbach's Alpha
1	'Working environment as CAS'	-					3.6	.5
1.1	organizational integration	.740**	-				3.4	.7
1.2	Functional Autonomy	.776**	.279**	-			3.8	.7
1.3	Personal benefit	.285**	-0.063	.201**	-		2.9	.7
2	'human management method shared values and collaboration '	-.162*	-.198*	0.061	0.065	-	2.7	.5
3	technological support	.263****	0.035	.198*	.179*	0.004	3.9	.7

*p<0.05, **p<0.01

On the other hand, a significant positive correlation was found between technological support and 'Working environment as CAS' in general (r=0.263, p<0.01). Specifically, it was found in the dimensions: 'Personal benefit ‘' (r=0.179, p<0.05) and functional autonomy (r=.0.198, p<0.05). This finding could well imply that smart technology can enable autonomous workers in DWE such as CAS organizations to create a work process that synchronizes personal benefit, functional autonomy, and integration into the overall goal of the organization. In addition, positive correlations were found between technological support ‘ and dimensions: Functional Autonomy (r=0.198, p<0.05) and personal benefit (r=0.179, p<0.05).

Background Variables

Normal distribution tests of the quantitative variables were conducted using the Kolmogorov-Smirnov test. All variables demonstrated a non-normal (asymmetric) distribution. Therefore, the differences in the means between the categories of the variables were tested using parametric tests - the Kruskal-Wallis test.

Organization type - The findings demonstrate significant differences between the types of organizations in relation to the dimensions of the variable 'sharing resources and knowledge' and 'personal benefit'. The averages of the organizational integration's dimensions are highest among employees of government and technological organizations (M=3.7). In contrast, the averages of the 'personal benefit' dimension demonstrate an opposite trend, according to which the average is highest among employees of commerce (M=3.5, SD=0.3), and lowest among employees government organizations (M=2.6, SD=0.4). 'Human management method shared values and collaboration ‘ values were found to be at the highest level on average and significantly among employees of technological organizations (M=3.0, SD=0.4) compared to employees of educational organizations (M=2.6, SD=0.6). Also, regarding 'technological support', significant differences in averages are demonstrated, with employees of technological, educational and commercial organizations demonstrating high averages (M~4.0) compared to employees of government organizations who demonstrated low technological support (M=3.5, SD=0.4). Employee position – as shown in Table 5.

The findings exhibited in Table 5 demonstrate significant differences in the scores of the 'sharing of resources and knowledge' dimension between positions, with the highest average being found among employees in operational positions (M=3.8, SD=0.7), compared to lower scores in management (M=3.2, SD=0.5) and professional (M=3.4, SD=0.7) positions. Significant differences were also found in the scores of the 'functional autonomy' dimension between the roles, with the highest average being found among employees in professional roles (M=4.0, SD=0.5) compared to lower scores in management (M=3.7, SD=0.9) and operations (M=3.6, SD=0.8) roles. Human management method shared values and collaboration values were found to be significantly higher among employees in the professional and operations field (M1=3.0, M2=2.8) compared to employees in management roles (M=2.2, SD=0.5). [23-28]

Regression Analysis

Regression analysis was performed to find factors that have an influence on the interaction between the variables.

Regression tests were performed between the variables of technological support and manager 'human management method shared values and collaboration ‘ values and the 'Working environment as CAS' that characterizes DWE such as CAS organizations. After a variety of regression analyses, it was found that the employee's position variable is significant. See Table 6.

Table 5: Differences in average scores for the variables according to employees' position in the organization.

n=150		Professional n=70		Operation n=38		Management n=42		Position
M	SD	M	SD	M	SD	M	SD	
3.5	0.3	3.5	0.3	3.6	0.7	3.4	0.6	'Working environment as CAS'
3.4	0.7	3.4	0.7	3.8	0.7	3.2	0.5	organizational integration
4.0	0.5	4.0	0.5	3.6	0.8	3.7	0.9	Functional Autonomy
2.7	0.7	2.7	0.7	2.8	0.8	3.0	0.5	Personal benefit
3.0	0.4	3.0	0.4	2.8	0.5	2.2	0.5	'human management method shared values and collaboration '
4.1	0.6	4.1	0.6	3.9	0.9	3.8	0.7	technological support

*p<0.05, **p<0.01

Table 6: Regression to predict work environment as CAS as a function of the predictor's 'human management method shared values and collaboration ' and 'technological support.

Role		B	R Square	F	Sig.
Professional	**(Constant)**	**5.249**	**.177**	**7.2**	**<.050**
	Technology support	-.218			
	'human management method shared values and collaboration '	-.281			
Operation	(Constant)	3.378	.957	337.3	<.001
	Technology support	.588			
	'human management method shared values and collaboration'	-.733			

Table 6 presents the results of two distinct regression models predicting the perception of the work environment as a CAS, based on 'technological support' and 'human management method shared values and collaboration '. The table shows specifically for employees in Professional roles and those in Operation roles.

The analysis focusing on Operation roles yields particularly strong and noteworthy results.

The overall regression model for predicting CAS perception among Operation employees is highly statistically significant. The F-statistic for this model is 337.3, with a significance level of <.001.

Crucially, the model demonstrates exceptional explanatory power. The R Square value is 0.957, indicating that a remarkable 95.7% of the variance in CAS perception among Operation employees is explained by the combination of 'technological support' and 'human management method shared values and collaboration '. This signifies a very strong predictive capability of these factors within this specific role group. This robustness likely stems from the fact that Operation employees' activities are fundamentally dependent on technological support for synchronizing and managing work processes, decision-making, and information sharing, viewing technology as critical for process management itself. Furthermore, they exhibit a significant preference for automated technological management over human management, potentially due to the stability, accuracy, and synchronization automated systems provide, which are essential for their work. Therefore, for this group, a work environment characterized by effective technological support (facilitating CAS dimensions like sharing and integration) and a decreased reliance on human management method shared values and collaboration is exceptionally well predicted by these factors. Technological support has a strong and positive association with the perception of the work environment as a CAS. The regression coefficient (B) is 0.588. This suggests that Operation employees who perceive higher levels of technological support are significantly more likely to view their work environment as a Complex Adaptive System.

Human management method shared values and collaboration (as measured among the employees) has a strong and negative association with CAS perception. The coefficient (B) is -0.733. This indicates that Operation employees with a higher degree of utilitarian orientation tend to have a lower perception of their work environment as a CAS. These findings for Operation roles highlight a powerful relationship between both technological support and human management method shared values and collaboration and CAS perception, distinct from the results observed for Professional roles, particularly in the overall model's predictive strength and the direction of the technological support effect. The influence observed in the Operation group are especially pronounced and robust. It is important to note that basic statistical tests were performed, such as testing the correlation between the predictor variables ("human management method shared values and collaboration" and "technological support"). This test found a very low correlation (0.004) between the two predictors, which rules out high multicollinearity as a possible explanation for the unusually high explanatory power ($R^2 = 0.957$) found in the regression model for operational roles.

Conclusions and Discussion

The findings of the study indicate that the key dimensions of a complex adaptive work environment [CAS] are functional autonomy, resource and knowledge sharing, and organizational integration. Those dimensions illustrate the difficulty of functioning in this environment where the personal benefit of an autonomous worker must synchronize with the overall mission of the organization. It also indicates that the

appropriate way for employees in a distributed working environment with characteristics of complex adaptive systems, is to manage interactions, work processes, and decision-making processes. This is based on the use of smart technologies, smart contracts, and AI that enable employees to develop breakthrough innovation, manage systemic interactions, share information and resources, and carry out rational decision-making processes that are not violated by the utilitarian methods of human managers. The regression models revealed a particularly strong negative association between employee human management method shared values and collaboration, and CAS perception for employees in Operation roles (Regression Coefficient B = -0.733). This effect was more pronounced and robust compared to other roles like Professional roles. This negative relationship between human management method shared values and collaboration (as measured in employees) and CAS perception may be linked to the negative perception workers might have towards the human management method shared values and collaboration of managers. Employees in autonomous decentralized organizations (DWE such as CASs) express a preference to rely on intelligent information systems and smart contracts for organizational processes and synchronization rather than relying on a human manager, even a utilitarian one. This preference indicates a desire to eliminate the influence of a human manager and the manager's need for "personal benefit that is for the common good". Employees in DWE such as CAS organizations would prefer the optimization of work processes and organizational decision-making in an automated and decentralized manner. The negative relationship found between human management method shared values and collaboration and the 'information/resource sharing' dimension of CAS is also noted as potentially indicating a conflict between traditional leadership approaches (which might be perceived as utilitarian) and the collaborative nature of CAS environments.

Furthermore, a clear connection was found between the foundation of technological support and CAS behavior, especially in technological and government organizations. A clear connection was also found between technological support and organizational operational activity. Activity is responsible, among other things, for supporting, synchronizing, and operating work processes in the organization, decision-making processes, and sharing information and resources between employees. This finding can support the hypothesis that information technologies are not only important for sharing data and information between employees but are also critical for managing work processes. It can be said that, according to these findings, employees even prefer work process management based on technological support over independent organic management or hierarchical human management. Built-in technological support that will meet this requirement can include AI support, process management algorithm, and knowledge sharing between users, work process mirroring, scheduling, accuracy, and smart contracts that preserve rights. All of these are found in blockchain applications, which apparently can support the CAS required for the effectiveness of a decentralized organization. Therefore, the observed negative correlation and strong negative regression coefficient (especially for Operation roles) likely stem from the employees' preference for automated technological systems that reduce the perceived need for human managers to perform the analysis of "personal benefit for the common good", which is a characteristic associated with utilitarian management.

The significance of these findings is apparent when an organization wishes to be more innovative but maintain efficiency and profitability, it will need to move to work processes managed by smart information technologies, use blockchain systems that enable smart contracts between workers, and base them on AI. This approach will facilitate rapid, focused, and systematic sharing of required information and resources between autonomous workers. In addition, the negative perception of workers towards the human management method shared values and collaboration of managers must be considered. It might affect the nature of management and the transition to smart technologies. Employees in autonomous decentralized organizations (DWE such as CAS) prefer to rely on intelligent information systems through smart contracts that carry out organizational processes and synchronization between them, rather than relying on a human manager, even if the manager, like them, is characterized as utilitarian. According to this study, the employees' preference is to eliminate the influence of a human manager, to eliminate the manager's need for "personal benefit that is for the common good", even if it characterizes their personal behavior. Employees in a DWE such as CAS organization would prefer the optimization of work processes and organizational decision-making in an automated and decentralized manner.

We have learned from previous studies that organizations with CAS characteristics, such as include employees who value operational autonomy while collaborating to achieve shared goals and employees who will prefer a flat, task-oriented management structure. These findings were part of the basic assumptions of this study, which led to the fact that in order to achieve a flat structure, synchronized autonomous activity, and optimal distribution of information and resources, these employees will prefer the automated decentralized control method using smart algorithms that are at the core of an advanced information system. This conclusion can be further strengthened by employing AI applications embedded in the work processes of the organization, which can establish a significant basis for automated management, control of the work processes, and decision-making of employees in DWE such as CAS organizations.

The high correlation between the use of a management method based on smart technology and the behavior of the operation employees is particularly noteworthy. It can indicate the motive for the employees' preference for automated management by smart information and communication technologies found in blockchain systems and based on smart contracts. This preference indicates the vital need of those employees for updated and efficient operational processes that can contribute to the stabilization and synchronization of organizational activities. Efficient and supportive operational measures have become a very significant basis in promoting the effectiveness of the DWE such as CAS organization. Furthermore, the negative relationship between human management method shared values and collaboration and the "information/resource sharing" dimension indicates a potential conflict between traditional leadership and the collaborative nature of CAS environments.

These findings have significant implications for the future of many organizations. As organizations increasingly resemble DWE such as CASs, investing in decentralized information technologies and supporting AI adapted to autonomous work may be essential. Blockchain and AI-based systems can provide a transparent and impartial management framework, fostering collaboration and knowledge sharing while minimizing human intervention.

The study suggests that investment in distributed information technologies, such as blockchain and artificial intelligence, is essential for organizations that are in the process of moving toward a DWE such as CAS. The study suggests that smart technological systems can provide a transparent and unbiased management framework that encourages collaboration and knowledge.

Managers must prepare today for a coming soon world in which intelligent information systems based on blockchain that enable smart contracts between people, and AI that enables immediate and focused sharing of information and resources between autonomous workers in a distributed work environment and in complex conditions. This new capability may make management roles redundant, accelerate work processes, reflect institutional knowledge, streamline value chains, that lead to more professional interactions and enable the creation of disruptive innovation at a faster and more up-to-date pace.

Limitations and Potential Tracks for Further Research

The study is based on a specific sample of workers in one country, and therefore the findings should be tested elsewhere if it is desired to approach more generalization.

Further research is needed to examine the effects of different types of information technologies on working environments as CAS, and to explore the cultural and social influences on the adoption of these management practices. The study acknowledges that its findings are based on a specific sample of workers, limiting generalizability and suggesting future research in different geographical and cultural contexts.

It also explicitly notes the need for further research on different types of information technologies and cultural/social influences on the adoption of management practices.

The study can identify associations but cannot definitively establish cause-and-effect relationships between the variables. The reliance solely on employee self-reports for all variables introduces some potential for measurement biases, such as social desirability or subjective interpretation.

"Human management method shared values and collaboration" variable is measured by scale that does not necessarily refer to Management model while the overall sample size is 150, the most significant and robust findings relate specifically to the Operation subsample, comprising only 38 participants, This relatively small subsample size for the group with the strongest results, while statistically significant within the sample, can impact the confidence in generalizing these findings to a wider population of operation employees. However, the study can be expanded to other countries and to various sectors of organizations.

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