DESIGNING AND VALIDATING A QUANTUM MANAGEMENT MODEL FOR EDUCATIONAL ORGANIZATIONS USING MIXED-METHODS

DESENHO E VALIDAÇÃO DE UM MODELO DE GESTÃO QUANTUM PARA ORGANIZAÇÕES EDUCACIONAIS UTILIZANDO MISTOS DE MÉTODOS

DISEÑO Y VALIDACIÓN DE UN MODELO DE GESTIÓN CUÁNTICA PARA ORGANIZACIONES EDUCATIVAS MEDIANTE MÉTODOS MIXTOS

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ABSTRACT: In the vein of other areas of human knowledge, some scientific paradigms have settled the theories and models developed for management and leadership. In this respect, two major paradigms, namely, Newtonian and quantum, have extensively influenced all organizational theories and models. Implementing such models accordingly calls for new management styles called quantum management (QM). For this purpose, 16 experts in educational management, selected by purposive sampling, were interviewed until theoretical saturation was reached. The study findings demonstrated that the causal conditions with a weak coefficient of determination (R^2, 28%) were the moderate predictors of QM in educational organizations. As well, the underlying and intervening conditions along with QM with a medium R2 (51%) could strongly predict the strategies/enablers, and then the strategies/enablers with a medium R2 (55%) were the strong predictors of the QM consequences.

KEYWORDS: Quantum management. Educational organizations. Grounded theory. Structural equation modeling.

RESUMO: *Na linha de outras áreas do conhecimento humano, as teorias e modelos desenvolvidos para gestão e liderança estão sendo sedimentados por alguns paradigmas científicos. A esse respeito, dois paradigmas principais, a saber, o newtoniano e o quântico, influenciaram extensivamente todas as teorias e modelos organizacionais. A implementação de tais modelos exige novos estilos de gerenciamento, aqui denominados de gerenciamento quântico (QM). Para tanto, foram entrevistados 16 especialistas em gestão educacional, selecionados por amostragem intencional, até atingir a saturação teórica. Os achados do estudo demonstraram que as condições causais com fraco coeficiente de determinação (R^2, 28%) foram os preditores moderados de QM em organizações educacionais. Além disso, as condições subjacentes e intervenientes juntamente com QM com um R2 médio (51%) poderiam prever fortemente as estratégias/facilitadores e, em seguida, as estratégias/facilitadores com um R2 médio (55%) foram os fortes preditores das consequências do QM.*

PALAVRAS-CHAVE: *Gestão quântica. Organizações educacionais. Grounded theory. Modelagem de equações estruturais.*

RESUMEN: *En la línea de otras áreas del conocimiento humano, las teorías y modelos desarrollados para la gestión y el liderazgo están siendo asentados por algunos paradigmas científicos. A este respecto, dos paradigmas principales, a saber, el newtoniano y el cuántico, han influido ampliamente en todas las teorías y modelos organizacionales. La implementación de dichos modelos en consecuencia requiere nuevos estilos de gestión, aquí denominados gestión cuántica (QM). Para ello, se entrevistó a 16 expertos en gestión educativa, seleccionados por muestreo intencional, hasta alcanzar la saturación teórica. Los hallazgos del estudio demostraron que las condiciones causales con un coeficiente de determinación débil (R^2, 28%) fueron los predictores moderados de QM en las organizaciones educativas. Además, las condiciones subyacentes e intermedias junto con QM con un R2 medio (51 %) podrían predecir fuertemente las estrategias/facilitadores, y luego las estrategias/facilitadores con un R2 medio (55 %) fueron los fuertes predictores de las consecuencias de QM.*

PALABRAS CLAVE: *Gestión cuántica. Organizaciones educativas. Grounded theory. Modelado de ecuaciones estructurales.*

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Introduction

The 21st century is identified with Einstein's theory of relativity and quantum theory, elaborated by his student, Heisenberg (MISSOURI, 2006). Therefore, the start of this century has been described as the era of quantum technology. Computers, the internet, barcode readers, and laser surgery are some examples of the new consequences and innovations of theoretical physics, called quantum mechanics (SHELTON; DARLING, 2001). Following the expansion of quantum physics theories, its principles and concepts have also been progressively introduced to other fields, including the humanities, particularly organization and management (LORD; DINH; HOFFMAN, 2015), as novel paradigms versus the traditional ones with the assumptions of the Newtonian physics (ERÇETIN; KAMACI, 2008). The message of quantum here is that all particles in the world, mainly humans, are dynamic, conscious, and interconnected beings. A quantum is also an atom in motion, with some probable tendencies, that show order has roots in disorder, wherein multi-causal, complicated, and intertwined relationships replace simple single-cause ones. Moreover, human perception is highly subjective, and creative thinking involves inspirational and enlightening capabilities. Internal discourse accordingly shapes basic human emotions (SHELTON; DARLING, 2001).

Matching the rapidly changing world today with quantum assumptions has thus provoked theorists to apply the principles of quantum thinking to management (NOROUZZADEH; IRANZADEH; FEGHI FARAHMAND, 2019). The related literature has recently focused on a new model for organization and management: a novel paradigm called quantum theory, characterized by complexity, uncertainty, randomness, non-topical causality, idealism, collaborative collusion, complementarianism, and the many-worlds interpretation. This paradigm is further associated with the scientific perspective in modern management, aimed at developing employees' capabilities to meet organizational goals (DARLING; WALKER, 2001), typically defined in the form of quantum management (QM). In this way, QM refers to a leadership style by which trust, security, dynamic communication, and learning are established between leaders and members, and above all, vertical communication is downgraded, but the horizontal one is augmented (DEARDORFF; WILLIAMS, 2006). Since QM handles human systems, it has been argued that the goals, values, ideals, and motivations of those involved in an organization, along with the emerging organizational culture, should be considered part of its system dynamics (ZOHAR, 2022).

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In Shelton and Darling (2001), seven quantum skills have been additionally delineated, including quantum seeing or vision (viz., to look objectively), quantum thinking (namely, to hold two opposing thoughts at the same time), quantum feeling (explicitly, to feel vitally alive), quantum knowing or knowledge (that is, to know intuitively), quantum acting (viz., to act responsively), quantum trust (or to trust the flow of life), and quantum being or existence (to be exact, to live in relationships). QM accordingly demonstrates the power of direct intuitive methods, such as meditation, immersion in nature, and other activities to transform knowledge among top managers in the organizational hierarchy into entrepreneurial creativity that incorporates social goals (LASZLO, 2020). QM is also founded on chaos theory concepts, in which the future of an organizational structure is unchanging and expiring. The leadership maintains the balance between tension and order during organizational variations, which helps promote creativity and prevent unpredictability (QIAN *et al.*, 2019). Zohar (2022) also introduces some common characteristics or determinants of quantum-oriented organizations, including being holistic, showing flexibility and responsiveness, having a bottom-to-top structure, being self-organized and emerging, with a growth rate based on diversity and uncertainty, as well as being lively and playful, deeply green, and vision- and value-adapted. QM is thus an approach toward improving the abilities and effectiveness of managers, especially employees (DARLING, 2008). In their book Quantum Management: A Textbook of New Leadership, Porter-O'Grady and Malloch (2009) further highlighted the QM skills as tools in organizations to accomplish much more positive results and effectiveness.

Over and above the aforementioned theoretical proof, QM benefits from good empirical support. In this line, Golami (2019) reported a significant relationship between QM and leadership effectiveness among the managers of Bu-Ali Sina University, Iran. Nazaripour, Arefinezhad, and Shariatnezhad (2018), in their proposed model, similarly revealed that leaders and managers of organizations could practice quantum vision to see objectively to create a quantum leadership style and match their attitudes with quantum thinking to hold two opposing thoughts at the same time, and thus pave the grounds for quantum knowledge and reflect intuitively on different issues raised in this regard. Kilmann (2011) additionally found that top managers' practice of QM skills could yield a broader vision and a better understanding of organizations, thereby boosting organizational performance and productivity. In other studies, a positive relationship has been thus far confirmed between QM and organizational agility (NAZARI; KHOSRAVI, 2017), knowledge management (NOROUZZADEH; IRANZADEH; FEGHI FARAHMAND, 2019), student learning and school performance (ACAT; YUSUF,

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2014), employee productivity (KHOSHTINAT; FARAHANI; SALIMI, 2017), career success among teachers (JEBALI; NAKHOSTIN GOLDOOST, 2020), job performance and satisfaction (ROOMI KADIJANI, 2020), and leadership effectiveness (GOLAMI; MORADI; SOHRABI, 2019).

Of note, organizations are in dire need of establishing QM. While the quantum paradigm in management was initially proposed by Porter-O'Grady in 1999, and much research has so far been conducted in this line, it has seemingly failed to find one's place to the extent that its dimensions have remained unknown. Considering the studies fulfilled in recent years on the role of QM in organizations, no research has thus shed light on a QM model for educational organizations, to the author's knowledge. While following the most common management criteria, QM should have unique features. As a result, organizations, especially the educational ones, whose uppermost missions are the fulfillment of organizational goals, should develop QM models from theoretical perspectives and authenticate practical rules to do so. In this respect, marking the components of the QM model for educational organizations to change their management from the Newtonian (or conventional) paradigm into the quantum one is essential. According to theoretical considerations and empirical background, QM has been thus far investigated thematically in terms of its effectiveness and indicators. However, it needs to be studied by grounded theory (GT) to solve the problems facing the theoretical application of QM to educational organizations. For example, structural, executive, and software-related concerns, how to recruit and train managers and teachers, organizational culture, organizing and redesigning procedures, proper vision, thinking, knowledge, as well as action and communication, and many countless challenges, which need underlying conditions, can thus help reach QM. Reviewing the results of these studies shows no QM model for educational organizations, so the use of GT in the present study is attributable to the lack of theoretical foundations and empirical background, making it impossible to develop a hypothesis. For this purpose, a new theory is advanced instead of resorting to predefined ones. This raises the most important question addressed in the present study: "How is the QM model for educational organizations?"

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Method of research

This applied developmental study aimed to design and validate a QM model for educational organizations, using a mixed-methods research design and an exploratory approach. To develop the research model, GT was employed. For this purpose, the data were collected through semi-structured interviews and questionnaires. At the qualitative stage, some in-depth interviews were conducted based on the purposive sampling of eminent experts in educational management (i.e., faculty members and professors of educational management at universities across Iran), and theoretical saturation was reached after 16 interviews. To analyze the data extracted from the interviews, using GT, three steps, including open, axial, and selective coding, were completed to help design the QM model for educational organizations. In addition, seven educational management experts and professors were recruited to meet the fitness of the results. Moreover, the emerging model was given to seven participants, and their added comments were received and applied. To fulfill the logic and depth of the problem, there was much attempt to ensure that the interviews had continuity and proper sequence during their implementation and analysis. The interview outcomes were also reviewed in detail and then approved after making some corrections according to the major categories and their dimensions.

Structural equation modeling (SEM) and the SmartPLS software package were utilized to validate the model concerned based on GT. A questionnaire was designed to determine the priority and importance of each category in the QM model for educational organizations. The questionnaire accordingly consisted of 61 items, whose validity was confirmed following some corrections by five experts, as the study participants, at the qualitative stage. Moreover, the reliability of the whole questionnaire was calculated by Cronbach's alpha coefficient of 0.897 as an acceptable value. The statistical population at this stage comprised 384 professors of higher education management and planning, school principals holding degrees in educational management, and presidents and vice-chancellors of universities and educational institutions in Iran. In the meantime, the sample size was determined using Krejcie and Morgan's Table (1970), and the sampling was of the random type. When randomly selected participants were unwilling to cooperate, their names were excluded, and new individuals were selected again by random sampling.

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Findings

The qualitative data obtained from the interviews were analyzed based on GT. For this purpose, the recorded interviews were analyzed, conceptualized, and classified after being transcribed verbatim using content analysis. Their similarities, conceptual connections, and common characteristics of the open codes, concepts, and categories were then established. The primary and secondary codes were then obtained at the open coding stage. Table 1 shows the classification of the core categories during axial coding. Table 2 presents the significant categories regarding the causal, underlying, and intervening conditions, the central phenomenon, and the related strategies/enablers and consequences of the selective coding stage.

All through the open coding, 367 primary codes were acquired. At the axial coding stage, the codes were initially compared, merged into categories that fit each other, and finally, 19 core categories were obtained out of 57 major ones, emerging all around an axis to make a vital web of relationships (Table 1).

Table 1 – Primary codes, their frequency, and axial coding

No.	Sources of primary codes	Major categories	Core categories	Frequency
1	P1 P1 P3 P2 P6 P8 P10 P12 P16	Expertise, personality, self-efficacy, a competitive spirit	Individual factors	9
2	P1 P2 P3 P7 P8 P11 P14 P13 P16	A dynamic organizational environment, resources, restraints, organizational expectations, organizational interactions	Organizational factors	9
3	P11 P7 P6 P1 P1 P5 P5 P15	Cultural beliefs, social values, social expectations, culture sharing	Sociocultural factors	8
4	P1 P6 P9 P8 P7 P5 P13	Delegation and decentralization, quantum skills among top managers, support for quantum vision among top managers, support for quantum-based structures	Structural and managerial factors	7
5	P1 P2 P5 P6 P7 P8 P10 P11 P14 P15	Organizational structure redesign, process reengineering, defining and facilitating resources	Structure redesign	10
6	P1 P2 P3 P3 P4 P6 P9 P10 P11 P12 P13 P14	Adapting to the environment, adapting to complexities	Flexibility and adaptability	12
7	P1 P5 P13 P10 P15 P12 P16	Employee engagement, organizational behavior, employee responsibility	Participation and responsibility	7
8	P1 P2 P3	Influence on subordinates, quantum characteristics and views of managers, power of encouragement and motivation	Quantum leadership	3
9	P1 P2 P3 P5 P6 P7 P10 P11 P12 P16	Trust-building through communication, institutional trust (viz., the perspective of those at higher levels), vertical (boss-	Trust-based communication	10

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		subordinate) trust, horizontal trust between employees trust, horizontal trust between employees		
10	P1 P2 P4 P8 P9 P11	Management based on scheduled goals, order and organization, time and place control	Time management	6
11	P2 P6 P7 P8 P15 P11 P16 P16	Professional development for employees, professional training and development skills, skill-based employee promotion	Professional training and development	8
12	P2 P7 P8 P16	Encouraging organizational ideas, cultivating internal motivation, material and spiritual motivation	Encouragement and motivation	4
13	P2 P5 P5 P5 P8 P9 P14 P16	Identifying needs, determining sources of knowledge, organizational knowledge sharing, directed learning	Learning management	8
14	P2 P5 P5 P5 P8 P9 P14 P16	Job evaluation, performance efficiency evaluation, performance-based rewarding	Performance-based assessment	8
15	P2 P2 P8 P14	Competent and smart managers, efficient managers	Efficiency of managers	4
16	P2 P7 P7 P11	Improving organizational effectiveness, performance success	Performance effectiveness	4
17	P2 P3 P4 P7 P8 P9 P11	Fostering creativity in the education system, creating innovation	Creativity and innovation	7
18	P2 P6 P8 P10	Resource productivity, employee productivity, organizational productivity	Productivity	4
19	P1 P3 P7 P12 P13 P14 P15 P16	Quantum vision	QM	18
	P2 P3 P6 P7 P9 P11 P16	Quantum thinking		
	P2 P3 P5 P6 P12 P12 P13 P15	Quantum knowledge		
	P3 P4 P7 P9 P11 P13 P15 P16	Quantum acting		
	P3 P4 P9 P10 P12 P13 P15 P16	Quantum communication management		
Total	367	57	19	57

Source: Prepared by the authors

The selective coding continued until no information was added to the major categories, and saturation was reached (Table 2).

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Table 2 – Final classification of major categories based on conditional, interactive/procedural, and consequential dimensions

No.	Major categories	Core categories	Type of categories
1	Expertise, personality, self-efficacy, a competitive spirit	Individual factors	Conditional
2	A dynamic organizational environment, resources and restraints, organizational expectations, organizational interactions	Organizational factors	
3	Cultural beliefs, social values, social expectations, culture sharing	Sociocultural factors	
4	Delegation and decentralization, quantum skills among top managers, support for quantum vision among top managers, support for quantum-based structures	Structural and managerial factors	
5	Quantum vision, quantum thinking, quantum knowledge, quantum acting, quantum communication management	QM	Axial phenomenon
6	Organizational structure redesign, process reengineering, defining and facilitating resources	Structure redesign	Conditional
7	Adapting to the environment, adapting to complexities	Flexibility and adaptability	
8	Employee engagement, organizational behavior, employee responsibility	Participation and responsibility	
9	Influence on subordinates, quantum characteristics and views of the manager, power of encouragement and motivation	Quantum leadership	
10	Trust-building through communication, institutional trust (viz., the perspective of those at higher levels), vertical (boss-subordinate) trust, horizontal trust between employees	Trust-based communication	
11	Management based on scheduled goals, order and organization, time and place control	Time management	
12	Professional development for employees, professional training and development skills, skill-based employee promotion	Professional training and development	Interactive
13	Encouraging organizational ideas, cultivating internal motivation, material and spiritual motivation	Encouragement and motivation	
14	Identifying needs, determining knowledge sources, organizational knowledge sharing, directed learning	Learning management	
15	Job evaluation, performance efficiency evaluation, performance-based rewarding	Performance-based assessment	
16	Competent and smart managers, efficient managers	Efficiency of managers	Consequential
17	Improving organizational effectiveness, performance success	Performance effectiveness	
18	Fostering creativity in the education system, creating innovation	Creativity and innovation	
19	Resource productivity, employee productivity, organizational productivity	Productivity	

Source: Prepared by the authors

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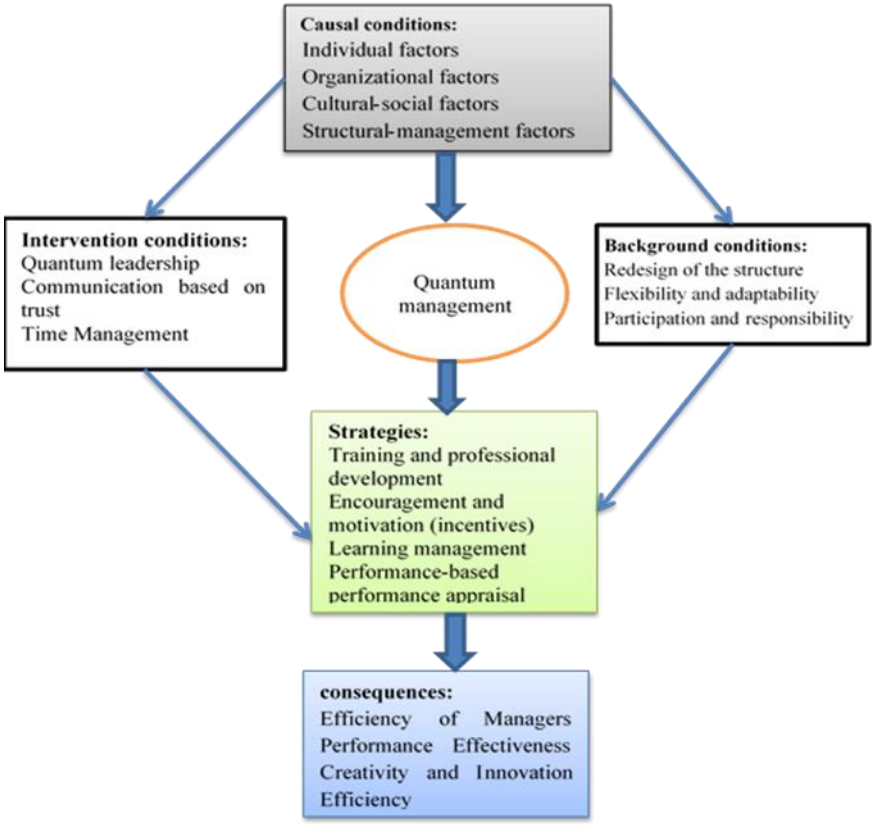
As illustrated in Table 3, all the major and core categories were classified into conditional, interactive/procedural, and consequential. Finally, the calculated core categories were considered a system of processes, with their related phases, steps, and sequences via the axial coding inspired by Glaser (1998), as shown in Figure 1.

Figure 1 – Final QM model for educational organizations



Source: Prepared by the authors

Validating the research model

The partial least squares (PLS) SEM was used in this study to test the conceptual model. For this purpose, the SmartPLS software package was implemented. Moreover, the SEM fitness was obtained by the coefficient of determination (R2), predictive relevance (Q2), redundancy, and significant coefficients. The most basic criterion to measure the relationship between the structures in the SEM was the t-statistic. If this value fell outside the range of -1.96 to +1.96, it could be significant at the 95% confidence interval (CI), or the path coefficient estimated was not significant, and the hypothesis could be rejected if the value of the t-statistic was within this range.

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All direct and indirect path coefficients were significant at the 95% CI, and thus all the relationships developed in the conceptual model were confirmed because the t-statistic was higher than the critical value of 1.96 and at the CI of 95%. Figure 3 shows the conceptual model of the research in the standard coefficient estimation mode. Here, the effect size of the variables was stated.

The independent ones could also explain the R2 as a metric to account for the change in each model-dependent variable (Chin, 1998). Three criterion values of 0.19, 0.33, and 0.67 were thus defined for the weak, medium, and strong modes of the structural fit of the model, using R2.

Table 3 – Exogenous endogenous categories and their related R2

Endogenous variables	**Exogenous variables**	**R^2**	**Assessment results**
Intervening conditions	Causal conditions	0.278	Weak
QM	Causal conditions	0.184	Weak
Underlying conditions	Causal conditions	0.394	Moderate
Strategies/enablers	Intervening conditions, QM, underlying conditions	0.507	Moderate
Consequences	Strategies/enablers	0.551	Moderate

Source: Prepared by the authors

The Q2 index, introduced by Stone (1974), was further employed to determine the model's predictive power (Hansler *et al.*, 2009). The intensity of the predictive power for the endogenous structures was further determined as 0.02, 0.15, and 0.35. Accordingly, if the value of the endogenous structure was close to 0.02, the model had weak predictive power. Table 4 depicts the values reported for each endogenous category in the research model.

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Table 4 – Q2 index for endogenous categories in the research model

Predictor exogenous variables	**Predictor endogenous variables**	**Q^2**	**Predictive power of the model**
Causal conditions	Intervening conditions	0.314	Medium
Causal conditions	QM	0.207	Medium
Causal conditions	Underlying conditions	0.467	Strong
Intervening conditions, QM, underlying conditions	Strategies/enablers	0.547	Strong
Strategies/enablers	Consequences	0.615	Strong

Source: Prepared by the authors

In line with Table 4, the Q2 index for all endogenous variables was evaluated as strong and moderate. Therefore, the structural model was of good quality, the observed values had been well reconstructed, and the model had good predictive power for the endogenous variables.

The goodness of fit (GoF), as an overall measure of model fit for SEM introduced by Tenenhaus *et al.* (2005), could further act like the fit indices in the LISREL model, between zero and one, in which the values close to one showed the excellent quality of the model.

Table 5 – Results of the overall measure of the model fit using GoF

$\overline{R^2}$	$\overline{Communalities}$	$GOF = \sqrt{\overline{Communalities} \times \overline{R^2}}$
0.382	0.415	0.398

Source: Prepared by the authors

As per Table 5, the standard value of GoF (0.398) was obtained, which was greater than 0.36, and suggested the excellent predictive power of the model for the endogenous variables. In this way, the research model had a good fit.

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Discussion and conclusion

The main objective of the present study was to design and validate a QM model for educational organizations. The research findings presented five main factors as the antecedents of QM in educational organizations. In the words of the interviewees, individual-organizational, sociocultural, and structural-managerial factors needed to be considered at the onset so that QM could emerge in educational organizations and then be implemented, which were in agreement with the results reported in Golami (2019) and Nazaripour, Arefinezhad, and Shariatnezhad (2018). The conceptual codes extracted from the transcribed interviewees also signaled this consistency.

According to the participants' viewpoints, the underlying factors were recognized in three categories of structure redesigning in educational organizations under current conditions, flexibility in all general dimensions, including decision-making and the like, and the participation and responsibility of employees in a collective agreement. The causal factors of the QM phenomenon in educational organizations could not be thus formed in a vacuum, but once there were specific environmental platforms, the QM process in educational organizations was designed and re-engineered in terms of its structure from the conventional to dynamic and innovative modes could be made possible, which was in harmony with the findings in Nazaripour, Arefinezhad, and Shariatnezhad (2018). To help educational organizations succeed, managers have no choice but to give importance to understanding organizational flexibility and employee responsibility. The context further indicates the special conditions in which interactions are made and strategies/enablers are adopted to respond to the QM phenomenon. Given this, educational organizations' QM strategies/enablers are shaped in such contexts. The QM process (i.e., proper quantum vision, thinking, knowledge, acting, and communication management), which needs underlying conditions, becomes noticeable. Organization and redesign, as highlighted by the interviewees, should not thus happen once but repeatedly as a process because the quantum approach in organizations also seeks change and rotation in the organizational cycle. Organizational effectiveness can be consequently achieved through this re-engineering along with employees' flexibility and responsibility.

Based on the participants' opinions, the intervening factors associated with QM in educational organizations were identified with three main themes quantum leadership, trust-based communication, and time management. The intervening conditions could thus be considered a broader structural context related to the QM phenomenon, facilitating or hindering

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the strategies/enablers in a specific context (STRAUSS; CORBIN, 2011). As confirmed in the coding results, the QM interaction in educational organizations could be influenced by the categories of quantum leadership, trust-based communication, and time management, which was consistent with the findings in Nazaripour, Arefinezhad, and Shariatnezhad (2018), Villalba-Diez and Zheng (2020), and Kilmann (2011). Accordingly, the intervening conditions and the underlying ones could shape the modes of interaction and the suggested strategies/enablers. Based on the interviews and their analyses, the intervening conditions could make the proposed strategies/enablers much more demanding if they had failed to have their share. If leaders and organizations aim to progress in today's changing world, they must create an intellectual leap and develop novel skills, which QM has established among managers (AFJAHI; HAMZEHPOUR, 2014). Therefore, effective leadership in quantum-based organizations involves special behaviors and skills within QM. Of note, QM is a leadership style in which there is trust, security, dynamic communication, and learning between leaders and members, so vertical communication is typically reduced, and the horizontal one is boosted (DARLING; WALKER, 2001). Moreover, quantum-oriented managers can control space and time and build trust in employee communication.

The actions and reactions to implement QM can also have consequences in educational organizations, including the efficiency of managers, performance effectiveness, creativity and innovation, and productivity. Based on the extracted codes, QM could give rise to overall productivity for the stakeholders in educational organizations. The study results here supported the previous research findings, such as the reports in Golami (2019), Nazari and Khosravi (2017), and Kilmann (2011). Besides, a positive relationship has been thus far confirmed between QM and some consequences, such as organizational agility (NAZARI; KHOSRAVI, 2017), knowledge management (NOROUZZADEH; IRANZADEH; FEGHI FARAHMAND, 2019), student learning and school performance (ACAT; YUSUF, 2014), employee productivity (KHOSHTINAT; FARAHANI; SALIMI, 2017), career success among teachers (JEBALI; NAKHOSTIN GOLDOOST, 2020), job performance and satisfaction (ROOMI KADIJANI, 2020), organizational success (KILMANN, 2011), and leadership effectiveness (GOLAMI; MORADI; SOHRABI, 2019).

Based on the primary objectives of this study (namely, the antecedents), QM in educational organizations could be affected by some conditions whose non-fulfillment could make it impossible to implement this leadership style. These conditions also depended on individual-organizational, sociocultural, and structural-management factors, with their

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importance in the success of QM, which policymakers should regard. The individual-organizational factors in the quantum-oriented approach (viz., having proper quantum vision, thinking, and knowledge of an organization, as well as being responsive to customers and quantum acting along with communication management) could be thus necessary for QM practice by decision-makers in educational organizations. Neglecting these factors can make QM fruitless from its introduction. Moreover, sociocultural factors in an organization, including cultural beliefs, social values, social expectations, and culture sharing, should be reinforced in line with QM. In addition to the individual-organizational and sociocultural factors, the structural-managerial ones (i.e., delegation and decentralization, quantum skills among top managers, support for quantum vision among top managers, and support for quantum-based structures) should also be met in educational organizations. Preparing these factors accordingly requires delegating authority to educational organizations at the onset of QM.

To explain the general fit of the research model, the causal conditions with a weak R2 (28%) and a moderate predictive power (0.314) could be considered for QM in educational organizations. As well, the underlying conditions, QM, and intervening conditions had a medium R2 (51%) as a strong predictor (0.547) for the strategies/enablers, whose medium R2 (55%) and strong predictor power (0.615) accounted for the QM consequences. The final model resulting from the qualitative part of the research also had a good fit and could be implemented in educational organizations. As a result, it is acknowledged that the message of quantum is that all particles in the world, mainly humans, are dynamic, conscious, and interconnected beings. A quantum is also an atom in motion with some probable tendencies that show order has roots in disorder, wherein multi-causal, complicated, and intertwined relationships replace simple single-cause ones (Shelton & Darling, 2001). In general, QM in educational organizations requires a change from the conventional into dynamic and innovative modes, from the beginning stage to the ending, viz., the development of the results. To understand QM in educational organizations and identify the effective factors in this phenomenon, the major categories extracted and presented in the research model can thus lead to some fundamental changes in the productivity of educational organizations.

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REFERENCES

ACAT, B.; YUSUF, A. An Investigation the Effect of Quant um Learning Approach on Primary School 7th Grade Students' Science Achievement, Retention and Attitude. **Educational Research Association The International Journal of Research in Teacher Education**, v. 5, n. 2, p. 11-24, 2014.

AFJAHI, S.; HAMZEHPOUR, M. A Comprehensive Approach to Quantum Theory and its Applications in the Organization. **Strategic Management Thought**, v. 8, n. 2, p. 161-204, 2014.

DARLING, J. R. Effective Conflict Management: Use of & Walker w.Earl the Behavioral style model. **Leadership and Organizational Development Journal**, v. 22, n. 5, p. 230-242, 2008.

DARLING, J. R.; WALKER, W. E. Effective conflict management: use of the behavioral style model. **Leadership and Organizational Development Journal**, v. 22, n. 5, p. 230-42, 2001.

DEARDORFF, D.; WILLIAMS, G. **Synergy leadership in quantum organization**. 2006. p. 2-12. Available at: https://www.rockypeaklc.com/synleader08.pdf. Access: 10 Dec. 2022.

ERÇETIN, S. S.; KAMACI, M. C. Quantum leadership paradigm. **World Applied Sciences Journal**, v. 3, n. 6, p. 865-868, 2008.

GLASER, B. **Doing grounded theory**: Issues and discussions. Mill Valley, CA: Sociology Press, 1998.

GOLAMI, M. **Investigating the Relationship between Quantum Management Skills and Leadership Effectiveness in Quantum Organizations**. Payame Noor University of Hamadan, Payame Noor Malayer Center, 2019.

GOLAMI, MJ; MORADI, M.; SOHRABI, R. Investigating the Relationship between Quantum Management Skills and Leadership Effectiveness in Quantum Organizations. *In*: INTERNATIONAL CONFERENCE ON NEW DEVELOPMENTS IN MANAGEMENT, ECONOMICS AND ACCOUNTING, 3., 2019, Tehran. **Proceedings** […]. Tehran: Iran Business Excellence Association, 2019.

JEBALI, N; NAKHOSTIN GOLDOOST, A. **Investigating the Role of Quantum Management Components of Managers in Job Success and Perceived Organizational Support of Ardabil High School Teachers**. Educational Management, Islamic Azad University, Ardabil Branch, 2020.

KHOSHTINAT, B.; FARAHANI, T.; SALIMI, R. **Investigating the Impact of Managers' Quantum Skills on Increasing the Productivity of Organizational Employees (Case Study: Bank Melli Branch of Guilan Province)**, Fourth Conference on Economics and Applied Management with National Approach, Babolsar, Hazrat Masoumeh University of Qom, Islamic Azad University, Rafsanjan Branch , Payame Noor University, Yazd Branch - University of Social Welfare and Rehabilitation Sciences, Bu Ali Sina University, 2017.

(cc) BY-NC-SA

KILMANN, R. H. **Quantum organizations**: a new paradigm for achieving organizational success and personal meaning. Newport Coast, CA: Kilmann Diagnostics, 2011.

LASZLO, C. Quantum management: the practices and science of flourishing enterprise. **Journal of Management, Spirituality & Religion, Special Issue on Quantum Management**, v. 17, n. 4, p. 301-315, 2020.

LORD, R, G.; DINH, J. E.; HOFFMAN, E. L. A Quantum Approach to time and Organizational Change. **Academy of Management Review**, v. 40, n. 2, p. 263-290, 2015.

MISSOURI, L. **Soul Intelligence Springboard to Quantum Leadership**. 2006. Available at: https:// coachfederation.org/NR/.../4819/soul_intelligence_Seale_Wilson.pdf. Access: 10 Dec. 2022.

NAZARI, R.; KHOSRAVI, S. Modeling Effect of Communication Skills on Quantum Management and its Role on Organizational Agility: a Case Study of Isfahan Sport Organizations. **Journal of Human Resource Management in Sport**, v. 4, n. 1, p. 61-70, 2017.

NAZARIPOUR, A.; AREFINEZHAD, M.; SHARIATNEZHAD, A. Designing a quantum leadership model in government organizations using structural-interpretive modeling approach. **Public Administration Perspaective**, v. 8, n. 29, p. 135-153, 2018.

NOROUZZADEH, A.; IRANZADEH, S.; FEGHI FARAHMAND, N. Analysis of the Effect of Quantum Leadership Dimensions on Organizational Excellence with the Intermediate Role of Knowledge Management and Quantum Skills in Ardabil University of Medical Sciences. **Journal of Healthcare Management**, v. 10, n. 3, p. 67-75, 2019.

PORTER-O'GRADY, T.; MALLOCH, K. **Quantum leadership**: a textbook of new Leadership. Boston, MA: Jones and Bartlett, 2009.

QIAN, C. *et al.* **Facile synthetic Photoluminescent Graphene Quantum dots encapsulated β-cyclodextrin drug carrier system for the management of macular degeneration**: Detailed analytical and biological investigations. J Photochem Photobiol, B., 2019.

ROOMI KADIJANI, S. H. **The Role of Manager Quantum Skills in Predicting Job Satisfaction, Organizational Commitment and Job Performance of Sarab Education Staff**. Educational Management, Islamic Azad University, Sarab Branch, 2020.

SHELTON, C.; DARLING, J. The quantum skills model in Management: a new paradigm to enhance effective leadership. **The Leadership and Organization Development Journal**, v. 22, n. 6, p. 264-273, 2001.

SHELTON, C.; DARLING, J. The quantum skills model in Management: a new paradigm to enhance effective leadership. Translated by Gholshan, E. **Journal of Administrative Transformation**, v. 7, n. 40, p. 43-65, 2004.

(cc) BY-NC-SA

STRAUSS, A.; CORBIN, J. M. **Basics of qualitative research**: Techniques and procedures for developing grounded theory. Translated by Mohammadi, B, Tehran: Institute of Humanities and Cultural Studies, 2011.

VILLALBA-DIEZ, J.; ZHENG, X. Quantum Strategic Organizational Design: Alignment in Industry 4.0 Complex-Networked Cyber-Physical Lean Management Systems. **JIDOKA**, v. 20, n. 20, p. 269-284, 2020.

KREJCIE, R.V.; MORGAN, D.W. Determining Sample Size for Research Activities. **Educational and Psychological Measurement**, v. 30, n. 3, p. 607-610, 1970. DOI: 10.1177/001316447003000308.

ZOHAR, D. What Is Quantum Management? *In*: ZOHAR, D. **Zero Distance**. Singapore: Palgrave Macmillan, 2022. DOI: 10.1007/978-981-16-7849-3_4.

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