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The role of academics' socio-demographic characteristics as moderating in WFH productivity: Empirical evidence

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A B S T R A C T

The present study examines the faculty staff's socio-demographic factors (i.e., gender, academic ranking, and experience) as moderating variables on the relationship between the four interrelated factors (organizational, individual, technological, and client engagement) and their productivity (performance) during the Covid-19 pandemic. A conceptual framework was developed by integrating several relevant studies in the field of Work from Home (WFH) productivity. To end this, we involved (n=388) academic staff working from home during the Covid-19 crisis to test the hypotheses in the higher education context. The findings showed that the academics' WFH productivity was significantly associated with the four interrelated factors (organizational, individual, technological, and client-related factors) either collectively or individually, and the most important one was the individual-related factors. The moderation analysis reveals that the effect of the socio-demographic characteristics (gender, academic ranking, and experience) on WFH productivity was varied. Surprisingly, the study findings provided evidence for the first time that the client's engagement (student) factor, which has not been studied before, was found as one of the main determinant factors of WFH productivity during the Covid-19 crisis.

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1. Introduction

Due to the Covid-19 epidemic, the usage of remote employees has significantly increased in recent years across several economic sectors. To combat the virus, governments everywhere put in place several containment measures, which led to the adoption of alternative work arrangements by many organizations. In response to these unique circumstances, higher education institutions underwent upheavals, with many making quick and unanticipated transitions to virtual and digital learning. Jordan was not an exception when it came to the devastating effects on the education sector and other important industries. The abrupt pandemic outbreak forced the academic staff to work remotely, which was an unanticipated change for both universities and educators. This situation has posed substantial challenges for communities of practice, compelling them to continue teaching and learning remotely (Roose, 2020; AbuJarour et al., 2021). The shift in education from a predetermined set to online teaching and learning has made academic tasks more difficult.

During Covid-19, several higher education institutions worldwide have designed guidance and strategic plans to support supervisors in helping staff members, departments, and employees to be engaged and productive while working remotely. Many of these institutions offer round-the-clock breaks, for example, to alleviate junior faculty concerns about losing months

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of writing and research due to coronavirus-related disruptions. Others look at various ways to support professors on and off the career path (Brynjolfsson et al., 2020). While remote work provides many advantages for universities and faculty members who use virtual learning technologies, some obstacles can be overcome. A large work of prior research concentrates on comprehending the process of virtual learning and addressing its obstacles under normal circumstances (Lupu, 2017; Beo, 2018; Wienclaw, 2019). Many studies on the effects of working from home (also known as WFH) on productivity and wellbeing have been carried out in non-academic settings. The perceived factors influencing the productivity of academic staff members working remotely from home during COVID-19 at higher education institutions found in underdeveloped countries, such as Jordan's educational system, are, nevertheless, rarely examined in empirical studies. Furthermore, there are gaps between local priority demands and global theme interests due to the lack of empirical evaluation of the scientific output of developing nations in worldwide research repositories (Hassan et al., 2020). The study's objective is to identify the key potential factors that are highly correlated with the productivity of educational staff who work remotely from home under the Covid-19 conditions and to determine whether their socio demographic traits (gender, experience, and academic standing) have any significant moderating effects.

This paper examines how socio-demographic characteristics of academics moderate the relationship between working from home (WFH) and productivity. The study finds that gender, age, and job experience can impact the relationship between WFH and productivity. Female academics, younger academics, and those with less job experience were found to be more productive when working from home than their male, older, and more experienced counterparts. The paper suggests that future research should explore the reasons behind these differences and that organizations should consider these findings when designing remote work policies. The next sections include extensive literature on the factors influencing remote WFH productivity and the study model and hypotheses. The authors then offer a step-by-step research approach they used for the study, followed by a discussion of the findings, last thoughts, policy implications, recommendations, and limitations.

2. Literature Review

Due to the rapid changes in technology and business environments, as well as globalization and changing customer demands, the value and opportunities of remote work have received much scholarly attention in recent years (e.g., Lupu, 2017 Beňo, 2018; Wienclaw, 2019; Roose, 2020; AbuJarour et al., 2021). Many studies have been done on the advantages of working remotely for both individuals and enterprises, as well as the factors that affect its successful adoption (Kelliher & De Menezes, 2019). The research on these relationships that could affect a company's production is uncertain. According to Lupu et al. (2017), increasing productivity is one of the main reasons to use remote work from home. Employees can gain from extended periods of uninterrupted time to focus on their activities by removing time restraints, disrupting factors, and geographical restrictions. Less interruptions, better focus, motivation, job satisfaction, enhanced employee dedication, and higher work energy levels can result from this (Lupu, 2017, Anderson & Kelliher, 2000). Also, working remotely from home saves time, energy, and effort by eliminating the need to go to and from the main office, giving the employee more time and energy for work and family duties. According to reports, part of the time saved will most likely be used to complete work obligations (Dixon et al., 2019). This is also highlighted as a perceived organizational benefit of remote work (Toscano & Zappalà, 2022). Among the suggested reasons are working at peak efficiency hours, minimizing interruptions and distractions, being in an environment that promotes enhanced focus, and reducing incidental absence (Golden & Gajendran, 2019).

Studies showed that productivity increases when employees work from home. A 2016 study by the Harvard Business Review found that remote workers were more productive, had greater levels of job satisfaction, and saw reduced attrition rates. The study also revealed that 91% of remote workers said working from home increased productivity. Other similar studies supported the notion that working at home can raise worker efficiency and productivity (Beckmann et al., 2017; Godart et al., 2017). For Chinese call center employees, a causal relationship between remote work and work efficiency has been investigated and confirmed (Bloom et al., 2015). By reducing travel jams, carbon and particle emissions, and housing costs, the more widespread use of remote work may significantly benefit worker satisfaction. For example, according to a study by Monteiro et al. (2019), different Portuguese firms saw dramatically different effects of remote work on productivity. However, the outcomes were usually favorable for businesses involved in research and development (R&D).

However, the negative aspects of WFH are commonly noted. These include separation from team members due to physical and social distance and detachment from coworkers. Employees who worked from home had more difficulty unplugging and stopping work after hours. According to Algorithm (2020), these drawbacks are concerned with “a company's culture, an employee's personality, and obligations to one's family” (Alghaithi, 2020: 63). In a similar vein, Rožman and Čančer (2022) highlighted that not all businesses can allow employees to work from home because some tasks cannot be completed from a remote location. The culture and WFH policies of an organization have an impact on employee productivity. More productive workers feel that their employer values them, cares about them, and gives them the tools, project management skills, and training they need to do the job. Employee productivity rises and improves when they do not spend time, money, or resources traveling to and from work. However, whether remote work helps a company's business will ultimately depend on that organization's culture. According to research on ICT's effects on home-based remote work, there is a correlation between technology and the opportunity to work outside of an employer's physical facilities. Telecommuting and other flexible work arrangements have been made available by ICT-based practices, increasing employee autonomy at work (Belzunegui-Eraso & Erro-Garcés, 2020). However, working from home is especially challenging for people with kids, but other family members,

neighbors, and friends have all been identified as key WFH problems (Allen et al., 2015). Furthermore, working remotely may cause a loss of visibility, heightening teleworkers' anxieties about being passed over for rewards, promotions, and positive performance reviews. Greater adaptability can easily result in multitasking and blending personal and professional responsibilities. Researchers in higher education institutions use similar practices. They are expected to attend meetings or conversations with coworkers if not for teaching or supervising. The rest of their working hours are spent in their lab, though they have the option to work remotely if they have permission to do so. Academics have previously encountered some of the drawbacks of working from home as well as some productivity gains. When people first started using personal computers, this was accurate.

Until now, academics with WFH expertise have largely been those involved in online distance education. They reported improved autonomy, daily schedule flexibility, and elimination of unnecessary distractions, and high levels of job productivity and satisfaction. They did, however, complain about a lack of opportunity for skill development and inadequate communication. Because many academics had to work entirely from home during the Covid-19 pandemic, it provided a chance to examine the WFH experience for a wider variety of academics. Regarding WFH success moderators, there is a smattering of information. It is known that working from home limits, one's control over time due to domestic responsibilities. Research has shown time and time again that family responsibilities than men's jobs impact women's jobs more. Some workers are no longer constrained by office hours thanks to the ability to work from home. However, some research on work-life balance, gender, and teleworking has drawbacks (e.g., Vyas & Butakhieo, 2020). These results demonstrated that while teleworking enables the dual function of working and caring for children, it also leaves little time for leisure activities. Teleworking's negative side effects have been associated with poor mental and physical health and well-being (e.g., Oakman et al., 2020). Stanisçuaski et al. (2020) investigated the effects of working from home, managing household responsibilities, and taking care of kids on productivity. The researchers discovered that male academics without children experienced the least impact on their output during the pandemic. The most impacted, however, were academic women who were mothers (Stanisçuaski et al., 2020).

Sullivan and Lewis suggest that while working from home allows women to fulfill their domestic responsibilities and manage their family duties better, it also leads to higher reported work-family conflict. The Covid-19 pandemic disrupted the academic productivity and research time of female scientists more than their male counterparts, mainly due to their parental responsibilities did. According to Xiao et al. (2021), women may face greater challenges working from home, as they are often responsible for household chores and other domestic activities. Due to the lack of assistance with home schooling, childcare, and regular household maintenance, such as cooking and cleaning, working mothers may experience additional stress when working from home. Even when working from home, women are still expected to manage household duties that promote individual and family well-being. Several studies have shown how the pandemic reduced the scholarly output of female academic faculty. The proportion of female authors has decreased while the gender gap between male and female authors has grown from 23% to 55% over time in medical journals. While women with young children reported a decline in first-author submissions compared to pre-pandemic times, male faculty members reported no appreciable changes in their academic output during the Covid-19 pandemic. 57% of authors of academic books and journals, according to DeGruyter (2020), claimed to have invested less time in research than expected. In conclusion, emerging nations like Jordan have not previously given much thought to the effects of WFH on academic life and production. However, researchers should develop creative strategies to conduct groundbreaking research from home during the pandemic lockdown. Institutions must accept WFH arrangements because they have enough infrastructure, services, and rules. It's possible that certain academics and institutes of higher education benefited from the new arrangements and desired to preserve WFH in some forms.

Previous studies have also explored the relationship between working from home (WFH) and productivity and the influence of socio-demographic characteristics on work outcomes. However, few studies have examined how socio-demographic characteristics moderate the relationship between WFH and productivity, as this paper does. One related study found that gender and job type impacted the relationship between WFH and job satisfaction, with women and those in non-managerial positions reporting higher job satisfaction while working from home. This finding is consistent with the current study's finding that female academics were more productive when working from home. Another study found that older workers and those with more job experience reported higher job satisfaction while working from home. This finding contrasts with the current study's finding that younger academics and those with less job experience were more productive when working from home. Overall, these studies highlight the importance of considering socio-demographic characteristics when examining the impact of WFH on work outcomes, as different groups of workers may have different experiences and needs. Additionally, future research could explore how other factors, such as work-life balance, technology use, and job autonomy, impact the relationship between WFH and productivity. On the other hand, WFH has caused proportionally more difficulties for others. This paper aims to examine ways to increase academic efficiency when working from home.

3. The Research Model and Hypotheses Development

Based on content analysis of prior studies as well as contingency theory, a model was developed to guide this study to achieve its objectives. It is argued that the academic staff's remote working productivity can be considered a function of the four proposed interrelated categories of factors/challenges: organizational, technological, individual, and learner engagement

factors. The expected relationship among these major factors as independent variables and employees' remote work productivity as a dependent variable, and their demographic characteristics as moderating variables (gender, academic rank, and age) is depicted in figure (1). The constructs and a discussion of studies that focused on them are shown below. The predicted relationship between these constructs is also stated and explained throughout each construct's presentation.

(1) Organizational factors include every aspect of the internal and external factors that affect how an organization behaves. These factors inside an organization include operational characteristics, procedures, or circumstances. In addition to other considerations, organizational components, including management and supervisory support, formal policies, managerial training, and communication skills, affect technology adoption in work-from-home arrangements. University administrators can adopt various attitudes, practices, and rules to encourage the use of technology in remote work situations (Afrianty et al., 2022). According to Aboelmaged and Subbaugh (2012), organizational characteristics are extremely important in determining how productive workers who participate in WFH are. Support from their employers and training can make teleworkers more resilient and content. For example, Bentley et al. (2016) found that social, and organizational support, including supervisor, coworker, and organizational support, can help minimize psychological strain and social isolation in a sample of 804 teleworkers from 28 businesses. In their study of the influence of WFH during Covid-19, Vyas and Butakhieo (2021) identified several features of organizational characteristics such as facility costs, technology, organizational communication, and trust. According to Grundke et al. (2018), remote employment can enhance creativity when executives focus on outcomes and trust their people. A successful telework program, according to academics, depends more on leadership than technology. Other research revealed that WFH agreements included access to IT, training, managerial support, and digital infrastructure capabilities. While synthesis and theoretical work in understanding the organizational characteristics that permit WFH configurations is increasing, the scope and goal of these contributions may vary. As a result, it is important to learn more about the WFH experiences of Jordanian universities' academics. In their study on the factors impacting adjustment to Covid-19 remote work, Pokojski et al. (2022) stressed the value of education and growth. Cabero-Almenara et al. (2021) stressed the relevance of academics' technical abilities and preparation in the Covid-19 era. Some researchers concurred that WFH systems require institutional management support (Afrianty et al., 2022; Aboelmaged & Subbaugh, 2012), including excellent utilization of legislation, services, and infrastructure (Aczel et al., 2021).

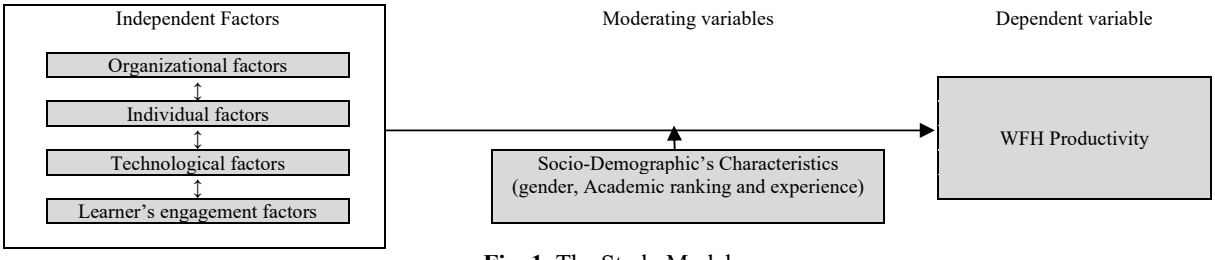

Fig. 1. The Study Model

(2) Technological Factors: Access to suitable tools and equipment, efficient productivity tools, technical assistance, and fast internet are among the technological factors that affect working from home. Digital infrastructure, on the other hand, encompasses the equipment and software provided by universities to facilitate the operation of communication and information systems both within the institution and in private sectors, enabling teachers to work from home. The Covid-19 pandemic has also expedited the digitalization process and the uptake of technology needed for effective operations in the current scenario. According to Pangrazio et al. (2020), digital learning is concentrated on fostering the attitudes and abilities required to use technology in a controlled setting. As stated by Cobo-Rendon et al. (2021) and Al-Azawei et al., digital acceptance, in contrast, is tied to the individual's attitude and behavior toward using technical resources (2017). Information and communication technology (ICT) and the capacity to operate without direct access to an employer's physical workspace are positively correlated in earlier studies. Due to the use of ICT, flexible work arrangements like flextime and telecommuting have evolved, giving employees a greater choice in their jobs (Belzunegui-Eraso & Erro-Garcés, 2020). Academics have to rely on numerous internet venues because of the Covid-19 epidemic. As a result, their adoption and use of cutting-edge technology tools became important factors to consider in a work-from-home (WFH) arrangement. Academics had to work remotely from their homes in Jordan due to government-enforced lockdowns and social segregation policies.

(3) Individual Factors: Work-life balance and flexibility are the most common examples of individual-related factors. Due to WFH's higher scheduling flexibility, employees may spend more time with their families, lowering work-life conflicts and raising job satisfaction, boosting productivity. Employees must be flexible during emergencies like Covid-19 restrictions, WFH, and lockdowns (Van Zoonen et al., 2021). Academics must adapt to their daily schedules, living arrangements, skill sets, self-management, and working practices, incorporating digital technology-enabled communication and cooperation (Razmerita et al., 2021). According to Marshall, Michaels, and Mulki, social isolation is the absence of support, acknowledgment, and opportunities for casual connection with coworkers. Work-family balance

and establishing limits must also be considered while adapting the work-from-home concept. During the Covid-19 epidemic, research on the work-from-home paradigm produced inconsistent results regarding the boundaries and work-family balance (Bouziri et al., 2020; Birimoglu Okuyan & Begen, 2022; Sull et al., 2021).

In the case of WFH, individual factors like digital aptitude and orientation are also currently seen as significant in influencing employee productivity (Khin and Ho, 2018). According to Quinton et al. (2018), a person's dedication to using digital technology to help them complete tasks is known as their digital orientation. As a result, a person's openness to employing digital technologies increases with their level of digital orientation. The ability of people to manage digital technology while performing or supporting their tasks is known as digital capability. Employee productivity during WFH would increase if the firm provided IT supporting mechanisms to strengthen employees' digital skills, such as IT training, management aid, and digital infrastructure. Some research found that the benefits of WFH on productivity could be positive or detrimental, depending on factors like talents, education, hobbies, or industry sectors. For instance, Etheridge et al. (2020) discovered that productivity declines were worst among women and those in low-paying jobs in the United Kingdom. Additionally, the study found a strong correlation between the drop in productivity and the decline in mental health. Physical health plays a role in the productivity benefit of WFH, and musculoskeletal problems are regularly cited as a drawback of WFH. At the same time, Moretti et al. (2020) and Yoshimoto et al. (2020) show that WFH during the pandemic causes workers to have musculoskeletal problems.

(4) Client (Learner) Engagement Factor: the degree of curiosity, interactions with classmates, and willingness to learn about the subjects are all examples of what is meant by client engagement in pupils (Briggs, 2015). However, previous studies have not examined this factor. Therefore, the current study's authors think that students' active participation, readiness, dedication, proactive engagement, relationships, and experience may play crucial roles in boosting the quality and productivity of online learning and remote working from home. By gauging student engagement levels and considering the pertinent variables, instructors can design courses and activities that motivate students to participate in their learning and schoolwork actively (Jennings & Angelo, 2006; Mandernach, 2015; Mandernach et al., 2011).

Based on the above discussions and the study's model, the following hypotheses are suggested:

- Ho1: The four-interrelated antecedents' factors (organizational, individual, technology and client's engagement) are significantly associated with faculty staff's WFH productivity.

  This hypothesis is divided into four sub-hypotheses:
  - Ho1a: The organizational factors are significantly associated with faculty staff's WFH productivity.
  - Ho1b: The individual factors are significantly associated with faculty staff's WFH productivity.
  - Ho1c: The technological factors are significantly associated with faculty staff's WFH productivity.
  - Ho1d: The client's engagement factor is significantly associated with faculty staff's WFH productivity.
- Ho2: Academic staff socio-demographic's characteristics (gender, academic ranking, and experience) are significantly moderating the relationship between the four interrelated factors (organizational, individual, technology, and client's engagement) and their productivity during WFH.

This hypothesis is divided into three sub-hypotheses:

  - Ho2(a): Academic staff's gender significantly moderates the relationship between the four interrelated factors (organizational, individual, technology, and client's engagement) and their productivity during WFH.
  - Ho2(b): Academic staff's ranking significantly moderates the relationship between the four interrelated factors (organizational, individual, technology, and client's engagement) and their productivity during WFH.
  - Ho2(c) Academic staff's experience significantly moderates the relationship between the four interrelated factors (organizational, individual, technology, and client's engagement) and their productivity during WFH.

4. Research method

4.1 Sampling and data collection

To achieve the study objectives as well as test hypotheses, a quantitative approach was used to examine the relationship between the identified variables statistically. Given the nature of this study, the target population was the academic staff employed at the University of Jordan the largest public university in Jordan. The total population of the staff is 1,667 (The University of Jordan's annual report 2021). A sample of 500 academic staff members was randomly selected. To collect data, structured questionnaires were distributed among participants through official emails. No information regarding participants' identities was requested to ensure confidentiality and anonymity. Three hundred eighty-eight valid questionnaires were collected (i.e., the response rate was 77.6) and used for analysis.

4.2 Measurement development

The questionnaire consists of three types of variables: (1) the independent variables (organizational, technological, individual, and learner engagement), (2) the dependent variable (WFH productivity), and (3) the moderating variables: socio-demographic characteristics. The content of the questionnaire was based on previous studies, mainly: the independent factors were based on previous studies such as (Kazekami, 2020; Fodor et al., 2020; Anderson & Kelliher, 2020; Thorstensson, 2020; Schwartz et al., 2020; Toscano & Zappalà, 2022; AbuJarour et al. 2021) using a seven-point scale ranging from (1) highly important to (7) low important. The dependent variable was derived from previous studies (e.g., Lindsay et al., 2002; Rose, 2012; Ibegbulam & Jacintha, 2016; Ghabban et al., 2019), using a scale ranging from (1) less efficient to (7) the most efficient. The moderating variables were based on previous studies (e.g. Khin & Ho, 2018; Etheridge et al., 2020). Based on the pilot study's findings and input from six expert academic staff members in this subject, the questionnaire's content was adjusted to the context of Jordanian business culture to perform construct validation. In our survey, WFH productivity as a dependent factor was measured subjectively. Subjective scale measures have been widely used in the literature, indicating that they are a viable and trustworthy tool (Lindsay et al., 2002; Rose, 2012; Ibegbulam and Jacintha, 2016; Ghadban et al., 2019). The relative difficulty of acquiring objective productivity statistics makes using subjective measurements for academic productivity even more crucial. Faculty members typically perform a variety of responsibilities that are difficult to define and vary greatly depending on the type of school and field. Furthermore, the institution's mission, context, discipline, and even within one institution, the emphasis on aspects of the institutional mission will determine how faculty members are evaluated for teaching, research, and public service. Even within one institution, the percentage of time spent on teaching versus other scholarly activities will vary by discipline. Additionally, subjective indicators like specialty, ranking position, and gender would enable comparison across academic staff and circumstances.

4.3 Socio-Demographic Information

From the academic staff, 388 valid questionnaires in all were gathered. According to the respondent's demographic data, 59.54% of the academic participants were males, 40.46% were females, 88.66% were married, 39.43% were aged between 45 to 59, and 29.12% of the respondents (or around one-third) had years of experience ranging from 15 to 24 years.

Table 1
Socio-Demographic information (N=388)

Demographic variable	Category	Frequency	Percentage
Gender	Male	231	59.54%
	Female	157	40.46%
Age	25-34 years old	31	7.99%
	35-44 years old	121	31.19%
	45-59 years old	153	39.43%
	60 years old and above	83	21.39%
Marital status	Single	33	8.51%
	Married	344	88.66%
	Others	11	2.83%
Work experiences	5 years or less	51	13.14%
	Between 5-9 years	80	20.62%
	Between 10-14 years	78	20.10%
	Between 15-24 years	113	29.12%
	More than 25 years	66	17.02%
Academic ranking	Full professor	110	28.35%
	Associate professor	100	25.77%
	Assistant professor	115	29.64%
	Lecturer	71	19.%

4.4 Common method bias

The study is susceptible to common method bias because it uses self-report questionnaires with the same respondents providing independent and dependent variables (CMB). The study uses the Harman single-factor test to assess the presence of CMB. Recent studies still believe that this strategy is appropriate for evaluating CMB (such as Aburumman et al., 2023). The result from Harman's single-factor test does not indicate the presence of CMB since the accumulated variance value of 29.24% is significantly lower than the threshold value of 50% set in 2012 (Podsakoff et al.).

5. Analysis and findings

Data from the study were examined utilizing the Structural Equation Modeling (SEM). A multivariate statistical method known as SEM integrates actual data with the underlying model to examine interactions between components. PLS-SEM is useful for summarizing an exploratory study like this one (Hair et al., 2019). PLS-SEM is an effective technique for assessing a complex model with several components, indicators, and interactions (such as moderation) while focusing on prediction to estimate the suggested model without restricting the number of samples utilized (Hair et al., 2019; Jaradat et al., 2022). A PLS-SEM investigation was conducted using the SmartPLS 3 software to verify the proposed theoretical model and presumptions (Ringle et al., 2020). Analyzing the measuring approach considered the concept's reliability and validity. Several

variables, including (R^2, f^2, and Q^2) predict and path coefficients were used to analyze the structural model (Henseler et al., 2016).

5.1 Measurement model analysis

The structural path model's components were examined for indicator reliability, composite reliability, convergent validity, and discriminant validity as part of the measurement model evaluation, the first stage of the PLS-SEM study. The reflecting indicators' factor loadings, all of which are over 0.70 as shown in Table 2, proved their dependability. The indication reliability was assessed using the factor loading criterion (Hair et al., 2017). Table 2 presents the results of using composite reliability (CR) and Cronbach's alpha to assess internal consistency reliability, which are both greater than 0.70, satisfying the criterion (Ringle et al., 2020). Convergent validity was confirmed after the constructs' reliability, and convergence validity was evaluated. Average Variance Extracted (AVE) construction measurements must meet a minimum threshold of 0.50 (Fornell & Larcker, 1981). The AVE values of the buildings are all greater than 0.50 (as shown in Table 2). The degree to which a model's constructs differ from those of other models is called discriminant validity. Heterotrait-Monotrait (HTMT) ratio of correlation and Fornell and Larcker's (1981) criterion are often used for discriminant validity. The square root of the average variance extracted (AVE) should be bigger than the correlation coefficients between the constructs, according to Fornell and Larcker's technique. Table 3 demonstrates that the correlations between the constructs are lower than the components' square root values of the AVE.

Table 2
Measurement model results

Construct	Code	Loadings	CA	CR	AVE
Organizational factors	OF.1	0.855	*0.963*	*0.969*	*0.744*
	OF.2	0.879			
	OF.3	0.877			
	OF.4	0.899			
	OF.5	0.891			
	OF.6	0.904			
	OF.7	0.890			
	OF.8	0.893			
	OF.9	0.827			
Individual factors	IF.1	0.850	*0.966*	*0.969*	*0.662*
	IF.2	0.830			
	IF.3	0.824			
	IF.4	0.848			
	IF.5	0.836			
	IF.6	0.824			
	IF.7	0.777			
	IF.8	0.832			
	IF.9	0.758			
	IF.10	0.829			
	IF.11	0.822			
	IF.12	0.834			
	IF.13	0.711			
	IF.14	0.853			
	IF.15	0.821			
	IF.16	0.756			
Technological factors	TF.1	0.902	*0.950*	*0.964*	*0.871*
	TF.2	0.954			
	TF.3	0.916			
	TF.4	0.960			
Lerner's engagement factor	LPF.1	0.931	*0.952*	*0.963*	*0.838*
	LPF.2	0.912			
	LPF.3	0.939			
	LPF.4	0.876			
	LPF.5	0.920			
WFH Productivity	WFH.1	0.756	*0.966*	*0.969*	*0.596*
	WFH.2	0.768			
	WFH.3	0.787			
	WFH.4	0.781			
	WFH.5	0.809			
	WFH.6	0.799			
	WFH.7	0.803			
	WFH.8	0.759			
	WFH.9	0.764			
	WFH.10	0.817			
	WFH.11	0.778			
	WFH.12	0.770			
	WFH.13	0.723			
	WFH.14	0.764			
	WFH.15	0.762			
	WFH.16	0.798			
	WFH.17	0.762			
	WFH.18	0.740			
	WFH.19	0.770			
	WFH.20	0.737			
	WFH.21	0.760			

This suggests that there is no issue with the constructs' discriminant validity. Henseler, Ringle, and Sarstedt (2015) claim that a contemporary approach for evaluating discriminant validity is to compute the HTMT ratio of correlation. It is advised that the HTMT value be less than 0.85. All of the constructs in Table 4 have values less than or equal to 0.85, demonstrating that discriminant validity is not a problem (Henseler et al., 2015).

Table 3
Discriminant validity assessment using the Fornell-Larcker criterion

Construct	1	2	3	4	5
Individual factors	**0.814**				
Lerner's engagement factor	0.470	**0.916**			
Organizational factors	0.450	0.570	**0.880**		
Technological factors	0.242	0.485	0.346	**0.933**	
WFH productivity	0.461	0.557	0.529	0.431	**0.772**

Table 4
Discriminant validity assessment using the HTMT criterion

Construct	1	2	3	4	5
Individual factors	-				
Lerner's engagement factor	0.489	-			
Organizational factors	0.461	0.592	-		
Technological factors	0.250	0.509	0.359	-	
WFH productivity	0.469	0.576	0.543	0.448	-

5.2 Structural model analysis

After confirming the construct validity and reliability of the measuring strategy used in the study, the structural model is assessed based on its propensity to predict outcomes and the relationships between its constituent parts. The evaluation evaluates the significance of the cross-validated redundancy (Q2), effect size (f2), and structural path coefficients (Hair et al., 2017). Additionally, bootstrapping was utilized to simplify evaluating the statistical significance of the path coefficients. The R^2 value of the model's endogenous variables was used to analyze the total variance predicted (Hair et al., 2017). An R^2 value of 0.25, 0.50, or 0.75 for endogenous variables is classified as weak, moderate, or substantial, respectively, according to the categorization scheme developed by Hair, Ringle, and Sarstedt (2011). As shown in Table 5, the R^2 value indicates a weak but significant predictive relevance for WFH productivity ($R^2 = 0.43$). Moving on to f^2, which represents the modified R^2 value when a certain construct is removed from the model. The effect size has a small impact if the f^2 value is 0.02, a medium impact if it is 0.15, and a large impact if it is 0.35. The effect sizes f^2 for organizational, individual, technological, and learner engagement factors on WFH productivity signify a tiny and significant impact size, yet at the same time 0.064, 0.049, 0.045, and 0.053. The f^2 values are shown in Table 5. Additionally, blindfolding was used to evaluate a theoretical/structural model for predictive relevance utilizing the index of cross-validated redundancy (Q^2) for endogenous variables, as suggested in Chin (2010). Tenenhaus (1999) pointed out that values of Q^2 larger than zero show the model's predictive effectiveness. In this study, it was demonstrated that the structural model was capable of adequately predicting each endogenous component. Table 5 displays the results.

The bootstrapping approach is used employing 5000 resamples (Kline, 2005). To determine if the anticipated pathways were supported, for each proposed path, the predictor variables and t-values were analyzed. Four direct relationships were anticipated in this study, and they all seem to be significant (See Table 5). The findings showed that organizational factors were the most important predictor of WFH productivity (β = 0. 0.241, t = 3.719; $p < 0.05$), thus, Ho1a was supported. Additionally, it was shown that individual factors, technological factors, and learner engagement factor all had a positive and significant impact on WFH productivity (β = 0.196, 0.185 and 0.238; t = 3.977, 3.023 and 3.262; respectively, $p < 0.05$). This indicates that H o1b, Ho1c and H01d were also supported. Table 5 below shows the outcomes of the structural model analysis.

Table 5
Results of hypothesis testing

Structural path	β and T-values	*p*-value	Conclusion	f^2	R^2	Q^2
Organizational factors → WFH productivity	0.241 (3.719)	0.000*	Accepted	0.064		
Individual factors → WFH productivity	0.196 (3.977)	0.000*	Accepted	0.049		
Technological factors → WFH productivity	0.185 (3.023)	0.003*	Accepted	0.045		
Learner's engagement factor → WFH productivity	0.238 (3.262)	0.001*	Accepted	0.053	***0.430***	***0.235***

*Note: * $p < 0.05$*

5.3 Moderating effects of demographic characteristics

Studies that handle data as a single population, according to Matthews (2017), have problems because they ignore substantial variations between two or more data subsets. As a result, multiple-group analyses (MGA) aid in identifying whether there are substantial variations in group-specific parameter estimations. It also considers the observed heterogeneity, reducing the chance that the results can be misrepresented (Matthews, 2017). Additionally, PLS-SEM can readily assess continuous

moderators using many items to improve prediction validity compared to single-item measures (Latan, Noonan, and Matthews, 2017). The correlations between organizational factors, individual factors, technological factors, learner's engagement factors, and WFH productivity were examined using MGA to examine the moderating effects of individual characteristics (gender, academic ranking, and experience). As a result, the respondents in the pool sample were divided into two groups based on their gender (male vs. female), academic ranking (Ph. D. holders vs. non-Ph. D. holders), and level of experience (high: 10 yrs. vs. low: > 10 yrs.). The study's findings revealed that gender moderates the correlations between technological factors and WFH productivity, as demonstrated in Table 6 (Ho2a). More particularly, it was discovered that the male group's path coefficients were higher than the female group's. The link between technological factors and WFH productivity is also moderated by experience (confirming Ho2a) (See Table 8). More particularly, it was manifested that the low-experience group's both path coefficients were greater than those of the high-experience group. Academic ranking moderates the relationships between individual factors and WFH productivity (confirming Ho2c) (See Table **7).** The association between individual factors and WFH productivity was shown to have path coefficients greater for a group of non-Ph. D. holders than for a group of Ph. D. holders. These results are inconsistent with previous studies (e.g. Alon et al., 2020; Wenham et al., 2020; Staniscuaski et al., 2021; Jessen & Waights, 2020; Augustus, 2021; Kotini-Shah et al., 2022).

Table 6
PLS-SEM multigroup results on gender

Hypothesis (Ho2a)	Path Coefficients (β)		p-Values		STDEV		Path Coefficients-Diff
	(M)	(F)	(M)	(F)	(M)	(F)	
Organizational factors → WFH Productivity	0.244	0.144	0.023*	0.172	0.107	0.105	0.100
Individual factors → WFH Productivity	0.141	0.112	0.112	0.229	0.089	0.093	0.029
Technological factors → WFH Productivity	0.260	0.152	0.014*	0.161	0.106	0.108	0.108
Lerner's engagement factor → WFH Productivity	0.085	0.357	0.427	0.000*	0.105	0.092	0.272*

*Note: * $p < 0.05$*

Table 7
PLS-SEM multigroup results on Academic ranking

Hypothesis 9Ho2b)	Path Coefficients (β)		p-Values		STDEV		Path Coefficients-Diff
	(PhD)	(Non-PhD)	(PhD)	(Non-PhD)	(PhD)	(Non-PhD)	
Organizational factors → WFH Productivity	0.262	-0.037	0.002*	0.766	0.084	0.137	0.299*
Individual factors → WFH Productivity	0.136	0.067	0.058*	0.697	0.072	0.171	0.070
Technological factors → WFH Productivity	0.175	0.317	0.037*	0.091*	0.083	0.175	0.143
Lerner's engagement factor → WFH Productivity	0.181	0.395	0.021*	0.006*	0.079	0.144	0.214*

*Note: * $p < 0.05$*

Table 8
PLS-SEM multigroup results on Experience

Hypothesis9Ho2c)	Path Coefficients (β)		p-Values		STDEV		Path Coefficients-Diff
	(High)	(Low)	(High)	(Low)	(High)	(Low)	
Organizational factors → WFH Productivity	0.199	0.260	0.044*	0.017*	0.099	0.108	0.061
Individual factors → WFH Productivity	0.189	0.059	0.019*	0.501	0.081	0.088	0.130
Technological factors → WFH Productivity	0.118	0.347	0.243	0.002*	0.101	0.111	0.228*
Lerner's engagement factor → WFH Productivity	0.187	0.264	0.045*	0.008*	0.093	0.098	0.077

*Note: * $p < 0.05$*

5.4 Importance-performance map analysis (IPMA)

The IPMA is carried out in accordance with the method suggested by Ringle et al. (2020) to assess the relevance of crucial variables and constructs. IPMA extends PLS-SEM results by bringing each construct's performance into practical PLS-SEM investigation by comparing the total effects of latent variables that imply their importance in affecting the target construct with the mean score of latent variables that reflect their performance. The mean scores of the rescaled indicators are used to calculate performance values, while the overall effect of direct links between the predicting constructs and the target construct is used to compute importance values (Hair et al., 2017). To compare and evaluate different overall performances, latent variable scores are rescaled on a scale of 0 (representing the worst performance) to 100 (representing the best performance). For the variable of focus (WFH productivity), the IPMA is utilized as a supplement to the path analysis in PLS-SEM (Ringle et al., 2020).

Four categories may be used to organize the IPMA results. Despite its modest relevance, the first quadrant on the bottom left performs well. Despite its great relevance, the second quadrant from the top left shows poor performance. The fourth quadrant in the top right signifies great significance and high performance, whereas the third quadrant in the bottom right shows high performance despite low importance (Ringlle et al., 2020). The IPMA findings are shown in Table 9 and Figure 2. Organizational, individual, technological, and learner engagement factors were evaluated for importance and performance. In terms of importance, individual factors are the most significant determining WFH productivity, followed by organizational factors, learner engagement factors, and technological factors, respectively. The results showed that individual factors score the greatest performance value, followed by the organizational, learner's engagement, and technological factors, respectively.

Table 9
Results of the importance map analysis

IPMA (on WFH productivity)	Unstandardized total effect	Performance
Organizational factors	0.192	71.464
Individual factors	0.204	72.404
Technological factors	0.123	70.818
Lerner's engagement factor	0.174	70.846

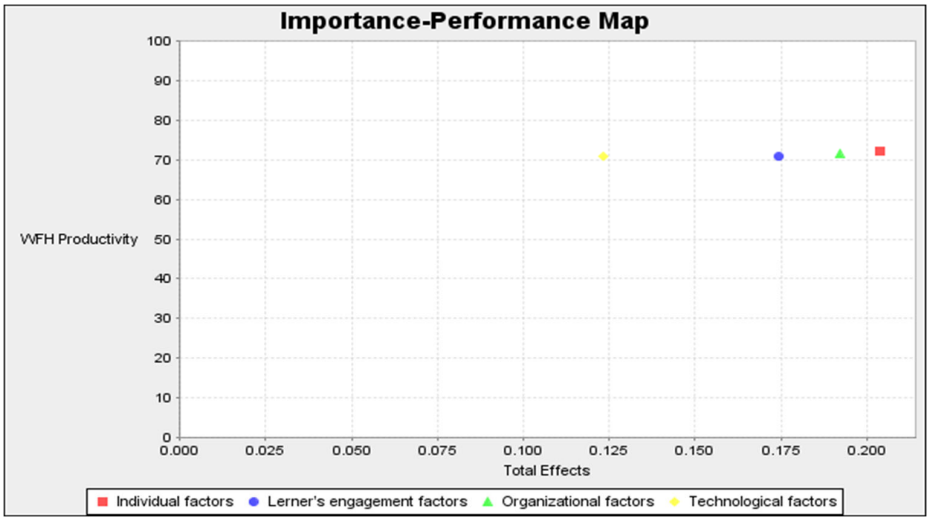

Fig. 2. Importance performance map of latent constructs

6. Study Contributions, Implications, and Limitations

This study's primary goal was to investigate the effects of faculty staff socio-demographic factors, including gender, academic standing, and experience, as moderating variables in the relationship between organizational, individual, technological, and client engagement factors and productivity (performance) during the Covid-19 pandemic. The study created a high-quality measure of teacher productivity, and the volume of data made it possible to conduct the first comprehensive analysis of factors influencing work-from-home productivity in higher education institutions. The study also found a link between work-from-home productivity and faculty demographics, including gender, academic standing, and experience. Additionally, it gave proof for the first time that the client's engagement (student) component, which had never been investigated before, was discovered as one of the primary determinants of WFH production during the Covid-19 crisis.

The results of the structural model analysis revealed that the four major interrelated factors (organizational, individual, technological, and client engagement), collectively or individually, were significantly linked to WFH productivity (performance) during the Covid-19 era in the Jordanian business environment. These factors together can predict about 42% of the variations in the academic's productivity. The IPMA findings showed that organizational, individual, technological, and learner engagement factors all positively and significantly impacted WFH productivity when each was taken alone, and the most important ones were the individual-related factors. The most common examples of individual-related factors are work-life experience and flexibility. The WFH configuration allows employees greater flexibility in their work schedules, leading to higher job satisfaction and fewer work-life conflicts by allowing them to spend more time with their families. Moreover, it is now understood that individual characteristics, such as digital aptitude and orientation, are crucial in determining an employee's productivity in a WFH setting. The findings also confirmed the role of socio-demographic

characteristics (gender, experience, and ranking position) as moderating in the relationship between organizational, individual, technological, and learner engagement factors and WFH productivity using MGA.

Based on the findings mentioned above, to enhance WFH productivity, policymakers in any higher education institution should pay more attention to the features of these factors, take appropriate actions, and employ effective strategies within their organizations. For example, features such as management support, communication, training, development, providing resources, delivering psychological support, coaching, improving community learning, empowering students, and digital service infrastructure capabilities and regulations as part of WFH arrangements should be improved within higher education institutions. It may be a need for any higher education institution to develop a formal WFH guideline. In addition, such actions might need financial and legal implications.

Furthermore, policymakers should constantly work to improve staff members' IT knowledge and experience as well as student engagement aspects. As a result, it is important to implement more targeted training programs for staff and students, as well as to develop processes with appropriate technological tools, foster a culture of collaboration, and construct systems in which they can store their experiences and the best practices of the IT staff. Additionally, any higher education institution's main objective should be to increase student participation. This component requires effective teaching techniques such as fostering interactions between students and professors, promoting active learning, fostering student cooperation, providing timely feedback, and conveying high expectations.

The current results, according to the researchers, have certain limitations. One of them is the time frame of the pandemic during which the survey was carried out. Another limitation is that the survey sample was composed of the academic staff that uses remote work arrangements at only one public university in Jordan, the University of Jordan. Further, the study employed subjective productivity measures for academics. This could have an impact on the study's generality and validity. Future longitudinal research could provide a better understanding of the productivity of remote working overtime.

7. Conclusion

In conclusion, this study explored the moderating effect of academics' socio-demographic characteristics on productivity while working from home (WFH). The findings indicate that gender, age, and job experience moderate the relationship between WFH and productivity. Specifically, female academics, younger academics, and those with less job experience were found to be more productive when working from home than their male, older, and more experienced counterparts. This study highlights the importance of considering socio-demographic characteristics when examining the relationship between WFH and productivity. Future research could further explore the reasons behind these differences in productivity, such as the impact of personal and professional responsibilities, work-life balance, and access to resources, among other factors. Additionally, future studies could investigate other potential moderators, such as personality traits or job type, to better understand the complex relationship between WFH and productivity. Finally, organizations should consider the implications of these findings when designing and implementing remote work policies, as different groups of employees may require tailored support and resources to maximize their productivity while working from home.

Compliance with ethical standards

Ethical Approval

We confirm that all methods were carried out in accordance with relevant guidelines and regulations of the university of Jordan.

Competing interest

The authors declare no conflict of any interest.

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Availability of data and material

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