NUST JOURNAL OF SOCIAL SCIENCES AND HUMANITIES
Vol.3 No.2 (July-December 2017) pp. 178-192

The Productivity Paradox: Does Happiness Matter?

Farooq Rasheed[1] and Eatzaz Ahmad[2]

Abstract:

Productivity paradox refers to a situation when investment in information technology is inversely related with economic growth. We test the hypothesis whether economic happiness plays a moderating role between information related capitalization and economic growth and thus may or may not invalidate the productivity paradox. Using 20 years annual panel data of OECD and APT economic blocs, happiness moderates the relationship between inputs labour and capital productivities with output growth in both the economic blocs. Economic Happiness is thus recommended to be boosted in getting effective labour and capital productivities.

Keywords: Productivity Paradox, Happiness, Information Technology

1. INTRODUCTION

a. Productivity Paradox

Economic inefficiencies are often seen in various regions of the world. It is observed that economic growth often lags the amazing technological progress and South Asian region is no exception. Islam, Salim and Bloch (2016) examine the impact of intra-regional initiatives on various aspects of efficiency along with growth of productivity in South Asia. They observed that the South Asian region has suffered from a total factor productivity shrinkage and economic hammering of some degree through technological inefficiencies and are slow in adopting such technological innovations.

Amjad and Awais (2016) review Pakistan's productivity performance over the period of 1980 to 2015. Authors examined the contribution of physical capital, human capital and TFP to labour

[1] Mr Farooq Rasheed <farooq.rasheed@mail.au.edu.pk> is Assistant Professor at Air University, Islamabad, Pakistan.
[2] Eatzaz Ahmad <eatzazahmed@hotmail.com> is Chair Professor of the State Bank of Pakistan at University of Peshawar, Peshawar, Pakistan.

productivity and observed that the contributions of physical capital and education remained modest and there has been a declining trend in TFP growth. They identified the declining trend in labour productivity and total factor productivity (TFP) for which the lack of sustained growth and declining levels of technological investment were found to be the key causes. They concluded that Pakistan's economy has not taken full advantage of the favourable technological developments. This is somewhat similar to the predictions of Moore's Law, which has held for more than four decades. It was noted that companies bought computers on the guarantee that the "computer age" would revolutionize business.

In the 1970s, information technology (IT) related technical equipment accounted for about 25% of all information technology related business investments. However, a number of researches in the 1980s and 1990s failed to get any evidence for improvement in such a technological productivity contribution [Berndt and Morrison (1995)]. In the 1980s and the early 1990s, the "productivity paradox" was widely debated. The productivity paradox is the unusual observation made that as more investment is made in IT, workers' productivity instead of growing actually declines. Despite striking advances in computer field and increasing capacity of the IT sector, growth rate of productivity declined in the US economy. Labour productivity growth rate in the 1960s was around 3% and fell to approximately 1% in the beginning of the new millennium. These paradoxical productivity patterns are also referred to or termed as "Solow Computer Paradox" due to Solow's (1987) statement "You can see the computer age everywhere but in the productivity statistics". Researches point out three possibilities for such a paradox:

i. Data and analytical problems hide productivity revenues, i.e., the ratios for input and output are not easy to measure. As a culture moves progressively from a qualitative one to a quantitative one, its effect on productivity increases even more, thus further hiding the gains which could be ascribed to technology.
ii. Revenues gained by a company through productivity may not always be easy to account for, because these could be offset by losses in other divisions or departments. But as the overall productivity is

considered, these could be buried in the details. Once again, profits accrued just by investments in productivity become hard to measure.

iii. Complex designing, administering and maintaining of IT systems. These costs are due to rapid obsolescence of equipment and software, incompatible software and network platforms and issues with security such as data theft and viruses. This drives a continuous cycle of technology replacement.

Wetherbe, *et al*. (2007) emphasize that in order to interpret the paradox, the concept of productivity has to be well understood. The existence of the paradox may not be the same among different firms or economies. This could be due to the differences in their efforts of adopting technological development and possibly the differences in standards of information technology.

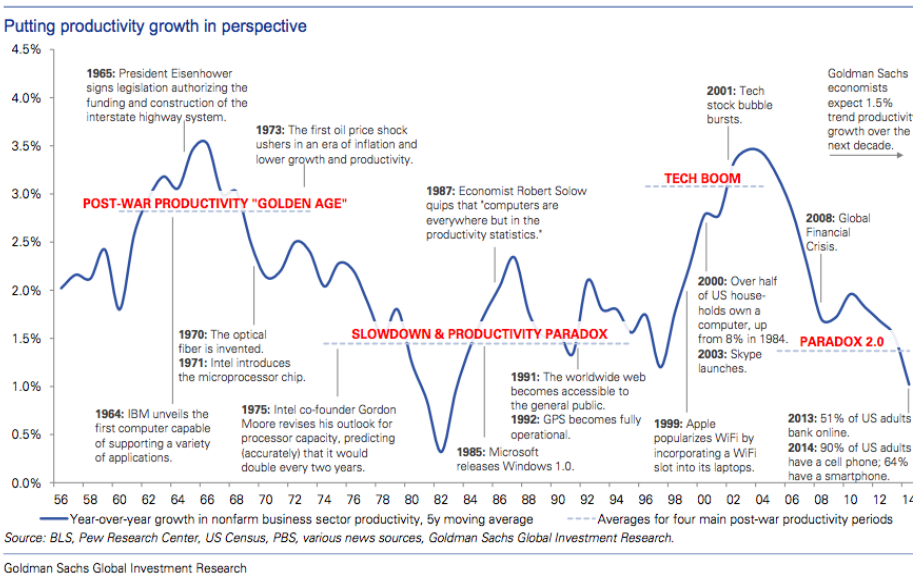
To answer how information technology affects productivity, it seems important to understand the functional role of information technology towards production. Economists consider its role as a factor of production and thus provide vital statistics for growth accounting and help in defining meaningful linkage between inputs like labour, capital and IT capitalization with growth rate of the output of an economy. Table 1.1 showing the trends and reoccurrence of such a paradox is visible beyond year 2001.

Most of the studies have also found that in comparison to other capital investment, IT investments were associated with higher marginal productivity. Some studies translate these returns into "excess returns", by stressing a perspective that investments should pay the same risk adjusted returns thus ending up with lower net returns. In contrast, Brynjolfsson and Hitt (1996) observed that the net returns from IT investments were nonetheless more than the returns in non-IT investments; partly due to the complementary nature of such investments that the firms establish for raising assets.

Acemoglu, *et al.* (2014) have revisited the productivity growth and IT related issue and found no significant evidence of increasing productivity growth in labour working in IT exhaustive industries-bearing high cost of technological investments. Furthermore, authors are of the view that such IT related investments are one of the causes of

workplace distractions. Arguably this could have negative effects at workplace productivity till such noise pollution factors are controlled.

Table 1.1. Reoccurrence of Productivity Paradox



In their study on information technology business value, Melville, *et al.* (2004) split performance into two categories: business process performance and organizational productivity and define that business process related performance is actually operational efficiency measured by factors like customer service, flexibility and culture of information sharing, while the factors like market value, profitability, competitive advantage account for firm's productivity. Sunny, *et al.* (2005) noted significant association between IT investments and performance efficiencies in the hotel industry through factors like enhanced annual sales, greater level of repeat business, increased occupancy rate, enhanced positive word of mouth and reduced operating costs. Gartner (2012) states "However, despite unclear causality, on an industry level there appear to be interesting relationships between the level of investment and the operating profits of organizations… many organizations with high operating margins also have high IT spending as a percentage of revenue. This view should not imply that, by investing more in IT, an organization should expect to get better profitability,

rather, it should simply outline how different industries behave under varied economic conditions." This suggests that financial return cannot be considered as the sole indicator of performance, rather other factors are required to be explored.

b. Economic Happiness

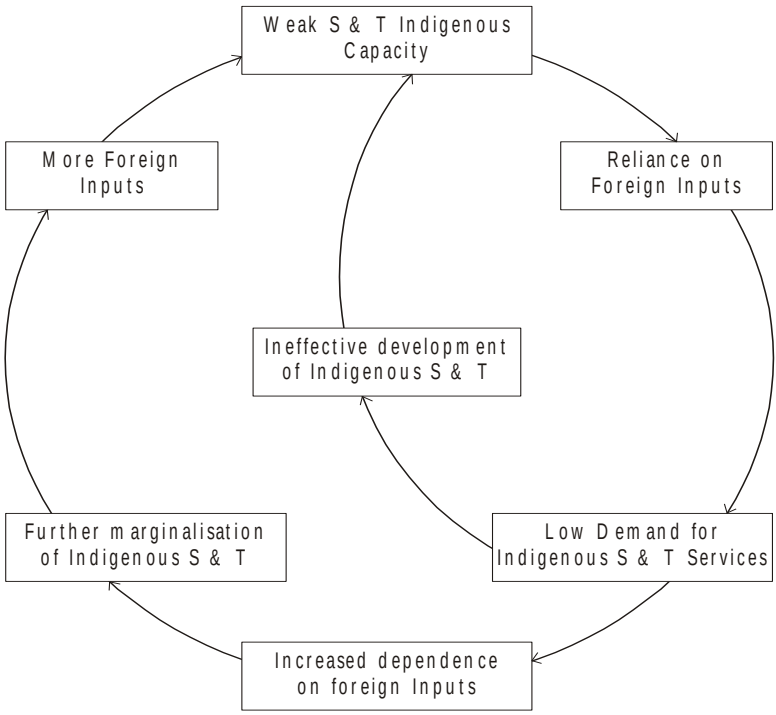
Kazi (2002) using Figures 1 and 2 demonstrates how the technological reliance and economic dependence are complementary in nature, but often forms a vicious circle of technological reliance. This vicious circle encircles increased dependence on foreign inputs that lead to weak indigenous capacity and thus an ineffective economic growth and development. It may result in possibilities like retreating economic growth, enhancing poverty index, reduction in wellbeing index for the society, etc. The idea that wellbeing or happiness is becoming important. Magnus (2001) using Swedish micro data reported that the economics of happiness is quantitative and theoretical in nature that studies well-being, life satisfaction, quality of life, psychological and health aspects.

Though the wealth accumulation is considered as the key objective in life, but should not be at the cost of happiness. Mostly the measures of economic improvements do not reflect the happiness aspects. Can money buy happiness? The debate on this query is now taking place frequently. Anielski (2009) classifies assets as natural, financial, human & social types and stresses to improve them to build not just a wealth but a genuine wealth.

This helps recent literature also emphasize on happiness and labor productivity linkage. The dimension of happiness has been taken into account to test such linkage to support the happy society view of philosophers like Aristotle, Confucius and Plato.

Does a rise in happiness affect productivity? Through conducting three different styles of experiments, Oswald, Proto & Sgroi (2015) found that happiness makes labors more efficient and productive. In the experiments, the selected persons were made happier and found that the treated people were 12% more productive and observed that lower happiness is associated with low productivity.

Figure 1. The Vicious Circle of Technological Reliance



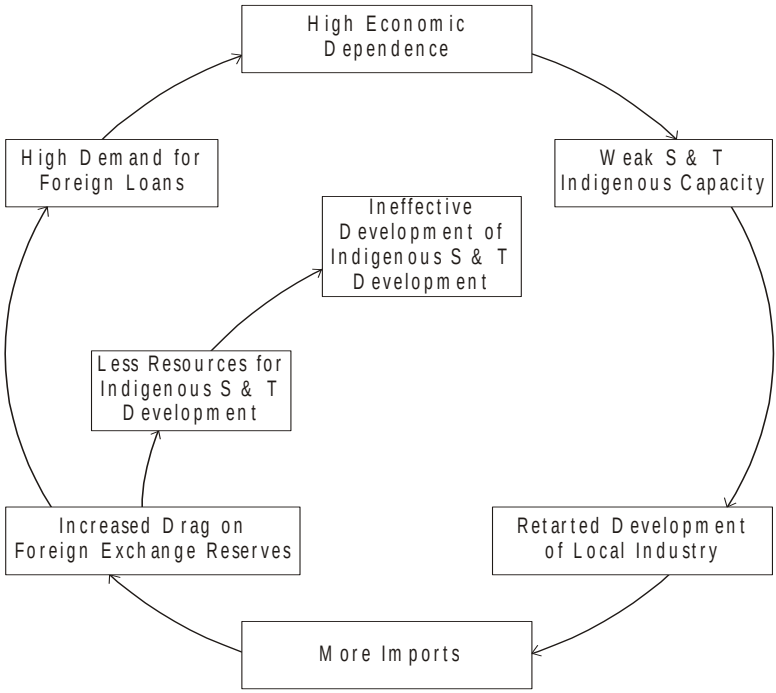
Source: Adopted from Kazi (2002)

To see the impact on economic growth, two variables - life expectancy and investment ratio representing happiness were considered to test the significance in the relationship between them, Li & Lu (2010) found a robust positive correlation.

Guriev and Zhuravskaya (2009) in contrast found a positive and significant effect on life satisfaction with Gini coefficient. Rasheed, Ahmad and Rauf (2011) using pooled data of industrial / developed economies, observed a significant impact of economic happiness on GDP growth.

Veenhoven (2000) established counter logical connection between economic happiness and income equality and found that the presumed link fails to exist. Average economic happiness was high in countries where income related equality was poor.

Figure 2. The Vicious Circle of Economic Dependence Superimposed on the Circle of Technological Development



Source: Adopted from Kazi (2002)

Since a happy state of labour is more productive therefore a happiness factor can influence the existing relationship between capitalization in information technology (IT) and economic growth through effective labour productivity and thus invalidates productivity paradox. Happiness aspect as a policy objective in achieving higher productivities is generally overlooked. This study thus attempts to test the hypothesis whether economic happiness plays moderating role between information related capitalization and economic growth.

2. DATA AND METHODOLOGY

In order to test the argument we raised, the annual time series data of total employment to represent participatory labour force (N)[3],

[3] Expectedly, labour force in general is more the more IT literate over the time.

Investment in Information and Communication Technologies (ICT) to represent capital and GDP(Y) at factor cost for the all OECD and ASEAN plus three (APT[4]) countries are taken from The World Bank's data bank for a period of 20 years from 1996 to 2015. The happiness (H) data are taken from world data base of happiness and New Economic Foundation, UK. Generally in OECD countries the growth in investing in information technology is higher and modern than in Asian economies, therefore we have considered OECD and APT blocs to be compared for the hypotheses we have developed.

The data are transformed into natural log form to get responsiveness of each input, i.e., labour and capital towards output productivity using panel least square regression estimates of the following equations with happiness as a moderator in which Equations 2.1 and 2.2 will test the moderating role[5] of happiness factor. Since pooled ordinary least square (PLS) mitigates the existence of non-independent observations, thus catering to the issue of serial correlation; thus we preferred PLS over other regression models such as fixed or random effect models.

$$Ln\ Y_t = \beta_0 + \beta_1\ Ln\ K_t + \beta_2\ Ln\ N_t + \varepsilon_t \quad \ldots(2.1)$$

$$TFP_t = \lambda_0 + \lambda_1 Ln\ H_t + \varepsilon_t \quad \ldots(2.2)$$

$$Ln\ Y_t = b_0 + b_1\ Ln\ K_t + b_2\ Ln\ H_t + b_3\ Ln\ K_t H_t + \varepsilon_t \quad \ldots(2.3)$$

$$Ln\ Y_t = d_0 + d_1\ Ln\ N_t + d_2\ Ln\ H_t + d_3\ Ln\ N_t H_t + \varepsilon_t \quad \ldots(2.4)$$

where,

$Ln\ Y_t$ = Natural Log of GDP at factor cost,

$Ln\ K_t$ = Natural Log of Investment in Information and Communication Technologies,

$Ln\ Nt$ = Natural Log of Labour,

$Ln\ H_t$ = Happiness index,

$Ln\ H_tK_t$ and Ln N_tK_t are the cross product terms to test moderation,

[4]Consists of countries from ASEAN bloc plus China, Japan, and South Korea.

[5]*Testing Moderation:* Moderator effects are indicated by the interaction of an independent variable and the moderating variable in explaining dependent variable. Following equation demonstrates estimation of moderated regression $Y = Z + aX + bM + cXM + E$. The interaction of X and M measures the moderation effect via slope 'c'. Slope 'a' measures the main effect of X. The effect of X on Y is $a + cM$, thus, the impact of X on Y depends on M is also justified [Baron & Kenny (1986)].

TFP_t = Total factor productivity represented by the residual series *'ε'* is the error tem, Subscript *'t'* is the time period.

3. RESULTS

The panel regression estimates of the testing hypotheses are provided in Appendix I. Since each country specific cross section selected in the pooled data has different types of stochastic components which means some countries may have a unit root and some may not. In this situation we have applied common unit root test [Levin, Lin and Chu (2002)] to test the stationarity of all the selected series (see Table 3a in the Appendix I). The results show that non-stationarity in the series found at levels and stationarity at the first difference of the selected series, suggesting a possibility of long run policy implications.

Table 3.1. Results for Economic Growth

Variable	Coefficient	Prob.	R-squared	Durbin-Watson
(OECD Bloc)				
C	11.15	0.00	0.96	1.12
Ln(K)	0.31	0.00		
Ln(N)	0.43	0.00		
(APT Bloc)				
C	23.14	0.00	0.99	0.81
Ln(K)	0.53	0.00		
Ln(N)	0.27	0.04		

Note: Estimates are based on Equation 2.1.

For both OECD and APT countries, with strong degree of coefficient of determination and no issue of autocorrelation, the response of investment in information communication technology (ICT) on GDP is found significant at 5% level of significance and the response of labour on GDP is also found significant at 5% level of significance (see, Table 3.1).

TFP incorporates technological change, i.e., adopting new technologies and happiness through sociopolitical factors [Bosworth and Collins (2008)]. To test economic happiness factor as a determinant of total factor productivity (TFP), we estimated Equation 2.2 using the

residuals from Equation 2.1 and found economic happiness as statistically significant in both OECD and APT economic blocs at 10% and thus gives a reason to test economic happiness factor as a moderating variable (see, Table 3.2).

Table 3.2. Results for Total Factor Productivity

Variable	Coefficient	Prob.	R-squared	Durbin-Watson
(OECD Bloc)				
C	19.30	0.34	0.99	2.88
Ln(H)	1.56	0.09		
(APT Bloc)				
C	1.25	0.12	0.98	2.18
Ln(H)	0.85	0.06		

Note: Estimates are based on Equation 2.2.

The possibility of moderation of economic happiness on investment in ICT and GDP relationship is also proved significant at 5% level of significance for OECD bloc and significant for APT bloc at 10% level of significance (see, Table 3.3). Finally in the case of labour and GDP association, the positive moderating role of happiness is again statistically established for both OECD and APT blocs at 1% level of significance (see, Table 3.4).

Table 3.3. Results for Moderator on IT

Variable	**Coefficient**	**Prob.**
(OECD Bloc)		
C	5.08	0.00
Ln(K)	0.10	0.09
Ln(H)	0.29	0.00
Ln(KH)	0.16	0.03
(APT Bloc)		
C	0.85	0.00
Ln(K)	0.02	0.00
Ln(H)	0.19	0.00
Ln(KH)	0.08	0.00

Note: Estimates are based on Equation 2.3.

Table 3.4. Results for Moderator on Labour

(OECD Bloc)

Variable	Coefficient	Prob.
C	3.31	0.00
Ln(N)	0.80	0.00
Ln(H)	1.12	0.00
Ln(NH)	0.19	0.00

(APT Bloc)

Variable	Coefficient	Prob.
C	1.48	0.00
Ln(N)	1.21	0.00
Ln(H)	1.19	0.00
Ln(NH)	0.54	0.00

Note: Results are based on Equation 2.4.

4. CONCLUSION

Acemoglu, *et al.* (2014) observing growth patterns among IT based manufacturing industries in US economy from 1980-2009, found some evidence of productivity growth in IT based industries but not beyond the 1990s; accompanied by observation of a steep rise in unemployment. However, authors are of the view that rejection of Solow Paradox by that proponents of the technological discontinuity view may have been premature. We believe there can be some other factors that can reverse the situation. We, by introducing economic happiness as an intangible capital, claim that economic happiness can be augmented with labour force to make them as effective labour force that can help in raising production of efficiencies IT based. Our results approve that economic happiness is pivotal in enhancing the impact of labour and capital productivities on output growth.

The policy makers for an economy must aim at enhancing this intangible capital which in the end heaves economic values. The vast literature suggests quality of life, life satisfaction, social security, religious independence, access to justice, equality, health, education are vital determinants of economic happiness and among others thus may be aimed at developing economic policies.

APPENDIX I

Table 3a Common Unit Root Process for all series

Method	Statistic	Prob.**
	Unit root test at level	
Levin, Lin & Chu t*	14.4001	1.0000
	Unit root test at first difference	
Levin, Lin & Chu t*	-4.11307	0.0000

REFERENCES

Acemoglu, D., Dorn, D., Hanson, G. H., and B. Price, (2014) Return of the Solow paradox? IT, Productivity, and Employment in US Manufacturing. *The American Economic Review*, *104*:5, 394-399.

Amjad, R., and N. Awais (2016) Pakistan's Productivity Performance and TFP Trends, 1980-2015: Cause for Real Concern. *The Lahore Journal of Economics*, 21, 33.

Anderson, P. (1997) Review: Organizational Linkages: Understanding the Productivity Paradox. *Administrative Science Quarterly*, 42:3, 595-597.

Anielski, M. (2009) *The Economics of Happiness: Building Genuine Wealth*. Gabriola Island, British Columbia, Canada: New Society Publishers.

Baron, R. M., and D. A. Kenny (1986) The Moderator–Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology*, 51:6, 1173.

Berndt, E. R. and C. J. Morrison (1995) High Tech Capital Formation and Economic Performance. *Journal of Econometrics*, 65, 9-43.

Bosworth, B., and S. M. Collins (2008) Accounting for Growth: Comparing China and India. *Journal of Economic Perspectives*, 22:1, 45–66.

Brynjolfsson, E., and A. Saunders (2010) IT's Contributions to Productivity and Economic Growth. In Wired for Innovation:

How Information Technology Is Reshaping the Economy, 41-60, MIT Press.

Gartner (2012) IT Metrics: IT Cost Transparency Action Plan, Definition and Performance Metrics to Start the Journey.

Gil-Padilla, A. M. and T. F. Espino-Rodriguez (2008) Strategic Value and Resources and Capabilities of the Information Systems Area and Their Impact on Organizational Performance in the Hotel Sector. *Tourism Review*, 63:3, 21–47.

Guriev, S., and E. Zhuravskaya (2009) (UN) Happiness in Transition. *Journal of Economic Perspectives*, 23:2, 143-68.

Guzzo, R. A. (1996) Review: Organizational Linkages: Understanding the Productivity Paradox. *Academy of Management Review*, 21:4, 1235-1237.

Islam, A., R. Salim, and H. Bloch (2016) Does regional integration affect efficiency and productivity growth? Empirical evidence from South Asia. Review Urban & Regional Development, 28: 107–122. doi:10.1111/rurd.12048

Ives, B. (1994) Editor's Comments: Probing the Productivity Paradox. *MIS Quarterly*, 18: 2, 21-24.

Kazi, M.A. (2002) "The Need for Integrated S&T policies for Islamic Countries: The Role of Comstech" in Essays on Science. Edited by Mohammad Said, Baital-Hikmah

Johnston, R. and P. Jones (2004) Service productivity: Towards Understanding the Relationship between Operational and Customer Productivity. *International Journal of Productivity and Performance Management*, 53: 3, 201–213.

Lee, G. and J. Perry (2002) Are Computers Boosting Productivity? A Test of the Paradox in State Governments. *Journal of Public Administration Research and Theory: J-PART*, 12: 1, 77-102.

Li B. and Y. Lu. (2010) Accessed from http://profile.nus.edu.sg/fass/ecsluyi/happiness_sub.pdf

Lichtenberg, F.R. (1995) The Output Contributions of Computer Equipment and Personnel: A Firm Level Analysis. *Economic Innovations and New Technology*, 3, 201-217.

Levin, A., Lin, C.F., and C.S.J. Chu (2002) Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics*, 108: 1, 1-24.

Lopez-Calix, J. R., Srinivasan, T.G., and M. Waheed (2012) *What Do We Know about Growth Patterns in Pakistan?* (Policy Paper Series on Pakistan No. 05/12) Washington, D.C.: World Bank.

Marchand, D.A. (2005) In Business Management. Improving Performance using Information System. By Dave Chaffey & Steeve Wood. Essex, UK PEL.

Melville, N., Kraemer, K. and V. Gurbaxani (2004) Review: Information Technology and Organizational Performance: An Integrative Model of IT Business Value. *MIS Quarterly*, 28:2, 283-322.

Moore, G.E. (1965) Cramming more components onto integrated circuits. *Electronics*, 38: 8. Accessed on March 1st, 2017: https://drive.google.com/file/d/0By83v5TWkGjvQkpBcXJKT1I1TTA/view

Naym, J. and M.A. Hossain (2016) Does Investment in Information and Communication Technology Lead to Higher Economic Growth: Evidence from Bangladesh. *International Journal of Business and Management*, 11: 6, 302.

Oswald, A.J., Proto, E., and D. Sgroi (2015) Happiness and productivity. *Journal of Labor Economics*, 33: 4, 789-822.

Pinsonneault, A. and S. Rivard (1998) Information Technology and the Nature of Managerial Work: From the Productivity Paradox to the Icarus Paradox. *MIS Quarterly*, 22: 3, 287-311.

Preacher, K. J., Rucker, D. D., and A. F. Hayes (2007) Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research*, 42: 1, 185-227.

Rasheed, F., Ahmad, E. and S.A. Rauf (2011) Happiness in Solow Growth Model. *Journal of Business and Economics*, 3: 2, 127-144.

Solow, R. (1987) Book Review: We'd Better Watch Out. *New York Times*, July 12, 36.

Sunny, H., Kim, W.G. and S. Jeong (2005) Effect of Information Technology on Performance in Upscale Hotels. *International Journal of Hospitality Management*, 24: 2, 281-294.

Triplett, J. (1999) The Solow Productivity Paradox: What do Computers do to Productivity? *The Canadian Journal of Economics*, 32: 2, 309-334.

Veenhoven, R. (2000) The Four Qualities of Life: Ordering Concepts and Measures of the Good Life. *Journal of Happiness Studies,* 1: 1, 1-39.

Wetherbe, J. C., Turban, E., Leidner, D. and E. R. McLean (2007) *Information Technology for Management: Transforming Organizations in the Digital Economy* (6th ed.). New York: Wiley.