Remote Employment: Advantages and Challenges for Egypt's Labor Force (After the 25thJanuary Revolution)

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Abstract—The growing problem of youth unemployment in Egypt after the 25th January Revolution has directed the attention of some human resource experts towards considering remote employment as a partial remedy for the unemployed youth instead of the unavailable traditional jobs, a trend which will also help with the congested offices and unsolved traffic problem in Cairo and spread a flexible work culture, but despite of that, the main issue remains unresolved for these organizations to deal with the system challenges. In the past few years, in developed countries, there has been a growing trend for many companies to shift to remote employment instead of the traditional office employment for many reasons: due to the growing technological advances that helped some employees do their work from home on a part time basis, the need for achieving an employee's work balance in the middle of unbalanced complicated life, top management focus on employee's productivity rather their time spent at work. The objective of this paper is to study and analyze the advantages and challenges that Egypt's labor force will be facing in their implementation of remote or virtual employment in both government and private organizations after the 25th January revolution. Therefore, the research question will be: What are the advantages and different challenges that Egyptian organizations might face in their implementation for remote employment system and how can they manage these challenges for the system to work effectively? The study is divided into six main parts: the introduction, objective and importance of the study, research problem, methodology, experience of some countries that implemented remote employment, advantages and challenges of implementing remote employment in Egypt and then the conclusion which discuses the results and recommendations of the study.

Keywords—25th January Revolution, Egypt, Remote Employment, Telework, Work From Home (WFH).

I. Introduction

THE fast advances in technology in the more global and diverse world at the beginning of the 21st century has shifted the work pattern from the traditional office to nontraditional work environment in home offices or remote centers. The terms remote employment, virtual work, telework or telecommuting are used interchangeably. Telecommuting involves working at one's home or another location where employees use computers and communication technology to communicate with the main office, supervisors, co-workers, and customers. Telecommuting occurs whenever an employee

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is paid for work done at an alternative worksite and total commuting time is thereby reduced.

This study focuses on the multiple advantages and benefits of implementing remote employment in public and private organizations in Egypt and the fact that it will help solve two of the most important public concerns for the government of New Egypt after solving two of the most important public concerns for the government of New Egypt after the January Revolution, which is high youth unemployment and Cairo's unresolved traffic congestion.

A. Importance and Objective of the Study

The significance of the study at present is due to the growing need for introducing remote employment in Egypt in the absence of sufficient traditional jobs for youth after the 25th Revolution when unemployment rate reached 13% (Egypt's Central Agency for Public Mobilization and Statistics or CAPMAS Report, Feburary, 2013). In addition to the traffic problem that reached its peak in central Cairo due to the continuous riots taking place at the city center or Tahrir square, causing severe traffic congestions all over Cairo.

The significance of the study also lies in the fact that it tackles an area which has not been studied by researchers before with regards to the Egyptian case.

Hence, the objective of the study will focus on the following:

- Studying and analyzing remote employment as a work system with regards to its advantages and disadvantages and managing its challenges.
- 2- Deriving practical lessons learnt from some countries for its application to the Egyptian case.

Therefore, the research problem can be summarized in the following question:

What are the advantages and different challenges that Egyptian organizations might face in their implementation of remote employment systems and how can they manage these challenges for the system to work effectively?

B. Methodology

The researcher will be using the descriptive method in reviewing and analyzing the different academic literatures and conducted interviews related to the study of remote employment in some countries with regards to its benefits, challenges, management and control tools to be replicated in the Egyptian case.

C. Sources of Data Collection

Secondary data was collected from various literatures in the field including academic journals, books, specialized magazine, some official reports, census and publications. In addition to primary data collection through conducting interviews with government officials and private sector employers.

II. DEFINING REMOTE EMPLOYMENT

Remote employment, telecommuting and telework are all terms that are used interchangeably that indicate a flexible workplace using information and communication technologies. They are defined as any work completed away from an employer's place of business or any work completed away from the employee's formal office or customer location [1].

The term "telecommuting" is more commonly used in the US while "Telework" is the term used in Europe and outside the US. Some literature reviews distinguished between "Remote Workers" and "Telecommuters" by the amount of time employees spend working outside their work offices. Remote workers are usually termed to full time, regular distance employees while telecommuters are those who work remotely some week days or irregularly. Although in some other literature reviews remote employment may also include part time or full time employees and it can range from one day to couple of days in the week [2].

In this study, the researcher will use the terms remote employment, telework or work from home (WFH) to refer to the concept of working away from the corporate office whether on a part time or a full time basis and also at any time during the week.

A. The Growing Trend of Remote Employment

Although telework has been estimated to be 10 years old, work shifting from traditional work to remote work has grown significantly within the last years, increasing by 74% from 2005 to 2008. The Census of the Council of Economic Advisors (Census, 2010) estimated that about 10% of American employees work from home (WFH) at least one day a week [3]. Federal employees were encouraged to telework since 2000 and the US administration's proposed budget for 2011 called for a 50% increase in telework. In 2009, twelve members of the Congress asked the House of Transportation Committee and Energy and Commerce Committee to include telework incentives in the nation's energy and transportation laws which was approved in March 2010 by the White House Conference on Workplace Flexibility for implementing these new work strategies [4].

B. Types of Telework or Remote Work

The analysis of 50 definitions of telework showed that they rely on three main concepts: organization, location and technology. According to Beer and Blanc (1985) telework, telecommuting or remote work may cover a variety of situations like mobile work that links the professionals during travel to their head office using electronic communication.

Electronic homework which is telework at the worker's home using new information technologies or satellite centers which are separate units away from the central organization but remaining communicated electronically. In addition to the neighborhood centers that provide electronic facilities near the workers' homes to keep them connected to their work [1], [5].

III. THE CHINESE EXPERIMENT FOR WORKING FROM HOME (WFH)

The senior management of CTrip, China's largest travel agency was interested to allow its Shanghai call center employees to work from home to be able to reduce office rental costs which were increasing due to the booming real estate market in Shanghai and also to reduce the high attrition rates at their agency. The Chinese experiment was run on 16,000 employees at CTrip who worked four days a week for 9 months from home and a control group who worked in the office all days of the week for a period of nine months.

By the end of the 9 months experiment, results revealed were in favor of the home employees as compared to the office employees like previous research finding [6]. The home employees revealed 13% of performance increase, of which about 9% was from working more minutes per shift, fewer breaks and sick days and 4% from more calls per minute due to the quieter work environment at home, higher satisfaction and psychological attitude scores than the office employees. They also reported a reduction of \$2,000 in the employee's costs and a lower job attrition rates by over 50% compared to office employees.

Due to the success of the experiment, more than half the employees at CTrip switched to WFH when top management offered them the option to either work from home or at the office, but surprisingly 49% of home employees later preferred to switch back to their offices due to their feeling of loneliness, lack of opportunities to socialize and their concerns about the possible negative impact for WFH on their promotions [7].

IV. THE ADVANTAGES AND DISADVANTAGES OF WFH

A. Advantages of WFH

Many organizations realized that WFH has its advantages for remote employees, employers, and the community, yet there are some negative aspects that also need to be considered. The most common advantages of remote employment that appeared in most academic literatures can be summarized in the following points [8] & [9]:

- 1- Flexibility and Efficiency: Companies such as US WEST and Pacific Bell in US and FI group in the UK which are involved in telecommunication technology are active in using telework to increase their organization's flexibility and efficiency.
- 2- **Supporting decentralization**: Companies such as Chamberlains and Rank Xerox in UK are using telework to support their organization's decentralization.
- 3- **Reducing overhead costs**: In some expensive cities like Tokyo and London, overhead costs are very high and can

be reduced through telework. Xerox for example estimated that they could achieve a 31% cut in total costs from using the telework system.

- 4- Employee's work life balance and productivity: Most researchers found that remote working helps employees achieve a better work life balance, benefit from the time and money savings that virtual work offers as well as the flexible time and autonomy. Many employers reported also that employees show an increase in productivity. A two year pilot project on telework at New York telephone showed an average of 43% productivity increase per participant.
- 5- Recruitment and retention of staff: Telework helps with employers' recruitment of skilled labor and retention of staff especially women after maternity and senior managers near retirement. Telework has also proven to be a good work source for the disabled; its success was proved in the pilot telework by American Express companies.
- 6- Creating employment opportunities in rural and isolated areas: Some developing countries have established tele-cottages where information technology is available to the public for education, business and leisure. Some countries like India, Sri Lanka, Tanzania use remote employment in the economic development of their countries.
- 7- Community Benefits: In Los Angles, telework is used to relieve traffic congestion, save gas consumption and improve air quality. Remote employment has been widely known in the US and Europe to help with the unemployment problem.

B. Disadvantages of WFH

Despite the fact, that remote employment or WFH has many advantages, there are also some disadvantages which can be dealt with while managing the system. Among the disadvantages of WFH cited in some of the literature reviews are [10]- [12]:

- 1- Feeling of isolation by remote worker: A remote worker may suffer from the feeling of isolation due to the absence of daily face-to-face communication at work and less opportunities for socializing with colleagues. Some academic literature, however suggested that this feeling of isolation by remote workers depends to a great extent on their managers' leadership skills in communicating and motivating them and also on the employees' competency. This feeling of isolation may also be less for part-time remote workers than the full-timers.
- 2- Disrupting remote employees work and life balance: Some academic literature also reported that remote workers may risk after sometimes to become into workaholics which is a common syndrome among the home employees as most get involved in all sort of work activities like sending emails, making a telephone call to the office to verify their visibility which in total disrupts their work life balance.
- 3- Lack of managerial control over remote employees:

One of the common problems of remote employment is that managers may find it difficult to control or view what their employees are doing, as employees are located in their private place with full autonomy which gives them the opportunity to be involved in some other non work activities [11].

- 4- Undermining team based interaction and corporate cultural integration: Remote employees may not have the opportunity to be involved in team based social activities which can be a good transmitter for corporate cultural through the organizational collective values, beliefs, norms or stories recalled [12]. Remote employment was seen by most managers as a threat to the transmission of corporate culture.
- 5- Detaching remote employees from emotional and technical support: The loss of social work interaction for remote employees may deprive them from the emotional and technical support which they get from their work groups or teams that is considered an important source of employees' motivation. Remote workers may tend to be neglected or forgotten by their managers or their roles may be undervalued or suspected by their colleagues [11].

V. MANAGING REMOTE EMPLOYEES

Managing and dealing with the different drawbacks of remote employment is the most challenging part for most organizations as it must include good preparation, proper planning before implementation and a means of control and motivating employees. Reviewing the different academic literatures, the researcher came up with ten basic fundamental requirements for managing remote employment which can be summarized in the following points [1], [7], [13], [14]:

- 1- Strategic planning: Top management involves almost all employees in the planning stage for the remote work, the goals and the expected outcomes to all are well defined and clear.
- 2- Rules and regulations: Managers need to educate remote workers with their rules and regulations with regards to acceptable behavior and attitude of remote employees, expectations, norms and values.
- 3- Results oriented management approach:
- a- **Setting clear goals:** managers need to be very specific and clear in what they expect from their remote employees in terms of measurable and timely output.
- b- **Training:** for remote managers on how to lead their employees effectively and motivate them. Remote employees must also receive different training on how to deal with the new technologies and the expected behavior and protocol of dealing with the system, effective time management in order not to disrupt their work life balance.
- c- Support and Guidance: managers must be available for remote employees when support or guidance is needed. Managerial written guidance should also be available on the employee website.
- d- **Regular interaction**: since isolation is the worst thing for remote employees, managers should keep regular

interaction by introducing new surveillance devices or electronic technology, setting short term targets that can be monitored by managers regularly, or pay home visits to the employee.

- e- Performance based rewards and incentives: rewards and promotions should fairly be distributed among remote workers and their office-based peers with inclusion of remote employees in the organizational structure..
- 4- Organizational and cultural change: organizations have to change their management style from "management by walking around" to management by objective. This stage will involve gradual fundamental changes in the organizational management through redesigning the core business process, installation of new technologies, readjusting the way managers communicate or evaluate their employees' output.
- 5- Effective implementation and use of collaborative technologies: which includes more than email, conference calls and instant messages like screen sharing and remote access software, social networking applications or project management software and others.
- 6- A private work place: remote employees working from home may need to have a private place inside their homes for remote working. Managers may need to pay a visit to their employees to check with the suitability of the remote work place.
- 7- Human Resource Management Support: remote employment requires a good support from their human resource management team to be able to provide managers with the necessary support needed for organizational change, recruitment and selection of remote employees, training, performance management, incentives, benefits, career development and building remote employees commitment.
- 8- Selection of self-disciplined and self-motivated employees: Not any employee can be selected to work without supervision, managers need to set with their human resource managers the competencies criteria needed for employees recruitment and selection based on personality traits like self discipline, conscientious, responsible and emotionally stable. Managers may need to approve the eligibility of their employees to shift to remote working.
- 9- **Trust:** is considered a very important moral obligation by managers in their supervision of remote employees.
- 10- Induction of organizational culture: it is recommended that employees spend couple of months first at their onsite companies, to be integrated with their teams and managers and learn about their organizational culture before they move to their remote places.

VI. EGYPT'S JANUARY REVOLUTION AND THE GROWING NEED FOR WORK SHIFT

The growing need for work shift from the traditional style of work to the remote style of work in Egypt was mainly supported by the huge investment in technology within the last ten years in the country, making internet access and other communication technology almost available in all governorates. Another reason that supports the remote work shift was due to the worsening of some of the already existing problems of unemployment, traffic congestion and fuel crises after the 25th January revolution due to the continuous public riots taking place in different sectors in the country.

A. Youth Unemployment

The problem of youth unemployment has always been Egypt's main concern especially after the revolution. The Central Agency for Public Mobilization and Statistics (CAPMAS) declared that the unemployment rate in Egypt was estimated to be 13 percent during the last quarter of 2012 compared to 12.5 percent during the third quarter of the same year due to a slowdown of the economic activities during that period in the country(CAPMAS,2013). On the other hand, some economic experts estimated that the unemployment rate reached 25% in some sectors. Egypt's workforce has been estimated to be 23.5 million, while the youth unemployment rate to be 73.9% [15].

B. Cairo's Traffic Congestion

A study by the World Bank (World Bank, 2013) revealed that Cairo's traffic congestion leads to 4,000 injuries and 1,000 death cases each year, besides the costs to the country which is estimated to be EGP 50 billion (US\$8 billion) a year or almost 4% of Egypt's Gross Domestic Product (GDP). The estimated loss was due to the employees' wasted time in traffic jams, their additional consumption of gas oil and the indirect impact of health hazards caused by the environment [16].

C. Egypt's Fuel Crises

The current shortage of gas oil in the Egyptian market which many truckers, bus drivers, farmers and bakers use for their engines added to the country's economic problems and is leading to more traffic congestions as many drivers block the streets to pressure the government to find a quick remedy for this problem [17].

1. Egypt: Remote Employment Expected Benefits

Many government officials and private company owners believe that there is a great potential for remote employment in Egypt as it will help solve some of the countries' urgent problems. The expected benefits for Egyptian organizations whether private or public from shifting to remote employment, can be summarized in the following points [18], [19]:

- Helping with the unemployment problem: Many experts believe that Egypt will benefit from remote employment as it will attract a large number of the unemployed population, especially women and those who prefer to raise their income by doing some earned tasks from home.
- Encouraging entrepreneurship: many entrepreneurs find it difficult to start their own business due to the high overhead costs of renting or buying an office, installing office furniture and paying electricity bills which in total may need a minimum starting capital between LE

250,000 to LE 1 million depending on the type of business. Therefore, remote employment will encourage many entrepreneurs to start their own business with less cost.

- Helping with the traffic congestion and gas crises: remote employment will also help relief the daily traffic congestion in the Greater Cairo area and other major cities like Alexandria which will also be reflected positively on the gas crises.
- Increasing Employees' Productivity: Employees
 productivity will be expected to increase due to the
 savings in the wasted transportation time, less stress and
 better mood.
- Better work life balance and family relations: remote working will help employees achieve a better work life balance and strengthen the family relations, a long social problem that has always been of public concern.
 - 2. Egypt: Remote Employment Expected Challenges

The challenges facing remote employment in Egypt lies mainly in the characteristics of management in almost all Egyptian organizations which became an integral part of their organizational culture, a state which will require a change management if these organization have to shift to remote employment. Some of these challenges can be summarized in the following [20]:

- Lack of clear line of authority and role clarifications.
- Lack of strategic planning and clear goals as most managers in Egyptian organizations are not trained to plan strategically or set clear measurable goals.
- Ambiguous rules and regulations.
- Centralized, authoritarian style of management is the most common style for Egyptian managers.
- Management by walking around is the most common management approach for almost all Egyptian managers.
- Most managers, especially in the public sector are not well trained on how to plan, organize, motivate and control.
- Bureaucratic organizational culture is the common norm in almost all Egyptian organizations, public or private.
- Investigative management replaces trust in almost all managerial cultures.
- Most employees have developed common norms and values with regards to poor time management, inability to work on their own,
- Most organizations function with personnel management instead of the human resource management.

VII. CONCLUSION

Remote employment has been widely known in the US and Europe as Telework, Work from Home (WFH) and Remote Employment. Experience with remote employment has proved its success in many countries despite its different challenges. Remote employment has its benefits to the employees, to the employer and to the community at large. Among the most common benefits to the employee is achieving better productivity and job satisfaction, balancing

between work and personal life. Among the most common benefits to the employer is saving costs, better recruitment and retention of staff and productivity. As for the community, the benefits would be providing more jobs to the unemployed, decreasing the traffic congestion and saving fuel. Despite of that, remote employment has many disadvantages like employees may suffer from isolation, visibility problem, interruption between work/ life balance. Managing remote employment requires management to move from the "Management by Walking Approach" to the "Management by performance or objective" which requires managers to set very clear goals and to act strategically. Training for both employees and managers are also required. Not all employees can be eligible to work remotely as they must have competitive personal criteria and attributes like proper time management, self disciplined and the ability to work without supervision. The growing shift from the traditional jobs to the remote jobs in Egypt is due to the high investment in technology within the last ten years and also due to the worsening of already existing problems of unemployment, traffic congestion and gas crises after the 25th January revolution.

VIII. RECOMMENDATIONS

There are many benefits for Egypt to shift to remote employment despite the challenges which will require a collaborative effort between government, employers and employees, each having a specific role that can be specified in the following recommendations:

Government's Role

- 1- Provide employers with the necessary information, support and guidance before and during the shift to remote employment.
- 2- Encourage new entrepreneurs to shift to remote employment through attractive tax schemes, low interest loans or others.
- 3- Issuance of new legislation and laws for remote workers for protection of remote workers rights.
- 4- Collaborate with experts from NGOs and civil society to form a remote worker consultancy house to educate the employers on managing the change to remote working.
- 5- Lead a pilot study remote area to assess the challenges and spread the lessons learnt to others.

Employer's Role

- 1- The necessity for improving their management systems in their companies first before shifting to remote working.
- 2- Appointing an efficient human resource management system would also help management define their goals, expectations and expected output from each employee.
- 3- Undergo gradual cultural change with regards to the organizational system, process, values and expected behavior.
- 4- Planning strategic remote employment by involving all managerial levels in the planning, implementation and evaluation stage.

- 5- Shifting to the performance based management approach instead of management by walking around.
- 6- Training employees and managers on how to do it.

The Employee's Role

- Work on integrating new personality needed competencies like self discipline, time and self management.
- Self education with the new technology needed for remote employment.
- 3- Employee should learn that ethics and trust is central to the success of a remote worker.

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REFERENCES

- Martino, Di Vittorio Di & Wirth, Linda, "Telework: A new way of working and living", International Labor Review, Vol. 129, No.5, 1990, Pp. 529- 552.
- [2] Gibson, Jane, Blackwell, Charles, Dominicis, Peter & Demerath, Nicole, "Telecommuting in the 21st Century: Benefits, Issues, and a Leadership Model Which Will Work", The Journal of leadership Studies, Vol. 8, No. 4, 2011, Pp.76-77.
- [3] Council of Economic Advisors, (2010), Work Life Balance and the Economics of Workplace Flexibility, Website: http://www.whitehouse.gov/files/documents/100331-cea-economicsworkplace-flexibility.pdf /. Retrieved 6/3/2013.
- [4] Lister, Kate, (May 2010), retrieved March 5 2013, From: TeleworkResearchNetwork.com, Website: www.workshifting.com/.../Workshifting%20Benefits-
- [5] A., Beer & G., Blanc: Le travail a distance; Enjeux et perspective, Une analyse documentaire. Paris: Assoication International Futuribles, 1985, p. 81
- [6] Bailey, Diane & Nancy Kurland, "A review of the telework research; findings, new directions and lessons for the study of modern work", Journal of Organizational Behavior, Vol. 23, 2002, Pp. 283-400.
- [7] Bloom, Nicholas; Liang, James & Roberts, John, Does Working From Home Work? Evidence from A Chinese Experiment, 2013, pp.20-21. Retrived March 26, 2013, from: http://www.econ.brown.edu/econ/events/bloom.pdf
- [8] P. Judkins, D. West and J. Drew, Networking in Organizations The Rank Xerox experiment. UK: Aldershot Gower, 1986, p. 18.
- [9] Bureau of National Affairs: Current Development- Daily Labor Report (Washington DC), anonymous vol. No.161, 1989, pp. 3-4.
- [10] Marshall, G, Michaels, C & Mulki, J., "Workplace Isolation: Exploring the construct and its measurements", Psychology & Marketing, Vol.24, No.3, 2007, pp.195-223.
- [11] Felstead, Alan, Jewson, Nick & Walters, Sally, "Managerial Control of Employees Working From Home", British Journal of Industrial Relations, Vol.41, No.2, 2003, pp. 244-253.
- [12] Stephen P., Robbins & Mary, Coulter. Management. (Tenth Edition). New Jersey: Pearson Prentice-Hall, 2009, pp. 124-130.
- [13] Ware, James, Grantham, Charles, 2010, Managing a Remote Workforce: Proven Practices from Successful Leaders, The Work Design Collaborative, LIC, pp.7- 20, retrieved: March 12 2013, from: (www.thefuture.of.work.net).
- [14] Busch, E., Nash, J., & Bell, B. S. (2011). Remote work: An examination of current trends and emerging issues. Ithaca, NY: Center for Advanced Human Resource Studies, Cornell University.
- [15] According to: Egypt's Report, The Central Agency for Public Mobilization and Statistics Manifesto (CAPMAS), 12/2/2013.

- [16] World Bank, August, 21, 2012, Cairo's Traffic is Much More that Nuisance, Retrieved February 12, 2013, from: http://www.worldbank.org/en/news/feature/2012/08/21/cairo-traffic-much-more-than-nuisance.
- [17] Alnagar Alaa, Azmet Al Waqood (translation: Solar Crises), Tahrir News. Retrieved March 13, 2013, from: http://www.tahrirnews.com/news/view.aspx?id=bb4bf7ec-90b3-43ef-ae2e-bce071dcb337
- [18] Nagdy, Saad, (Ministry of Transport) & Tawil, Hiwida (Ministry of Agriculture), interview on remote employment benefits and challenges, 1/2/2013.
- [19] Hawary, Shahenda (private conference office) & Semeda, Hamada (private business office), interview on remote employment benefits and challenges to Egypt, 2/2/2013.
- [20] Nahas, Safwat (Ex. Director of Central Agency for Organization and Administration), interview on government management system, 3/2/ 2013

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