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Exploring the Impact of Experiments on Knowledge Workers' Productivity in the Pakistani Software Industry

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Abstract

The world has been changed into global apartment by the innovation of ICT. The concepts of time and distance have been dashed down with the magical clicks of technology. All these supersonic changes are caused by the highest level of competency and latest knowledge of the workforce. The structure of the economy is dynamic and it continues to change with the changes of tide and space; where once organizations were dependent on the productivity of a manual workforce, they are now increasingly depending on the productivity of knowledge workers. Today, knowledge workers account for more than two-thirds of the workforce, and thus should be the centre of focus of strategic plans to improve productivity. The aim of this experimental research study was to explore the impact of suggested factors on knowledge worker productivity. The researcher used the survey method for collection of data with instrument of questionnaire to achieve the objectives of the study. The sample size was consisted of 100 respondents, which were selected randomly from major software firms of Pakistan. Results of descriptive statistics and structural equations modelling (SEM) revealed that independent variables, e.g. on-job-training, workplace, motivation, education and work experience and well-being have a positive effect on knowledge worker productivity. In order to increase the knowledge worker productivity, management requires to betterly understand how to make knowledge workers more productive by examining the factors that affect productivity and by analysing any relationship between the factors and roles.

Keywords Motivation, On-Job-Training, Education and Work Experience, Workplace, Software Industry

Introduction

The world is changing with smashing speed. It has been changed into a global apartment by the robust and advanced inventions in the field of communication technology. The evolution and revolution of ICT (Information, Communication and Technology) has transformed the labour market, changing labour contents and character, workplaces, environment, new forms of employment and new opportunities for highly skilled labour force (Llich, 2017). Drucker (1959) noted that knowledge workers would be the most valuable assets of 21st century organization because of their high level of productivity and creativity. This has made the labour market highly competitive and due to the shortage of skilled workers cannot cope up with a global competition for talent (Dobss et al., 2012). Due to the expansion of ICT sector and high competition, there is an increase in the workload and job expectations of knowledge workers which lower their ability to do tasks, low motivation and hence reduction in productivity. There is a need to increase productivity for organizations, government and media, as in western cultures, an increasing number of organizations have initiated large-scale changes as a solution to increase productivity (Ruostela et al., 2015).

The number of IT firms registered at the Security & Exchange Commission of Pakistan (SECP) is 4600 (SBP 2017). Whereas, Pakistan Software Export Board (PSEB) stated that there are 4464 companies registered with them. According to Board of Investment (BOI), Pakistan has more

than 2000 IT companies with 300,000 English speaking IT professionals with expertise in current and emerging IT products and technologies. There are 15 Software technology parks. Pakistan Software Export Board (PSEB) stated that more than 20,000 IT graduates and engineers are being produced each year as digital growth in Pakistan is going through a rapid evolution. Neill (2021) examined that software industry is the fastest growing industry in Pakistan, as in 2020, 35.89% of the workforce in Pakistan worked in the agricultural sector, about a quarter worked in industry and 38.32% in the services sector. The size of the software sector is approximately $6.5 billion. Pakistan is contributing about 1% of GDP which is about 3.5 billion USD. According to a survey of 300 IT firms by the National ICT R&D fund, under (MOITT), 14% of the firms had more than 50 employees, 17% had 25-50 employees, and the rest had less than 25 employees (Ignite, 2014).

Pakistan Software Houses Association (PSHA)) stated that although Pakistan's IT industry is growing fast and has become a moderately sized sector, yet there is limited activity in the development of products in Pakistan's IT services sector. However, skill shortage is the major problem identified in this sector; arise from the lack of technical skills and education but also due to work experience. The basic problem faced by the Pakistan Software Industry and by the numerous industries is production of graduates with out-dated skills (Bilal et al., 2017). Pakistan IT industry has no shortage of ideas but the ideas are not concrete and there is a gap between policy formulation and implementation. Pakistan Technology Industry Survey (PTIS), 2019 examined the biggest growth challenge for the industry was once again identified as talent. Literature indicates that major issue in software companies in Pakistan is related to shortage of skills, low education which can grow in the coming years. Hence, it is important for the managers, chief technology officers and senior executives begin to better understand how to make knowledge workers more productive by examining the factors that affect productivity and by analysing any relationship between the factors and roles.

Review of the related Literature

There is sufficient literature available on the subject matter of performance of knowledge workers in relation to certain factors including motivation, workplace, on-job-training, well-being and education and experience. To analyse the attributes of knowledge worker productivity, (Ramirez and Nembhard, 2004) concluded that strategic planning is needed to provide measurements for the evaluation of performance to get the perfect output from their employees by enhancing their productivity. Davenport (2011) also used strategic approach in his article state that a radical different approach is needed in the organizations. Least-common-denominator approaches is involving more technology for all have reached a point of diminishing returns even though technology is an important facilitator of communication, of collaboration, and of access to rising volumes of information.

In order to measure knowledge worker productivity, Pulic (2008) presented 'measuring model' in which he believed that productivity of knowledge worker is equal to the ratio between value added and wages of the workers, and to increase productivity of knowledge workers, we have to increase their value added. Furthermore, a study by Malone (2011) found that rather than introducing factors affecting productivity, it is more important to understand that by whom and how the knowledge-based work is being done by going beyond excluding non-value adding task. He named this phenomenon hyper-specialization; means dividing the tasks in sub-tasks and then identifying the right workers for such work by stating, perform with higher quality at greater speed, and at lower cost.

There are great numbers of research studies on the treatment of knowledge workers to enhance their productivity as Alter (2005) identified that same treatment of all knowledge workers is still a major problem in software industry. Imposing the same solution on everybody is efficient and convenient. Certainly, in IT, it is difficult for the organizations to apply different knowledge workers different type of treatment according to his needs. For this, environments can be creating in such a way that all people work efficiently having all their job related needs being satisfied. The findings of Erne (2011) research study distinguished that good software, planning compliance, personal skill development behavior and personal skill development as the predominant factors of performance indicators on which researchers find similarities across knowledge intensive firms in software industries.

Environment plays a vital role in the development of workers knowledge and productivity. Óskarsdóttir and Oddsson (2017) asserted that organizations can create such needed environment that encourages knowledge sharing and as an individual knowledge worker, there need to be efficient and effective to maximize his productivity. Shahzad et al., (2017) empirically estimate that organizational

culture has a positive impact on innovation process and creativity. A strong culture will motivate knowledge workers including software engineers and other to work efficiently. It will also help them to participate in decision making in order to increase organizational innovation performance. Shujahat et al., (2019) also gives indication that organizations should practice the strategies of how to make the productivity of knowledge workers valuable and more efficient. The ways were to provide them with ICT systems and other aspects of knowledge management in order to enhance their productivity at work.

The productivity of knowledge workers is affected by several factors. Chadburn et al., (2017) proposed that comfort, convenience, IT connectivity, good design and working to a specific time scale are efficient factors of productivity and executives, management and high authorities can play their important roles in implementing these factors on knowledge workers. Canedo and Santos (2019) in their empirical study showed that people, product, organization, investment in technology, and lack of contractual relations and engagement of open-source project contributors are the factors which influence productivity. Salleh et al., (2017) examined how important the role of a secretary can be for an organization. Findings proposed that as the secretary is given several responsibilities e.g. to manage and work properly. So, motivation by the organization, efficient/relevant training and management skills are his/her responsibilities that should be provided to the employees. Similar findings can be proposed in the paper of Moussa et al., (2017), in which he signifies the importance of Hackman and Oldham (Job Characteristic Model). The model presents the variables of autonomy, feedback, task significance, task identity and skill variety as the important tools to foster productivity.

Organizations can develop strong strategies to manage the productivity of knowledge workers. Kianto et al., (2019) examined the significant role knowledge management play in the productivity of knowledge workers as his findings showed that creation, innovation and knowledge utilization can be stimulate when the management is efficiently working in order to have boost knowledge workers productivity and for the success of the company. Shujahat et al., (2019) in his research work found that knowledge management process and innovation has a positive effect on knowledge workers productivity. It lies between these two but in this the aspect of knowledge sharing does not have a significant or overall impact on productivity of knowledge workers.

Continuous learning brings innovation and creative ideas to the work. For this, Ge et al., (2020) presented his work in which he analysed that emerging software organizations mostly demand those knowledge workers who bring creation and more output and for this, education and working experience are correlated with larger value of creative ideas. Pashkevich and Haftor (2020) contribute in the literature in such a way that continuous learning is crucial in fostering the productivity process. (Lee et al., 2021) explored that the productivity which diminishes due to the factor of age can be mitigate if they are given efficient training and motivation to learn and use ICT systems. The key point here is that in order to learn the new ICT systems, the workers should be highly educated as well to face the challenges of advanced technologies.

Theoretical Framework

The purpose of this section is to provide a theoretical background which strengthens our study and the independent variables suggested in this study. Drucker (1999) raised important factors that determine knowledge worker's productivity. According to him, knowledge workers must identify the task themselves. For this, they should be given autonomy in order to work without pressure. Innovation and updating must be the part of knowledge work and continuous learning required for the knowledge workers. The matter of quality must be more important than matter of quantity and lastly, the organizations must see knowledge workers as an asset and not cost. Hackman and Oldham (1976) introduced the 'Job Characteristics Model', when a job create various and meaningful tasks, the workers are motivated to innovate, engaged with their roles and to work in the best interest of the firm and also an increase in the sense of responsibility for their work outcomes. They proposed five points as the drivers of knowledge worker productivity, which states that, the tasks for knowledge workers must requires variety of skills and talents. They must be able to identify task's start, middle and end. In order to give more output, employees must feel their role meaningful by adding something meaningful in the tasks and employees have an opinion in order to carry out their work efficiently.

Feedback is always the foundation to great success. Feedback on performance helps them to take better actions in order to improve their productivity in the desired lines. Peter Drucker theory and Hackman and Oldham Job Characteristic Model, both are presenting factors of autonomy, continuous

learning which comes from relevant training, innovation, feedback which can influence productivity of knowledge workers. As Hackman and Oldham has used five variables, e.g. skill variety, task identity, task significance, autonomy, and feedback as the drivers to increase productivity of the workers in organizations, we are using on-job-training, motivation, role of workplace, education and work experience and well-being as our independent variables. Using these variables, we'll check that to what extent these variables affect knowledge workers productivity in the software industry of Pakistan.

Methods and Procedures

1. Data Collection

The empirical analysis of the study is based on collected data through structured questionnaire using Google Forms and also physical forms sent to the knowledge workers of major software firms around the country. A five-point Likert scale from 'Always' to 'Never' is used in Section 2, 3, 5 and 6 where, likert scale was selected to measure the relationship between independent variables and dependent variable of productivity. The targeted population for the research are the knowledge workers which include software engineers, system analysts, product manager, database administer and web developer from major software firms of Pakistan like; Net Sol Technologies, TRG Tech, Ovex Technologies, System Pvt. Ltd, Elixir Tech Ibds, Descon, and Kalsoft (Shahzad et al., 2017). Simple random sampling technique is used to achieve the objective.

2. Data Analysis

The study uses descriptive analysis and SEM (Structural Equation Model). The research is quantitative in nature as questionnaires are circulated among knowledge workers to measure the productivity as survey strategy is the best approach to collect quantitative data (Saunders et al., 2011).

3. Sample of the Study

Out of the total questionnaires, 100 questionnaires were received which were complete. So, the sample size is 100. The reason behind this sample size was time constraint and specifically in the era of COVID-19, most of the major software firms like; NETSOL, Ovex Technologies, System Pvt. Ltd, Elixir Tech Ibds, Descon, and Kalsoft were either working from home or had allowed 50% staff.

4. Questionnaire Design of the Study

The questionnaire was split into six sections, where each section corresponding with a research objective. The questionnaire contains a separate section for demographic information as well like respondent's age, gender, marital status and income. Section-1 is covering the objective to explore the effect of on-job-training on knowledge worker productivity. Section-2 covered all the aspects of workplace and its impact on productivity of knowledge workers. Section-3 of the questionnaire covers the following dimensions of motivation and its impact on knowledge worker productivity. Section-4 consists of education and work experience affecting knowledge worker productivity. Section-5 is well-being and its effects on knowledge worker productivity and lastly, Section-6 is about productivity.

5. Reliability Analysis

Reliability analysis in research design is needed in order to lower the possibility of getting a wrong answer. Reliability represents the consistency and repeatability of measurements. To find the reliability of the instrument, Cronbach's Alpha technique is applied. The consistency of the questions should mean the same for all respondents and even if these questions are asked various times (Floyd, 2002). As per standard rules, reliability scale of 0.6-0.7 indicates an acceptable level of reliability, and 0.8 or greater indicates a very good level. The reliability scale for this study ranged from .691 to .840. Scale reliability coefficient is 0.7414. All of the variables obtained satisfactory level of reliability.

6. Cronbach's Alpha for the variables

Sr. No.	Variables	No. of Items	Alpha
1	Knowledge Worker Productivity (KPWi)	5	0.8405
2	On-Job-Training (OJTi)	4	0.6910
3	Workplace (WPi)	6	0.7526
4	Motivation (MTVi)	5	0.8334
5	Education and Work Experience (EWEi)	5	0.8015
6	Well-being (WBi)	5	0.7414

Source: Authors' Estimates

7. Model Specifications

The Structural Equation Model (SEM) is used to evaluate the impact on knowledge worker productivity with selected independent variables. The functional form can be expressed as:

$$K_{WPi} = \alpha_{KWPi} + \beta_{OJT}(OJT_i) + \beta_{WP}(WP_i) + \beta_{MTV}(MTV_i) + \beta_{EWE}(EWE_i) + \beta_{WB}(WB_i) + \epsilon_i$$

Data Analysis, Results and Discussion

In this section, descriptive analyses of the data along with the results of structural equations modelling are presented.

Table 1: Demographic Information

Gender	Male 77(77%)	Female 23(23%)			
Marital Status	Single 68 (68%)	Married 32 (32%)			
Age	Less than 18 1 (1%)	Up to 20 39 (39%)	Up to 30 44 (44%)	Up to 40 16 (16%)	Up to 50 0
Income	Less than 20000 13(13%)	20000-50000 27(27%)	50000-80000 31(31%)	80000-110000 11(11%)	More than 110000 18(18%)

Note: In parenthesis, percentages are given. **Source**: Authors' Estimates

Table 1 shows majority of the respondents were male representing 77% of the total response, where females represent only 23% of the response. Our study find that majority of the workers in software houses are single with a response rate of 68% and married people with a response of 32%. Findings demonstrate that age group from less than 18 years are only 1% and highest age group are from 30-39 representing 44% of the total. Income range of less than Rs. 20,000 is 13%, where rate of response from highest income level of more than Rs. 110000 is 18% only.

Table 2: Descriptive Analysis: Mean and percentages of Participants attitude towards On-Job-Training

Statement						**Avg. Response**
I am provided with on-the-job training specific to the tasks I am involved in.	Never 14(14%)	Rarely 9(9%)	Sometimes 31(31%)	Often 26(26%)	Always 20(20%)	3.29
Type of training, I am provided with.	Quality Training 29(29%)	Managerial Training 7(7%)	Technology Training 30(30%)	Soft Skills Training 15(15%)	Team Training 19(19%)	2.88
Number of time when training is provided.	Weekly 23(23%)	Monthly 8(8%)	Every six months 19(19%)	Yearly 25(25%)	Occasionally 25(25%)	3.21
I find that on-job-training is very suitable for doing my tasks.	Never 5(5%)	Rarely 8(8%)	Sometimes 23(23%)	Often 25(25%)	Always 39(39%)	3.85

Note: In parenthesis, percentages are given. **Source**: Authors' Estimates

As per the results mentioned in table 2; 31% respond that they are provided with relevant training sometimes. Where 14% and 9% believe that they are never or rarely given training related to their tasks respectively. Results show that technical training is the most practiced type of training provided in organizations representing 30% response rate. Workers respond with equal ratio of 25%, 25% for yearly and occasionally. Workers with 39% are satisfied that they are always provided with suitable training related to their tasks, where 23% and 25% are given sometimes and often proper training and remaining 5% are never given suitable training for performing their tasks.

Table 3: Descriptive Analysis: Mean and percentages of Participants attitude towards Workplace

Statement	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**	**Avg. Response**
Our meeting practices are efficient.	1(1%)	10(10%)	26 (26%)	41(41%)	22(22%)	3.73
Ergonomic issues are properly taken care at our workplace.	8 (8%)	11(11%)	22 (22%)	33(33%)	26(26%)	3.58
Important information systems are easy to use.	5 (5%)	3(3%)	23 (23%)	39(39%)	30(30%)	3.86

Group work software is used in our workplace.	4 (4%)	6(6%)	17(17%)	29(29%)	44(44%)	4.03
New ways of working are actively explored and experimented at our workplace.	2 (2%)	14(14%)	21(21%)	39(39%)	24(24%)	3.69
The surrounding and furniture provide a pleasant environment.	5 (5%)	9(9%)	20(20%)	27(27%)	39(39%)	3.86

Note: In parenthesis, percentages are given. **Source**: Authors' Estimates

Table 3 shows that 22% of the total respondents are always having efficient meeting practices. 33% knowledge workers from software organizations show their ergonomic issues are often taken into consideration where, 26% believe that their issues are always properly taken care at their workplace. Out of the total response, 5% of the respondents believe that for them, information software are never easy to use. Highest response rate with 44% respondents are using group work software in their workplaces. 24% always experiment new modes of working and 2% never have explored modern ways of working in their organization. The surrounding which always present pleasant environment have the highest response rate of 39%.

Table 4: Descriptive Analysis: Mean and percentages of Participants attitude towards Motivation

Statement	Never	Rarely	Sometimes	Often	Always	Avg. Response
My organization provides rewards.	8(8%)	10(10%)	28(28%)	29(29%)	25(25%)	3.53
My organization builds trust to work effectively.	2(2%)	11(11%)	18(18%)	33(33%)	36(36%)	3.9
Autonomy at work increases my motivation	1(1%)	14(14%)	19(19%)	30(30%)	36(36%)	3.86
My work performance is appreciated at the workplace.	5(5%)	9(9%)	22(22%)	30(30%)	34(34%)	3.79
Good co-workers increase my motivation level.	1(1%)	8(8%)	15(15%)	26(26%)	50(50%)	4.16

Note: In parenthesis, percentages are given. **Source**: Authors' Estimates

Table 4 on motivation is about participant's attitude towards motivation when organizations provide rewards on which respondents agree that they are always given rewards representing 25%, while 8% of the respondents are never provided with any kind of rewards. Out of the total respondents, 36% of the respondents are those who are always provided trust building by their respective organizations. Only 1% responds to the question of autonomy that they are not given where, 36% always have autonomy at work in order to increase their work performance. Appreciation of worker's performance has a response rate of 34% as they are always appreciated, while only 5% respondents never. Half of the total (50%) respondents agree that good co-workers always help them to increase their motivation level.

Table 5: Descriptive Analysis: Mean and percentages of Participants attitude towards Education and Work Experience

Statement						Avg. Response
Highest level of education, I have completed.	Matric 2(2%)	Inter/Higher Diploma 12(12%)	Bachelor's Degree 61(61%)	Master's Degree 23(23%)	Doctorate 2(2%)	3.11
I am involved in managerial responsibilities.	Never 21(21%)	Rarely 11(11%)	Sometimes 31(31%)	Often 18(18%)	Always 19(19%)	3.03
I have been in my current position.	Less than 1 year 37(37%)	1-3 years 35(35%)	3-5 years 19(19%)	5-7 years 3(3%)	More than 7 years 6(6%)	2.06
Nature of my current position.	Self-employed 9(9%)	Contract/Project Based 18(18%)	Per-day Permanent 3(3%)	Part-time 6(6%)	Full-time 64 (64%)	3.98

Years of experience I have working in software industry.	Less than 1 year 22(22%)	1-3 years 26(26%)	3-5 years 24(24%)	5-7 years 9(9%)	More than 7 years 19(19%)	2.77

Note: In parenthesis, percentages are given. **Source**: Authors' Estimates

Table 5 on education and work experience represents the response of 61% that most knowledge workers have bachelor's degree as highest level of education and 23% are with their doctorate and master degree respectively. Only 19% are always involved in managerial responsibilities. Survey showed that 37% of the respondents are working in for less than 1 year in their current position and 6% are being working for more than 7 years. 64% workers of the software organizations work full time, 6% part-time and 18% on contract basis. 17% of the respondents have more than 7 years of experience, while 22% have less than 1 year of working experience working in software industry.

Table 6: Descriptive Analysis: Mean and percentages of Participants attitude towards Well-Being

Statement	Never	Rarely	Sometimes	Often	Always	Avg. Response
I enjoy my work.	2(2%)	3(3%)	15(15%)	42(42%)	38(38%)	4.11
I find my work meaningful and having a clear purpose.	2(2%)	7(7%)	13(13%)	40(40%)	38(38%)	4.05
My work does not cause stress.	27(27%)	20(20%)	34(34%)	14(14%)	5(5%)	2.5
My work and leisure time are balance with each other.	4(4%)	26(26%)	22(22%)	26(26%)	22(22%)	3.36
Our work community is able to solve conflicts efficiently.	3(3%)	14(14%)	16(16%)	40(40%)	27(27%)	3.74

Note: In parenthesis, percentages are given. **Source**: Authors' Estimates

Table 6 on well-being reveals that 38% workers always enjoy their work with and 2% never enjoy their work. 40% of the respondents are those who often find their work meaningful, 38% always while 2% never find their work meaningful and having clear purpose. 27% of the respondents are not having stress while doing their work. Of equal proportion of response rate of 26%, 26% find that they are able to balance between their work and leisure time both often and rarely while, 22% always and 4% are never able to balance between their work and leisure time. Whereas, 27% of the respondents believe that their work community is able to solve the conflicts efficiently.

Table 7: Descriptive Analysis: Mean and percentages of Participants attitude towards Productivity

Statement	Never	Rarely	Sometimes	Often	Always	Avg. Response
I achieve satisfactory results in relationship to my goals.	2(2%)	7(7%)	18(18%)	42(42%)	31(31%)	3.93
I am able to carry out my work tasks efficiently.	0	4(4%)	8(8%)	47(47%)	41(41%)	4.25
The quality of my work's output is high.	1(1%)	5(5%)	11(11%)	39(39%)	44(44%)	4.2
My job helps me to utilize my knowledge and skills.	2(2%)	6(6%)	14(14%)	38(38%)	40(40%)	4.08
The work group I work in works efficiently as a whole.	3(3%)	4(4%)	19(19%)	30(30%)	44(44%)	4.08

Note: In parenthesis, percentages are given. **Source**: Authors' Estimates

Table 7 reveals the results about productivity, where 31% respondents showed that they are always achieving satisfactory results and carried out their work tasks efficiently. 47% are often able to carry out their work tasks efficiently. 44% of the respondents believe that the output of their work is always high. As per utilizing knowledge and enhancing knowledge and skills are representing 40% and 38% always and often respectively. 4% rarely and 2% respond that their job never helps them to utilize their knowledge and skills. 44% believe that the work group they works in always work efficiently as a whole.

Table 8: Standardized (KWP) Estimation

Variable	Estimate	S.E	z-score	Two-tailed p-value
On-Job-Training (OJTi)	3.0095	1.183	2.54	0.012
Workplace (WPi)	0.282	0.119	2.37	0.019
Motivation (MTVi)	1.5756	0.75	2.10	0.037
Education and Work Experience (EWEi)	0.273	0.109	2.50	0.013
Well-being (WLBi)	2.1873	1.095	2.00	0.047
R^2 = 0.684				

Note: Dependent Variable: Knowledge Worker Productivity. **Source**: Authors' Estimates

Table 8 shows that OJT, WP, MTV, EWE and WB have a positive relationship with adoption. 1unit increase in OJT will increase KWP by 3.0095. It describes that on-job-training has the most significant impact and can play a significant role in enhancing productivity of knowledge workers of major software firms of Pakistan. Similarly, 1 unit increase in WP will increase KWP by .282, while 1 unit increase in MTV will increase the KWP by 1.5756, 1 unit increase in EWE will increase the KWP by .273 and 1 unit increase in WLB will increase KWP by 2.1873.

P-values of OJT, WB, MTV, EWE and WLB are less than 0.05, depicting that these variables are significant in terms of impact. R-square illustrates 68% variation in dependent variable, i.e. productivity is explained by independent variables collectively.

Discussion

In this research study, the researcher conducted the study to find and investigate the factors that affect productivity of knowledge workers. The productivity of knowledge workers is measured through five variables on-job-training, workplace, motivation, education and work experience. Analysis through the use of structural equation modelling proved that each variable individually affects productivity of knowledge of the workers. The variable of on-job-training significantly shows a positive relationship with productivity that relevant/technical training helps to boost the productivity of knowledge workers. Similarly, flexible workplaces provide greater productivity through well-designed collaborative environment. Motivation has a positive impact on knowledge workers productivity which depicts that autonomy, rewards and good co-workers helps to motivate the workers to work efficiently. Education and work experience has a significant impact on knowledge worker productivity. Higher education and more years of working experience help knowledge workers to foster their productivity. Lastly, the variable of well-being also plays a crucial role in enhancing the productivity of knowledge workers. Knowledge workers can be more productive and creative when they are more enthusiastic about their job and task performance. The study acknowledges the previous studies of Fernandez (2013), Plavalin (2017), Lee et al., (2021), Bakker and Demerouti, 2008).

Conclusion

The focus of this research study was to explore the impacts of on-job-training, workplace, motivation, education and work experience and well-being on productivity of knowledge workers. The strength of this relationship has been investigated by using a structured questionnaire and the data which were collected from all over the Pakistan. The main objective of the research was to determine the understanding, perception and needs for the knowledge workers to measure the impact on their productivity. Results showed a significant positive impact of various factors on knowledge worker productivity. The study has a total of 100 respondents. A key finding of the research is that on-job-training has the most significant and strong relationship with productivity. Therefore, it can be concluded that as technological advancement has change the requirements of performing tasks, more effective and advanced training techniques are required by the organizations as it can play a vital role in boosting innovation and ideas.

Hence, the results suggest that management should have an emphasis on strategies regarding boosting productivity through different dimensions, e.g. on-job-training, workplaces, motivation, education and work experience and well-being which lead to improve the quality output of knowledge workers and to get a competitive advantage worldwide.

Recommendations

Knowledge workers have become the main power that fuel economies and at this point of time, industry's main focus should be to adapt and adopt to the global trend that exist. However, Pakistan is still lacking with proper rules and regulations which are not practiced and implemented in the software organizations. The researcher proposes the following recommendations.

- There should be proper training sessions provided to the employees by the employers.

- Workplaces should be designed in such a way that they have an impact on knowledge worker productivity.
- Motivation should be extended to the workers to enhance their ability to do work efficiently, so extrinsic motivation in form of rewards and appreciation must be practiced in the organizations.
- Education and work experience should be checked and consider as an important aspect which can enhance knowledge worker's productivity.
- Lastly, well-being of the knowledge workers must be high in order to have higher attributes of job satisfaction.

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