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High-performance work systems and organizational ambidexterity: the mediating role of knowledge management systems—evidence from the Egyptian public-telecommunication sector

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Abstract

Purpose The purpose of this study is to examine the mediating role of the quality-based knowledge management systems (KMSs) in explaining the relationships between AMO-based high-performance work systems (HPWSs) and organizational ambidexterity (OA).

Design/methodology/approach Using cross-sectional survey, the authors collected data from 277 employees working at the Egyptian public-telecommunication sector and analyzed the hypothesized model using the partial least square structural equation modeling technique. Interviews were conducted with 39 key positions and mirrored against the quantitative data. The qualitative data were analyzed using the thematic analysis technique.

Findings The authors found that the HPWSs dimensions (i.e., ability and opportunity-enhancing practices) explain the OA level. The HPWSs dimensions (i.e., ability, motivation, and opportunity-enhancing practices) have a significant positive effect on the KMSs quality. The KMSs (i.e., system, service, and information quality) have a significant positive effect on OA and mediate the relationship between HPWSs and OA.

Originality/value This study is among the first to add significant information on how the quality-based KMSs (as mediator) explain the complex relationship between HPWSs dimensions and OA.

Research limitations/implications Limited attention was paid to investigating the OA enablers. This study bridges the aforementioned research gap by providing in-depth explanations on how the working systems atmosphere emphasizing ability, motivation, and opportunity-enhancing practices alongside the quality-based KMSs enable OA.

Practical/managerial implication The findings provide the decision makers in public-telecom sector with a clear guideline for achieving ambidexterity in turbulent business environment.

Keywords High-performance work systems, Knowledge management systems, Organizational ambidexterity

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Introduction

Nowadays, businesses are facing disruptive environmental changes, which led to the need for highly customized products, individual treatments, and shorter products life cycle [38]. According to Tsai and Lasminar [66], organizations can cope with ever-changing environment by *reacting* to external events, and *proactively* shaping business strategies. Here, the concept of "ambidexterity" has emerged in the literature to spotlight the process of continually renewing an organization's direction, structure, and capabilities to meet changes in environmental demand [41]. Seraphin [63] demonstrates that ambidextrous organizations can *exploit* their current competencies to react swiftly to changes in the external environment, at the same time, they *explore* new opportunities to shape the organization future. Here, Soto-Acosta et al. [64] defined organizational ambidexterity as the ability to create *incremental* and *radical* innovations, which require the organization to exploit existing skills and explore new opportunities for experimentation, research, and discovery.

The current literature proves that ambidextrous organizations have the ability to boost their performance in challenging business environments [1, 10, 45]. So far, however, we know a little about the *practices*, leading to organizations ambidexterity (known as OA enablers), which received limited attention from the scholars [41, 51]. From this line of reasoning, recent HRM literature has addressed the *practices* creating organizational ambidexterity and leading to high-sustained organizational performance and outcomes [20, 28, 45, 68]. Thus, the present study gives a special emphasis on the significant shift in the role of HR practitioners from *operational* to *strategic* business partners [40], which led to the emergence of a new system of HRM practices, processes, and policies that adapt to changing in business environment while building business strategic plan [20, 68, 70]. The new working system has been known as high-performance work system (HPWS) [70]. The HPWS-related business model, known as AMO, has been adopted to integrate HRM practices associated with high individual and organizational performance through enhancing employees' *ability*, *motivation*, and *opportunity* enhancing practices for achieving organizational objectives. According to Jyoti and Rani [40], *ability-enhancing* practices emphasize employees' competencies through careful selection process, competencies-based performance management, continuous talent review, and agile training & development systems. In addition, *motivation-enhancing* practices motivate employees by using organic incentives systems with multiple components [28]. Finally, *opportunity-enhancing* practices provide employees with an opportunity that enable them to develop their innovative ideas and to use their skills through adopting participative structures and cross-functional teamwork [52]. The present study, thus, provides explanations on how AMO-based HPWS helps building workforce competencies that are capable of effectively managing and adapting to change [40, 59], which is essential for managing the tensions between exploration and exploitation and achieving organizational ambidexterity in disruptive markets [67, 68, 70] (Additional file 1).

On the other hand, HPWS creates a work environment that promotes employee learning, collaboration, and continuous improvement [69], which requires building quality-based KMS (i.e., information, service, and system quality) [32]. According to Chakrabarti et al. [18] and Gorla et al. [31], *system quality* explains the quality of the KMS components (i.e., database, software, hardware, network) that affect the technical goodness of the KMS (i.e., system flexibility, system sophistication, ease of learn, and ease of use). In addition, *service quality* is the consistency between employees' expectations and perceptions regarding KMS service performance (i.e., responsiveness, reliability, and empathy). Finally, *information quality* addresses the quality of the KMS outputs (i.e., effectiveness, efficiency, confidentiality, integrity, availability, compliance, and reliability). Based on this, the present study gives emphasis on the necessity for the existence of quality-based KMS to provide the technological infrastructure and tools that facilitate and support learning and development processes embedded in HPWSs by providing access to knowledge resources, best practices, and lessons learned [31], leading to organizational ambidexterity [20].

Accordingly, the present study aims to explore *OA enablers* through examining the potential interdependencies among HPWS, KMS, and OA. The current literature examines the HPWS, KMS, and OA relationship either *independently* or as a *dyadic* function [20, 59, 60, 70, 71]. Nevertheless, the present study considered HPWS, as a new working methodology (based on ability-enhancing, motivation-enhancing, and opportunity-enhancing practices), that facilitates attracting competent individuals, developing their abilities, and boosting their commitment, engagement, and collaboration [68], leading to organizational ambidexterity [40, 59]. However, this can only happen if the organization builds quality-based KMSs that enable employees to acquire information and share their previous expertise [25, 64]. From this perspective, the present research adds new insights into the current literature by elaborating how AMO-based HPWS leads to OA through fostering quality-based KMS. Significant implications for management practice are highlighted to elucidate the decision-maker's role in achieving ambidexterity in public-telecom sector. The present

study, thus, incorporated the AMO-based HPWSs as individualistic independent construct, OA as dependent variable, and hypothesizing quality-based KMSs as mediating variable. Accordingly, this study has been directed toward answering the central question of: "*How can KMSs explain the relationship between HPWSs and OA*"?

This study is structured as follows. The next section reviews the literature on HPWSs, KMSs, and OA relationship, leading to hypotheses' development. This is followed by presenting the research methodology. Then, the empirical results of the study are presented and analyzed. Finally, the concluding section outlines the theoretical contributions, practical implications, main limitations of the study, and avenues for future research.

Theoretical background

Socio-technical systems (STSs) model

STSs theory addressed the influence of people-technology interactions on technology relevancy and people behavior [17]. Based on the STSs basic assumptions, Botla and Kondur [13] introduced the STSs model that emphasizes the HRM practices (HRMPs) and knowledge management (KM) processes that enable organizations to respond to environmental challenges. In this context, Elsawy and Elbadawi [26] have demonstrated that HRM practices supported by technical system significantly affect organizational performance. Likewise, Mom et al. [52] demonstrated that HRM-based technology is a powerful tool for changing and enhancing an organization's culture by aligning social and technical systems. Thus, social networks facilitate *sharing knowledge* among individuals to cope with environmental changes and attain organizational objectives [5, 38]. Mardi et al. [45] demonstrated that technology has a direct and positive relationship between social interaction and organizational performance.

Accordingly, the STSs model's component of "corporate entrepreneurship" enables developing new processes, products, and models to enter new markets which is similar to the *exploratory innovation* concept [34]. In addition, the STSs model's component of "competitiveness" enables corporate entrepreneurs to exploit the existing capabilities to cope with external environment changes which is similar to *exploitative innovation* concept [64] (see Fig. 1).

The modified STSs model

Based on the previous discussion, the STSs model of Botla and Kondur [13] elaborates the mechanism by which HRM practices and KM processes enable corporate entrepreneurs to keep competing in the market by reacting quickly to environmental changes. Nevertheless, modifications should be made to develop a new model that not only re-acts but also pro-acts to ever-changing business environment. From this perspective, the STS model dimensions of HRMPs and KM processes have been replaced by high-performance work systems (HPWSs) and quality-based knowledge management systems (KMSs). Internal competitiveness and entrepreneurship dimensions have been merged under organizational ambidexterity, including exploitative and exploratory innovation (Fig. 2).

Organizational ambidexterity (OA)

"Ambidexterity" has been defined as performing two things simultaneously to deal with change and stability paradoxes [44]. From this perspective, Fu et al. [30] and Baškarada & Watson [9] asserted that ambidextrous organizations focus on their ability to balance exploiting current resources efficiently and exploring new opportunities and ideas effectively, which helps improve products and services that affect the competitive advantage of the organization. The current literature addressed the term

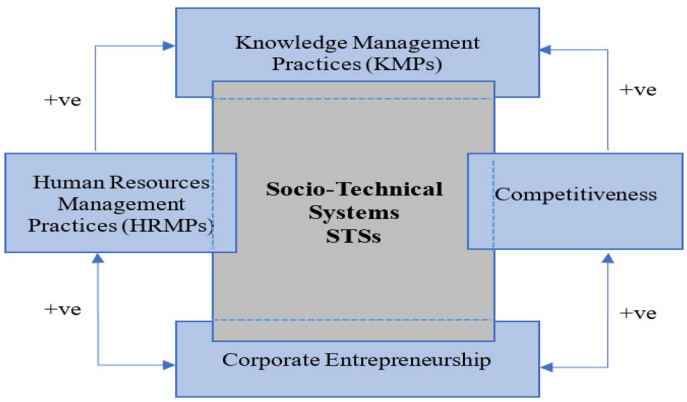

Fig. 1 Four dimensions of Botla and Kondur's [13] STSs model

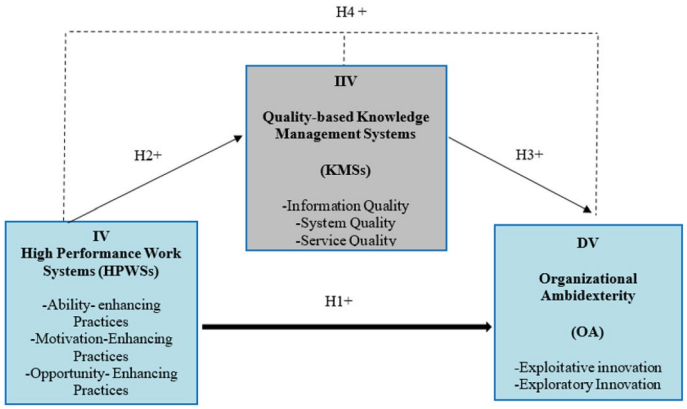

Fig. 2 The theoretical framework. *Source:* Created by authors

"ambidexterity" associated with competing goals such as manufacturing flexibility, efficiency, and differentiation [64]. Recently, scholars assessed organizational ambidexterity using two competing goals: *exploratory innovation* and *exploitative innovation* [44, 72]. Exploratory innovation involves exploring new areas, discovering, and generating new opportunities and ideas by pursuing experimentation, search, and discovery activities, which boosts innovation. Exploitative innovation involves using current competencies and reusing its current capabilities and knowledge to increase productivity [44, 72].

High-performance work systems (HPWSs) and OA

Large body of the literature addresses the potential interdependency between HRM practices and organizational performance [20, 45, 70]. The majority of the literature underlines the *operational* role of the HRM practitioners on carrying-out a well-known list of the HRM traditional functions in isolation of the organization strategies [70]. Nevertheless, the recent HRM studies stress the significant shift in the role of the HR professionals from *operational* to *strategic* business partners [40], which allows developing an integrated system of HRM policies and practices that adapt to changing in business environment while building business strategic plan [20, 68, 70]. Here, the new concept of high-performance work system (HPWS) has emerged in the HRM literature [15]. Úbeda-García et al. [68] defined HPWS as HR policies, practices, and processes that help enhancing employees' performance and organization's outcomes. HPWS emphasizes employee's innovative knowledge, skills, and abilities (KSAs) which are significant for achieving competitive advantage [20]. Wei et al. [70] asserted that traditional HRMPs consider each HRM function as a separate practice. However, HPWSs have *cumulative* effects that emphasize both vertical and horizontal fit. The horizontal-fit refers to the integration among HRMPs and the vertical-fit refers to integration between HRMPs and business strategy [20]. In this context, HRM scholars stress that HPWSs is a bundle of HRM Practices such as competencies-based performance management and continuous talent review [40], agile, cross-sectional training systems to enhance employee's ability [38], organic incentives systems with multiple components to motivate employees [28], and participative structures that improve employee's opportunities [52]. The suggested HRM practices are integrated with each other as well as with an organization business strategy for sustaining high organizational performance [20, 45]. According to Sangwan [59] and Jyoti and Rani [40], the HPWSs-related business model known as AMO integrates HRM practices with high individual and organizational performance through enhancing employees' ability, motivation, and opportunity for achieving organizational objectives. AMO model has three dimensions: (i.e., ability-enhancing practices, motivation-enhancing practices, and opportunity-enhancing practices). *Ability-enhancing* practices emphasize the employees' skills and knowledge level through applying careful selection process and providing them with appropriate training. *Motivation-enhancing* practices motivate employees by using performance appraisal, rewards, career opportunities, and job security. *Opportunity-enhancing* practices are HRMPs that provide employees with an opportunity that enable them to develop their innovative ideas and to use their skills; knowledge and motivation, such as teamwork; involvement; and adequate communication.

HRM scholars demonstrated that AMO-based HPWSs help building workforce that are capable of effectively managing and adapting to environmental change, which is essential for achieving OA [40, 59]. From this standpoint, Ossenbrink et al. [55] integrated *contextual* and

structural approaches to organizational ambidexterity to elucidate the management practices and employees' behaviors needed to explore novel opportunities and exploit existing abilities. The *contextual* ambidexterity entails policies, processes, and practices that shape the employees' innovative behavior at the workplace. However, the *structural* ambidexterity is associated to the desired modifications in organizational design, which enables exploring and exploiting workers' competences at different managerial levels [55]. Following this line, Caniëls and Veld [15] and Úbeda-García et al. [68] demonstrated that HPWS entails building organic design that empowers ambidexterity (exploitation and exploration), while at the same time facilitates developing policies and practices that enhance workers' *innovative abilities* and *motivate* them to create value for the organization [20, 30]. Therefore, HPWS is essential for effectively managing the tensions between exploration and exploitation [7, 9], which helps organizations to keep ambidextrous in disruptive markets [67, 68, 70].

Accordingly, a positive relationship between HPWSs and OA has been demonstrated [30]. Recent HRM literature argues that building HPWS enables the creation of reactive and proactive strategies [68]. Wei and Lau [70] pointed out that HPWSs shape workers' adaptive capabilities (i.e., flexibility, responsiveness to the market opportunities, and quickness in pursuing the opportunities). They asserted that the workers' flexibility partially mediates the relationship between HPWSs and organizational outcomes. Likewise, Chang [19] investigated the indirect relationship between HPWSs and OA. The findings showed that the economic value of workers' experience and skills (human capital) partially mediates the relationship between HPWSs and organizational ambidexterity. Úbeda-García et al. [68] demonstrated a positive direct and significant effect of HPWSs (i.e., selective staffing, developmental performance appraisal, comprehensive training, equitable reward system, skills flexibility) on organizational ambidexterity. According to Fu et al. [30] and Caniëls and Veld [15], HPWSs create high level of employees' engagement, commitment, and motivate employees' innovative work behavior to explore new opportunities while maintaining efficiency in existing operations [32]. In the same line, Jyoti and Rani [40] stated that HPWSs promote open channels of communication, encourages teamwork, and establishes mechanisms for sharing knowledge and information. HPWSs, thus, enable the exchange of diverse perspectives, ideas, and experiences, which is crucial for generating innovative solutions and balancing exploration and exploitation in organizational ambidexterity (OA) [15, 30].

Accordingly, HPWSs are expected to improve OA by creating an organizational environment that nurtures employee skills, fosters engagement and collaboration, and aligns structures and processes. These factors enable organizations to simultaneously explore new opportunities and exploit existing resources, leading to enhanced innovation, competitive advantage, and long-term success.

Based on the above argumentations, the following hypothesis and related sub-hypotheses are developed

H1 A significant positive relationship exists between HPWSs dimensions and OA.

H1a A significant positive relationship exists between ability-enhancing practices and organizational ambidexterity.

H1b A significant positive relationship exists between motivation-enhancing practices and organizational ambidexterity.

H1c A significant positive relationship exists between opportunity-enhancing practices and organizational ambidexterity

HPWSs and knowledge management systems (KMSs)

Knowledge management systems (KMSs) have been defined as systems created to provide ease capturing, storing, searching, transferring, sharing, and reusing explicit and tacit knowledge within the organizations [64]. A quickly growing body of literature addresses the significant role that KMSs play in supporting decision makers in dynamic environment [64], which helps increasing the organization's survival ability in crisis conditions [62]. However, the majority of the literature discusses the KMSs role emphasizing the KM process (i.e., identifying and capturing, organizing and storing, sharing and transferring, applying and innovating with knowledge) [40, 49]. Nevertheless, few studies went beyond the *process-based* KMSs to emphasize the *quality-based* KMSs that explain how the KMSs enhance people, product, and process quality in dynamic environment [25, 36, 62, 64]. According to Chakrabarti et al. [18] and Gorla et al. [31], KM is a system made of three sub-systems (i.e., system quality, service quality, and information quality). *Firstly*: *system quality* explains the quality of the KMS components (i.e., database, software, hardware, network) that affect the technical goodness of the KMS (i.e., system flexibility, system sophistication, ease of learn, and ease of use). *Secondly*: *service quality* is the consistency between employees' expectations and perceptions regarding KMS service performance (i.e., responsiveness,

reliability, and empathy). *Thirdly*: *information quality* addresses the quality of the KMS outputs (i.e., effectiveness, efficiency, confidentiality, integrity, availability, compliance, and reliability).

According to Jyoti and Rani [40] and Gürlek [32], high-performance work systems (HPWSs) are often associated with knowledge management systems (KMS) due to their complementary nature, shared goals and mechanisms, and the potential for KMSs to enhance the effectiveness of HPWS. In this context, Wang et al. [69] indicated that HPWSs aim to create a work environment that promotes employee learning, collaboration, and continuous improvement, which aligns with the goals of KMSs in facilitating knowledge sharing and creation. According to Yee [71], the quality-based KMSs provide the technological infrastructure and tools that enable employees to access and transfer their knowledge, which supports the implementation of HPWSs through providing employees with the necessary information resources needed to perform their tasks effectively. Moreover, KMSs can act as a catalyst in the relationship between HPWSs and organizational outcomes [40, 47]. It facilitates the acquisition, storage, and dissemination of knowledge, which enhances employees' ability to apply their skills and knowledge in their work, leading to improved performance and organizational ambidexterity [31]. KMSs also support the learning and development processes embedded in HPWSs by providing access to knowledge resources, best practices, and lessons learned [20].

Therefore, the current literature demonstrates that KMSs have a significant positive relationship with HPWSs [12, 32, 40]. Michaelis et al. [49] and Wang et al. [69] agreed on that careful selection of qualified and skilled individuals to share their experience and knowledge to solve problems helps fostering KMSs within the organization. Likewise, Jyoti and Rani [40] found that HPWSs (in terms of ability, motivation, and opportunity-enhancing practices) enhance KMSs ability to create, acquire, and share knowledge. Chen and Huang [20] asserted that efficient training motivates individuals to share experience and know-how, utilize what they learn, and gain new knowledge. Yee [71] argued that applying KMSs helps managers to motivate employees and create a dynamic and inspiring culture. Gorla et al. [31] demonstrated a positive and significant relationship between HPWSs (error-free performance) and information quality.

In light of the previous discussion, the linkage between HPWSs and KMSs is based on their shared objectives of enhancing employee performance, learning, and organizational outcomes. Accordingly, the following hypothesis and related sub-hypotheses are developed:

H2 A significant positive relationship exists between HPWSs dimensions and KMSs.

H2a A significant positive relationship exists between ability-enhancing practices and KMSs.

H2b A significant positive relationship exists between motivation-enhancing practices and KMSs.

H2c A significant positive relationship exists between opportunity-enhancing practices and KMSs

KMSs and OA

According to Santoro et al. [60], KMSs provide platforms and tools for employees to share their knowledge and experiences across organization departments. Knowledge sharing can enhance both exploration and exploitation activities by enabling employees to access and apply relevant knowledge from different domains. In this context, Baškarada and Watson [9] indicated that KMSs enable leaders to pursue exploitation and exploration through capturing and sharing the best practices when the firm engages in a similar action. In addition, Santoro et al. [61] indicated that the KMS components related to system quality (i.e., ICT adoption, IT infrastructure, and collaborative technologies) enhance the creation of open innovation ecosystems characterized by readiness to collaborate, partner intensity, and openness variety.

Further, Soto-Acosta et al. [64] demonstrated that IT capability of the KM system affects innovation ambidexterity (exploitative and explorative innovation). Here, Elmorshidy [25] showed that KMSs components of (information quality, service quality, and system quality) enable employees to fulfill complex tasks quickly, communicate effectively with other employees, in addition to, improve their work by exploring new ways of doing job and finding new solutions for current and potential problems. According to Vaio et al. [24], acquiring big data and storing function for the internet of things (IoT) guarantee sustainability and competitiveness by providing enormous data flows that allows predicting the customers' potential preferences. Moreover, they allow the organization to achieve innovation by enabling it to exploit its current resources [61].

Accordingly, the current literature has proved a positive relationship between KMSs and OA [23, 35, 42, 46, 60, 61]. In this context, Santoro et al. [61] found that KMSs enhance the creation of open innovation (collaborative ecosystems) through openness, variety, partner intensity, and readiness to collaborate. Nevertheless, Santoro et al. [60] indicated that KMSs (in terms of infrastructure and strategy) are positively affecting the

firm entrepreneurial ambidexterity. Other research groups emphasized the impact of KMSs on innovation capabilities [35] and organizational performance [23]. According to Hussain [35], KMSs (knowledge creation, collection, organizing, dissemination, and application) have a positive effect on an organization innovation capacity. Furthermore, Dezi, Ferraris, and Vrontis [23] demonstrated that KMSs are positively affecting organizational ambidexterity and performance and mediating the relationship between external embeddedness (the information regarding external networks) and organizational ambidexterity and performance.

Based on the above argumentations, we infer that building quality-based KMSs enable organizations to manage their knowledge and promote both exploratory and exploitative innovation, leading to ambidexterity. Therefore, the following hypothesis is developed:

H3 A significant positive relationship exists between KMSs and OA.

Referring to the above discussions, the majority of the literature examines the HPWS, KMS, and OA relationship either *independently* or as a *dyadic* function [20, 59, 60, 70, 71]; however, the present study considered HPWSs as function of KMSs, leading to OA. In other words, HPWSs, as new working system (based on ability-enhancing, motivation-enhancing, and opportunity-enhancing practices), are expected to improve OA by creating an organizational environment that attract competent individuals, develop their abilities, and boost their commitment, engagement, and collaboration [68], which leads to increasing organizational ambidexterity [40, 59]. However, this can only happen if the organization builds quality-based KMSs that enable employees to learn information and share their previous expertise [25, 64]. The present study, thus, incorporated the HPWSs as individualistic construct and hypothesizing KMSs as mediator to examine how the HPWSs lead to OA through fostering KMSs. Therefore, the following hypothesis and related sub-hypotheses are proposed:

H4 The KMSs (as mediators) affect the relationship between HPWSs dimensions and OA.

H4a The KMSs (as mediators) affect the relationship between ability-enhancing practices and organizational ambidexterity.

H4b The KMSs (as mediators) affect the relationship between motivation-enhancing practices and organizational ambidexterity

H4c The KMSs (as mediators) affect the relationship between opportunity-enhancing practices and organizational ambidexterity

Methodology

Research population

The present study is based on the public telecom industry in Egypt as represented by the Telecom-Egypt (WE) Company. As one of the Middle East's oldest and largest telecommunications companies, WE Company is the only public entity specializing in the telecommunications sector in Egypt [65]. WE Company serves 11 million customers and employs 35,000 employees [50]. Nevertheless, the term "ambidexterity" has been given little consideration in public sector [2, 46]. In this context, Ali et al. [2] highlighted the challenges faced by the ICT-based public organizations and the need for good governance practices that help them to deal with demand of changes in the turbulent business environment.

This study population, thus, consists of 2870 regular WE staff members who are distributed over WE-Headquarter basic three managerial levels (see Table 1). WE population is classified into 2156 regular workers classified over WE core departments, 246 division chiefs, 225 managing directors, 183 general managers, 42 section heads, in addition to the CEO, seven vice-chairmen, and nine board of directors.

Sampling methods and data collection techniques

This study uses the *mixed methods* approach to provide a comprehensive picture on how the HPWSs and KMSs enable OA [27, 54, 58]. A cross-sectional survey was held with a sample of WE staff members. Simultaneously, the semi-structured interviews were conducted with a sample of WE key positions and mirrored against the quantitative data to explore the OA enables emphasizing HPWS & KMS modifications [6, 54].

The Telecom-Egypt Company (WE) was selected to validate the research proposed model. WE headquarter has a total population of 2870 regular employees. A sample of 399 WE staff was randomly selected from WE-Headquarter different managerial levels (see Table 1). The sample size was calculated based on a sample size equation for a given entire population of 2870 workers at confidence level of 95% and a percentage of error of 5%. After eliminating incomplete responses, 277 valid questionnaires were received with a response rate of 82% [48].

Table 1 provides detailed information on the sample size distribution over WE population.

Across-sectional survey was conducted with the selected participants online using *google drive* form from

Table 1 Research population and the response rate for the collected data. *Source:* Egypt Telecom Headquarter HR department

Managerial level	Job title	Population size	%	Sample size	No. of distributed questionnaires	No. of responses	Response rate %
Top-level managers	Chairman of board of directors	1		–	–		
	CEO	1		–	–		
	Vice-chairman	7	0.2	–	–		
	Sections head	9	0.3	1	1	1	100
	Section head	42	1.5	5	5	5	100
	General manager	183	6.4	22	22	22	100
Middle-level managers	Managing director	225	7.8	27	27	27	100
Operational managers	Division chief	246	8.6	29	29	29	100
Employees		2156	75	255	255	193	76
Total population		2870					
Sample size				339	339	277	82

early of April to the late of July 2020. The time needed to complete the survey was 10–15 min. The participants were selected based on *the proportionate stratified random sampling* method [11], followed by *systematic random sampling* technique to draw the units in each stratum [53].

Using the same methodology, a sample of 39 key positions was carefully drawn from WE headquarter's managerial levels (see Table 2). The *purposive sampling method* was used to ensure the quality of data gathered from certain knowledgeable experts [3]. Data were collected through *semi-structured interviews* to identify the managers' opinions in close-ended questions regarding WE working systems and their impact on OA, followed by open-ended questions that discuss in detail their initiatives to create reactive and proactive strategies [6, 56]. All interviews were conducted in July 2020 at the WE headquarter. Each interview took approximately 45 min.

Research variables and instruments

The independent variable (HPWSs) was assessed using a 5-point Likert-type scale with 12 items distributed across three major dimensions: ability-enhancing practices (three items), motivation-enhancing practices in terms of performance appraisal (five items), and opportunity-enhancing practices (four items) [40]. Moreover, the mediating variable (KMSs) was assessed using a 5-point Likert-type scale with 21 items spread across three dimensions: system quality (nine items), information quality (7 items), and service quality (five items) [57]. Nevertheless, the dependent variable (OA) was assessed using a 7-point Likert-type scale with eight questions based on its two dimensions, exploratory innovation (four items) and exploitative innovation (four items) [68].

Results

Procedural and statistical remedies

To improve the research rigor and avoid potential biases, the hypothesized model had been analyzed using the *partial least square (PLS) structural equation modeling (SEM)* technique [33], along with *procedural and statistical remedies* to deal with missing values and the psychometric properties of the subscales [4, 29]. Referring to Fig. 3, the two-steps analysis model (i.e., measurement model and structural model assessment) was carried out to test the research hypothesis. A good measuring scale demonstrate adequate validity and reliability. *Cronbach's alpha* and *composite reliability* are used to measure the constructs' internal consistency [33]. Based on criteria developed by Fornell and Larcker [29], average variance extracted (AVE) scores are used to measure the constructs' validity.

The present study depends on analyzing *explicit* opinions expressed by WE key positions. That is why the *deductive thematic analysis* approach with a *semantic-level focus* is adopted [14]. Referring to the four phases of the thematic analysis suggested by [14, 43] in *phase one*, *pseudonyms* (assumed names) were assigned for carefully selected 39 WE key positions classifying them into five groups: three section heads, four general managers, nine managing directors, 10 division chiefs, and 13 specialists (see Table 2). In *phase two*, an *Interview transcript* was designed. The transcript includes a list of well-prepared questions that highlight research questions

Table 2 Sample distribution over WE population for the qualitative data collection. *Source:* Egypt Telecom Headquarter HR department

Managerial Level		Population	Sample	Key-position title
Top-level managers	Sections Head	9	1	Sections head of customer experience
	Section Head	42	2	Section head of Network Project Design, Strategies, and Management Sector
				Section head of the insurance policies and information systems sector
	General manager	183	4	General Manager, Head of Decision Support Sector
				General Manager of Financial Systems and Reports
				General Director of the Presidency of Communication Equipment Operation and Maintenance Sectors
				General Manager of Income Insurance
Middle-level managers	Managing director	225	9	Director of Marketing Planning Department
				HR Manager
				Manager of the Procurement department
				IT Manager
				IT Support Manager
				Manager of Performance Management
				Manager of Billing Systems Department Manager
				Manager of the Coordination and Follow-up Dep
				Human Resources Manager
Operational managers	Division chief	246	10	Division Chief of Financial Department
				Division Chief of Stores and Procurement Dep
				Division Chief of supporting operational processes
				Division Chief of IT department
				Division Chief of Media Department
				Division Chief of Performance Management
				Division Chief of Information Systems
				Division Chief of billing systems
				Division Chief of Sales department
				Division Chief of Billing Systems department
Employees	Specialists	2156	13	Sales Operation Specialist
				Training and development specialist
				Quality Insurance Specialist
				Sales Specialist
				Sales Specialist
				Workforce Specialist
				Financial analysis specialist
				Operational Processes Specialist
				Treasury and Cash Operations Specialist
				Key Account Management Specialist
				HR Specialist
				An employee in Sales Department
				IT Specialist
Total		2870	39	

and hypotheses. Here, audio recording transcripts were used to support the data collection process. In *phase three*, ideas initiated by interviewees were coded and noted in well-structured *codebook*, separating them into key themes for a more robust analysis. In the *final phase*, agreed initiatives had been identified which facilitates drawing preliminary conclusions about interviewees' agreed opinions.

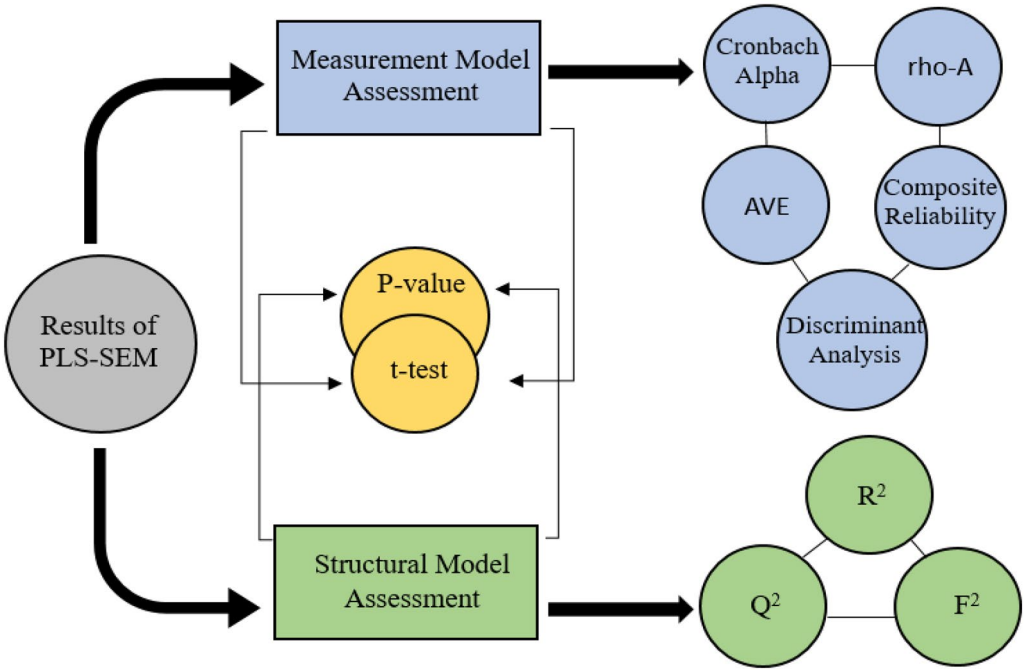

Fig. 3 Procedures of the PLS-SEM adopted from Hair et al. [33]

Measurement assessment

Convergent validity

For testing the purification of the research variables and constructs (i.e., HPWSs, KMSs and OA), to identify the factor loading for the items and determine which of them should be extracted from the construct. So, factor analysis was run, through selecting principle component analysis (PCA), and rotate the resulting factors orthogonally via VARIMAX rotation. Factor loadings that are less than 0.5 were extracted from the construct, and the eigenvalue of (1) or greater than (1) indicates better variation that to be explained by a factor [29]. In social science, accepted cumulative variance is 60% [33]. When the sample size is greater than 250, the average communalities should be equal to or greater than 0.6. The extracted communalities average was calculated by dividing the sum of all communality values on the total number of items.

Based on CFA results in Table 3, all factor loadings for all items are significant and exceed 0.5, all *t* values are significant and greater than the cutoff value 1.645. Fornell and Larcker [29] and Hair et al. [33] recommended that average variance extracted (AVE) should be > 0.5. According to Hair et al., (33) AVE stands for the extent to which the construct can explain and indicate the variance away from the error of its measurement. In the current study, the scores of AVE for all constructs (except motivation whose AVE = 0.46) are above 0.5. Thus, based on the results of EFA vis SPSS and the results of CFA via AMOS, the convergent validity is established and retained.

The outcomes of Table 4 reveal that all of the conditions were satisfied. First, all standardized factor loading values are more extensive than 0.32 and significant at a *p* value of 0.001. The *t* test value is greater than 1.96 (Table 3), indicating the items' reliability. Second, all of the model's consistent measures (CR, CA, and rho-A) (Table 3) are more than 0.7 [33], indicating that the constructs in this model are reliable. Furthermore, the constructs' AVE values (average variance extracted) (Tables 3 and 4) are more significant than 0.5, indicating that the study constructs have convergent validity. Lastly, regarding discriminant validity, the square root of AVE for each study variable was calculated using the Fornell and Larcker [29] criterion (Table 5).

During 500 resamples, the structural model uses the bootstrapping approach to examine the linkages between the hypothetical structures. The following conditions for such an evaluation: *R*2 values (the coefficient of determination) for path models in PLS-SEM are 0.67, 0.33, and 0.19, indicating strong, moderate, and weak values, respectively [21]. The *t* test and *p* values are used to determine the significance of the path coefficients and to evaluate the study hypotheses to accept or reject the associations. The researcher used Stone–Geisser (*Q*2) indicators to examine the model's goodness through PLS-SEM. These indicators quantify the amount to which the

Table 3 CFA Results for the Whole Construct

Factors and items measures		Estimated loading	Standardized loading	SE.	t value	Average variance extracted AVE	
HPWSs	*(F1) ability-enhancing practices (A1–A3)*					.57	.52
	A1	1.000	.622	–	–		
	A2	1.202	.792	.120	10.42		
	A3	1.252	.836	.122	10.296		
	(F2) motivation-enhancing practices (M1–M5)						
	M1	1.000	.751	–	–	.46	
	M2	.989	.703	.087	11.373		
	M3	.913	.622	.091	9.985		
	M4	.590	.529	.070	8.438		
	M5	1.094	.770	.087	12.514		
	(F3) opportunity-enhancing practices (O1–O4)					.55	
	O1	1.000	.669	–	–		
	O2	1.233	.868	.102	12.106		
	O3	1.089	.746	.101	10.805		
	O4	.898	.671	.091	9.867		
KMSs	*(F4) system quality (SQ1–SQ9)*						
	SQ1	1.000	.652	–	–	.685	.85
	SQ2	1.220	.833	.100	12.151		
	SQ3	1.263	.856	.102	12.224		
	SQ4	1.095	.824	.091	12.044		
	SQ5	1.258	.838	.103	12.219		
	SQ6	1.153	.840	.094	12.244		
	SQ7	1.193	.848	.097	12.337		
	SQ8	1.213	.865	.097	12.521		
	SQ9	1.260	.875	.100	12.637		
	(F5) information quality (IQ1–IQ7)						
	IQ1	1.000	.856	-	-	.666	
	IQ2	.965	.827	.054	17.738		
	IQ3	.876	.703	.064	13.730		
	IQ4	1.041	.833	.058	17.982		
	IQ5	1.023	.869	.053	19.394		
	IQ6	.983	.833	.055	17.962		
	IQ7	.897	.783	.055	16.190		
	(F6) service quality (SVQ1–SVQ5)						
	SVQ1	1.000	.869	–	–	.777	
	SVQ2	.985	.885	.048	20.664		
	SVQ3	.972	.910	.044	21.908		
	SVQ4	.997	.889	.048	20.832		
	SVQ5	.883	.854	.046	19.238		
OA	*(F7) exploitative innovation (EXTI1–EXTI4)*						
	EXTI1	1.000	.861	–	–	.722	.70
	EXTI2	1.119	.932	0.53	21.201		
	EXTI3	.909	.772	0.58	15.601		
	ETI4	.844	.826	.043	17.422		
	(F8) exploratory innovation (EXERI1–EXRI3)						
	EXRI1	1.000	.843	–	–	.676	
	EXRI2	1.092	.824	.073	14.946		
	EXRI3	1.10	.800	.070	14.504		
							.804

Table 4 Measurements estimate

Items/ Constructs	HPWSs			KMSs			OA		S.D	*t* test	*P* value
	A	M	O	IQ	SQ	SVQ	EXIT	EXRI			
A1	0.755								0.038	19.718	0.000***
A2	0.878								0.016	53.913	0.000***
A3	0.877								0.013	65.231	0.000***
M1		0.811							0.027	30.528	0.000***
M2		0.789							0.023	34.402	0.000***
M3		0.707							0.046	15.295	0.000***
M4		0.616							0.046	13.280	0.000***
M5		0.816							0.021	38.046	0.000***
O1			0.714						0.049	14.529	0.000***
O2			0.889						0.012	71.658	0.000***
O3			0.835						0.022	37.804	0.000***
O4			0.792						0.030	26.685	0.000***
IQ1				0.857					0.022	39.075	0.000***
IQ2				0.848					0.022	37.842	0.000***
IQ3				0.760					0.039	19.636	0.000***
IQ4				0.864					0.021	40.664	0.000***
IQ5				0.876					0.018	47.789	0.000***
IQ6				0.876					0.021	41.244	0.000***
IQ7				0.831					0.023	35.871	0.000***
SQ1					0.706				0.047	15.123	0.000***
SQ2					0.859				0.019	46.337	0.000***
SQ3					0.874				0.020	43.158	0.000***
SQ4					0.853				0.023	36.960	0.000***
SQ5					0.861				0.019	44.769	0.000***
SQ6					0.859				0.019	45.283	0.000***
SQ7					0.866				0.018	47.862	0.000***
SQ8					0.871				0.021	41.394	0.000***
SQ9					0.876				0.020	44.915	0.000***
SVQ1						0.895			0.014	64.872	0.000***
SVQ2						0.909			0.015	61.451	0.000***
SVQ3						0.927			0.012	74.683	0.000***
SVQ4						0.910			0.014	66.061	0.000***
SVQ5						0.889			0.018	49.753	0.000***
EXTI1							0.874		0.022	39.352	0.000***
EXTI2							0.926		0.016	57.853	0.000***
EXTI3							0.861		0.021	40.436	0.000***
EXTI4							0.888		0.017	51.410	0.000***
EXRI1								0.395	0.087	4.528	0.000***
EXRI2								0.882	0.015	57.395	0.000***
EXRI3								0.880	0.020	44.612	0.000***
EXRI4								0.855	0.026	33.157	0.000***
Mean	**3.505**				**3.487**					**5.690**	
	3.650	**3.516**	**3.404**		**3.542**		**3.448**	**3.534**		**5.971**	**5.451**
S.D	0.809				0.772					0.910	
CA	0.906				0.972					0.884	
	0.788	0.805	0.823		0.933		0.951	0.945		0.910	0.759

Table 4 (continued)

Mean	**3.505**			**3.487**			**5.690**	
	3.650	**3.516**	**3.404**	**3.542**	**3.448**	**3.534**	**5.971**	**5.451**
rho-A	0.913			0.973			0.906	
	0.808	0.825	0.843	0.935	0.954	0.946	0.901	0.835
CR	0.921			0.947			0.911	
	0.876	0.865	0.884	0.946	0.958	0.958	0.937	0.853
AVE	0.50			0.645			0.572	
	0.704	0.566	0.656	0.715	0.720	0.821	0.788	0.610

t value is significant at 1.96, * Significant at $p < 0.05$, ** Significant at $p < 0.01$*** Significant at $p < 0.001$

A, ability; M, motivation; O, opportunity; IQ, information quality; SQ, system quality; SVQ, service quality; EXTI, exploitative innovation; EXRI, exploratory innovation; PLS-SEM via Smart-PLS, complete bootstrapping-5000 subsamples. $p = 0.000$ significant for all estimates. *CA* Cronbach's alpha, *CR* Composite reliability, *AVE* Average variance extracted

Table 5 The discriminant validity for HPWSs, KMSs and OA. *Source*: the authors based on Fornall–Lacker [29]

–	**HPWSs**	**KMSs**	**OA**
HPWSs	0.704	–	–
KMSs	0.679	0.803	–
OA	0.622	0.594	0.756

Table 6 Criteria for the goodness of the model fit. *Source*: the authors based on Hair et al. [33]

Indicators	**Criteria**
Q^2	> 0
f^2	0.02, 0.15, and 0.35 are considered small, moderate, and large
SRMR	< 0.08

SRMR Standardized root mean square residual

quality and accuracy of the model prediction are measured [33]. Moreover, Cohen's indication ($f2$) is the effect size of each construct in the adjustment model [33]. Finally, the researchers used SRMR (standardized root mean square residual), which is used when the research measurement comprises different scale types (e.g., 5- and 7-point Likert-type scales) and whose value should be < 0.08 [33] (see Table 6). The structural model evaluation (PLS-SEM) findings reveal a highly satisfactory model. As a result, all of the metrics ($Q2$, $f2$, SRMR, t test values, and p values) reached their cutoff values [33].

Also, HPWSs explain 46% of the variance in KMSs. Moreover, HPWSs explain roughly 44% of the variation in OA via KMSs [21]. Therefore, to the findings, HPWSs in terms of ability and opportunity-enhancing practices are predictors of organizational ambidexterity; however, motivation-enhancing activities have no direct influence on OA. Moreover, HPWSs impact KMSs in terms of (ability, motivation, and opportunity-enhancing practices). In addition, KMSs help the company establish organizational ambidexterity. The data support the hypothesized direct links for the first hypotheses. Furthermore, the second and third hypotheses and their sub-hypotheses are supported (See Figures 4, 5 and Tables 7 and 8).

This research has also investigated the indirect effect; hence, it proposed (H4) as a mediating effect of KMSs in the HPWSs–OA relationship (Table 9). The results in Table 9 reveal that HPWSs considerably indirectly influence OA via KMSs (in terms of ability, motivation, and

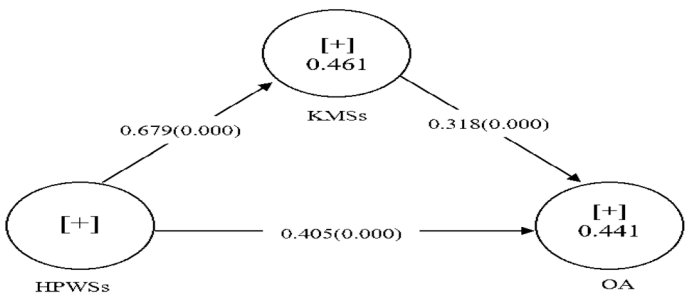

Fig. 4 Path coefficients diagram (major components). *Source:* Created by authors

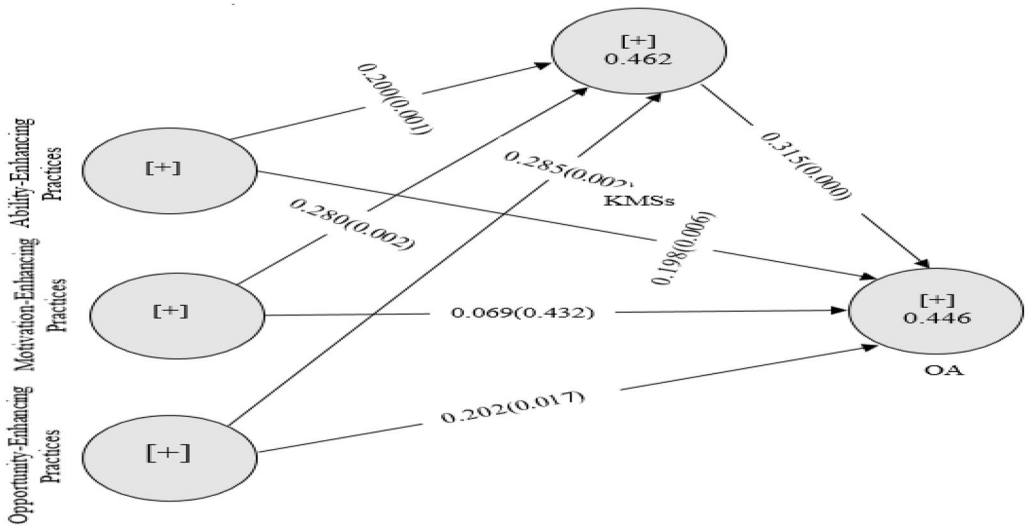

Fig. 5 Path coefficients diagram (Sub-Hypotheses). *Source:* Created by authors

Table 7 Structural model assessments- (PLS-SEM)

Structure path	Q^2	f^2		
		Coefficient	Effect	*p* value
HPWSs > OA	0.292	0.158	Moderate to large	0.004**
HPWSs > KMSs	0.246	0.856	Large	0.000***
KMSs > OA	0.206	0.098	Small	0.018**
SRMR	0.057 < 0.08			

t value is significant at 1.96, * Significant at $p < 0.05$, ** Significant at $p < 0.01$, *** Significant at $p < 0.00$

opportunity-enhancing practices). The direct (0.405) and indirect (0.216) impacts of the whole HPWS construct on OA are considerable in the suggested study model. Hence, the entire KMSs construct partially mediates the HPWSs–OA connection construct [8]. It demonstrates that a portion of the influence of HPWSs on OA is mediated by KMSs, while HPWSs continue to explain a portion of OA. Moreover, the direct (0.198) and indirect (0.063) effects of ability-enhancing practices on OA are significant. Further, the direct (0.202) and indirect (0.090) effects of opportunity-enhancing practices on OA are significant. Thus, KMSs partially mediate the ability–OA relationship and the opportunity–OA relationship. However, the direct (0.069) effect of motivation-enhancing practices on OA is not significant, while the indirect (0.088) effect of motivation on OA is significant via KMSs. Thus, KMSs fully mediate the effect of

Table 8 Goodness of model fit indicators PLS-SEM

H	Structure path	Path coefficient	S.D	R^2	*t* test	*P* value	Decision
H1	HPWSs > OA	0.622	0.036	0.441	17.217	0.000***	Accepted
H1a	Ability-enhancing practices > OA	0.261	0.072		3.622	0.000***	Accepted
H1b	Motivation-enhancing practices > OA	0.157	0.086		1.823	0.068	Rejected
H1c	Opportunity-enhancing practices > OA	0.292	0.086		3.393	0.001***	Accepted
H2	HPWSs > KMSs	0.679	0.033	0.461	20.688	0.000***	Accepted
H2a	Ability-enhancing practices > KMSs	0.200	0.060		3.356	0.001***	Accepted
H2b	Motivation-enhancing practices > KMSs	0.280	0.089		3.138	0.002**	Accepted
H2c	Opportunity-enhancing practices > KMSs	0.285	0.090		3.169	0.002**	Accepted
H3	KMSs > OA	0.318	0.061		5.261	0.000***	Accepted
H4	HPWSs > KMSs > OA	0.216	0.043		5.052	0.000***	Accepted
H4a	Ability-enhancing practices > KMSs > OA	0.063	0.022		2.924	0.003**	Accepted
H4b	Motivation-enhancing practices > KMSs > OA	0.088	0.032		2.758	0.006**	Accepted
H4c	Opportunity-enhancing practices > KMSs > OA	0.090	0.036		2.533	0.011*	Accepted

** Significant at $p < 0.05$, *** Significant at $p < 0.00$

Table 9 The mediating effect of KMSs

H4, H4a, H4b, H4c	Total effect(direct + indirect)		Direct effect		Indirect effect via KMSs	
	Path coef	*P* value	Path coef	*P* value	Path coef	*P* value
HPWSs—> KMSs—> OA	0.622	0.000***	0.405	0.000***	0.216	0.000***
Ability-enhancing practices—> KMSs—> OA	0.261	0.000***	0.198	0.006***	0.063	0.003**
Motivation-enhancing practices—> KMSs—> OA	0.157	0.068	0.069	0.432	0.088	0.006**
Opportunity-enhancing practices—> KMSs—> OA	0.292	0.001***	0.202	0.017*	0.090	0.011*

* Significant at $p < 0.05$, ** Significant at $p < 0.01$, *** Significant at $p < 0.001$

motivation-enhancing practices on OA. This means that motivation only affects OA via the existence of KMSs. Thus, the fourth hypothesis is accepted.

Discussion

The present research established a significant, positive relationship between HPWSs dimensions (i.e., ability, motivation, and opportunity-enhancing practices) and OA. The findings demonstrate that *ability*- and *opportunity*-enhancing practices explain changes in OA. These findings are in line with the results obtained by Caniëls and Veld [15] who asserted that HPWSs enhance employees' innovative *abilities* needed to explore new opportunities while maintaining efficiency in existing operations. In this context, Jyoti and Rani [40] stressed that HPWSs give workers the *opportunities* to manage the tensions between exploration and exploitation through promoting open channels of communication, encourages teamwork, and establishes mechanisms for sharing knowledge. Furthermore, Úbeda–García et al. [68] and Chen and Huang [20] proved that HPWS entails building organic design that empowers ambidexterity, while at the same time facilitates developing policies and practices that enhance workers' *innovative abilities* and *motivate* them to create value for the organization. Likewise, Fu et al. [30] verified that HPWSs provide employees with an *opportunity* to generate innovative ideas through exchanging perspectives and experiences, which is crucial for generating and balancing exploration and exploitation in organizational ambidexterity (OA).

Nevertheless, the present research does not support the *direct* effect of the HPWSs dimension of *motivation*-enhancing practices on OA. This result is consistent with Jansen et al. [37] who proved that reward-based performance management does not directly affect ambidexterity. In the same context, Cegarra-Navarro et al. [16] asserted that employees who feel secure in their jobs (considering job security as a dimension of motivation-enhancing practices) achieve ambidexterity and offer strong performance. However, this is restricted to creating a work environment that provides employees with adequate career-path development. Accordingly, the obtained results validate the research first hypothesis that assumed a significant positive relationship between HPWSs (in terms of ability and opportunity-enhancing practices) and OA.

On the other hand, the present research established a significant, positive relationship between HPWSs dimensions and KM service, system, and information quality. These results are consistent with empirical findings obtained by Yee [71] who proved that quality-based KMSs support the implementation of the HPWSs through providing the technological infrastructure and tools that enable employees to access and transfer their knowledge, in addition to providing them with the necessary sources of information needed to perform their tasks effectively. In the same line, Gorla et al. [31] found that HPWSs have a positive and significant relationship with *information quality*. Moreover, Wang et al. [69] indicated that HPWSs create a work environment that promotes employee learning, collaboration, and continuous improvement. Here, Chen and Huang [20] proved that KMSs supports the learning and development processes embedded in HPWSs by providing access to knowledge resources, best practices, and lessons learned. Thus, Michaelis et al. [49] and Wang et al. [69] agreed on that careful selection of qualified and skilled individuals to solve problems and share their experience and knowledge helps boosting KMSs within the organization. Moreover, applying organic incentives and remuneration systems with multiple components to motivate employees to share their knowledge (tacit and explicit) [69]. Here, Chen and Huang [20] asserted that efficient training motivates individuals to share experience and know-how, utilize what they learn, and gain new knowledge. In the same line, Yee [71] argued that applying KMSs helps managers to motivate employees and create a dynamic and inspiring culture. Based on the previous results, we reported that HPWSs (in terms of ability, motivation, and opportunity-enhancing practices) improve the quality of KMSs to create, acquire, and share knowledge [40]. Accordingly, the obtained results validate the research second hypothesis that assumed a significant positive

relationship between HPWSs dimensions and KMSs quality.

The present research established a significant, positive relationship between the quality of the KMSs (i.e., service, system, and information quality) and OA. These findings are consistent with the prior research's conclusions. In this context, Santoro et al. [60] proved that KMSs provide platforms and tools that enable employees to share their knowledge and experiences across organization departments, and access relevant knowledge from different domains, which enhances both exploration and exploitation activities. In the same line, Santoro et al. [61] indicated that the KMS components related to system quality (i.e., ICT adoption, IT infrastructure, and collaborative technologies) enhance the creation of open innovation ecosystems characterized by readiness to collaborate, partner intensity, and openness variety. Furthermore, Elmorshidy [25] showed that KMSs components of (information quality, service quality, and system quality) enable employees to fulfill complex tasks quickly, communicate effectively with other employees, in addition to, improve their work by exploring new ways of doing job and finding new solutions for current and potential problems. Accordingly, the obtained results validate the research third hypothesis that assumed a significant positive relationship between KMSs and OA.

Moreover, the present research demonstrated that KMSs mediate the relationship between OA and HPWSs dimensions of *ability*- and *opportunity*-enhancing practices. Concerning the indirect effect of motivation on OA via KMSs: although this study showed insignificant direct relationship between *motivation*-enhancing practices and OA, the presence of KMSs shows the indirect effect of motivation-enhancing practices on OA via KMSs, which fully mediate such an indirect relationship between them. As a result, the influence of motivation-enhancing practices on OA is only indirect through KMSs. Based on Christofi et al. [22], innovation is a logical result of producing and sharing knowledge inside the company. Therefore, HRM strategies that increase employee engagement foster a culture that promotes KMS [28]. Using KMSs fosters a dynamic and stimulating atmosphere conducive to creativity [71]. Thus, the obtained results support the research fourth hypothesis assuming KMSs mediate the HPWSs/OA relationship is validated.

Conclusion

This research examines the mediating role of KMSs in explaining the relationships between HPWSs and OA. It proposes new ambidextrous model through modifying the STSs model of Botla and Kondur [13]. The researchers argue that, for organizations to survive, achieve long-term success, compete, and innovate, they need to focus more on three pillars: people, knowledge, and innovation. Based on the research findings, AMO-based HPWSs help people to improving their talents, motivating them, and presenting them with relevant chances. Additionally, quality-based KMSs encourage knowledge production and sharing among employees, the organization may simultaneously attain innovation ambidexterity by pursuing both exploratory and exploitative innovation. As a result, the research findings highlight the importance of KMSs as both a mediator and a trigger for acquiring ambidexterity [47]. This is the first attempt to address this issue from the perspective of STS-based HPWSs, quality-based KMSs, and innovation-based OA, applied to the Egyptian public-telecommunications sector.

Theoretical and practical implications

The current literature still seems disconnected in regards to the potential interdependency among HPWSs, KMSs, and OA, which had been examined either *independently* or as a *dyadic* function [20, 59, 60, 70, 71]. From this perspective, the present study contributes to the current literature through the elaboration on how AMO-based HPWS leads to OA through fostering quality-based KMS. Hence, a special emphasis was given to the significant shift in the HR role from operational to strategic partners [15], which allows developing an integrated system of HRM policies and practices that fulfills the assumptions of AMO theory [40], leading to organizational ambidexterity [40, 59]. Yet, this can only happen if the organization builds quality-based KMSs that enable employees to acquire information and share their previous expertise [25, 64]. Based on this, the present study adds new insights into the STS theory-based literature that provides explanations on how HRM practices and km systems processes lead to organizational ambidexterity (corporate entrepreneurship and competitiveness) [13]. The STS-based literature emphasized the operational role of the HRM practitioners in carrying-out well defined HRM functions in individualistic manner, in isolation from the organization strategy [70]. Nevertheless, the present study highlights the HR professionals' strategic role in achieving vertical integration between the HRMPs and organization strategy as well as the horizontal integration among HRM practices. The present study, also, goes beyond the process-based KMSs toward the quality-based KMSs to provide elaboration on how the quality of the KMS components (i.e., information, service, and system) [25, 36, 62, 64] enables employees access to knowledge resources, best practices, and lessons learned [31], leading to organizational ambidexterity [20]. Accordingly, this research contributes

to our understanding of the interdependency between HPWS, KMS, and organizational ambidexterity, providing valuable insights for both academics in the field of management.

On the other hand, this study bridges the gap between theory and practice by elucidating how the decision makers in public-telecom sector can attain ambidexterity in the turbulent business environment [2, 7, 46]. Thus, the qualitative data collected from WE key positions elaborate the desired modifications in WE working systems that encourage creative and entrepreneurial thinking and motivate employees. Moreover, it helps creating a dynamic and stirring culture that facilitates sharing knowledge and enables organizational ambidexterity [71].

In terms of the ability-enhancing practices: WE company uses strict recruitment criteria and selection process for hiring employees. WE institution offers both technical and managerial training programs to develop new and current employees' skills. Here, the HR *General Manager* and *Acting Head of Decision Support Sector* assert that; WE develops well-organized *competencies matrix* that categorizes a list of competencies that should be possessed by current and new workers to meet expected work requirements. Thus, training programs for technicians and managerial staff were designed and delivered through WE institution, followed by on-job assessment. WE recruitment and selection department utilizes the prearranged *competencies matrix* as criteria to hire employees with specific qualifications that fit job demand.

Regarding motivation-enhancing practices: *Sales Specialist* declares that WE administration adopts the reward-based performance rewarding system. Rewards and performance are evaluated quarterly. The exceptional reward only goes to the carefully selected outstanding employee. The reward systems and promotions within the company differ from one department to another due to the nature of work. Here, *points-based job evaluation* method has been used for appraising jobs.

The *Director of Performance Management* asserts that "employees with wide background are potential to achieve ambidexterity than narrow background employees (i.e., engineers holding MBA certificate) [39]. WE administration gives opportunities for employees to study professional master's and doctoral degrees, which resulted in the graduation of more than 242 holders of a professional master's degree and more than 148 of those with a professional doctorate. Yet, a small percentage of them get promoted." The *Head of Warehouse Accounts Department* clarifies that; "The promotion opportunities are higher among technicians than among administrative staff due to the company intensive need for technician work." Thus, the learning opportunities offered by the company for their administrative employees do not motivate them to share directly what they have learned. This in turn explains why motivation does not have a direct relationship with OA.

Concerning opportunity-enhancing practices; WE *HR manager* and *training & development specialist* declare that, "WE administration gives opportunity to talent employees to attend executive management meetings and participate in decision-making." *IT Manager* elucidates that, "Communications among departments are fairly good and depend-on carrying-out the shared tasks." Likewise, the *decision support system manager* asserts that, "WE is decentralized organization. All employees have the freedom to set their objectives by the beginning of the year and set-down on quarterly basis with their immediate managers to discuss the work progression and possibility of enhancing their performance. Employees have the right to report to their immediate managers regarding the work-process and the way of doing the job. Their initiatives are welcomed and discussed with the team."

Regarding WE-KMSs, WE *Head of the insurance policies and information systems* declares that, WE administration makes enormous investments in developing its information systems and making them available to all workers. In this sense, *General Manager of Income Insurance* reveals that, "WE has an official website and e-mail through which instructions, job advertisements, and company news are published and shared among the staff." *IT division chief* states that, "Information systems are currently one of the most critical pillars in WE company, as they help to make the best decision in the most appropriate time." In terms of information quality (i.e., confidentiality, availability, compliance, and reliability), WE-KMSs are protected and secured. Concerning service quality (i.e., responsiveness, empathy, and reliability), *General Manager, Acting Head of Decision Support* Sector stresses that "WE technical support team is distinguished and very helpful. They understand the specific needs of users and adapt themselves to changes in the market."

For applying OA: *General Manager, Acting Head of Decision Support* Sector stresses that "WE distributes its products using wide collection of (i.e., e-payment channel, as well as the company's application (mobile or fixed) and the official website of the company and social media). This is because WE owns and sells some of these services within its portfolio as well as has distinguished

relationships from all dealers in the communications and information technology market as it is the largest operator in Egypt." Further, "WE is *Customer Focused Organization*. It is directed toward satisfying the customer's expectations. *Head sectors of Customer Experience sector* stresses that, WE is directing the customer toward a specific products and creating a need for the customer by integrating products to reach the highest level of customer experience in the communications market. In addition, *Sales specialist* states that "WE is interested in increasing economies of scale in its current markets through signing protocols with government agencies and large enterprises to reach the world in providing voice, internet, mobile, and connectivity services. In this sense, the *Division chief of financial department* reveals that, WE company launched the Wi-Fi wallet in cooperation with Banque Misr and launched new home Internet packages and is constantly expanding the infrastructure and supporting the technological transformation and the Internet of things. In the recent period, Telecom Egypt seeks to meet customers' needs by making questionnaires of the opinion and needs of the customer by making groups of customers and discussing with them their needs and the required products. (*Head sectors of Customer Experience*).

Direction for further studies

This study has limitations that might be investigated further in future research. *Firstly*, this study emphasized ambidexterity at the organization level to secure the organization's capacity to attain ambidexterity through the functions of KMSs and HPWSs. Alternatively, future research should focus on *employee* ambidexterity. Second, this study was applied to the Egyptian public-telecom industry to provide conclusions that would aid this industry. Otherwise, we recommend that future research be conducted in both the commercial and governmental sectors. *Thirdly*, the research relied on cross-sectional data. Thus, future studies should include a longitudinal analysis to supplement the findings. *Finally*, the researchers recommend that future studies highlight the organization-employee relationship (i.e., person-organization fit or employee value proposition model) emphasizing on their impact on organizational ambidexterity in both the private and public sectors.

Abbreviations

HPWS	High-performance work systems
KMSs	Knowledge management systems
OA	Organizational ambidexterity
HRMPs	Human resource management practices
STSs	Socio-technical systems
AMO	Ability, motivation, and opportunity-enhancing practices
AVE	Average variance extracted
PLS-SEM	Partial less square structure equation model

Supplementary Information

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Additional file 1. Pilot study.

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Declarations

Ethics approval and consent to participate

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Consent for publication

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Competing interests

The authors declare that they have no competing interests.

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