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ISSN 2399-1747
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Printed by CPI Group (UK) Ltd, Croydon, CR0 4YY

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Will Saudi Arabia get older? Will its pension system be sustainable?
Spectral answers

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Abstract
Purpose – The purpose of this paper is to answer the following two questions: Will Saudi Arabia get older? Will its pension system be sustainable?
Design/methodology/approach – The methodology/approach is to forecast KSA’s population with wavelet analysis combined with the Burg model which fits a $p$th order autoregressive model to the input signal by minimizing (least squares) the forward and backward prediction errors while constraining the autoregressive parameters to satisfy the Levinson-Durbin recursion, then relies on an infinite impulse response prediction error filter.
Findings – Spectral analysis projections of Saudi age groups are more optimistic than the Bayesian probabilistic model sponsored by the United Nations Population Division: Saudi Arabia will not get older as fast as projected by the United Nations model. The KSA’s pension system will stay sustainable based on spectral analysis, whereas it will not based on the U.N. model.
Originality/value – Spectral analysis will provide better insight and understanding of population dynamics for Saudi government policymakers, as well as economic, health and pension planners.
Keywords Spectral analysis, Wavelet analysis, Burg model, Kingdom of Saudi Arabia’s population, Pension system, Population projection

Introduction
The proportion of people aged 60 or more will represent 25 per cent of the total Saudi population of 40 million by the end of 2050. The number of people aged 80 or more is expected to reach 1.6 million, or 4 per cent of the total population in the same period (Abusaq, 2015). The number of pension benefits claimants will rise and the working class will have to pay extra pension costs in that period. Health expenditures are expected to increase between 2015 and 2050 due to an increase in the elderly rate from 5.4 per cent (1.6 million) to 25 per cent (10 million), but health expenditures will be offset by a decrease of the public expenses related to education in the same period as the youth dependency ratio will decrease to 24 per cent from 41 per cent. The objective of our paper is to add a spectral perspective to the Saudi population projections of the Population Division of the United

JEL classification – C53, J11, J26
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Nations (U.N.) used in Abusaaq’s paper. We forecast 80 years of Saudi Arabia population by age groups with spectral analysis presented in Rostan and Rostan (2017a). The Burg (1975) model combined with wavelet analysis is a versatile and robust model that may help the Saudi government policymakers, planners and pension managers to gain insight into the future pyramid of ages. Spectral analysis represents a broad range of applications, algorithms and implementations of processing signals. The foundation of spectral analysis is retracted in the classical numerical analysis techniques of the seventeenth century (Oppenheim and Schafer, 1975). Its applications encompass many fields from electrical signals to audio signal processing, wireless communication, waveform generations, demodulation, filtering, equalization or seismology whenever the forecast of waveform time series is involved. In recent years, spectral analysis has been applied to time series outside the field of Physics. A first attempt was the appraisal of the financial sustainability of the Spanish pension system using Spanish population forecasts (Rostan et al., 2015), then an application to Spanish GDPs forecasts (Rostan and Rostan, 2018). Spectral analysis was also applied to yield curve forecasting (Rostan et al., 2017) with a robust outcome. With a refined methodology using multiscale principal component analysis to take into account the co-dynamics of age groups, Rostan and Rostan (2017a) forecasted European and Asian populations which lead to original outcomes when compared to more conformist population projections of the U.N. Finally, the versatility of spectral analysis applied to the forecast of financial times series with distinctive properties was illustrated with market data in Rostan and Rostan (2017b). Population estimates follow mean-reverting processes overtime and are conspicuous candidates of waveform time series forecasting with spectral analysis.

Our benchmark, promoted by the Population Division of the U.N. Secretariat, follows the methodology presented in Raftery et al. (2012): it is based on Bayesian probabilistic population projections where “the total fertility rate and female and male life expectancies at birth are projected probabilistically using Bayesian hierarchical models estimated via Markov chain Monte Carlo using U.N. population data for all countries. These are then converted to age-specific rates and combined with a cohort component projection model. This yields probabilistic projections of any population quantity of interest”.

In the next section, we present the rationale of selecting spectral analysis for population projections and a four-step methodology based on spectral analysis that belongs to deterministic methods as opposed to probabilistic methods, such as our benchmark which is a Bayesian probabilistic model.

Methodology

Our methodology is the fusion of three sources: a book (Rostan and Rostan, 2017a), a seminal paper (Rostan et al., 2015) on population projections and a paper on financial time series forecasting (Rostan and Rostan, 2017b). The assumption of the model relies on the fact that population estimates follow waveform patterns like several physical phenomena such as electrical, audio or seismic signals which propagate through space in waveforms. Signal processing (SP) proposes sparse representations of signals for the purposes of analysis or enhancement. “Signals carry overwhelming amounts of data in which relevant information is often more difficult to find than a needle in a haystack. Processing is faster and simpler in a sparse representation where few coefficients reveal the information we are looking for” (Mallat, 2009). SP includes spectral analysis and enhancing acquired data using digital filtering. Spectral analysis is the technical process of decomposing a complex signal into a simpler one. Spectral analysis uses different techniques divided into two classes, non-parametric and parametric methods. Non-parametric methods include periodogram, Bartlett’s method or non-uniform discrete Fourier transform. Parametric methods include
autoregressive model (AR), moving-average model (MA), autoregressive moving average (ARMA) and maximum entropy spectral estimation. In this paper, the Burg (1975) model combined with wavelet analysis and applied to population projection is a parametric AR model. The Burg model is able to capture the amplitude of the wave, the slope of the trend, the decaying or increasing amplitude of the wave overtime and may qualify for population projections.

Our database is represented by the Saudi Arabia pyramid of ages divided by the Population Division of the U.N. Secretariat by five-year age group into 17 classes: 0-4 years, 5-9, 10-14, 15-19, ..., 80+. We project the population values of the 17 age groups from 2020 to 2100. We benchmark our model to population forecasts of the Population Division of the U.N. Secretariat. Figure 1 provides an insight of adapting SP to Saudi population projections: age groups represented by times series propagate through time like signals. We observe this behavior in other fields such as communication systems, SP and electrical engineering where a signal refers to “a function that conveys information about the behavior or attributes of some phenomenon” (Priemer, 1991). More specifically, in electrical engineering, the embodiment of a signal in electrical form is made by a transducer that converts the signal from its original form to a waveform expressed as a current or a voltage, or an electromagnetic waveform, for example, an optical signal or radio transmission. Figure 1 captures the oscillation of population time series in waveforms. Based on the U.N. population projections between 2020 and 2100, most of these waves have an uptrend until 2050-2060 and then experience a downturn until 2100.

Notes: 1950-2015 data obtained by census; after 2015, population projections (medium variant) of the Population Division of the U.N. Secretariat
The alarming trends belong to the young population: age group 0-4 starts its downtrend in 2020, age group 5-9 in 2025, age group 10-14 in 2030, age group 15-19 in 2035, age group 20-24 in 2040 and age group 25-29 in 2045. All age groups except the 80+ decay in amplitude overtime to converge inside a 2 million to 2.7 million range in 2100.

Wave propagation is defined in SP as how waves travel. Once we acknowledge the wave propagation of the time series and the analogy with optical or radio transmission signals, we may apply SP to population estimates: the assumption of the paper is, thus, that population estimates propagate through time like signals through space. As observed in Figure 1, historical population data between 1950 and 2015 clearly behave in waveforms.

Figure 1 illustrates age groups population estimates in thousands (both sexes combined) by five-year age group propagating in waveforms. Historical estimates are obtained by census between 1950 and 2015. After 2015, Figure 1 illustrates probabilistic population projections of the U.N (medium variant) from 2020 until 2100, which converge toward a 2 million to 2.7 million range in 2100. The probabilistic U.N. model makes the 80+ age group an outlier group which increases steadily overtime, reaching a 4.9 million level in 2100.

We apply a four-step methodology to project population estimates with spectral analysis, illustrated with KSA’s 0-4 age group population projection Figure 2.

![Figure 2. Kingdom of Saudi Arabia’s 0-4 age group population from 1950 to 2015 (14 data)](image)

Step 1: De-noising and compression of the first-order difference of Saudi Arabia’s total population time series

We compute the first-order difference of the KSA’s 0-4 age group population time series to transform non-stationary series into stationary series. We apply the augmented Dickey-Fuller test to the time series before and after differentiation: before differentiation, the time series are non-stationary (i.e. existence of a unit root), and after differentiation, the time series is stationary (rejection of the existence of a unit root). The choice of this transformation relies on the fact that wavelet analysis presents a more accurate forecasting ability with stationary time series rather than non-stationary time series. Refer to Rostan and Rostan (2017b) for a demonstration.

We then de-noise the series using a one-dimensional de-noising and compression-oriented function using wavelets. The function is called “wdencmp” in Matlab (Misiti et al., 2015). The underlying model for the noisy signal is of the form:

\[ s(n) = f(n) + \sigma e(n) \]  

where time \( n \) is equally spaced, \( e(n) \) is a Gaussian white noise \( N(0,1) \) and the noise level \( \sigma \) is supposed to be equal to 1. The de-noising objective is to suppress the noise part of the signal \( s \) and to recover \( f \). The de-noising procedure proceeds in three steps:

1) **Decomposition**: We choose the wavelet \( \text{sym4} \), and choose the level 2-decomposition. \( \text{Sym4} \) is a symlets wavelet of order 4 used as the mother wavelet for decomposition and reconstruction. It is a nearly symmetrical wavelet belonging to the family of \( \text{Symlets} \) proposed by Daubechies (1992). We compute the wavelet decomposition of the signal \( s \) at level 2.

2) **Detail coefficients thresholding**: For each level from 1 to 2, we select a threshold and apply soft thresholding to the detail coefficients.

3) **Reconstruction**: We compute wavelet reconstruction based on the original approximation coefficients of level 2 and the modified detail coefficients of levels from 1 to 2.

Like de-noising, the compression procedure contains three steps:

1) Decomposition. 2) Detail coefficient thresholding. For each level from 1 to 2, a threshold is selected and hard thresholding is applied to the detail coefficients. 3) Reconstruction. The difference with the de-noising procedure is found in step 2. The notion behind compression is based on the concept that the regular signal component can be accurately approximated using a small number of approximation coefficients (at a suitably selected level) and some of the detail coefficients.

We illustrate in Figure 3 KSA’s 0-4 age group population (14 years) before differentiation (top figure), after differentiation (middle) and after de-noising and compression (bottom).

Step 2: Wavelet decomposition

We decompose the signal after being differentiated, de-noised and compressed. The signal, i.e. the 14-year time series of KSA’s 0-4 age group population transformed at step 1, is decomposed into decomposed signals \( cAs \) named approximations and \( cDs \) named details. The discrete wavelet transform is a kind of decomposition scheme evaluated by passing the signal through low-pass and high-pass filters (Corinthios, 2009), dividing it into a lower frequency band and an upper band, respectively. Each band is subsequently divided into a second-level lower and upper bands. The process is repeated, taking the form of a binary, or
“dyadic” tree. The lower band is referred to as the approximation \( cA \) and the upper band as the detail \( cD \). The two sequences \( cA \) and \( cD \) are downsampled. The downsampling is costly in terms of data: with multilevel decomposition, at each one-level of decomposition, the sample size is reduced by half (in fact, slightly more than half the length of the original signal, as the filtering process is implemented by convolving the signal with a filter. The convolution “smears” the signal, introducing several extra samples into the result). Therefore, the decomposition can proceed only until the individual details consist of a single sample. Thus, the number of levels of decomposition will be limited by the initial number of data of the signal. The level of decomposition of the signal is left to the appreciation of the user. In this paper, we apply a third-level decomposition. The choice of the third level is explained at the end of the methodology section. Figure 4 illustrates the third-level [diagram]

Figure 3. Observed KSA’s 0-4 age group population from 1950 to 2015, 14 annual data (top), first-order difference of KSA’s 0-4 age group population (middle), de-noising and compression of the first-order difference of KSA’s 0-4 age group population (bottom)

Figure 4. Third-level decomposition of the transformed KSA’s 0-4 age group population at current prices (after differentiation and de-noising/compression) using one-dimensional discrete wavelet analysis
decomposition of the transformed KSA’s 0-4 age group population (after differentiation and de-noising/compression, 13 points). We observe in Figure 4 that details $cDs$ are small and look like high-frequency noise, whereas the approximation $cA4$ contains much less noise than does the initial signal. In addition, the higher the level of decomposition, the lower the noise generated by details. For a better understanding of signal decomposition using discrete wavelet transform, refer to the methodology section of Rostan and Rostan (2017b).

**Step 3: Burg extension of approximations and details.**

We apply the Burg extension to $cA$ and $cD$. To run the Burg extension, we apply an autoregressive $p$th order from historical data, in this paper we choose a $p$th order equal to the longest available order when forecasting. For instance, in 2016, when forecasting KSA’s 0-4 age group population for the subsequent years, the longest $p$th order available is 12 out of 13 data. Given $x$ the decomposed signal (which is $cA$ or $cD$), we generate a vector $a$ of all-pole filter coefficients that model an input data sequence using the Levinson-Durbin algorithm (Levinson, 1946; Durbin, 1960). We use the Burg (1975) model to fit a $p^{th}$ order autoregressive (AR) model to the input signal, $x$, by minimizing (least squares) the forward and backward prediction errors while constraining the AR parameters to satisfy the Levinson-Durbin recursion. $x$ is assumed to be the output of an AR system driven by white noise.

Vector $a$ contains the normalized estimate of the AR system parameters, $A(z)$, in descending powers of $z$:

$$H(z) = \frac{\sqrt{e}}{A(z)} = \frac{\sqrt{e}}{1 + a_2 z^{-1} + \ldots + a_{(p+1)} z^{-p}}$$

(2)

As the method characterizes the input data using an all-pole model, the correct choice of the model order $p$ is important. In Figure 5, the prediction error, $e(n)$, can be viewed as the output of the prediction error filter $A(z)$, where $H(z)$ is the optimal linear predictor, $x(n)$ is the input signal and $\hat{x}(n)$ is the predicted signal.

In a last step, the infinite impulse response (IIR) filter extrapolates the index values for each forecast horizon. IIR filters are digital filters with infinite impulse response. Unlike a finite impulse response (FIR) filter, an IIR filter has the feedback (a recursive part of a filter) and is also known as recursive digital filter.

**Step 4: Wavelet reconstruction**

We recompose the forecasted signals after the Burg extension using the methodology illustrated in Figure 6 for the third-level decomposition/reconstruction diagram. After reconstruction, we retransform the time series of the first-order difference of the KSA’s 0-4 age group population into KSA’s 0-4 age group population.
Finally, we focus on the optimal level of decomposition of our forecasting model. We make the level varying from 1 to 7. 0-, 1- and 2-levels of decomposition return an error message. Figure 7 illustrates the average RMSE computed on the last five in-sample years of our database (forecasts versus observed data) from 1995 to 2015 of KSA’s population for the 17 age groups.

Whichever the level of decomposition, RMSE is constant (425.47). For simplification, we use the lowest level of decomposition, the third level, to generate the forecasts in the results section.

**Figure 6.**
Diagram of a third-level wavelet decomposition/reconstruction tree to forecast the initial signal \(s(t)\)

**Figure 7.**
Average RMSE versus level of decomposition

*Identifying the optimal level of decomposition*

Finally, we focus on the optimal level of decomposition of our forecasting model. We make the level varying from 1 to 7.

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Whichever the level of decomposition, RMSE is constant (425.47). For simplification, we use the lowest level of decomposition, the third level, to generate the forecasts in the results section.
Results for KSA’s population projections

Results for the 17 age groups

KSA’s pyramid of ages is divided into 17 age groups: 0-4, 5-9, 10-14, 15-19, …, 80+. We forecast the population values of the 17 age groups from 2020 to 2100 using the Burg method combined with wavelet analysis. We benchmark our model to KSA’s population projections of the Population Division of the Department of Economic and Social Affairs of the U.N. Secretariat. We review some examples of age group population projections obtained with spectral analysis. The first example is the 0-4 age group population represented by Figure 8.

Figure 8 shows that the 0-4 age group projection obtained with spectral analysis captures the uptrend depicted by population estimates observed before 2020. Spectral analysis adjusts the frequency and amplitude of the age group projection to the information provided by past data based on the SP theory. The uptrend is explained by the baby bust, which will last in Saudi Arabia, based on spectral analysis, until the end of the century, but which will end, based on the U.N. model, in 2020.

A second example is the 30-34 age group population represented by Figure 9. We observe again a divergence of the forecasts generated by the two models, spectral analysis being bullish with the 30-34 age group, reaching 9.3 million on 2100. In contrast, the U.N. model displays a steady decline of the value of the 30-34 age group after 2050, reaching 2.4 million in 2100.

A third example is the 80+ age group represented in Figure 10. This outlier 80+ age group displays a clear rupture between spectral analysis and the U.N. benchmark. Like all other age groups, spectral analysis identifies a trend whose amplitude and frequency are explained by past data. On the contrary, the U.N. 80+ age group points sharply upward for the remaining 80 years of the twenty-first century. The U.N. secretariat obviously assumes that medical progress and social protection of elderly people will make their age group number skyrocketing, but does not take into consideration:
That epidemiologic factors such as the emergence of new viruses (e.g. Zika virus), antibiotic-resistant bacteria (e.g. half a million cases of multidrug-resistant tuberculosis in 2013), depletion of the immune system by genetically modified food or overuse of pesticide, deterioration of the environment quality by global warming may slowdown the rise of octogenarians. Global warming responsible for many
epidemiologic occurrences was evidenced by year 2016, the warmest year since modern record-keeping began in 1880 (NASA’s Goddard Institute for Space Studies, 2017) and by the fact that 16 of the 17 warmest years on record have occurred since 2001. This makes 2016 the third year in a row to set a new record for global average surface temperatures;

- That economic factors such as a deep and prolonged recession due to rampant oil prices, which have already taken a toll on the Saudi economy, may lead to significant budget deficits which may reduce transfer payments from the government, trimming the financial support of senior citizens.
- That political factors such as war against terror may impair the social protection of the 80+ vulnerable population with government budget cuts. Recently, by declaring war against terrorism at an Islamic Military Counter Terrorism Coalition meeting gathering its 41 members, Saudi Arabia has coordinated a collective response to fight terrorism through military actions and security measures (Naqvi, 2017). The leadership of Saudi Arabia in the war against terror will force the country to reassess the economic and social costs that these measures represent. In addition to the terrorism threat, risk of war has reached alarming levels in the Middle East. The risk is supported by an aggressive arms industry, which is lobbying superpowers. Out of the top 10 international arms producers, eight are American. The arms industry spends millions lobbying US Congress and state legislatures and defends its turf with efficiency and vigor (Hallinan and Wofsy, 2015). Tensions in sensitive areas are, therefore, created and maintained by the arms industries and their political advocates that exploit religious differences to support conflicts: the historical Shia-Sunni enmity has led to many conflicts in human history, the war between Iraq and Iran (1980-1988) is a recent example (Rostan and Rostan, 2017a). The death toll was estimated to 1.5 million casualties. Proxy war is another example of conflict created and encouraged by superpowers and their arms industries. As a result, Saudi Arabia has purchased a record US$1.15bn arms to the USA in 2016 (Zengerle, 2016). Following the visit of US President Trump in Riyadh in 2017, a weapons’ deal worth nearly US$110bn was sealed immediately and an agreement of US$350bn was signed over 10 years (David, 2017). The Syrian conflict, which has extended from 2011 until today, is an example of proxy war between Russia and its allies, who are supporting President Bashar al-Assad government representing the Shia minority and the USA, Saudi Arabia and their allies who are arming and supporting Sunni rebels. Another example of proxy war is the war in Yemen between Saudi Arabia and Iran. In this ailing economic and political context, the optimal allocation of resources for senior citizens in Saudi Arabia may not be a priority for the country.

The U.N. foresees the 80+ age group skyrocketing by more than 3,276 per cent by the end of the century compare to 2015 with 4.9 million of senior citizens in 2100 versus 146,856 in 2015, which makes this figure rather unlikely. Spectral analysis forecasts a constant increase of the 80+ age group, reaching a 492,115 level in 2100 with a 235 per cent increase compare to 2015. The reality might lie somewhere inside this range.

Results for the total KSA’s population
Figure 11 illustrates the total KSA’s population forecasted with spectral analysis and by the U.N.

From 2020 to 2100, spectral analysis forecasts a steady increase of KSA’s population estimates. U.N. estimates will experience an increase until 2065 toping a 46-million
high, then the population will deplete reaching a 44-million level in 2100. Spectral analysis estimates will hit the 86 million marks in 2100 about two times the U.N. estimate.

**Reviewing the differences between KSA’s population projections obtained with spectral analysis and the U.N. benchmark**

Population projections forecasted with the two methods converge to one conclusion: KSA’s population will be larger by the end of the century than today, 44 million in 2100 with U.N. projections, 86 million with spectral analysis versus 31.5 million in 2015. However, the drivers of KSA’s population growth are different depending on methods.

Figure 12 illustrates the 17 age groups forecasted with spectral analysis, which should be compared to the 17 age groups forecasted by the U.N. and illustrated in Figure 1. A general comment is that population estimates forecasted with spectral analysis are not converging toward the 2.5 million level as we observe in Figure 1 with U.N. projections. This convergence toward the 2.5 million level is a clear limitation of the U.N. Bayesian probabilistic model, which derives the age group projections from common denominators, the total fertility rate and female and male life expectancies at birth, projected probabilistically using Bayesian hierarchical models estimated via Markov chain Monte Carlo. With the U.N. model, all age groups projections (except the 80+) converge toward a specific level because the model volatility decreases overtime, making the range of individual age groups narrowing. Time series forecasted by spectral analysis and illustrated by Figure 12 are not converging toward a specific level; they are more diffuse and look more realistic. In 2100, spectral analysis series range between 12.4 million for the 35-39 age group and 492,115 for the 80+ age group. In addition, we observe that age groups of young people (0-4, 5-9, 10-14, 15-19) stagnate after years 2050-2065. All other age groups have a clear uptrend between 2020 and 2100.
Appraising the financial sustainability of KSA’s pension system
As an application of population projections to the appraisal of the financial sustainability of KSA’s pension system, we regroup the 17 age groups in three major age groups, the 0-19, 20-64, 65+ illustrated by Figure 13.

From Figure 13, starting with the upper curves, we observe that the working class 20-64 who feeds the pension system is at lower levels between 2020 and 2100 with the U.N. projections (25.5 million on average) than spectral analysis projections (44.6 million on average). The 65+ age group who depletes the pension system is at significantly higher levels between 2020 and 2100 with the U.N. forecasts (8 million on average) than spectral analysis forecasts (1.9 million on average). Finally, the 0-19 age group that is considered the future generation to feed the pension system is at higher levels between 2020 and 2100 with spectral analysis (13.2 million on average) than the U.N. model (9.8 million on average). Overall, spectral analysis population projections are more optimistic than the U.N. model projections concerning financial sustainability of KSA’s pension system with 19.1 million more workers on average who feed the pension system over the period 2020-2100, 3.4 million more next-to-become-workers on average (the 0-19 age group) with spectral analysis than

Notes: 1950-2015 data obtained by census; after 2015, population projections obtained with spectrum analysis

Figure 12.
The 17 Age groups constituting the Saudi pyramid of ages for the 1950-2100 period
the U.N. projections and 6.1 million less retirees on average (who deplete the pension system) with spectral analysis than the U.N. model.

**Forecasting the KSA’s fertility rate**

Finally, focusing on KSA’s fertility rate defined as the ratio of live births to the population, expressed per 1,000 population per year, we choose the age group 0-4 as proxy of the live births that we adjust to the 2015 World Bank fertility rate estimate for KSA, i.e. 2.71 per 1,000. We obtain Figure 14. From Figure 14, the fertility rate forecasts...
obtained by the two models are both bearish between 2020 and 2100, the decline being stronger with the U.N. model than spectral analysis at the beginning. However, by 2100, the spectral analysis estimate ends up lower with a value of 1.19 versus 1.32 with the U.N. model.

**Conclusion on KSA’s population projections**

Our objective is to provide a robust model to government policymakers, planners or pension managers, to gain insight into the future KSA’s pyramid of ages: spectral analysis assumes that population time series propagate through time like signals through space. KSA’s pyramid of ages is divided into 17 age groups by the Population Division of the Department of Economic and Social Affairs of the U.N. Secretariat: 0-4, 5-9, 10-14, . . ., 80+. We forecast estimates of the 17 age groups from 2020 to 2100. We benchmark our model to the Bayesian probabilistic model promoted by the U.N. Secretariat.

We show that the overall population forecasts of the two models have positive trends, spectral analysis making the KSA’s population increasing at a positive rate until 2100 when it reaches the 86-million marks, the U.N. model increasing at a negative rate and decreasing after 2065 to reach 44 million in 2100.

However, the drivers of KSA’s population growth are different depending on the method. The 80+ age group of the U.N. follows a distinct pattern, a sharp uptrend for the last 80 years of the twenty-first century. The U.N. obviously assumes that medical progress and social protection of elderly people will make their age group number skyrocketing. The U.N foresees the 80+ age group jumping by more than 3,276 per cent (4.9 million elderly people in 2100) by the end of the century compare to 2015, which makes this figure rather unlikely. Spectral analysis forecasts a smooth increase of the 80+ age group reaching 492,115 in 2100 (+235 per cent compare to 2015). The reality might lie somewhere in the middle. Concerning the 16 remaining age groups, the U.N. model makes the age groups following a waveform pattern. All groups converge inside a 2 million to 2.7 million range in 2100. This pattern is a clear limitation of the U.N. Bayesian probabilistic model, which derives the age group projections from common denominators, the total fertility rate and female and male life expectancies at birth, projected probabilistically using Bayesian hierarchical models estimated via Markov chain Monte Carlo. The projections converge toward a specific range because the model volatility decreases overtime, making the range of individual age groups narrowing and converging. Time series forecasted with spectral analysis are not converging toward the same level; they are more diffuse and look more realistic.

In addition, forecasts of age groups of young people (0-4, 5-9, 10-14, 15-19) obtained with spectral analysis stagnate after years 2050-2065. All other age groups have a clear uptrend between 2020 and 2100.

In an attempt to appraise the financial sustainability of KSA’s pension system by analyzing the age groups feeding and depleting the pension system, we regroup the 17 age groups in three main age groups, the 0-19, 20-64, 65+. We show that over the period 2020-2100, the financial sustainability of KSA’s pension system is more optimistic with spectral analysis than the U.N. with 19.1 million more workers on average who feed the pension system over the period 2020-2100, 3.4 million more next-to-become-workers on average (the 0-19 age group) with spectral analysis than the U.N. projections and 6.1 million less retirees on average (who deplete the pension system) with spectral analysis than the U.N. model.

Focusing on the fertility rate, we show that the fertility rate forecasts obtained by the two models are both bearish between 2020 and 2100, the decline being stronger with the U.N. model than spectral analysis at the beginning. However, by 2100, the spectral analysis estimate ends up lower with a value of 1.19 versus 1.32 with the U.N. model.
To recap, “Will Saudi Arabia Get Older by 2100?”. The U.N. model says that the 65+ age group will increase from 3 per cent of the total population in 2015 to 29 per cent in 2100 when spectral analysis says that the proportion of this age group will stay the same at 3 per cent. The 20-64 age group that represented 64 per cent of the population in 2015 will grow to 80 per cent with spectral analysis and slip to 52 per cent with the U.N. model. However, the young generations (0-19 age group) who represented 33 per cent of the total KSA’s population in 2015 will slip to 17 per cent with spectral analysis and 19 per cent with the U.N. model. Thus, the two models converge regarding the estimated proportion of the 0-19 age group in 2100. Overall, whichever the model, Saudi Arabia will get older.

Will KSA’s pension system be sustainable? The answer is no with the U.N. model, but yes with spectral analysis.

Compliance with ethical standards
Disclosure of potential conflicts of interest: All authors declare that no potential conflict of interest exists.

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent: Informed consent was not necessary for this study.

References
Further reading


About the authors

Pierre Rostan worked for more than 12 years in industry, having developed expertise in forecasting and risk management. He has been a New Products Manager in the R and D Department of the Montreal Exchange, Canada; Risk Consultant at APT Consulting Paris and Analyst at Clearstream Luxembourg. He holds a PhD in Administration from the University of Quebec, Canada. His major areas of research are assets pricing, numerical methods and forecasting. As an Associate Professor at Prince Sultan University, Kingdom of Saudi Arabia, he teaches courses in the area of finance. Pierre Rostan is the corresponding author and can be contacted at: pierre@psu.edu.sa

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Teaching evaluation and student response rate

Tashfeen Ahmad
University Project Management Office,
University of the West Indies, Kingston, Jamaica

Abstract
Purpose – The purpose of this paper is to share the author’s viewpoint on how to increase student response rate in course evaluation surveys.
Design/methodology/approach – The approach is to highlight measures which increased student response rate in online surveys of the author’s teaching evaluation at The University of the West Indies, Jamaica.
Findings – This viewpoint suggests that student response rate to course evaluation can be improved by the lecturer’s effective communication. The examples of effective communication are given in this paper.
Originality/value – This work will encourage the lecturers to initiate more student engagement to improve response rate of their teaching evaluation.

Keywords Online survey, Course evaluation, Paper survey, Response rate, Teaching evaluation

Paper type Viewpoint

Importance of student evaluation of teaching
Student evaluation of teaching is important for a number of reasons. These evaluations ensure quality in university teaching, provide an independent method of gauging teacher’s effectiveness, guide in making decisions for major curriculum changes and professional development for faculty and help in establishing a framework to better quantify and reward good teaching outcomes.

Shift in student evaluation of teaching from paper-based to online surveys
Paper-based assessment has been the most common form of student evaluation of teaching worldwide. However, over the past decade, there has been a shift away from paper-based to online assessment. As internet is becoming more available and affordable, traditional paper-based data collection methods, seem expensive, time consuming and less efficient.

Positives of this shift to online evaluation
One of the most important positives is efficiency gains, in terms of turnaround time from students and significant cost savings. In addition, online evaluations allow students the time, ease and ability to refine, expand and reflect on responses without the constraint of an “in class” time bound environment to complete paper-based surveys. This increases student
response to open-ended questions which provide qualitative data which is instrumental in improving teaching practices.

A review of the major literature works over the period 2000-2013 (as depicted in Table I) summarizes the main advantages of online method of evaluation.

**Challenges of this shift to online evaluation**

One of the biggest challenges is the low response and return rate of students to online evaluations when compared to paper-based evaluation responses (Benton et al., 2010; Goodman et al., 2015; Guder and Malliaris, 2010; Nowell et al., 2010).

A sample of the findings of response rates drawn from different research studies at various higher education institutions (as seen in Table II) over the years 1999-2013 indicates

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Main advantages</th>
<th>Research focus areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hmieleski and Champagne (2000)</td>
<td>More written feedback</td>
<td>Student course evaluations</td>
</tr>
<tr>
<td>Kasiar et al. (2002)</td>
<td>More written feedback</td>
<td>Comparison of traditional and Web-based evaluation processes</td>
</tr>
<tr>
<td>Johnson (2002)</td>
<td>Richer and higher data collection</td>
<td>Online student ratings</td>
</tr>
<tr>
<td>Hardy (2003)</td>
<td>More written feedback</td>
<td>Online student ratings</td>
</tr>
<tr>
<td>Ballantyne (2003)</td>
<td>Richer and higher data collection</td>
<td>Online evaluations of teaching</td>
</tr>
<tr>
<td>Ballantyne (2004)</td>
<td>Richer and higher data collection</td>
<td>Online student survey and comments</td>
</tr>
<tr>
<td>Anderson et al. (2006)</td>
<td>Provide more feedback</td>
<td>Student course evaluations</td>
</tr>
<tr>
<td>Donovan et al. (2006)</td>
<td>Richer and higher data collection</td>
<td>Student feedback on online vs traditional course evaluations</td>
</tr>
<tr>
<td>Laubsch (2006)</td>
<td>More written feedback</td>
<td>Comparison of online and in person evaluations</td>
</tr>
<tr>
<td>Donovan et al. (2006)</td>
<td>Richer and higher data collection</td>
<td>Constructive student feedback on online and traditional evaluations</td>
</tr>
<tr>
<td>Emery et al. (2008)</td>
<td>Efficiency, cost savings, richer responses</td>
<td>Open source online evaluation experiences</td>
</tr>
<tr>
<td>Miller (2010)</td>
<td>Time and cost savings, richer responses</td>
<td>Online evaluations</td>
</tr>
<tr>
<td>Samuels (2013)</td>
<td>Richer responses, efficiency, quicker and cost savings</td>
<td>Academic departments use of online course evaluations</td>
</tr>
</tbody>
</table>

**Table I.** Main advantages of using online course evaluation surveys

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Institution</th>
<th>Response rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layne et al. (1999)</td>
<td>Southeastern University</td>
<td>47% – online vs 60% – paper</td>
</tr>
<tr>
<td>Sax et al. (2003)</td>
<td>Several US institutions</td>
<td>17% – online vs 24% – paper</td>
</tr>
<tr>
<td>Dommeyer et al. (2004)</td>
<td>California State University</td>
<td>43% – online vs 75% – paper</td>
</tr>
<tr>
<td>Anderson et al. (2005)</td>
<td>University of Kentucky</td>
<td>83% – online vs 80% – paper</td>
</tr>
<tr>
<td>Avery et al. (2006)</td>
<td>Cornell University</td>
<td>47% – online vs 69% – paper</td>
</tr>
<tr>
<td>Laubsch (2006)</td>
<td>Fairleigh Dickinson University</td>
<td>61% – online vs 82% – paper</td>
</tr>
<tr>
<td>Nair et al. (2008)</td>
<td>Monash University</td>
<td>31% – online vs 56% – paper</td>
</tr>
<tr>
<td>Perrett (2013)</td>
<td>Large university in South US</td>
<td>71% – online vs 68% – paper</td>
</tr>
</tbody>
</table>

**Table II.** Comparison of response rates (online versus paper-based evaluation)
general lower return rates for online evaluations compared to paper-based evaluations in all except two cases (ranging as low as 17 per cent to a high of 83 per cent).

This low number of response rates, in online surveys, makes the data invalid. To mitigate this challenge, Nulty’s (2008) research provides a set of guidelines for required response rates to be considered valid and useful measure of accuracy for online evaluation. Since the larger is the class size, the lower response rate is required, Nulty recommends an ideal required response rate of 58 (size <20) and 35 per cent (>50) for accuracy of online survey results and to achieve validity.

**Major reasons for the differences in response rates**
The reasons for the differences in response rates range from gender and age factors (Hatfield and Coyle, 2013); privacy and anonymity (Khorsandi et al., 2012; Nevo et al., 2010); social pressure; distraction and location issues (Mau and Opengart, 2012); lack of engagement; incentives; communication; perceived inaction with feedback or general “survey fatigue” (Bennett and Nair, 2010); and demographic and economic variables peculiar to the institution of country (Morrison, 2011).

**Solving the issue of low response rate**
Bennett and Nair (2010) in their study at an Australian University were able to register an overall 83 per cent online response rate, but this was in response to the deliberate strategies and measures implemented to increase student involvement. Using effective engagement, communication and teacher–student participation techniques led to greater and more sustained response rates.

**Measures to increase student online response rates**
A vast amount of literature has been written about the problems and the strategies which can be used to encourage and increase the response rates of student online evaluation (Crews and Curtis, 2011; Morrison, 2011; Stowell et al., 2012).

The most comprehensive work done by Berk (2012) outlines a review of the problems and articulates an in-depth set of techniques and best practices which can be applied to increase online response rates. It should be noted however that he does not advocate a “one size fit all” solution but emphasizes that success in raising response rates will most likely be met by a combination of strategies and incentives over the long term.

In my opinion, the most important and fundamental ingredients for raising online response rates depends to large extent on the commitment, engagement and buy in of both students and teaching administrators to the process. For example, studies indicate that the biggest determinant for student participation in online evaluation is the level of engagement they obtain from teachers (Gaillard et al., 2011).

Those institutions which take the time to communicate and explain the process, how their responses will be used or incorporated to improve course delivery and outcomes experience increase in response rates (Wode and Keiser, 2011). On the other hand, students who do not feel a part of the process or think their feedback will not be taken seriously or valued or teachers who do not effect changes consequent on feedback experience lower response rates (Beran and Rokosh, 2009).

**What can lecturers do to increase response rate?**
The response rates are important as these evaluations are frequently used for consideration in tenure and promotion, hiring and pay increase decisions (Hammonds et al., 2017).
My viewpoint is that response rate can be increased if lecturers are informed about the timing of when the surveys are sent out, so they can also make a personal appeal (both in class and by email) to the students to complete their course evaluation surveys.

In this communication, lecturers should explain to the students how their comments would be taken seriously, and how it will be used to improve teaching (Heinert and Roberts, 2016).

The key is to inform students about the purpose of evaluations:

- Let students know that you will use their feedback to make changes in the course.
- Give students some examples of useful feedback you have received in the past, and how the course/pedagogy has benefited in response.

This best practice will show you improved results, and if you also want to score better in these evaluations, start giving chocolate cookies to your students (ESA, 2018).

References


Samuels, B. (2013), *Increasing Number of Academic Departments Use Online Course Evaluations*, CampusWest, 30 April.


**About the author**

Tashfeen Ahmad expanded his understanding of Psychology at Harvard University and joined The University of the West Indies, Mona, Jamaica, with 10 years of general management experience. He has taught courses in International Business, Production Management, Operations Management, Quality Management and Change Management. His research work focuses on the future of higher education and learning technologies. Tashfeen Ahmad can be contacted at: mrtashfeen@hotmail.com

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Strategic improvisation and HEIs performance: the moderating role of organizational culture

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Abstract

Purpose – This study aims to explore the relationships between strategic improvisation, organizational culture and higher education institutions (HEIs) performance. The dynamic nature of today’s environment, increased population and demand and budget cuts have created a lot of pressure on HEIs around the world. Hence, the need for effective human resource capable of providing advanced policies for efficiency and sustainability of these institutions.

Design/methodology/approach – A total of 229 questionnaires were filled and returned by academic leaders from HEIs in Kano state, Nigeria. The study used partial least squares path modelling to test the hypotheses postulated.

Findings – The major findings indicate that both strategic improvisation and organizational culture dimensions have direct relationship with HEIs performance. However, only innovative culture moderates the relationship between strategic improvisation and HEIs, while bureaucratic culture and supportive culture fail to support the proposed hypothesis.

Research limitations/implications – More studies are needed to further validate the impact of strategic improvisation (SI) on other public sector performance. Also, future studies should use longitudinal approach to establish at which stage SI has more impact on performance. Also, future studies should identify the difference that exists between units, department and faculty leaders, as some are more likely to engage in SI due to the nature of their specialization.

Practical implications – It is obvious that HEIs performance is not only limited to organizational factors but also individual characteristics such as ability to improvise. Hence, HEIs should consider SI ability during employment to ensure efficiency, performance and sustainability. Moreover, organizational culture of HEIs needs to be updated and to be more flexible in accommodating new initiatives or failure to encourage display of such ability.

Originality/value – Previous studies especially in the for profit sector have demonstrated the role of SI and organizational culture on performance. Thus, the present study is one of the early studies in the non-profit sector, specifically the HEIs. Moreover, the inconsistent result of the previous findings necessitates the study to test the moderating effect of organizational culture.

Keywords Higher education institutions, Organizational culture, Performance, Strategic improvisation

Paper type Research paper

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Introduction

Higher education institutions (HEIs) have been linked with economic prosperity and development that is achieved in a particular country (Chapman and Sarvi, 2017). This is made possible by transforming economic structure through the provision of educated workforce, highly skilled labour that are technologically competent and capable of competing not only locally but also globally (Banya, 2015). Knowledge economy, globalization and rapid technological change have been identified as the major factors forcing the need for change in an organization such HEIs (de Boer et al., 2017; Kiran et al., 2013). For organizations to achieve their objectives, they need to constantly learn, respond and adapt to fast changing environment of today’s world (Owen and Dietz, 2012). HEIs are not left out as they do not operate in a vacuum. HEIs face serious pressure by the changes and competitive nature of the new environment (Collis, 2002; Mullin, 2001). Hence, the need for them to provide enhanced academic programmes in line with the current needs of students, labour market and the economy at large (Al Zameli et al., 2015).

Continuous shrinking of funds almost on yearly basis, coupled with obsolete facilities, understaffing, technological change and higher public expectations are the major challenges of HEIs around the world (Chapman and Sarvi, 2017; Nayyar and Mahmood, 2014). Additionally, transforming the educational sector is one of the key issues facing developing countries like Nigeria (Banya, 2015). In Nigeria, the case is even worse, as HEIs failure has also been attributed to poor quality of leadership and governance, and prioritization of resource allocation (Dike, 2014). Specifically, academic leaders are seriously lacking in entrepreneurial skills to be progressive to attract funds that will contribute to performance of these institutions. For instance, Nkamnebe (2009) posits that Nigerian HEIs lack innovative leaders that have the ability to scan the environment to make tactical decisions. Consequently, HEIs fail to integrate the rapid changes that occur in the environment and the needs of the society. The Nigerian HEIs are in a sorry state, as a result of many or all of the aforementioned problems (Emmanuel, 2015); thus, the conclusion that the country’s HEIs is the worst within the West African sub-region (Apekhade, 2015). As a result of this, HEIs relevance in Nigeria has been seriously questioned in providing the required work force needed by the country. This is evidenced from the clear mismatch between societal needs and graduates produced by these institutions. Thus, there is an increased concern on HEIs (Zajda, 2013), with a lot of calls on them to adopt entrepreneurship as a panacea to their numerous problems (Gibb and Hannon, 2006).

In a competitive and dynamic environment of this nature, it is crucial for organizations including HEIs to be flexible (improvisation) so as to face uncertainty strategically (Goldman and Grinstein, 2010). Strategic improvisation (SI) has been attributed to an opportunity of exploring new ideas as a result of unexpected events (MacNab and Worthley, 2012; Moorman and Miner, 1998b). SI is increasingly important for employees, teams and organizations operating in a constantly changing environment. It is valuable in exploring opportunities out of the conventional fields, thus creating radically new ideas (Fisher and Amabile, 2009) as a result of unexpected events. In line with the above, organizational scholars argued that the increased pressure is as a result of an increased pace in competition, which provides opportunity for organization to use improvisational capability to succeed (Brown and Eisenhardt, 1995). Precisely, HEIs are complex organizations with non-routine crisis which requires immediate response and action to ensure efficiency. Consequently, HEIs are in need of leaders who have the zeal to ignore the formal rules in today’s rapid dynamic environment to ensure sustainability (Joyce and O’Boyle, 2013). In essence, traditional techniques are restricted to narrow area, hence providing effective results only in specific environment. Therefore, there is the need for continuous optimization and updating...
organizational (Nepal and Ramakrishna, 2017). For the avoidance of doubt, strategic planning is not completely bad; however, SI will help in reducing cost and time waste associated with planning (Sethi and Iqbal, 2008), which may be affected by the nature of the environment.

Empirical studies on SI have largely focussed on private sector, specifically product innovation, IT implementation, firm strategy and city administration (Kyriakopoulos, 2015; Magni et al., 2009; Vera and Crossan, 2005). Thus, neglecting non-profit organizations particularly HEIs. Additionally, most of the studies were conducted in high-velocity environment of developed countries (Cunha, 2005), neglecting emerging economies (Hodgkinson et al., 2016), which is characterized by rapid and unpredictable environmental changes (Zheng and Mai, 2013). It is apparent that HEIs need to adapt to today’s changing environment, and thus the research question on the impact of SI on HEIs performance. In essence, the need for organizational performance realization in this twenty-first century requires organizations to be flexible (improvise) to identify and accommodate new knowledge about their customers (Ahuja et al., 2016). Thus, resulting into increase in customer satisfaction, loyalty and by extension organizational performance as a result of continual retention of the customers (Levesque and Mcdougall, 1996).

Besides improvisation, organizational culture (OC) has also been linked to organizational performance (Bititci et al., 2015). In fact, OC is a major determinant of promoting critical thinking that facilitates innovativeness (Zhu, 2015). Hence, SI and OC are posits to influence organizational performance. However, past studies failed to look on the possible link between SI, OC and OP, especially in HEIs. In addition, strategic role of middle line managers have been fully documented in the for profit sector (Olayo et al., 2015), neglecting the non-profit sector like HEIs. As such, the link between leaders’ characteristics or leadership style and organizational performance is not complete when OC is ignored (Ogbonna and Harris, 2000). Apparently, OC largely depends on leaders in creating and maintaining a specific culture that suits their style, need, characteristics, ambition and corporate strategy of the organization (Turker and Altuntas, 2015). Certainly, OC has been identified as not only important in enhancing organizational performance but also vital for innovativeness and adaptation in HEIs (Schneckenberg, 2009). Hence, the need to consider the role of OC in Nigerian HEIs in this era of change, to ascertain its role in today’s dynamic environment. Despite the increase attention on SI in today’s environment, studies are still limited (Smith and Blundel, 2014); hence, there is the need to shed light on its impact and the moderating role of OC in enhancing HEIs performance. Thus, this study attempts to fill in the identified gap by examining the moderating role of OC on the relationship between SI and HEIs performance.

**Strategic improvisation and organizational performance**

For decades, strategic planning has been considered as the only best way of ensuring competitive advantage by corporate leaders in the late 1960s (Mintzberg, 1994). However, organizations struggling for survival that need to adapt to today’s rapid changing environment turn to improvisation (Wind and Mahajan, 1997). Ciborra (1996) defined improvisation as the process of overcoming the turbulent circumstances facing organizations by using available information and structure at their disposal. Improvisation is also defined as the deliberate and substantive convergence of the design and execution process (Miner et al., 2001; Moorman and Miner, 1998a, 1998b).

The concept of SI is an emerging field of study in the management science that deals with providing solutions on how organizations adapt to dynamism of today’s environment (Bakar et al., 2015b; Hadida and Tarvainen, 2014). Besides, strict adherence to strategic planning has been identified as a hindrance to creativity, flexibility and the development of
an appropriate plan for the organization (Slotegraaf and Dickson, 2004). In view of that, SI is viewed as a new paradigm for fast learning, adaptation and strategic renewal (Moorman and Miner, 1998b; Vera and Crossan, 2005). The accelerated rate at which changes occur within the environment cannot be overemphasized, thus making it difficult for organizations to always have the time to plan. As such employees are frequently forced to act before they can fully analyse all available options. Consequently, leaders improvise when they are faced with complex and dynamic situations that cannot be managed using the available routines. The ability of leaders to improvise will not only solve the problem but also give them the ability to capitalize on opportunities that will move the organizations forward, as a result of their novel strategic decisions (Hmieleski et al., 2013).

SI is defined as an action taken in real-time situations where it encompasses a high amount of spontaneity and creativity (Arshad et al., 2015b). SI is operationalized as the leaders’ ability to respond to unforeseen circumstances intelligently and effectively to solve a problem or use an opportunity. It involves making a creative decision or action outside the formal organization structure (Vera and Crossan, 2005). SI is seen as a behavioural strategy used by leaders on behalf of their organizations to respond to uncertainty, time pressure and resources insufficiency (Hu et al., 2017).

Previous studies have linked SI to organizational performance (Ahmad et al., 2015; Bakar et al., 2015c; Bingham, 2009). For instance, Bergh and Lim (2008) conducted a study on the absorptive capacity and improvisation from the organizational learning point of view using a sample of 205 of companies that announced and also implement restructuring actions. The findings revealed that both absorptive capacity and improvisation have an influence on subsequent restructuring (spin off) and performance, thereby establishing a relationship with improvisation and organizational performance. In another study, Hmieleski et al. (2013) also established a positive relationship between SI and organizational performance. Other studies using measures like product success or product development as an indicator of performance have also found a positive relationship between SI and firm performance (Akgün and Lynn, 2002; Leybourne and Sadler-Smith, 2006).

As such, scholars have called for more investigation on SI especially in public sector to devise means of eradicating HEIs emerging needs. SI is more of timely response, which may lead to new solutions and innovation that will serve as core competency advantage for these institutions (Yeboah Banin et al., 2016). Thus, we hypothesized that:

H1. SI is positively related to HEIs performance.

Organizational culture as a moderator
OC is defined as:

[... ] the pattern of basic assumptions which a given group has invented, discovered, or developed in learning to cope with its problems of external adaptation and internal integration, which have worked well enough to be considered valid, and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems (Schein, 2010, p. 18).

OC is a well-established construct that has been used both as dependent and independent variable (Turker and Altuntas, 2015). As such, OC has been well-established with other factors such as leadership (Ogbonna and Harris, 2000; Schein, 1984), employee turnover, job satisfaction (Uzkurt et al., 2013) and organizational performance (Parry and Proctor-Thomson, 2003; Scott et al., 2003) to mention a few.

OC concept has matured to generate a number of theories and models (Yiing and Ahmad, 2009; Zhu, 2015). The most common is that of Wallach (1983) where OC is divided into
bureaucratic, innovative and supportive dimensions. He argued that OC can be fully understood using these three basic components. Bureaucratic culture (BC) is more hierarchical in nature with clear descriptions of authority and responsibilities, where activities are organized systematically and channel to the lower level. An innovative culture (IC) is that in which creativity and result-oriented activities are encouraged and condoned, whereas a supportive culture (SC) is that which encourages teamwork and people oriented activities. In the past, government organizations are known to be bureaucratic in nature, whereas private organizations are more supportive and innovative. However, today’s dynamic environment requires all organizations to be entrepreneurial in nature; hence, there is the need for HEIs to combine all the component of OC to fully recognize, use and exploit available opportunities to ensure achievement of set objectives and sustainability.

Empirical studies on SI especially on its outcomes and consequences have not been fully exhausted (Arshad et al., 2015b; Chelariu et al., 2002). The findings were inconsistent; hence, studies remain inconclusive, and thus the possible need for a moderator. Studies such as Arshad and Hughes (2009), Arshad (2011), Bakar et al. (2015a) and Bakar et al. (2015c) reported a significant relationship, whereas Leybourne and Sadler-Smith (2006) reported insignificant or negative relationship. Additionally, the certainty of improvisation yielding positive impact is still not clear. As noted by Miner et al. (2001), improvisation can be good or bad, i.e. can have a positive or negative impact. Besides, improvisation may be highly innovative or chaotic, and it may solve a problem or worsen it (Vera and Crossan, 2005).

Thus, we argued that OC (bureaucratic, innovative and supportive) will moderate the relationship between SI and HEIs performance. First, Villa et al. (2003) posit that, to fully understand construct related to performance and leadership, OC should be considered as a situational variable. Second, research has found that the harmonious combination of appropriate leadership behaviours with certain types of OCs can positively influence employees’ performance (Ismiyarto et al., 2015; Ogbonna and Harris, 2000). Third, culture is one of the major sources of nurturing and developing new ideas in an organization (Uzkurt et al., 2013). Thus, the means for adapting to increasing needs of today’s dynamic and evolving environment by facilitating new initiatives implementation are provided, and this also provides for long-term competitive advantage and organizational success. In essence, OC has been identified as a core factor affecting the overall success of an organization, which does not only connect to daily routine of employees toward achieving their goal but also provides an avenue for fast adaption to today’s changing environment (Khuong and Nhu, 2015). In fact, only organizations that have the culture of tolerating failure (Sonenshein, 2014) and have little resistance to change will provide environment for improvisation (Leybourne, 2006). Hence, we propose the following hypotheses:

\[ H_{2a} \]. BC is positively related to HEIs performance.

\[ H_{2b} \]. IC is positively related to HEIs performance.

\[ H_{2c} \]. SC is positively related to HEIs performance.

\[ H_{3a} \]. BC has a significant and positive influence on the relationship between SI and HEIs performance.

\[ H_{3b} \]. IC has a significant and positive influence on the relationship between SI and HEIs performance.

\[ H_{3c} \]. SC has a significant and positive influence on the relationship between SI and HEIs performance.
Research method
Survey design was used because it enhances result generalization (Dooley, 2001). The items were adapted from previous studies and gauged on a five-point Likert scale with 5 strongly disagree to 1 strongly agree. In addition, some basic and relevant demographic information were also collected as presented in Table I. Prior to the main data collection process, the researcher conducted a pilot test using a sample of 40 respondents, after which some adjustments were made based on experts suggestions. The main sample of the study was 370 out of which only 229 responses were recorded from academic leaders across ten HEIs in Kano state, northwest part of Nigeria. In a bid to enhance validity and credibility of the result, the researcher emphasized on the confidentiality of the respondents and that there were no wrong or right answers to minimize social-desirability bias (Podsakoff et al., 2003). Also, to confirm whether common method variance (CMV) was not a major concern in the present study, Harman’s one factor test was conducted. The result showed 35.6 per cent which indicates that CMV is not an issue in the present study.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>(%)</th>
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</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
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</tr>
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<td>Male</td>
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</tr>
<tr>
<td>Female</td>
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<td>10.9</td>
</tr>
<tr>
<td><strong>Highest qualification</strong></td>
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</tr>
<tr>
<td>HND/degree</td>
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<tr>
<td>Masters</td>
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<td>10</td>
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<tr>
<td><strong>Years in current position</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 &lt; 2 years</td>
<td>95</td>
<td>41.5</td>
</tr>
<tr>
<td>2 &lt; 3 years</td>
<td>65</td>
<td>28.4</td>
</tr>
<tr>
<td>3 &lt; 4 years</td>
<td>30</td>
<td>13.1</td>
</tr>
<tr>
<td>4 &lt; 5 years</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>5 and above years</td>
<td>17</td>
<td>7.4</td>
</tr>
<tr>
<td>Missing</td>
<td>6</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Academic position</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below senior lecturer</td>
<td>139</td>
<td>60.7</td>
</tr>
<tr>
<td>Senior lecturer</td>
<td>65</td>
<td>28.4</td>
</tr>
<tr>
<td>Associate professor</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>Professor</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Missing</td>
<td>18</td>
<td>7.9</td>
</tr>
<tr>
<td><strong>Institution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>78</td>
<td>34.1</td>
</tr>
<tr>
<td>College of education</td>
<td>91</td>
<td>39.7</td>
</tr>
<tr>
<td>Polytechnic</td>
<td>26</td>
<td>11.4</td>
</tr>
<tr>
<td>Others</td>
<td>27</td>
<td>11.8</td>
</tr>
<tr>
<td>Missing</td>
<td>7</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Employer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal government</td>
<td>85</td>
<td>39.2</td>
</tr>
<tr>
<td>State government</td>
<td>125</td>
<td>57.6</td>
</tr>
<tr>
<td>Missing</td>
<td>7</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Table I: Profile of respondents
Research instruments
SI construct was measured using seven items guaged on a five-point Likert scale adapted from Vera and Crossan (2005). The items originated from the work of Moorman and Miner (1998a, 1998b), Tierney et al. (1999), Unger and Kernan (1983) and has a Cronbach’s alpha of 0.91. The study operationalized SI as the best strategy to cope with flexibility and provide the organization with capabilities to adapt to changing environmental demands rapidly and effortlessly (Bakar et al., 2015b).

In terms of OC, the popular Wallach (1983) items of 24 were used. Wallach (1983) assigned eight items each to the three dimensions of OC (bureaucratic, innovative and supportive). This classification has been used by other researchers such as Hamzah et al. (2013). In line with the above, OC is operationalized as a set of key values, assumptions, understandings and norms that is shared by members of an organization and taught to new members as correct (Daft, 1995).

The study operationalized performance as a uni-dimensional construct and subjective (non financial) based on Dess and Robinson (1984) submission, using scale from Berman and West (1998), Brewer and Selden (1998), Choi and Rainey (2010), Morris and Jones (1999), Moynihan and Pandey (2005) and Pitt and Tucker (2008). Performance is operationalized as the ability of the institutions to efficiently used its few resources and also provide the needed service to the satisfaction of its employees and customers. The items covered both managerial efficiency in terms of cost and service delivery, general employees performance and customer satisfaction.

Analytical procedure
The study made use of PLS-SEM version 3 to analysed the hypotheses of the study. Besides its friendly graphic nature, PLS-SEM has minimal restriction to both size and normality of data (Chin, 1998) and also accommodates both reflective and formative measures. The model of the study is reflective in nature, with some organizations dominants in one or more of these OC dimensions. Explicitly, the removal or absence of any of the dimensions does not affect the meaning of the latent variable (OC).

Furthermore, PLS-SEM is ideal for moderating analyses because it provides for measurement error. Thereby providing better and precise results (Chin, 1998). Also, PLS-SEM has the ability to estimate relationship of both inner model (measurement model) and outer model (structural model) simultaneously, which are the two basic two-steps process identified by Chin (2010). Assessing the outer model involves reliability and validity of the items in relation to the latent variables (LVs), while inner model deals with the association between LVs of the study (Chin, 2010; Hair et al., 2014). In fact, the use of PLS-SEM in analysis has become common in management, marketing and entrepreneurship studies in recent times (Gelhard and von Delft, 2016). Thus, a considerable increase is observed in advancement (PLSc, HTMT) to ensure rigorous analysis and applicability (Henseler et al., 2016).

Assessment of measurement model
Measurement model is a confirmatory process of items and LVs to ensure their reliability and validity (Hair et al., 2011). The three basic requirements of a reflective measurement model are internal consistency, convergent validity and discriminant validity. In this study, internal consistency was measured using three different criteria; Cronbach’s alpha (), composite reliability (CR) (Chin, 2010) and Dijkstra–Henseler’s rho () (Dijkstra and Henseler, 2015) all have a threshold of 0.70 (Henseler et al., 2016; Henseler et al., 2009). Table II indicates that all path loading values and that of the construct validity (, , ) are close to or exceed the threshold, hence satisfying and achieving internal consistency. In the
same vein, convergent validity using average variance extracted (AVE) was also established as values in Table II exceed the 0.50 threshold (Hair et al., 2011; Kock, 2011). Following Henseler et al. (2016) recommendation, Fornell–Larcker and Heterotrait–Monotrait (HTMT) criterion was used to achieve discriminant validity. According to Fornell and Larcker (1981), submission diagonal element (square root of AVE) is expected to be higher than the off diagonal one as presented in Table III. Similarly, Henseler et al. (2015) argued that comparing heterotrait–heteromethod correlations and the monotrait–heteromethod (HTMT) is more reliable in identifying discriminant validity. Accordingly, HTMT values presented in Table IV are all less than 0.90 which indicates that discriminant validity is not an issue in the present study.

### Table II. Measurement model result

<table>
<thead>
<tr>
<th>Items</th>
<th>Loadings</th>
<th>Factor loadings</th>
<th>A</th>
<th>$\rho_C$</th>
<th>$\rho_A$</th>
</tr>
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<tbody>
<tr>
<td>BC1</td>
<td>0.674</td>
<td>0.905</td>
<td>0.909</td>
<td>0.924</td>
<td>0.603</td>
</tr>
<tr>
<td>BC2</td>
<td>0.789</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC3</td>
<td>0.671</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC4</td>
<td>0.849</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC5</td>
<td>0.817</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC6</td>
<td>0.833</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC7</td>
<td>0.810</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC8</td>
<td>0.749</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC1</td>
<td>0.806</td>
<td>0.786</td>
<td>0.803</td>
<td>0.856</td>
<td>0.547</td>
</tr>
<tr>
<td>IC2</td>
<td>0.793</td>
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</tr>
<tr>
<td>IC4</td>
<td>0.709</td>
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</tr>
<tr>
<td>IC6</td>
<td>0.540</td>
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<tr>
<td>IC8</td>
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</tr>
<tr>
<td>OP2</td>
<td>0.743</td>
<td>0.885</td>
<td>0.889</td>
<td>0.909</td>
<td>0.556</td>
</tr>
<tr>
<td>OP3</td>
<td>0.764</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>OP4</td>
<td>0.733</td>
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<td>OP5</td>
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<td>OP6</td>
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<td>OP7</td>
<td>0.813</td>
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<td>OP8</td>
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<td>OP9</td>
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</tr>
<tr>
<td>SC1</td>
<td>0.697</td>
<td>0.780</td>
<td>0.815</td>
<td>0.848</td>
<td>0.531</td>
</tr>
<tr>
<td>SC2</td>
<td>0.553</td>
<td></td>
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</tr>
<tr>
<td>SC6</td>
<td>0.737</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC7</td>
<td>0.811</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI2</td>
<td>0.741</td>
<td>0.730</td>
<td>0.746</td>
<td>0.830</td>
<td>0.551</td>
</tr>
<tr>
<td>SI3</td>
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<td>SI4</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>SI7</td>
<td>0.664</td>
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</table>

### Table III. Discriminant validity

<table>
<thead>
<tr>
<th>Constructs</th>
<th>BC</th>
<th>HEIs performance</th>
<th>IC</th>
<th>SI</th>
<th>SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>0.777</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEIs performance</td>
<td>0.764</td>
<td>0.746</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>0.642</td>
<td>0.705</td>
<td>0.740</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>0.369</td>
<td>0.430</td>
<td>0.390</td>
<td>0.742</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>0.583</td>
<td>0.720</td>
<td>0.712</td>
<td>0.303</td>
<td>0.729</td>
</tr>
</tbody>
</table>
Structural model assessment

The study used 5,000 standard bootstrapping routine and 229 cases to evaluate the path coefficient and $R^2$ which are the two preliminary requirements of validating structural model (Hair et al., 2014; Rasoolimanesh et al., 2017). The structural model deals with establishing the link between and among constructs of the study through path coefficient, while the $R^2$ evaluates the explanatory power of the LVs in explaining the endogenous variables. The path coefficient values as presented in Table IV and Figure 1 involves the full model using Kock (2015) submission of one-tailed $p$-value. Specifically, the structural model that includes both main and moderating effect was run at once to evaluate the postulated hypotheses of the study.

The result shows that $H1$ which stated that there is a positive significance relationship between SI and HEIs performance is supported with a beta value of $\beta = 0.163$, $t = 3.306$ and $p < 0.1$ respectively. $H2a$ predicted a positive and significant relationship between BC and HEIs performance was also accepted with $\beta = 0.307$, $t = 3.358$ and $p < 0.001$. $H2b$ found IC to have a positive relationship with HEIs performance with $\beta = 0.220$, $t = 2.860$ and $p < 0.01$. The final direct relationship also confirmed the hypothesized relationship between SC and HEIs performance, where we have $\beta = 0.271$, $t = 3.396$ and $p < 0.001$, respectively. In addition, the path coefficient after the 5,000 resampling bootstrapping technique has no any

<table>
<thead>
<tr>
<th>Constructs</th>
<th>BC</th>
<th>HEIs performance</th>
<th>IC</th>
<th>SI</th>
<th>SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEIs performance</td>
<td><strong>0.848</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>0.786</td>
<td><strong>0.616</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>0.444</td>
<td>0.525</td>
<td><strong>0.511</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>0.659</td>
<td>0.862</td>
<td>0.709</td>
<td><strong>0.395</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heterotrait–monotrait (HTMT)</th>
<th>BC</th>
<th>HEIs performance</th>
<th>IC</th>
<th>SI</th>
<th>SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEIs performance</td>
<td><strong>0.848</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>0.786</td>
<td><strong>0.616</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>0.444</td>
<td>0.525</td>
<td><strong>0.511</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>0.659</td>
<td>0.862</td>
<td>0.709</td>
<td><strong>0.395</strong></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1.
Research model
sign of change at 95 per cent confidence level as presented in Table I to further validate the significance of the findings. Specifically, confidence intervals further confirm the rejection of the hypothesis after reporting negative lower level and positive upper level respectively.

The postulation that BC moderates the relationship between SI and HEIs performance was rejected. The hypothesis recorded a very low beta value of $\beta = 0.073$, $t = 1.185$ and $p < 0.118$ which above the 0.1 acceptable threshold. Interestingly, IC moderates the relationship between SI and HEIs performance with a beta value of $\beta = 0.089$, $t = 0.1359$ and $P > 0.1$, in such a way that the more innovative activities initiated by these institutions the more their performance. The relationship between SI and HEIs performance is negatively moderated by SC, and hence the rejection of the hypothesis. Despite recording $t = 1.962$ and $P > 0.05$, the negative beta value of $\beta = -0.128$ necessitates the rejection as we postulate a positive moderating effect.

The next criteria for vindicating the structural model as highlighted above is the $R^2$ (Henseler et al., 2009), which largely depends on the research area. Accordingly, Chin (1998) identified three orders of $R^2$ values of 0.67, 0.33 and 0.19 to represent substantial, moderate and weak, respectively. The $R^2$ value in of 0.641 (64 per cent) as presented in Table V can be classified as moderates in line with Chin (1998). Specifically, SI and BC, IC and SC explain 67 per cent of factors that affect HEIs performance in Nigeria (Table VI).

**Effect size and predictive relevance**

Apart from path coefficient and $R^2$ discussed above, Cohen (1988) effect size ($f^2$) submission was used in determining the relative effect of SI, organizational culture on HEIs performance. The effect size measure is a process of substantiating the specific effect of each exogenous variable has on endogenous variables of the study (Chin, 2010). Sullivan and Feinn (2012) emphasized the used of effect size because some findings may be of significance by chance; hence, there is the need to verify the magnitude of the contribution of each exogenous variables in the relationship. Accordingly, Cohen (1988) suggested three

<table>
<thead>
<tr>
<th>Hypo</th>
<th>Relationship</th>
<th>Beta</th>
<th>T statistics</th>
<th>P-values</th>
<th>Confidence interval</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SI $\rightarrow$ HEIs perf.</td>
<td>0.163</td>
<td>3.306</td>
<td>0.000</td>
<td>0.080-0.241</td>
<td>Accepted</td>
</tr>
<tr>
<td>2</td>
<td>BC $\rightarrow$ HEIs perf.</td>
<td>0.307</td>
<td>3.358</td>
<td>0.000</td>
<td>0.163-0.462</td>
<td>Accepted</td>
</tr>
<tr>
<td>3</td>
<td>IC $\rightarrow$ HEIs perf.</td>
<td>0.220</td>
<td>2.860</td>
<td>0.002</td>
<td>0.095-0.346</td>
<td>Accepted</td>
</tr>
<tr>
<td>4</td>
<td>SC $\rightarrow$ HEIs perf.</td>
<td>0.271</td>
<td>3.396</td>
<td>0.000</td>
<td>0.138-0.400</td>
<td>Accepted</td>
</tr>
<tr>
<td>5</td>
<td>SI $\times$ BC $\rightarrow$ HEIs perf.</td>
<td>0.073</td>
<td>1.185</td>
<td>0.118</td>
<td>0.138-0.400</td>
<td>Accepted</td>
</tr>
<tr>
<td>6</td>
<td>SI $\times$ IC $\rightarrow$ HEIs perf.</td>
<td>0.089</td>
<td>1.359</td>
<td>0.087</td>
<td>0.138-0.400</td>
<td>Accepted</td>
</tr>
<tr>
<td>7</td>
<td>SI $\times$ SC $\rightarrow$ HEIs perf.</td>
<td>-0.128</td>
<td>1.962</td>
<td>0.025</td>
<td>0.138-0.400</td>
<td>Rejected</td>
</tr>
</tbody>
</table>

Notes: LL = low level; UL = upper level

Table V. Results of hypotheses testing

<table>
<thead>
<tr>
<th>Constructs</th>
<th>$R^2$</th>
<th>SRMR</th>
<th>$Q^2$</th>
<th>OP</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEIs performance</td>
<td>0.675</td>
<td>0.070</td>
<td>0.417</td>
<td>1.000</td>
<td>Co-efficient ($R^2$), effect size ($f^2$), SRMR and predictive relevance ($Q^2$)</td>
</tr>
<tr>
<td>BC</td>
<td>0.070</td>
<td>Small</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>0.037</td>
<td>Small</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>0.075</td>
<td>Small</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>0.055</td>
<td>Small</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
categories of $f^2$ values of 0.02, 0.15, and 0.35 representing low, moderate, and high effect sizes, respectively. Table V indicates that the study recorded low effect size.

In addition, Woodside (2013) has suggested the use of other criteria apart from $R^2$ in determining how well hypothesized relationship explain the model of the study. He argued that $R^2$ is more likely to increase in a complex model than in a simple one. Hence, present study used Henseler et al.'s (2014) standardized root mean square residual (SRMR) and Stone–Geisser (Q2) predictive relevance using blind-folding in line with Hair et al.’s (2014) submission. Accordingly, the study recorded SRMR value of 0.070 to achieve a good model fit, taking a conservative threshold of 0.081 recommended by Hu and Bentler (1999). The study also established the predictive validity of the model using Stone–Geisser having recorded a value of 0.417, which is greater than the zero threshold suggested by Henseler et al. (2009).

Discussion
The study was based on two key arguments. One, complexity and uncertainty are major attributes of today’s environment in which most businesses (HEIs inclusive) operate. Therefore, these organizations are expected to adapt and engaged in SI especially during intense and unforeseen situations (Hmieleski and Corbett, 2008). Two, HEIs are exposed to competition; hence, the only way they can respond to this is to ensure that the culture of the organization undergoes change, which will surely take time to be achieved. Therefore, we argued that SI and OC dimensions are positively related to performance. Also, OC dimensions moderates the relationship between SI and performance (Figure 2).

From the proposed hypotheses, the finding establishes that SI is positively related to HEIs performance ($H1$). Consistent with $H1$, a positive and significant relationship was found between SI and HEIs performance. The finding is in line with previous studies (Arshad et al., 2015b; Bakar et al., 2015a; Gao et al., 2015) mostly conducted in the for profit sector. Putting resource base theory (Barney, 1986; Barney et al., 2001) into consideration indicates that leaders with improvisational ability are unique and source of competitive advantage in today’s environment. It also provides support for the need for management in non-profit organizations such as HEIs to recognize and appreciate improvisational behaviour especially during recruitment to ensure that only candidates with this ability are recognized during employment and leadership roles (Mohan et al., 2016; Ogbonna and Harris, 2000). In addition, the finding highlights the need for HEIs and other governmental organizations to seek for alternative to strategic planning in improvisation; thus, the ability to face and manage the current environmental pressure and unprecedented fast changes (Wind and Mahajan, 1997). Moreover, not-for-profit organizations should acknowledge the effect of SI behaviour across the institutions for performance and sustainability (Arshad et al., 2015a).
Furthermore, our postulations that organizational culture dimensions (BC, IC and SC) correlate positively with HEIs performance (H2) was significant, thus accepted. The finding is consistent with previous studies where either the dimensions or OC as a whole affects performance (Bititci et al., 2015). This is to say that, HEI activities are bureaucratic in nature, which hinders innovation especially at this critical time of increase pressure and the need for change in their instructional policies and activities (Zhu, 2015). HEIs are expected to be open for change both from the management perspectives as well as the operational staff to ensure success and sustainability. The study vindicates the saying that organizational culture creates people-oriented management, which serves as an intangible asset that defines individual and organizations behaviours (Maul and et al., 2001). As such, organizational culture encourages innovation and creativity which affect performance.

The postulation that BC positively moderates the relationship between SI and HEIs performance was insignificant and thus rejected. The finding is in line with Brewer and Clippard (2002) and Yiing and Ahmad (2009) where empirical evidences revealed that organizational culture where BC is the dominant usually affects innovation and performance. The finding is not surprising, as today’s environment largely depends on the situation at hand; hence, there is the need for flexibility and contingency approach to respond and adapt.

H3b stated that IC will positively moderate the relationship between SI and HEIs performance in such a way that, the more the ability to innovate, the better the performance of the HEIs was significant and accepted. This is in line with the argument of O’Cass and Viet Ngo (2007) that IC is very vital because it deals with the ability to read, predict and develop a unique way of providing superior customer satisfaction. This may not be unconnected with the fact that today’s environment is very complex and dynamic, which requires flexibility and innovation to ensure stability and cohesion to adapt to contemporary changes. In essence, HEIs are encouraged to ensure coherence of purpose among all units, provide reward and recognition, relaxation of their strict rule and innovative policies to develop a new culture that will provide competitive advantage and sustainability. However, H3 that postulated the moderating effect of organizational culture dimension SC on the relationship between SI and HEIs performance is rejected. Most HEIs education in Nigeria favours individual effort especially in research and academic activities. For example, an article written by one person gets more point during promotion than one with two or more authors. Consequently, affecting team work and supportive ability within HEIs as compared to other country where all authors get equal points.

Though the present study provides empirical support on the impact of SI on HEIs performance and the moderating role of IC, the study fails to establish the moderating role of BC and SC. However, the findings have significantly contributed to literature by acknowledging and establishing the impact of SI in non-profit organization like HEIs. Despite the contribution of the study, conclusion cannot be drawn as a result of a number of limitations discussed below. First, the use of a relatively smaller sample that only covers academic leaders in HEIs in one state in Nigeria, in a study that is exploratory in nature affects the generalization of the findings. Hence, the need to cover broader sample that includes leaders and non-leaders in all HEIs in Nigeria. Another limitation of the study is the failure to acknowledge the peculiarities associated with units, departments and centres, where improvisation and adaptation differs. Leaders from entrepreneurial centres, business and accounting departments, business schools as well as consultancy centres are more likely to engage in improvisational and entrepreneurial activities that will enhance their performance. Future study should identify the differences that exist between leaders from different departments, centres and units, to ascertain those leaders who are adamant to
change which affects the whole organization. Finally, both improvisation and organizational culture are behavioural in nature, which differs with time and stage in which it occurs. Hence, a longitudinal study is suggested, to monitor the changes and the most important time in which these factors affect performance.

References


Further reading


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