Measuring and Modelling the Adaptive Capacity of Universities: A Composite Indicators Methodology

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Abstract

Initiating, implementing, and sustaining reforms are the most daunting and challenging aspects of change in higher education institutions. This research argues that to survive and thrive in a changing environment, adaptive capacity is fundamental. Thus, this study aims to serve two purposes. While the leading purpose was measuring the adaptive capacity of universities using a conceptual model developed based on literature review, introducing the critical components that determine adaptive capacity was secondary. Therefore, guided by a pragmatic approach this study has tried to maintain both subjective reflections and objective data during data collection and analysis. Accordingly, to attain the purpose of the study mixed research design particularly, a sequential explanatory approach was used. To gather relevant data from the target population, the questionnaire was distributed and 594 completed and useful questionnaires were returned from 133 leaders at different position, 268 academic staffs and 193 support staffs, which was a 62.06% response rate. Besides, 15 interviews and documents were reviewed. Finally, among the composite indicators approach, structural equation modeling (SEM) mainly principal least square path modeling (PLS-PM) was used to measure and analyze adaptive capacity using XLSTAT software. As a result, the adaptive capacity of universities was found unsatisfactory i.e. lower than moderate. This indicates universities might not fully implement the change ideas they wish to introduce into their system. Consequently, the identified gaps and challenges in the studied universities strengthen the argument for the need to assess universities adaptive capacity using a model and make appropriate intervention before struggling to introduce any change initiative without a fertile ground.

Keywords: change, adaptive capacity, change implementation

1. Introduction

Organizations make various changes on their leadership, strategies, structures, process, material utilization, etc to improve institutional effectiveness, efficiency and to provide better services. However, initiating, implementing, and sustaining changes are the most challenging aspects of organizational change. Wang (2017) discussed three companies (Walmart, JCPenney, and Borders) that failed to implement successful changes. Both Walmart and JCPenney introduced new business models that were poorly received, whereas Borders failed to adopt new technology and enter the e-business market. Similarly, large proportions of change initiatives in the world fail or are only partially successful (Attaran 2000; Beer & Nohria 2000; Blackwell, 2003; Grady & Grady 2012; Self & Schraeder 2009, Weiner 2009; Werkman 2009; Woodward and Hendry, 2004). Studies have shown that approximately seventy (70%) percent of planned organizational change initiatives fail (Pellettiere, 2006).

According to Wang (2017), inadequate involvement of stakeholders in the change process, poor business imperatives in the new marketplace, and incapability to adapt to the new technology and working culture contributed to the failure of the above companies. Many literatures also indicated that resistance to change, incompetent leadership, poor readiness and commitment of leaders, lack of clear vision, contextual factors, organizational politics and resource limitation are the dominant factors attributed to the failure of most change initiatives (Hurvey, 2010; Oreg, 2006; Woodward and Hendry 2004; Wainaina et al., 2014). Watson (2013) also identified barriers to change management such as inefficient training, incapability to sustain changes and lack of communication.

In Ethiopian context, Mekonnen (2017), Sibhato and Singh (2012), and Kedir and Geleta, (2017) showed that the major problems that hindered effective implementation of changes in institutions are related to gaps in top management support, change management skill, organizational factors, project management capacity,
infrastructure, information technology, and contextual factors. Besides, Geda and Beyera (2015) identified limitations in maintaining the momentum of reforms: they described as both political, and management supports are erratic. Teshome (2003) on his part indicated that although reform implementation is encouraging, the weak consensus, participation, and support of stakeholders, lack of visionary leaders, capacity and willingness in implementing the change programs are among the challenges to the change process.

Melu (2016) said, several tertiary education reform efforts have been carried out in sub-Saharan Africa in recent years, but their impact has been limited. According to this scholar, most reforms focused on governance issues including institutional autonomy, academic freedom and the increasing role of universities in development. Similarly, to enhance quality, relevance, standards, as well as to improve effectiveness and efficiency, the Ethiopian government has introduced many changes into HEIs (Mehari, 2016; Woldegiyorgis, 2014).

Asgedom and Hagos (2016) indicated that in most cases change initiatives and reforms in Ethiopian HEIs were timely and necessary. Besides, to institutionalize these changes, HEIs and the government expend huge resource. However, significant change initiatives introduced at different times lost without making considerable impacts as intended (Asgedom and Hagos, 2016; Geda and Beyera 2015; Mehari, 2016; Woldegiyorgis, 2014). In this regard, we can mention many changes like student-centered approach, business process re-engineering (BPR), Balanced Score Card (BSC), Kaizen, modularization (Note 1), continuous assessment, etc. introduced into Ethiopian HEIs.

Varghese (2016) noted that severe criticism has been made on the implementation of BPR in Ethiopian HEIs. As he stated, even those who supported the use of BPR in principle were highly critical of the reforms that resulted. Menbru (2013) identified the absence of leadership commitment and continuity, failure to align with organizational objectives until lower-level units, resistances, and gaps in translating nominal responsibility into practical accountability as critical factors for failure to realize BPR.

Asgedom and Hagos (2016) indicated that most change initiatives lack the support of considerable academic staffs as well as the commitment and leadership qualities to implement these reforms. These scholars pointed out two critical factors largely responsible for the failure of reforms: the absence of deliberation and communication; and the absence of commitment to changes. Sibhato and Singh (2012) also evaluated a change implementation in Mekelle and Aksum Universities. They identified a lack of staff training, false report to outsiders that hide actual progress of implementation, frustration with a slow result on behalf of the top management and lack of top management determination and enthusiasm.

Besides, most changes are introduced typically in the traditional top-down approach, which is submissive to leader driven solutions (Woodward and Hendry, 2004). Documents on Ethiopian higher education reform indicated a top-down decision practice made by the government and its agency without adequate consultation and involvement of academic staff of public universities (Teshome, 2003). This is usually done in universities without open communication of the issues in a timely fashion with academicians and supporting staffs as they are directly linked to or to be affected in the process. As a result, academicians lose devotion, ownership, and attention rather prefers an observational standpoint (Mehari, 2016).

In an earlier study, Teshome (2003) also acknowledged that beyond problems related to resilience and resistance, the major challenge related to changing HEIs are inadequate capacity, lack of transparency and participatory approach of the leadership and management. In his research on governance and reform in Ethiopian HEIs, Mehari (2016) found out mismatches between the nature of business management tools and the basic characteristics of the university. He made clear that the source and approach to implementing the reform tools [BPR and BSC] and the means of institutionalizing were also problematic. Moreover, in most cases, changes in the Ethiopian context are adopted from developed nations although there are little gleams of homemade or local change initiatives. There are also experiences that change initiatives are adopted due to external imposition concerning educational funding (Mehari, 2016; Woldegiyorgis, 2014). These and other factors may hamper or be responsible for the failure of change initiatives.

What is so ever the reason, it is a huge loss when change initiatives are unsuccessful while massive investments are made to adapt. Not only economical, the failure of change initiatives in higher education costs strategically, socially and psychologically (Scott et al., 2008). A significant number of researchers argues that there is no point in undertaking change unless the organization is ready and able to adopt the change (see e.g. Armenakis & Harris 2002). This points the need to question universities organizational capacity for changes. Hence, examining adaptive capacity in universities context is another rationale of this research.

Besides, the insight and reactions of universities to changes and its demand as organizations are not well researched yet (Gornitzka, 1999; Leisyte, 2007). Educational institutions are unique organizations, especially
universities (Birnbaum, 2001; Clark, 1983) because; universities have complex systems consisting of many functional units and administrative hierarchies (academic & administrative). Gornitzka (1999) added that some fundamental characteristics of HEIs affect their ability and capacity for change. The unique nature of universities; being loosely coupled systems, professional autonomy, the unique culture of the academy and other features require a distinct approach to managing changes (Kezar and Adrianna, 2002; Mehari, 2016). May be due to these reasons, Barnett (2004), Hanna (2003) and Marshall (2010) commented as universities are extraordinarily resistant to changes. Supporting this, McMurray, (2001) and Brown (2013) indicated the difficulty of managing changes in universities. Kerr (2001) contended that most people believe universities are stable organizations that have changed little over the centuries. Contrary to this, Gabor (2010) described universities as adaptive systems that are constantly interacting with their environment and changing their behavior as needed. He further stated that universities are operating in an open and international context to produce graduates that join a rapidly developing technological environment. Despite these arguments, unquestionably universities are under changes and need to change themselves.

In the Ethiopian context, Yizengaw (2003) noted that bringing about change, particularly in higher education settings, is a difficult task because; resistance to change characterizes the higher education community. Adding to this point, (Melu 2017) acknowledged the complicatedness of leading changes in HEIs of developing countries like Ethiopia. He indicated that diversified problems, huge expectations, inadequate financial and technical capacity, and poor networking require exceptional knowledge, experience, and dedication. Accordingly, this research is expected to give potential insight into universities adaptive capacity, which is one of the key factors for successful change implementations.

Besides, some scholars have tried to assess organizational readiness for a specific change initiative. A pre-change audit for a specific organizational change may indicate the likely outcome of that change initiatives. However, what is so ever the driver or cause of changes, demand for changes come from different directions informed us the kind of change we are going to encounter tomorrow is unknown (Schein, 2010). Hence, Meyer & Stensaker (2006) argue that studying a particular change initiative has not contributed to building the change capacity and it does not suggest how organizations can develop their change capacity for the future. They further argue that the change capacity contributed to one particular change effort must then be viewed as only temporary (Meyer & Stensaker, 2006). Therefore, studying the overall adaptive capacity is essential.

Scholars like Pellettiere (2006) noted that the primary cause for change failures is the lack of reliable and valid diagnostic instruments to assess and track an organization’s capacity for change. Hence, to survive and thrive, organizations need to get ready for the surprise of tomorrow by developing their adaptive capacity for institutional reforms. Assessing this capacity may also indicate key areas where further action could enhance the prospects of future success (Pellettiere, 2006).

Consequently, based on a literature review, this research has come up with a relatively comprehensive framework to measure the adaptive capacity of universities. Since the major purpose of this study was to examine universities adaptive capacity, the researchers have tried to gather the attitudes, opinions, and practices of universities guided by the following basic questions:

1) How strong is the current adaptive capacity of universities for undertaking institutional changes?
2) How relevant is the model to measure the adaptive capacity of universities for institutional changes?

2. Conceptual Framework

As the sources and the targets of organizational changes are varied, impediments for their successful implementation are also different and emanate from different directions. This and many other reasons made the realization of organizational changes a complex process and hence, several organizations do not obtain the outcomes they desire. According to Gravenhorst, Werkman, and Boonstra (2003), in most organizational change studies, more attention is given to what (content) being changed in organizations than how (process) change is being accomplished. However, they indicated that it is important to note that aspects of the organization and aspects of the change process determine the successful implementation of change initiatives.

The state of an organization can contribute to or reduce its change capacity. With this notion, this research argues successful implementation of change initiatives primarily demand enhanced organizational capacities for change, alternatively adaptive capacity. Hence, the key question is how organizations build capacities aimed at both adapting to environmental turbulence and create sustainable change and adaptation (Siggelkow, 2001; Zajac, Kraatz, & Bresser, 2000).
Schein, (2010) contended that organizations do not know the kind of change they will encounter tomorrow, thus they should get ready for the surprise by building their capacity for change. However, as explained in the statement of the problem, studying organization(s) capacity for a single/specific kind of change does not contribute to building organization(s) general capacity for change implementation (Meyer & Stensaker, 2006). Rather, it is worth studying the common major factors that determine organization(s) adaptive capacity for any possible changes.

Consequently, the conceptual framework of this study was then developed by referring to various empirical evidence and proposed models of different scholars. In doing so, various steps were followed to determine adaptive capacity dimensions. An attempt was made to review different kinds of literature and dominant models in the study of organizational readiness for change and organizational capacity for change. This way, major dimensions, and contributing factors were identified, collected, and synthesized to measure the adaptive capacity of universities. Accordingly, this study has used composite indicators methodology and multi-scale complex systems analysis (MCSA) and complexity profile to develop a scale and measure the adaptive capacity of universities.

As it was contended, except few like Judge and Douglas (2009), Strichman (2004) and Seville (2017) many authors did not identify concrete dimensions to study the adaptive capacity of organizations for institutional changes. Even the identified dimensions by these scholars were not found satisfactory to the researcher since some vital indicators were missed as explained in chapter two (Review of the related literature). Accordingly, acknowledging the need to use a more comprehensive model, this research developed major dimensions and specific criteria to assess the adaptive capacity of universities. Consequently, this research has introduced a relatively new theoretical framework modifying the model of Judge and Douglas (2009), and Seville (2017) along with in-depth literature reviews.

Adaptive leadership, adaptive culture, effective communication system, systemic thinking practice, and resource availability were identified as the major dimensions and key factors that determine the adaptive capacity of universities to institutional changes. Under these five (5) major dimensions, nineteen (19) criteria are identified which are directly related institutions change capacity.

2.1 Items to Assess the Adaptive Capacity of Universities

The items used to determine the adaptive capacity of universities was developed in four stages. First, a broad literature review was conducted to gather information about the actions and circumstances that contribute to or hinder change implementations and processes in organizations. This includes theoretical ideas about how change should or should not be designed and led. Second, the results obtained in the first stage were arranged according to the major dimensions that are expected to be vital and contributing factor for change implementation. Thirdly, the identified dimensions were compared to literature and frameworks related to organizational readiness for change, change capacity and organizational resilience for institutional changes. Frameworks and conceptualizations of Judge and Douglas (2009), Seville (2017), Strichman (2004) and Gupta (2010) were basic to draw out the five major dimensions and nineteen sub-indicators of universities adaptive capacity for institutional changes. Fourth, a questionnaire with 93 short items was developed according to major dimensions and criteria in a five-point Likert scale.

3. Methodological Framework

This research was guided by pragmatism perspective that advocates the use of mixed methods in research (Feilzer, 2010). Thus, an attempt was made to maintain both subjective reflections and objective data during data collection and analysis. Accordingly, to attain the purpose of the study mixed research design particularly, the sequential explanatory approach was used. As noted by Creswell (2009:215) this approach requires two-phase, collecting quantitative data first and explaining the results in a more detailed manner using a qualitative approach. Hence, an attempt was made to understand the status of universities adaptive capacity.

Therefore, based on the literature review, composite indicators of adaptive capacity were constructed. Then, quantitative data was gathered to determine the current adaptive capacity of universities. The perception of academic staffs, support staffs and leaders at different positions were randomly collected from Bahir Dar, Debretabor universities, in Ethiopia using a five-point Likert scale, which is categorical and ordinal. Phenomenons like adaptive capacity are very complex concepts that are difficult to capture with only a single indicator. Hence, as Greco et al. (2016) indicated it is imperative to enlarge the range of indicators to encompass all the necessary information on a matter that is generally multidimensional. Trying to understand issues like adaptive capacity requires explaining both aggregated/composite results and weighting individual indicators. According to
Saisana and Tarantola (2002, p. 5), composite indicators are based on sub-indicators that have no common meaningful unit of measurement and there is no obvious way of weighting these sub-indicators. Similarly, Freudenberg (2003, p. 5) identifies composite indicators as ‘synthetic indices of multiple individual indicators’. Thus, the composite indicator might reflect a ‘complex system’ that consists of numerous ‘components’, making it easier to understand in full rather than reducing it back to its subparts. This requires the application of complex systems thinking.

This research has tried to address the composite/aggregate result of adaptive capacity as well as the weights of its specific indicators. A measurement of a complex multi-dimensional phenomenon necessitates a combination of different dimensions (Mazziotta and Pareto, 2013). The mathematical combination (or aggregation) of a set of indicators that represent the different dimensions of a phenomenon to be measured can be obtained by applying composite indicator or composite indices methodology (Saisana and Tarantola, 2002; Salzman, 2003; OECD, 2008).

Accordingly, the dependent variable i.e. adaptive capacity of universities was measured by aggregating the ratings of the five major dimensions (adaptive leadership, adaptive culture, resource availability, effective communication system, and systems thinking practice), which in turn were measured by aggregating sub-criteria of each dimension. The ratings of practices or status were using a five-point Likert scale from very high (VH)=5, high (H)=4, medium (M)=3, low (L)=2, & very low (VL)=1. However, the aggregate result may be statistically meaningless and difficult to intervene, unless specific indicators are clearly explained.

Even if the indicators of adaptive capacity were identified from the literature, the next significant question was the weighting scheme. Weighting may have a dual meaning in the construction of composite indicators (OECD 2008, pp. 31–33). It refers to the ‘explicit importance’ that is credited to every criterion or may be understood as a kind of coefficient that is attached to a criterion exhibiting its importance compared to the rest of the criteria. Second, it relates to the implicit importance of the attributes, as this is shown by the ‘trade-off’ between the pairs of criteria in an aggregation process.

Regardless of the composite’s objective (e.g. serving as a tool for policymakers or otherwise), these aggregate measures ought to be tested for their robustness as a whole to ensure quality (OECD 2008). Once the system of sub-indicators is determined and used to obtain the composite indicator it is important to analyze how much the composite indicator values are influenced by uncertainty in the source data and/or uncertainty in the weights (due to the stakeholders’ plurality of perspectives).

There are different alternative approaches to measure composite indicators. Cataldo (2016) explained that the approaches may be theory-based, which is an approach by combining variables suggested by a theory or well-established knowledge on the subject matter; whereas, data-driven approaches follow a best possible quantitative synthesis of a suitable set of elementary indicators, which represents the different aspects of an analyzed phenomenon. However, both approaches have their limits, hence; scholars introduced a model-based approach, which is in the mid-way between the previous approaches. This model is used to test and or estimate casual or proxy relationships of composite statistical data and qualitative assumptions (Cataldo, 2016; Hair et al., 2017). Among model-based approaches, Structural Equation Modeling (SEM) methodology was used in this study. Hair et al., (2017) explained SEM is a class of multivariate techniques that combines aspects of factor analysis and regression, enabling the researcher to simultaneously examine relationships among measured variables and latent variables (assessment of measurement theory) as well as between latent variables (assessment of structural theory). Under SEM methodology, researchers might use covariance-based techniques and component-based techniques. The first technique is primarily used to confirm or reject theories of empirically tested variables, whereas the second is to provide an estimate of most correlated latent variables according to the path diagram structure.

This investigation used component-based techniques, particularly Partial Least Squares (PLS) Path Modeling Approach (PLS-PM), because, PLS-PM helps to model complex multivariable relationships among observed and latent variables. This approach is also helpful to simultaneously estimates relationships between multiple independent, dependent and latent variables (Kline, 1998). As a result, PLS-PM/PLS-SEM was found a suitable approach to investigate the adaptive capacity of universities.

3.1 Adaptive Capacity Path Modeling Using XLSTAT-PLSPM

594 university staffs rated the practice and status of their university adaptive capacity to institutional changes based on the theoretical framework developed as a model for the self-developed construct i.e. adaptive capacity. As discussed earlier this construct is a composite variable. According to Hair et al., (2010) such variables are a linear combination of several variables. The higher-order construct Adaptive Capacity was considered as a synthesis of its sub-dimensions (latent variables), devoid of their criteria (manifest variables). As explained in the
theoretical framework, (i) Adaptive Leadership, (ii) Adaptive Culture, (iii) Resource Availability, (iv) Effective Communication System, and (v) Systems Thinking were the identified major dimensions.

To measure adaptive capacity (Higher Order Construct), each CI is related to other CI in a systemic vision by linear regression equations specifying the so-called Structural Model (or Inner Model). Accordingly, a systemic CI or a system of CIs was obtained, where the word “systemic” derives from system theory (Cataldo, 2016). Similarly, Fullan (2011 p.530) defined an organization’s capacity for change as a “collective capacity building” and that collective capacity is exemplified by the team, the group and/or the system. For this reason, not just an aggregation of elementary indicators, a set of indicators related to each other by mutual relationships, expressed through functional links were also summarized in this model.

![Figure 1. Latent and manifest variables of the multidimensional adaptive capacity model](image)

To estimate adaptive capacity the two-step approach was followed. Cataldo (2016) recommended this approach over hybrid and repeated measures approach of measuring higher-order construct due to its ability to explain relationships and parametric estimation. By following a two-step approach, the estimation was made. Hence, second-order constructs (latent variables) which are formative (inwards directed way) related to their first-order dimensions and reflectively measured (outwards directed way) by their manifest variables to give adaptive capacity.

The link between latent and manifest variables can be established in two ways; formative and reflective. Reflectively, the indicators (manifest variables) are regarded to be reflections or manifestations of their latent variables: a variation of the construct yields a variation in the measures. As a result, the direction of causality is from the construct to the indicator. In a formative way, the indicators are regarded as causes of their latent constructs: a variation of the measures yields a variation in the construct. So, the direction of causality is from the indicator to the construct.

Before making the PLS-PM analysis, a pre-treatment of the data was performed to avoid outliers and ensure the
distribution of data, and making the scales rounded to make measurements are the same and comparable. This means the results of each manifest variable were rounded to the nearest positive number to make the running of XLSTAT-PLS-PM convenient.

The PLS-PM is made up of the measurement model (the outer model) and the structural model (the inner). The first indicates measurable variables (or first-order constructs) or a block of observable variables (outer variables/criteria) that describe dimensions. The latter specifies the relationships between the latent variables and other criteria beneath them, which ultimately explain the higher-order construct/adaptive capacity. Thus, the measurement model represents the relationships between the observed data and the latent variables whereas the structural model represents the relationships between the latent variables and higher-order construct.

Figure 2.

3.2 Adaptive Capacity Composite Indicator Model Based

Consequently, adaptive capacity was conceived as a third-order higher construct affecting & affected by second-order/latent dimensions, which in turn are shaped by first-order variables or called the underlying specific aspects of the second-order dimensions. All the manifest variables are examined in ordinal scale form. The latent variables are the major dimensions of adaptive capacity and they are explained by the different number of manifest variables/criteria.

As shown in the diagram below, this model follows a formative-reflective approach. In this case, the second ordered constructs are a formative combination of manifest variables. The first step of estimation is made by considering only the measurement model that provides the estimation of the first-order constructs. In the second step, the estimated scores, obtained in the first step, are used as indicators of the second-order construct, which ultimately provides the measurement and structure of the higher-order construct. The estimation process used in two steps evaluating the outer model, the algorithm gives the scores of the lower-order constructs and next to the scores of the blocks are used as indicators of the higher-order construct and the inner model (Hair et al., 2014).

Figure 3. Path-diagram of adaptive capacity formative - reflective type
4. Quantitative Results

4.1 Measuring and Modeling Adaptive Capacity

As explained earlier, describing the status of the universities adaptive capacity for implementing institutional change initiatives was one of the basic intents of this study. However, as explained in the methodological framework, phenomena like adaptive capacity are difficult to capture with only a single indicator. Such phenomena are complex because relevant aspects and concerns cannot be captured by using a single perspective (Sanchez and Aluja, 2006). Thus, it is necessary to give due regard for concepts formed by different dimensions, each representing different aspects and interact with each other at the same time. Most of the time, the complexity also implies multidimensionality (Rifkin, 2004), and this affects the measuring process of the phenomenon being analyzed.

Therefore, adaptive capacity is considered as a composite variable (Note 2), whose measurement requires composite indicators (Note 3) (CIs) methodology. This method is the mathematical combination (or aggregation) of a set of indicators that represent the different dimensions of a phenomenon to be measured (Saisana and Tarantola, 2002; Salzman, 2003; OECD, 2008). Composite indicators not only offers a way to summarize the data but can be used to measure any type of property to which the focal concept refers, including attitudes, perceptions, and behavioral intentions (Rigdon, 2012). According to Rigdon, (2012), the distinction between composite and causal indicators relates to a difference in measurement philosophy. Causal indicators assume that a certain concept can be fully measured using a set of indicators and an error term whereas composite indicators make no such assumption but view measurement as an approximation of a certain theoretical concept. In social sciences research, viewing measurement as an approximation seems more realistic (e.g., Rigdon, 2014b), which, from a conceptual standpoint, favors the use of composite indicators over causal indicators.

To measure complex constructs like adaptive capacity, the existing literature offers different alternative approaches to obtain composite indicators. One may be a theory-based approach, obtained through the synthesis of theoretically selected elementary indicators. According to Cataldo (2016), theory-based is obtained through the combination of some variables utilizing a specified function, suggested by theory or by well-established knowledge on the phenomenon to analyze. Conversely, a data-driven approach, obtained through an optimal quantitative synthesis of a suitable set of elementary indicators, which represents the different facets of an analyzed phenomenon.

Both approaches have their limitations, to overcome the limitations scholars introduced model-based indicators methodology. The model-based approach is in a mid-way between the two previous approaches in that theory and data have collaborated. This is a statistical technique for testing and estimating causal or proxy relationships using a combination of statistical data and qualitative causal assumptions (Cataldo, 2016). This scholar further explained that model-based composite indicators are obtained by the estimation of a multi-equations model, describing, in an optimal way, not only the relationships among the observed variables but also between the observed variables and one or more of the latent constructs to be measured.

Among the many model-based approaches, Structural Equation Modeling (SEM) methodology was found relevant to compute composite indicators. This is a statistical technique for testing and estimating causal or combined relationships of many independent, dependent and latent variables. Hair et al., (2017) explained SEM is a class of multivariate techniques that combines aspects of factor analysis and regression, enabling the researcher to simultaneously examine relationships among measured variables and latent variables (assessment of measurement theory) as well as between latent variables (assessment of structural theory).

According to Cataldo (2016), covariance-based techniques and the component-based techniques can be used to estimate model parameters in SEMs. This scholar further explained, while the first approach is primarily used to confirm (or reject) theories of empirically tested variables, the second is to provide an estimate of most correlated latent variables (according to the path diagram structure) and the most representative of each corresponding block of manifest variables. However, this investigation follows component-based techniques, particularly Partial Least Squares (PLS) Path Modeling Approach (PLS-PM) due to different reasons.

This methodology was chosen over other approaches for several reasons (Barroso et al., 2010; Chin and Newsted, 1999; Hair et al., 2014; Hair et al., 2016; Henseler, 2017; Reinartz et al., 2009). PLS-PM is a statistical approach for modeling complex multivariable relationships (structural equation models) among observed and latent variables. This approach is helpful to simultaneously estimate relationships between multiple independent, dependent and Latent Variables (Kline, 1998).

Congruent with these scholars; first, this study is both explanatory and exploratory; so, PLS-PM can explain the
indicators of adaptive capacity and their contribution to the overall model. At the same time, exploring and identifying the magnitude of indicators is possible using this method. Second, PLS does not necessitate the normal distribution of data and this study used the nonparametric method. Thus, the categorical data collected via the Likert scale is best analyzed using this method. Third, the research’s focus was assessing the status of universities adaptive capacity using a model. But, the model was developed merely from a literature review, so this approach helped to ensure the predictive capacity of the model for further utilization. Forth, PLS-PM is increasingly useful to explain complex constructs (Henseler, 2017) like adaptive capacity, which is the aggregate behavior of complex adaptive systems. Besides, the explanatory power of composite indicators, their horizontal relationship and their impact on such complex constructs is possible using this method (Hair et al., 2014).

More to the above, this approach clearly shows how the data driven tradition of multiple table analysis can be somehow merged with theory driven tradition of structural equation modeling so as to allow running the analysis of multi-block data in light of current knowledge on conceptual relationships between tables.

Consequently, PLS-PM/PLS-SEM was found a suitable approach for the investigation of this kind of high level of abstraction, in cases where the building of a system of CIs depends on different levels of construction. The analysis of PLS-PM was done using XLSTAT software (Addinsoft, 2019). Throughout the analysis this research interchangeably used: Adaptive capacities as higher order construct; major dimensions as latent variables or second order construct; criteria as first order construct or manifest variables or first-order variables.

4.2 Measurement Model (Criteria to AC Major Dimensions)

Constructing higher order constructs/major dimensions avoid model complexity, reduce number of relationships, and decrease collinearity problem among criteria (Edwards, 2001; Law et al., 1998; MacKenzie, 2005). But, the PLS-PM analysis requires unidimensionality, which means second order/latent variables/ or in this case major dimensions are measured by criteria/manifest variables where the dimensions in turn are measured by path coefficients (Cataldo, 2016).

According PLS-PM method, there are three main indicators to ensure unidimensionality: the Cronbach’s alpha, the Dillon-Goldstein’s rho and the first eigenvalues of the covariance matrix.

Cronbach’s alpha is a coefficient that is intended to evaluate how well a block of indicators measure their corresponding latent construct (Bland et al., 1997; Vinzi et al., 2010b). This correlation coefficient requires a level greater than 0.7.

Dillon-Goldstein’s Rho is a Cronbach’s alpha generalization. The Dillon-Goldstein’s rho also focuses on the variance of the sum of variables in the block of interest. Similarly, a block of manifest variable is considered to be unidimensional when the Dillon-Goldstein’s rho is greater than 0.7. This index measures the unidimensionality of latent variables through the correlation between the reflective latent construct and each manifest variable of the corresponding block, i.e. the loadings (Sanchez, 2013; Vinzi et al., 2010b). At the same time if the block is unidimensional, the first eigenvalues should be larger than one and the second should be smaller than one.

Table 1. Composite reliability (Monofactorial manifest variables)

<table>
<thead>
<tr>
<th>Latent variable</th>
<th>Dimensions</th>
<th>Cronbach's alpha</th>
<th>D.G. rho (PCA)</th>
<th>1st Eigenvalue</th>
<th>2nd Eigenvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV1 Adaptive Leadership</td>
<td>5</td>
<td>0.884</td>
<td>0.911</td>
<td>3.422</td>
<td>0.563</td>
</tr>
<tr>
<td>LV2 Adaptive Culture</td>
<td>4</td>
<td>0.815</td>
<td>0.871</td>
<td>2.574</td>
<td>0.555</td>
</tr>
<tr>
<td>LV3 Resource Availability</td>
<td>3</td>
<td>0.788</td>
<td>0.864</td>
<td>2.108</td>
<td>0.506</td>
</tr>
<tr>
<td>LV4 Effective Communication System</td>
<td>3</td>
<td>0.865</td>
<td>0.916</td>
<td>2.363</td>
<td>0.350</td>
</tr>
<tr>
<td>LV5 Systems Thinking</td>
<td>4</td>
<td>0.876</td>
<td>0.914</td>
<td>2.922</td>
<td>0.437</td>
</tr>
</tbody>
</table>

As can be seen from the table above, all values are greater than 0.7 thus this statistics ensures the unidimensionality of the model. The formative construct’s convergent validity can be examined by its correlation with an alternative measure of the construct, using reflective measures or a global single item (redundancy analysis). No extremely high correlation coefficients, which might result in the constraints of factor discrimination, were found among the sub-factors (Byrne, 1998; Hair et al., 2006; Kline, 2005). All these indices are acceptable in each block/dimension, close to the conventional acceptability threshold of 0.7 for all blocks. Hence, the outer model is
well specified and that the latent variables are well measured by their manifest variables, their synthesis being effectively performed.

Similarly, Eigenvalues are characteristic value or characteristic roots. Eigenvalues values show the similarities among sets (LV1 to LV5) are presented in the above table. These values indicate the level of relationship shown by each dimension. Maximum value of an eigenvalue is 1 with a minimum of 0 for each criteria/manifest variable. The first/cumulative eigenvalues (PCA) range from 2.11 to 3.42, while the second eigenvalues obtained from the study were between 0.282 and 0.563 while, which also show the coefficient path and contribution of each dimension. This can be summarized as the blocks are unidimensional and can be taken as a single latent variable for further analysis.

As can be seen from the table below, the absolute GoF is 0.787, which is almost equivalent with the bootstrap estimate; the relative GoF is very high, so are inner and outer models GoF. The GoF is a compromise between the quality of the outer model and the quality of the inner model, so the normalized index is obtained by bringing each part to its maximum value. Hence, it is important to check the cross loadings.

Table 2. Goodness of fit index (Monofactorial manifest variables)

<table>
<thead>
<tr>
<th></th>
<th>GoF</th>
<th>GoF</th>
<th>Lower bound (95%)</th>
<th>Upper bound (95%)</th>
<th>1st Quartile</th>
<th>Median</th>
<th>3rd Quartile</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute</td>
<td>0.787</td>
<td>0.785</td>
<td>0.019</td>
<td>0.748</td>
<td>0.746</td>
<td>0.772</td>
<td>0.784</td>
<td>0.799</td>
</tr>
<tr>
<td>Relative</td>
<td>0.992</td>
<td>0.989</td>
<td>0.017</td>
<td>0.951</td>
<td>1.000</td>
<td>0.948</td>
<td>0.977</td>
<td>0.990</td>
</tr>
<tr>
<td>Outer model</td>
<td>0.993</td>
<td>0.990</td>
<td>0.017</td>
<td>0.952</td>
<td>1.000</td>
<td>0.949</td>
<td>0.978</td>
<td>0.991</td>
</tr>
<tr>
<td>Inner model</td>
<td>0.999</td>
<td>0.999</td>
<td>0.000</td>
<td>0.998</td>
<td>0.999</td>
<td>0.998</td>
<td>0.999</td>
<td>0.999</td>
</tr>
</tbody>
</table>

One method for assessing discriminant validity is by examining the cross loadings of the indicators. The cross-loadings (Monofactorial manifest variables) helped to examine discriminant validity. The next table ensures whether the manifest variables are strongly correlated to their own latent variables or in case to other variables, the results in bold showed the model has been well specified to relate to its latent variables. In addition, the cross loadings of the indicators indicated that a construct is unique and captures phenomena not represented by other constructs in the model.
Table 3. Cross-loadings (Monofactorial manifest variables)

<table>
<thead>
<tr>
<th>Manifest Variables</th>
<th>LV1 Adaptive Leadership</th>
<th>LV2 Adaptive Culture</th>
<th>LV3 Resource Availability</th>
<th>LV4 Effective Communication System</th>
<th>LV5 Systems Thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment</td>
<td>0.735</td>
<td>0.560</td>
<td>0.450</td>
<td>0.539</td>
<td>0.518</td>
</tr>
<tr>
<td>Vision</td>
<td>0.793</td>
<td>0.571</td>
<td>0.506</td>
<td>0.579</td>
<td>0.601</td>
</tr>
<tr>
<td>Trust</td>
<td>0.832</td>
<td>0.662</td>
<td>0.538</td>
<td>0.616</td>
<td>0.597</td>
</tr>
<tr>
<td>Empower</td>
<td>0.815</td>
<td>0.651</td>
<td>0.549</td>
<td>0.596</td>
<td>0.558</td>
</tr>
<tr>
<td>Capability</td>
<td>0.920</td>
<td>0.741</td>
<td>0.610</td>
<td>0.665</td>
<td>0.700</td>
</tr>
<tr>
<td>Innovation</td>
<td>0.707</td>
<td>0.877</td>
<td>0.597</td>
<td>0.669</td>
<td>0.656</td>
</tr>
<tr>
<td>S. Responsibility</td>
<td>0.598</td>
<td>0.789</td>
<td>0.534</td>
<td>0.580</td>
<td>0.625</td>
</tr>
<tr>
<td>S. Decision</td>
<td>0.659</td>
<td>0.836</td>
<td>0.557</td>
<td>0.657</td>
<td>0.630</td>
</tr>
<tr>
<td>S. Adaptability</td>
<td>0.502</td>
<td>0.658</td>
<td>0.448</td>
<td>0.463</td>
<td>0.474</td>
</tr>
<tr>
<td>Financial R.</td>
<td>0.467</td>
<td>0.510</td>
<td>0.751</td>
<td>0.515</td>
<td>0.531</td>
</tr>
<tr>
<td>Hum. Resource</td>
<td>0.635</td>
<td>0.652</td>
<td>0.945</td>
<td>0.663</td>
<td>0.684</td>
</tr>
<tr>
<td>Technology</td>
<td>0.475</td>
<td>0.483</td>
<td>0.767</td>
<td>0.610</td>
<td>0.534</td>
</tr>
<tr>
<td>Inf. Quality</td>
<td>0.648</td>
<td>0.697</td>
<td>0.641</td>
<td>0.902</td>
<td>0.720</td>
</tr>
<tr>
<td>Comm. Strategy</td>
<td>0.628</td>
<td>0.654</td>
<td>0.627</td>
<td>0.856</td>
<td>0.643</td>
</tr>
<tr>
<td>Info. Access</td>
<td>0.664</td>
<td>0.669</td>
<td>0.649</td>
<td>0.899</td>
<td>0.734</td>
</tr>
<tr>
<td>Seeing Wholes</td>
<td>0.643</td>
<td>0.658</td>
<td>0.619</td>
<td>0.690</td>
<td>0.864</td>
</tr>
<tr>
<td>Interconnections</td>
<td>0.620</td>
<td>0.650</td>
<td>0.644</td>
<td>0.664</td>
<td>0.859</td>
</tr>
<tr>
<td>Multi.dime. View</td>
<td>0.592</td>
<td>0.618</td>
<td>0.568</td>
<td>0.631</td>
<td>0.819</td>
</tr>
<tr>
<td>Adaptive Challenges</td>
<td>0.642</td>
<td>0.656</td>
<td>0.606</td>
<td>0.711</td>
<td>0.868</td>
</tr>
</tbody>
</table>

As can be seen from the table, the loadings between manifest variables and their own variable are the highest (see written in bold); all indicator loadings are above 0.70.

The next step is the analysis of the loading and communalities that are contained in the measurement model. The loadings are the correlation between the latent variable and its indicators, while the communalities are the squared loadings and are used to measure the part of the covariance between a latent variable and its indicator. As a rule of thumb, the acceptable level of loading and communalities are greater than 0.7 and 0.5 respectively. The table below presented the loadings and communalities of manifest variables.

High outer loadings on a construct indicate that the associated indicators have much in common, which is captured by the construct. This characteristic is also commonly called indicator reliability. At a minimum, all indicators outer loadings should be statistically significant. Significant outer loading could still be fairly weak; a common rule of thumb is that the standardized loadings should be 0.70 or higher. The rationale behind this rule can be understood in the context of the square of a standardized indicator’s outer loading, referred to as the communality of an item. Specifically, an indicator’s outer loading on the associated construct should be greater than the loadings on other constructs (i.e., the cross loadings).
Table 4. Correlations and outer weights

<table>
<thead>
<tr>
<th>Latent variable</th>
<th>Manifest variables</th>
<th>Loadings</th>
<th>Outer weight</th>
<th>Communalities</th>
<th>Redundancies</th>
<th>Standard error</th>
<th>Critical ratio (CR)</th>
<th>Lower bound (95%)</th>
<th>Upper bound (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV1 Adaptive Leadership</td>
<td>Commitment</td>
<td>0.659</td>
<td>0.176</td>
<td>0.434</td>
<td>0.43</td>
<td>0.024</td>
<td>27.112</td>
<td>[0.597, 0.699]</td>
<td>[0.661, 0.753]</td>
</tr>
<tr>
<td></td>
<td>Vision</td>
<td>0.711</td>
<td>0.207</td>
<td>0.505</td>
<td>0.50</td>
<td>0.022</td>
<td>32.165</td>
<td>[0.661, 0.753]</td>
<td>[0.702, 0.783]</td>
</tr>
<tr>
<td></td>
<td>Trust</td>
<td>0.746</td>
<td>0.272</td>
<td>0.557</td>
<td>0.56</td>
<td>0.019</td>
<td>39.379</td>
<td>[0.702, 0.783]</td>
<td>[0.769]</td>
</tr>
<tr>
<td></td>
<td>Empower</td>
<td>0.730</td>
<td>0.230</td>
<td>0.534</td>
<td>0.53</td>
<td>0.022</td>
<td>33.291</td>
<td>[0.677, 0.769]</td>
<td>[0.791, 0.852]</td>
</tr>
<tr>
<td></td>
<td>Capability</td>
<td>0.824</td>
<td>0.527</td>
<td>0.680</td>
<td>0.68</td>
<td>0.014</td>
<td>60.501</td>
<td>[0.791, 0.852]</td>
<td>[0.821]</td>
</tr>
<tr>
<td>LV2 Adaptive Culture</td>
<td>Innovation</td>
<td>0.788</td>
<td>0.509</td>
<td>0.620</td>
<td>0.62</td>
<td>0.016</td>
<td>47.894</td>
<td>[0.749, 0.821]</td>
<td>[0.653, 0.757]</td>
</tr>
<tr>
<td></td>
<td>S. Responsibility</td>
<td>0.709</td>
<td>0.345</td>
<td>0.502</td>
<td>0.50</td>
<td>0.024</td>
<td>29.966</td>
<td>[0.653, 0.757]</td>
<td>[0.707, 0.790]</td>
</tr>
<tr>
<td></td>
<td>S. Decision</td>
<td>0.750</td>
<td>0.443</td>
<td>0.563</td>
<td>0.56</td>
<td>0.020</td>
<td>37.382</td>
<td>[0.707, 0.790]</td>
<td>[0.790]</td>
</tr>
<tr>
<td></td>
<td>S. Adaptability</td>
<td>0.591</td>
<td>0.147</td>
<td>0.349</td>
<td>0.35</td>
<td>0.038</td>
<td>15.627</td>
<td>[0.509, 0.671]</td>
<td>[0.671]</td>
</tr>
<tr>
<td>LV3 Resource Availability</td>
<td>Financial R.</td>
<td>0.620</td>
<td>0.260</td>
<td>0.385</td>
<td>0.38</td>
<td>0.028</td>
<td>21.897</td>
<td>[0.551, 0.676]</td>
<td>[0.572, 0.697]</td>
</tr>
<tr>
<td></td>
<td>Hum. Resource</td>
<td>0.781</td>
<td>0.750</td>
<td>0.609</td>
<td>0.61</td>
<td>0.018</td>
<td>43.887</td>
<td>[0.739, 0.823]</td>
<td>[0.739, 0.823]</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
<td>0.634</td>
<td>0.350</td>
<td>0.401</td>
<td>0.40</td>
<td>0.029</td>
<td>22.151</td>
<td>[0.572, 0.697]</td>
<td>[0.841]</td>
</tr>
<tr>
<td>LV4 Communication System</td>
<td>Inf. Quality</td>
<td>0.809</td>
<td>0.499</td>
<td>0.654</td>
<td>0.65</td>
<td>0.015</td>
<td>53.315</td>
<td>[0.780, 0.841]</td>
<td>[0.731, 0.804]</td>
</tr>
<tr>
<td></td>
<td>Comm. Strategy</td>
<td>0.767</td>
<td>0.343</td>
<td>0.589</td>
<td>0.59</td>
<td>0.016</td>
<td>49.512</td>
<td>[0.731, 0.804]</td>
<td>[0.804]</td>
</tr>
<tr>
<td></td>
<td>Info. access</td>
<td>0.807</td>
<td>0.522</td>
<td>0.651</td>
<td>0.65</td>
<td>0.016</td>
<td>50.386</td>
<td>[0.767, 0.834]</td>
<td>[0.834]</td>
</tr>
<tr>
<td>LV5 Systems Thinking</td>
<td>Seeing Wholes</td>
<td>0.781</td>
<td>0.387</td>
<td>0.610</td>
<td>0.61</td>
<td>0.018</td>
<td>44.606</td>
<td>[0.737, 0.821]</td>
<td>[0.821]</td>
</tr>
<tr>
<td></td>
<td>Interconnections</td>
<td>0.776</td>
<td>0.347</td>
<td>0.603</td>
<td>0.60</td>
<td>0.017</td>
<td>47.013</td>
<td>[0.741, 0.807]</td>
<td>[0.807]</td>
</tr>
<tr>
<td></td>
<td>Multidi. View</td>
<td>0.741</td>
<td>0.230</td>
<td>0.548</td>
<td>0.55</td>
<td>0.018</td>
<td>40.987</td>
<td>[0.697, 0.773]</td>
<td>[0.773]</td>
</tr>
<tr>
<td></td>
<td>Ad’ Challenges</td>
<td>0.785</td>
<td>0.408</td>
<td>0.617</td>
<td>0.62</td>
<td>0.015</td>
<td>51.990</td>
<td>[0.752, 0.816]</td>
<td>[0.816]</td>
</tr>
</tbody>
</table>

Communalities are also indexes of local fit calculated on each manifest variable and the latent construct. This index is calculated with the purpose of checking the indicators of a block are well explained by its latent variable. Simply, they are squared loadings and they measure the part of the covariance between a latent variable and its indicator that is common to both (Sanchez, 2013). By referring this index, we can see the criteria contributing the most to the major dimensions compared to others, for adaptive leadership (capability /0.824/ & trustworthiness /0.746/), adaptive culture (innovation /0.788/ & shared decision-making /0.750/), resources (human resource /0.78/), communication system (information quality/0.809/ & information access /0.807/) and systems thinking ( adaptive challenges /0.785/ & seeing wholes /0.781/).

From the correlation matrix above, we can also see the effect of each manifest variable on its associated latent variable; all the outer weights are positive and significant. For example, commitment has the lowest impact on adaptive leadership (0.66). In addition, the outer weight coefficient of each variable in the linear combination helped to estimate the latent variable score.

The values of the outer weights can be compared with each other and can, therefore, be used to determine each indicator’s relative contribution to the constructor its relative importance. The analysis of outer weights concludes the evaluation of the formative measurement models.

Outer weights are the results of multiple regression of a construct on its set of indicators. To test the outer weights are significantly different from zero bootstrapping was made. These results express each indicator’s relative contribution to the constructor its relative importance to forming the construct. Weights are the primary criterion to assess each indicator’s relative importance, informative measurement models. When an indicator’s outer weight is non-significant but its outer loading is high (i.e., above 0.5), the indicator should be interpreted as absolutely important but not as relatively important. When an indicator has a non-significant weight and the outer loading is below 0.5, the researcher should decide whether to retain or delete the indicator by examining its theoretical relevance and potential content overlap with other indicators of the same construct.

All indicators loadings were found above 0.5 and outer weights are significant since zero does not fall in the given confidence interval. However, based on these results we can understand that capability is the most determinant
factor in adaptive leadership with the highest outer weight (0.527), trustworthiness (0.272), empowerment (0.230), and visionariness (0.207) follows consecutively and the least is commitment (0.176). From the adaptive culture block innovation outweighs others (0.509) in its importance for the construct. Shard decision making (0.443), and shared responsibility (0.345), but staffs adaptability (0.147) is the least for its contribution to the construct. On the other hand, human resource (0.750) was found the most important from resources followed by technology (0.350).

As can be seen from the above table information access (0.522) and information quality (0.499) are important from the effective communication domain. Lastly, identifying adaptive challenges (0.408), and seeing wholes (0.387) were found good contributors for the systems thinking construct.

The validation of the outer model is obtained as an average of the squared correlations between each manifest variable and the corresponding latent variable i.e. the average communality (0.548). An AVE value of 0.5 or higher indicates that, on average, the construct explains more than half of the variance of its indicators (explained below).

Generally, for the outer estimation (the first part of the formula is the average communality) for each block the maximum is the first eigenvalue, because the first principal component explains the maximum variability, while for the inner estimation the maximum is given by the first canonical correlation squared. The results of reflective constructs exhibit satisfactory levels of quality. Thus, we can proceed with the evaluation of the structural model.

4.3 Structural Models/the Inner Mode (Among AC Dimensions)

Once we have confirmed that the construct measures are reliable and valid, the next step addresses the assessment of the structural model results. This involves examining the model’s predictive capabilities and the relationships between the constructs. The key criteria for assessing the structural model in PLS-PM are the significance of the path coefficients, the level of the $R^2$ values, the $f^2$ effect size, and the predictive relevance $Q^2$.

Coefficient of determination /$R^2$/ Explained Variance/: Composite indicators largely correspond to the above definition of formative measurement models in that they are combined in a linear way to form a variate, which is also referred to as composite variable in the context of SEM (Bollen, 2011; Bollen & Bauldry, 2011). More precisely, the indicators fully form the composite variable (i.e., the composite variable’s $R^2$ value is 1.0). The resulting composite variable is considered a proxy for a latent concept (Rigdon, 2012), and the indicators do not necessarily need to be conceptually united rather should be viewed as a measurement for an approximation of a certain theoretical concept.

According to Henseler & Chin (2010) these situations require particular attention, since almost all of the adaptive capacity variance is explained by its dimensions ($R^2 \approx 1.0$). To resolve this issue, they recommend using a combination of the repeated indicators approach and the use of latent variable scores in a two-stage higher order component analysis. Thus, the results of the two-stage PLS-PM algorithm are reported as follows:

The $R^2$ of overall adaptive capacity was found 0.783, whereas each dimension was found between 0.683 and 0.818, indicating high predictive accuracy as reported in the above table. $R^2$ values of 0.75, 0.50, or 0.25 for endogenous latent variables can, as a rule of thumb, be respectively described as substantial, moderate, or weak (Hair et al., 2011; Henseler et al., 2009). Therefore, substantial results were obtained both in the higher order construct and latent constructs.

Table 5. Adaptive capacity model assessment

| Latent variable       | Type     | $R^2$ | Mean Communalties (AVE) | $t$  | $Pr > |t|$ | $f^2$ | Critical ratio (CR) | Standard error(Bootstrap) |
|-----------------------|----------|-------|-------------------------|------|-------|------|-------|-------------------|--------------------------|
| Adaptive Leadership   | Exogenous| 0.803 | 0.674                   | 77.18| 0.00  | 10.131| 47.911| 0.012             |
| Adaptive Culture      | Exogenous| 0.806 | 0.631                   | 55.575| 0.00  | 5.253 | 31.838| 0.008             |
| Resource Availability | Exogenous| 0.683 | 0.681                   | 52.081| 0.00  | 4.613 | 26.337| 0.008             |
| Eff.Comm' System      | Exogenous| 0.805 | 0.785                   | 53.310| 0.00  | 4.833 | 38.957| 0.007             |
| Systems Thinking      | Exogenous| 0.818 | 0.727                   | 62.504| 0.00  | 6.644 | 36.905| 0.009             |
| Adaptive Capacity     | Endogenous| 0.783 | 0.548                   |      |       |      | 0.958 |                  |
In addition to evaluating the magnitude of the $R^2$ values as a criterion of predictive accuracy, researchers are encouraged to examine Stone-Geisser’s $Q^2$ value (Geisser, 1974; Stone, 1974). This measure is an indicator of the model’s out-of-sample predictive power or predictive relevance. When a PLS path model exhibits predictive relevance, it accurately predicts data not used in the model estimation. In PLS-PM the quality of each structural equation is measured by the cv-redundancy index (i.e. $Q^2$), this value was found 0.554.

Commonly, $Q^2$ values larger than zero for a specific reflective endogenous latent variable indicate the path model’s predictive relevance for a particular dependent construct. It is a kind of cross-validated $R^2$ between the manifest variables of an endogenous latent variable and all the manifest variables associated with the latent variables explaining the endogenous latent variable, using the estimated structural model.

The mean communalities (AVE) of a block are the mean of the communality of manifest variables. An AVE value of 0.5 or higher indicates that, on average, the construct explains more than half of the variance of its indicators. All the average variance extracted (AVE) values exceeded the threshold (0.50), supporting the convergent validity of the construct measures (Henseler et al., 2016; Henseler, 2017). In this investigation’s case, the grand overall adaptive capacity AVE is 0.548 and the major dimensions AVE is all above 0.60 as presented in the model assessment table above.

By looking into the results of communalities, it is possible to understand the variability of the manifest variables captured by the higher concepts is sufficiently good; in particular that captured by effective communication system (0.79), systemic thinking (0.727) and the lowest is adaptive culture (0.631).

**Structural model path coefficients**: the estimation for the paths between the latent variables in the structural model is reported as standardized coefficients. The paths represent the hypothesized relationships among the constructs.

Table 6. Impact and contribution of the variables to adaptive capacity

<table>
<thead>
<tr>
<th>Latent variable</th>
<th>Effective Communication</th>
<th>Adaptive Culture</th>
<th>Adaptive Leadership</th>
<th>Resource Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems Thinking</td>
<td>0.904</td>
<td>0.897</td>
<td>0.896</td>
<td>0.826</td>
</tr>
<tr>
<td>Correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Path coefficient</td>
<td>0.245</td>
<td>0.216</td>
<td>0.210</td>
<td>0.169</td>
</tr>
<tr>
<td>Correlation * path coefficient</td>
<td>0.221</td>
<td>0.194</td>
<td>0.188</td>
<td>0.254</td>
</tr>
<tr>
<td>Contribution to $R^2$ (%)</td>
<td>22.204</td>
<td>19.473</td>
<td>18.852</td>
<td>25.429</td>
</tr>
<tr>
<td>Cumulative %</td>
<td>22.204</td>
<td>41.676</td>
<td>60.529</td>
<td>85.957</td>
</tr>
</tbody>
</table>

Figure 4. Adaptive capacity indicators path coefficient

From the above table, it is possible to deduce, adaptive leadership contributed about 25% with high predictive power. Other major dimensions were identified with predictive importance of systems thinking (22.2%), effective
communication system (19.47%), adaptive culture (18.85%), and resource availability (14.04%). On the other hand, the path coefficients have standardized values approximately ranged between $-1$ and $+1$ (values can be smaller/larger but usually fall in between these bounds). Estimated path coefficients close to $+1$ represent strong positive relationships (and vice versa for negative values) that are usually statistically significant (i.e., different from zero in the population).

The closer the estimated coefficients are to 0, the weaker are the relationships. Very low values close to 0 are usually not significantly different from zero. Reimartz et al. (2009) used the path model and path coefficient specifications as $0.15$-low; $0.30$-medium; and $0.5$-high. Based on this specification, all path coefficients are medium despite the coefficient of resource availability is slightly lower.

Whether a coefficient is significant ultimately depends on its standard error that is obtained by means of bootstrapping. The bootstrap standard error allows a computation of the empirical $t$ value. When the empirical $t$ value is larger than the critical value, the coefficient is significant at a certain error probability (i.e., significance level). A one-unit change of the exogenous construct changes the endogenous construct by the size of the path coefficient when everything else (i.e., all other constructs and their path coefficients) remains constant (ceteris paribus; Hair et al., 2010). Therefore, a one unit change of systems thinking, effective communication, adaptive culture, adaptive leadership and resources change adaptive capacity by $0.245$, $0.216$, $0.210$, $0.283$, and $0.169$ respectively, we may say all coefficients of adaptive capacity are significant.

Importance performance matrix analysis (IPMA): scholars describe importance as the total effect on the studied latent variable, whereas performance is the score of the latent variable.

In the system of composite indicators built with PLS-PM, it is possible to obtain the scores for each composite indicator, exogenous or endogenous, and for each composite indicator you can make a ranking among units. Moreover, PLS-PM provides information on the relative importance of constructs in explaining other constructs in the structural model. Information on the importance of constructs is relevant for drawing conclusions. For this reason, a composite indicator decision matrix is a valuable decision making tool. It is useful in extending the findings of the basic PLS-PM outcomes using the latent variable scores (Hock et al., 2010).

Consequently, in the System of CIs built with PLS-PM, it is possible obtain the scores for each CI, exogenous or endogenous, and for each CI you can make a ranking among units. The results of PLS-PM take into account the performance of each construct. In addition, CI average values and 95% lower and upper bounds were considered. For a specific endogenous CI, this Matrix contrasts the structural model’s total effects (the importance) and the average values of the CI (the performance).

As a result, conclusions can be drawn on two dimensions (i.e., both importance and performance), which is particularly important in order to prioritize actions.

Table 7. Importance performance result of adaptive capacity dimensions

<table>
<thead>
<tr>
<th>Latent variable</th>
<th>Importance</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive Leadership</td>
<td>0.283</td>
<td>44.838</td>
</tr>
<tr>
<td>Adaptive Culture</td>
<td>0.216</td>
<td>47.115</td>
</tr>
<tr>
<td>Resource Availability</td>
<td>0.169</td>
<td>43.523</td>
</tr>
<tr>
<td>Eff. Communication System</td>
<td>0.210</td>
<td>41.545</td>
</tr>
<tr>
<td>Systems Thinking</td>
<td>0.245</td>
<td>47.040</td>
</tr>
</tbody>
</table>

Based on this output, the performance of universities in the corresponding latent variables are different. Relatively, the performance scores of adaptive culture (47.16) and systems thinking (47.04) are the highest. Adaptive leadership (44.83), resource availability (43.52), and effective communication system (41.543) were ranked sequentially. Quite interestingly, according to the descriptive statistics, the aggregate mean score of adaptive culture (2.85) was the highest and effective communication (2.668) was the least. This may inform the model is a good model to measure the adaptive capacity of universities.

In addition to the $R^2$, referring to Boccuzzo and Fordellone, (2015), by looking the GoF index (0.787) the average predication of the entire model is about (78.7%). While $R^2$ indicates the amount of variance of the endogenous latent variables explained by its independent predictors, GoF may also assess the overall prediction performance of the model. The further details of importance and performance can be seen the following matrix and subsequent
Therefore, among the latent variables studied, adaptive leadership was found the most important indicator of adaptive capacity (0.283), followed by the practice of systems thinking (0.245). However, the performance of universities seems high in adaptive culture (47.12) and systems thinking (47.04). According to importance, adaptive leadership, systems thinking, adaptive culture, effective communication system, and resource availability were ranked from the most important to the least important by the model with score of 0.283, 0.245, 0.216, 0.210, and 0.169 respectively.

4.4 Decision Matrix

The results of PLS-PM take into account the performance of each construct. In addition, composite indicator average values are considered. For a specific endogenous composite indicator, this matrix contrasts the structural model’s total effects (the importance) and the average values of the composite indicator (the performance). As a result, conclusions can be drawn on two dimensions (i.e., both importance and performance), which is particularly important to prioritize actions.

The analysis is based on a scatter plot where each composite indicator is positioned according to its mean and its path coefficient concerning the target composite indicator. The x-axis represents the total effects of the composite indicators on the target composite indicator (i.e. their importance). The y-axis depicts the average latent variable scores of these latent variables (i.e. their performance).

As can be seen from the map presented above, constructs in the lower right area of the importance-performance map have a high importance for the target adaptive capacity but show a low performance. Hence, there is a particularly high potential for improving the performance of the constructs positioned in this area. Particularly, adaptive leadership and effective communication system requires special attention.

5. Qualitative Results

5.1 Introduction

In order to understand the adaptive capacity of universities, qualitative data was also gathered. The interview, open-ended questions, and document analysis were the main means to gather relevant information. The analysis results are reported under each major team in line with the theoretical framework.
5.2 Adaptive Leadership

Among the interviewees, a professor in one of the studied universities starts his response magnifying the responsibility of leaders using a metaphor. He said:

“Leaders have a lot to learn from drivers. Both have a lot in common. While a driver drives a car, a leader drives an organization. Look! The driver is an eye for the car similar to the visions & missions of an organization. Whom do you think set goals/destination through discussion, driver or leader? How frequently? The driver is also an ear of the car, like leaders needs to meticulously assess problems, changes, and what is happening in their organization. Who is the brain of the car? It is the driver that makes decisions like decisions and actions in organizations. Don’t you think the driver has heart for the car? Do you think he/she drives in a bad/rough road without caring for the car’s safety? Likewise, leader who truly care think about the wellbeing of the organization and staffs. A driver cannot sleep, as a leader cannot close his/her eyes to how and where the organization is moving. Like careful driving, it requires careful leading. Leaders are responsible for the success and failures of organizations. I know leading people are very challenging, but requires an active eye, ear; brain and heart like drivers.”

Most people agree that change, success, reform, adaptation, growth, and other organizational issues are dependent on leaders on most occasions. Sometimes in an already built system the managers or ‘the so-called leaders’ may be successful in running the existing systems. The researcher was keen to find out the most important concerns related to successful changes and the capacity to change. Trust, capacity, vision, commitment, and empowerment were the dominant ideas from the synthesis of the interview.

According to the interview results, “trustworthiness” is the most frequently mentioned issue in universities leadership. They mentioned there is a trust gap between leaders and followers. Leaders are generally viewed as appointees of the government or else they have indirect support of the government. Even in some universities that are exercising the democratic appointment of leaders through open competition, respondents feel, as there is an indirect hand of government officials. Respondents also commented that some violation of rules and guidelines over promotion and learning opportunities cause of mistrust for the university leadership. They pointed out that decisions are easily diverted by personal affiliation, political intervention [it seems some individuals from the ruling party], and corruption. Most of them mention the word “bias” reflecting the existence of bias in universities, which in turn requires questioning the practice of good governance. All these instances lead to wider suspicion for leaders for their approach, ideas, and every decision. To show how some staffs are losing trust, one of the respondents said, “When leaders talk about some kind of change idea, we always look for the petard they are thinking about behind. Why do they frequently preach about this? Is there something they want to complete in the name of the change?”

From the interview, the researcher could understand that trustworthiness might be a significant barrier to implement change initiatives successfully. Some participants mentioned as most staffs trust informal communication channels. Even though ideas related to informal communication are widely discussed in other parts, it seems as informal and unverified information is also among the causes of mistrust. Strengthening open and transparent communication system as well as communicating important issues and information through relatively trusted individuals [who have acceptance] is among the mechanisms respondents reflect to minimize the trust gap. Otherwise, who wants on board in a car of the un-trustful driver?

The second most important theme emerged from the interview was related to “leaders’ capacity”. The issues that draw the attention of the researcher are the preparation or requirements to be a leader in different university positions. Most respondents reflected that leaders in most university leadership positions have not gone through any leadership training. They also mention that leadership positions from the president to team leader positions do not have specific and clear requirements a position holder must fulfill. Very recently, some universities began competitive appointment of presidents and vice presidents, which is a good startup. During the competition, candidates are expected to present their strategic plan, their dream, and how they are going to change the university. However, participants feel that those who have oratory skill or the capacity to debate usually win. Respondents stress that usually, the candidates’ final goal is holding the position; they do not focus on what they want to accomplish using the position as a tool. There is no system of check and balance as to whether incumbent presidents are keeping/fulfilling their promise or not. Nominees complete their term regardless of their performances. Leaders’ flexibility was also mentioned along with leaders capacity, one of the participants said, “If you go to most leaders’ office, their frequency response is ….. if the rule allow…. I will permit.”

All this instances reflects as interviewees have doubts on leaders’ skills and indirectly shows their trust on the
leadership. However, almost all interviewees reflected that leaders’ capacity is the key to success for any change initiative and overall institutional success.

The third critical comment of respondents is leaders’ commitment to lead change initiatives. Majority of respondents perceive change initiatives are usually periodic and fashion, which gradually fade from both leaders and followers mind. Respondents attribute at the beginning leaders give attention in their speech and action, even they preach as the change is the key to every problem, but soon they become busy of other agendas. Looking leaders’ commitment in a different way, one respondent said,

“I have never seen any committed leader that dies for his ideas in my university. I think leadership is being a candle, raising a unique but important idea that most cannot and could not think. Sometimes because of your ideas people may reject you, you melt like a candle to light others. If you are thinking like majority, how could you be a change leader? I do not believe in majority vote, most people do not like unique ideas. Our leaders’ fear of expulsion, hence they think and do as majority, preferring their own interest. That is why I said our leaders are not committed for change or any universities success.”

Although not as such emphasized some respondents raised issues related to empowerment, and visionariness. They pointed that the role and involvement of middle level leaders are negligible. The offices of presidents and vice presidents are always busy of guests keeping their turn to meet them. Participants feel that minor issues that could be solved by middle and lower level leaders are taken to higher leaders. This may make top officials to be busy of routine tasks and a flood of clients. The other idea is leaders’ visionariness. The major comment related to vision is first, clarity of visions and second, actions related to visions. Visions do not seem clear and inculcated in the minds of staffs and most do not know what is expected of them. The attempt to form slogans, flag and symbols is promising. But very critically, actions and decisions don’t seem in congruent with visions according to participants’ perception. One of the participants said, “How could we become one of the ten universities in Africa by 2025, we are left with five years and our activities and focuses doesn’t help to achieve this.”

5.3 Change Adaptive Culture

According to respondents, it is difficult to explain the culture of their universities and the extent to which their culture is change adaptive. However, their perception can be synthesized in to two major themes, the culture of innovation and sense of ownership.

The culture of innovation can be further divided in to two creation and adoption. Respondents feel that universities are expected to be centers of new ideas and researches. But, the practice is inadequate. Few gifted individuals usually attempt innovative ideas or products and their products or ideas do not easily catch the attention of top officials, on top of that their influence on the system is also rare. In this regard, some universities have tried to solve their own problems by changing their systems, for example automated grading system, registration system and to some extent reporting systems. These changes are indigenous and born from the system itself. Of course, respondents perceive ideas may be taken from other experiences as long as they are relevant and helpful to advance the function of the system. But mostly, top leaders give more emphasis to change or innovative ideas that come through government line. Such systemic changes or innovative practices usually come with budget and accountability. However, doesn’t consult staffs or consider the ideas capacity to solve specific contextual challenges of the institutions. Some feel top-down changes as a burden.

Related with adopting and using technologies, respondents reflected that older staffs seems challenged to use new technologies; there were staffs that prefer submitting grades using papers while the university already automated and use online grading system.

The second important point is related to sense of ownership. Two important points emerged from the interview result. First, most of the changes introduced to the universities are top-down. Decisions on what to change and how to change mostly are not done collaboratively or the implementation process do not fully involve staffs. This seems staffs perceive change is done to them than with them. Likely, this triggers covert resistance and absence of ownership. Second, some respondents reflected poor staffs working habit, time management, dedication, and optimism for success. One respondent said, “What do you do to staffs who demand an incentive or money to every job you offer them? Staffs particularly teachers are autonomous; this leads to extreme loose of control and absence of punishment system. Let alone leading a new change, it is difficult to control and manage their responsibilities.”

The reform council’s 2011 assessment of the BPR reforms at Addis Ababa University was very critical of the
changes and their implementation. They concluded that the autonomy gained by the university did not contribute to improvements in institutional effectiveness to the extent expected (Varghese, 2016). This might necessitates revisiting to what extent staffs own the vision of universities, their sense of belongingness and optimism for their contribution. Among several factors, employee attitudes towards their jobs, their working environment, and the degree of significance they attach to their contribution to the overall attainment of organization’s goals are worth paying attention to (Geda and Beyera, 2015).

5.4 Resource Availability

Almost all respondents perceive that resource cannot be a challenge in the change management process. One participant said, “Be it human, technology or financial, which organization does have better resources than universities?” When they explain universities have sufficient budgets, even they return surplus budget to Ministry of Finance every year. They can hire as many staffs as they like, even beyond the criteria they are allowed to hire staffs depending on their need. The budget allocated for them every year is vast this includes budget for innovation and technology transfer. Similarly, universities are capable of buying and using most recent technologies or creating new products and ideas given the human resource they possess. This show, universities are in a good position to lead institutional changes resource wise.

However, participants of the study pointed out four specific but important issues related to resources. One, the internal revenue utilization has to be transparent and invested on matters that transform institutions. Two, the human resource recruitment process has to be free from bias and intervention, reflecting the existence of recruitment based on relationship or affiliation. Three, there is high wastage of resources, equipments and materials that could be used after minor maintenance are dropped as garbage. They commented the need to install a system of wise utilization or reusing. Fourth, universities do not use locally available resources; rather they focus on imported materials and equipments. Despite huge investment these materials might sometimes also stoked. However generally, resource limitation does not seem a source of capacity gap to implement institutional changes successfully in universities context.

5.5 Effective Communication System

Almost all respondents agree that communication system is a critical requirement in change implementation process. Important issues that draw from the interview are the practice of linking change initiatives to visions and missions, the practice of information management system, and measurement system as feedback to the function.

According to respondents, when change ideas are introduced limited attention is given to relate with the universities mission and vision. Discussions and information dwells on the change and the change only. There is a limitation on communicating how the change idea objectively contributes to the realization of the university’s vision.

The other point is related to the access, openness, timeliness, and clarity of information concerning the proposed change ideas. They pointed out that when a certain change idea comes most of staffs discussion focus on the disadvantages. There is a tendency of early communication a head of the formal channel, often misunderstandings, wrongly interpreted and rumor like. This puts an influence on subsequent discussions about the proposed changes. Thus, participants reflected that the communication system has to provide clear, sufficient, timely and open information about any proposed change initiative including the advantages and potential side effects. Besides, they agree that if ideas are communicated in the sense of let us discuss on this important issue, likely the support, the ownership and optimism of staffs can be achieved. Equally important, the communication system has to offer/convey the required skill or training necessary for implementing the proposed changes. Therefore, this seems the communication system is expected to deal with psychological and technical issues to create a fertile ground for changes.

The third point focus on using communication system as a measurement or feedback collection system. Respondents reflected that after the initial phases of change implementation, leaders declare success without collecting sufficient feedback about challenges, pity falls, and outputs of implementation. Most of the respondents evaluate success based on the potential of sustainability. Some feel as wrong or exaggerated reports are sent to higher officials, which is a bottle neck for early correction and learning. This is usually attributed to lack of control and close monitoring support of higher officials. One respondent said, “Presidents and vice presidents are too far from us, they are inaccessible, it is difficult to communicate with them on daily basis, from day one of their appointment they get out of sight.” This leads the communication system to rely on letters and formal procedures. Respondents feel that strengthening informal communications like sudden visits, encouragement and contacts are important to create intimacy.
5.6 Systems Thinking

Related to the practice of systemic thinking the interview results can be generalized into two major themes; these are system’s internal and external interactions and identifying adaptive challenges.

The interview informed that the horizontal interaction of system’s components is very limited, rather upward and downward/vertical communication is very strong. The interaction of offices and departments primarily focused on with whom they are working with. Most don’t know what is happening in their neighborhood. The dialogue, interaction, lesson sharing do not go far from within directorate or faculty/college. However, there is very good interaction especially with in departments and units, whereas the external interaction is a bit strange.

Even though the universities are interacting with the community relatively in a good manner through graduates and students; nevertheless, dominant interactions are taking place through top officials principally presidents, research and community service and through cafeteria. Every interaction, letters, communications, guests, organizations and other formal relationships come with the permission of presidents and vice presidents. So, it seems environmental scanning and universities dominant interactions are happening through top officials. The research and community service unit is also another key area of interaction. Respondents have doubts on its strength, but the universities are trying to contribute through research and community service activities. This is perceived as potential area of interaction with the environment. The universities cafeteria seems interacting daily with the community, influencing and being influenced. This happens during the purchase of student foods and equipments. However, generally it seems that top officials and the research and community service units are determinant for institutional changes, changes in the globe, changes around the community and for the capacity to change.

The second most important idea is related to identifying systemic challenges. Heifetz, Grashow, & Linsky (2009) call this an adaptive challenge. According to respondents, the observed gaps here were leaders are assumed to have the capacity to carefully observe, interpret, understand and identify systemic institutional challenges. However, the practice of identifying systemic problems and designing a change to resolve problems is minimal, rather standard remedies or solutions are sent from the capital in the form of change initiative, curriculum modularization, BPR, BSC, Kyzen etc are solutions from the center. As participants of the study, for university specific problems officials sit at the capital provide a cure, the practice of solving own problem with own solution is not strong. Similarly, in the study of Asgedom and Hagos (2016) on a governance reform, a dean reflected, “Staffs did not understand BPR. Even some leaders and process-owners did not understand BPR. This is what happens when changes are imposed from above. The major consequence of top-down reform is passivity on the part of professors.”

One interviewee said, “Unless we reflect our challenges and problems during meetings and reports, there are no ways to assess university’s challenges periodically in a planned manner or celebrate successes together.” The other interviewee reflected, “I am leading different departments as a college dean. Down the ladder, we discuss about challenges and problems. I report to higher officials problems that are common to all. Mostly problems like office equipments, laptop, laboratories, books, purchasing delay, delay in buildings, internet, transportation, students’ misconduct, teachers’ absenteeism etc.” Heifetz, Grashow, & Linsky (2009) label such kind of problems as technical challenges that require easy and technical solution.

Therefore, it seems inner horizontal interactions, change oriented communication with the environment, and dealing with universities systemic challenges were among the capacity gaps that probably hinder successful changes in the university.

6. Conclusions

Universities are the arena of many responsibilities. Through their teaching-learning, research and community service activities, they are expected to improve the social, political, economical, technological, health, cultural and other aspects of the nation. On the way to fulfill the progressive needs of the community and their mandates, universities have been making several changes to their system in order to enhance their structure, system, leadership, services etc. Both incremental and transformational changes the universities aspire to introduce in to their system at different times have suffered different challenges, as a result significant number of change efforts fail to bring the intended result.

This investigation aims to understand the adaptive capacity of universities to institutional changes.

Therefore, the following conclusions are drawn based on the findings of the research:

The adaptive capacity of universities to change initiatives is not satisfactory, and hence we may say that universities might not fully implement the change ideas they wish to introduce in to their system. The major
components that enable successful changes, which were measured in this research as components of adaptive capacity were found minimum. These skills, competencies, and practices of organizations indicate or help to predict the extent to which universities can cope with or benefit from the changes successful implementation. In addition, this result does not have significant differences among different generation of universities. This ultimately hinders the benefit they could get by successfully implementing the initiatives. Moreover, the basic leadership, cultural, communication, systemic thinking, and other practices of universities do not reflect institutions capacity to implement change initiatives successfully.

Based on the adaptive capacity model, adaptive leadership, change adaptive culture, resource availability, effective communication system and systems thinking can be the major dimensions that can explain universities adaptive capacity for changes.

Among the major dimensions, adaptive leadership, effective communication system, significantly influences the adaptive capacity of universities.

7. Reflection and Recommendation

The capacity to change is systemic and the cumulative effect of many actors, actions and resources. As concluded in the previous section, the adaptive capacity of universities was found low, so to enhance change implementation in universities; care must be taken considering the unique nature of the institutions. The researcher argues that the responses of universities to change initiatives are mainly determined by universities change capacity. In other words, if the change initiatives are to be successfully adopted in universities, the leadership, the culture, the communication systems, the systems thinking practice, and institutional resources should be revisited. Despite it is impossible to secure complete success; universities can assess their system and significantly change their capacity or readiness for any possible changes they might encounter tomorrow. Therefore, it is important to recognize adaptive capacity as a comprehensive construct, which can be understood using composite indicators. Consequently, the following recommendations are forwarded:

**Recommendation One:** Improving change adaptive leadership in universities.

First, it is wise to revisit the leadership system and practice in universities. Leaders’ commitment and dedication is a vital input for change management. Commitment to change can be generated through symbolisms and meanings making about changes. Leaders must find ways to secure their own and followers’ commitment by clearly communicating and linking the vision of universities to the proposed change initiative. The leadership also needs to enhance trustworthiness between leaders and employees. Frequent communication, empathy, and minimizing distance between leaders and staffs, and working with most acceptable and trusted employees might improve the trust between leaders and followers. In addition, leaders at different positions should be empowered to make decisions and actions. However, most importantly, leaders’ capability to manage change initiatives is determinant; hence, leaders have to be continuous learners and practitioners. Moreover, the preparation and requirement to hold a leadership position has to be revisited, requirement guidelines, criteria, and a check and balance system after holding leadership positions is imperative for smooth running of change initiatives.

**Recommendation Two:** Establishing a change adaptive Culture.

In order to build open, supportive and change adaptive organizational culture, staffs adaptability, shared decision-making and the practice of innovation and creativity has to be strengthened. Ensuring the clarity of goals among staffs and leaders at different positions, creating collaborative spirit and a shared vision, significantly helps to minimize resistance and improve adaptive culture. So, clear communication and mutual understanding among leaders, academic and support staffs guarantee shared system of meaning. In addition, recognizing, rewarding, supporting and promoting innovation and creativity, may ignite motivation among staffs. This also in turn makes employee willing and ready to adopt changes or innovative ideas and practices.

**Recommendation Three:** Improving resource access and utilization in universities.

In order to implement changes successfully, organizations must also think about the resources necessary to reach the desired goals. Commonly, financial resources (revenue generation and/or grant budget), human resources (sufficient competent and qualified staffs) and technological resources (the availability of tools and infrastructure) are among the major resources that determine the adaptive capacity of institutions. Here, the critical point that requires revisit might be the human resource recruitment process and wise utilization of resources since both are
accused of bias and wastage respectively.

**Recommendation Four:** *Institutionalizing effective communication system in universities.*

Enhancing a clear communication system in organization can reduce resistance by creating proper understanding of the change initiative and the establishment of trust among change agents and staffs. It is also a vital tool to install or construct the exact picture of the change initiative, which in turn is crucial to develop the support of stakeholders. In this era of globalization, HEIs demand efficient and effective information system, which is a transponder of quality & sufficient information to relevant stakeholders. Thus, it is important to consider the adequacy of information and the strategy we are employing to acquaint information about change initiatives. It is recommended that the system of clear, sufficient, timely and transparent information system in universities. Thus, the communication system in universities has to serve to create psychological and technical readiness for change initiatives among staffs and leaders.

**Recommendation Five:** *Developing systems thinking in universities.*

Since universities are complex adaptive systems, taking lesson on how to function as a system, potential bottlenecks, and on other necessary issues to consider as a system. Developing multi-dimensional view and working on adaptive challenges is important. This incorporates identifying patterns and inter-relationships, seeing the big picture, overcoming linear thinking and dealing with issues holistically and comprehensively. In addition, focusing on adaptive challenges that are reoccurring and systemic is important than simple technical challenges.

**Recommendation Six:** *Understanding adaptive capacity as a function of five major dimensions (adaptive leadership, change adaptive culture, resource availability, effective communication system and systems thinking) in improving adaptive capacity.*

Researchers, policy makers, university leaders and other concerned stakeholders might consider these components of adaptive capacity while they are trying to introduce change initiatives or to build their system’s capacity to cope with any changes either incremental or transformative. Consultants on reform or change might also consider these major and sub dimensions of proposed adaptive capacity in an attempt to introduce changes. Moreover, the model and the approach used to analyze in this study might be followed to check institutions adaptive capacity for change or reforms, potential gaps, promising areas and areas that need urgent intervention.

8. Implication of the Study

This is expected to have implications on the practice, methodology, and theory of organizational change and change management.

**Implications on the Practice:**

We wish changes to happen in our institutions. Leaders and change agents mostly focus on creating beautiful change ideas and the change management approach. However, successful changes do not happen by accident; require the full involvement and collaboration of stakeholders as well as resources. Beyond beautiful ideas, for successful changes to happen, the mind, the skill and resources should meet at optimal level. This means, one, leaders, staffs and concerned stakeholders should accept change initiatives with full heart. Successful change requires the mind and spirit of all stakeholders. Two, in addition to positive view and optimism, staffs and leaders needs to have the skill to implement the change initiative. Three, the necessary resources to implement change initiatives should be available.

Therefore, one practical implication of this research might be the attempt to balance the holistic and specific view of institutional adaptive capacity. This investigation has showed the whole picture of universities adaptive capacity to institutional changes as well as the specific practices contributing to adaptive capacity. So, this research might provide insights on the necessary components and issues of institutional capacity for change. Besides, from the feedback of this research, leaders and change agents might figure out, what should be done first, what strengths universities have, and the potential gaps. The same way, they can follow the methodology used in this study to trace and identify the strengths and weaknesses of their institution.

The second implication on the practice might be shifting the change management orientation to the change recipient orientation. Whether incremental or transformational changes, all change endeavors require a fertile ground. So, this study may assist leaders and practitioners to position themselves from recipient point of view. The usual way is while leaders and change agents lead changes, other staffs are implementers or receive and use change ideas. However, the question is the existence of appropriate platform to entertain change initiatives. It is uncertain when changes will happen or necessary to happen; nevertheless, the wise way is getting ready and...
ensuring institutional fitness for possible changes.

Commonly, leaders at the top level are assumed the sole responsible persons for the success and failures of institutional changes. But, rather than relying on few competent leaders or individuals, system building could improve the guarantee for making successful changes. Leaders might be at the center of many activities, the skill, knowledge and expertise they have is pivotal to establish systems. The communication system, the resource utilization system, the trust building, culture building e.t.c might be dependent on leadership, especially in new organizations. However, changing the outlook from leadership to collective capability perspective might be important for the practice of change management in universities.

The third implication for universities practice could be informing how they could benefit from change initiatives to survive and thrive with success in a changing world. Organizations stipulate changes to improve their effectiveness, performance, or provide better service to beneficiaries. If a university has good adaptive capacity, likely it will benefit from change initiatives. The lessons from this study might trigger universities to revisit the contextual or specific contributors and barriers of change. For example, trust building, using informal channel of communication, using middle level leaders, resource utilization e.t.c, then, they can easily identify where their support, resources and supervision should focus on during change implementation.

Implications on Methodology:

First, adaptive capacity is a complex issue and difficult to figure out or measure directly. This study has tried to propose a model for adaptive capacity at major dimension and specific indicator level. Consequently, universities might follow the same approach or refine the model to understand their adaptive capacities for institutional changes.

Second, this investigation has tried to give a lesson that abstract constructs can be measurable using indicators. Making constructs like adaptive capacity measurable and concrete is possible using composite indicators methodology. Most organizations including universities might feel such big constructs are difficult to intervene. For instance, quality education might be difficult to measure. However, setting specific indicators and identifying the strengths and the gaps using composite indicators methodology and employing approaches like PLS-PM might be a good lesson for universities. Thus, rather than leaving unstudied or measured developing composite indicators and trying to understand issues is a good approach to tackle adaptive challenges in universities.

Besides, identifying the weights of indicators, their contribution, and indicators that need action ease and clear the intervention of adaptive challenges. Otherwise, since it is cumulative, you feel the problem, but you do not know where to make action. Therefore, the methodology might give lessons on how to tackle adaptive challenges.

More to this point, using approaches like PLS-PM report many outputs, this provides clear and sufficient information about the issue under study. Therefore, it is an efficient approach.

Theoretical Implications:

Adaptive capacity can be conceptualized as the characteristics of an institutions (formal and informal; rules, norms and beliefs) that enable (individuals, organizations and networks) to cope with change, and the degree to which such institutions allow and encourage actors to change these institutions to go with anticipated changes. Judge and Douglas, (2009) indicated that adaptive capacity is multidimensional construct and comprises human skills and resources, formal systems and procedures, and organizational culture, values, and norms. Based on literature review, this research has tried to introduce a relatively comprehensive framework to gauge and/or understand the adaptive capacity of universities. Introducing adaptive capacity as a construct may be taken as an important step forward for understanding institutional changes or organizational studies in general. Producing and introducing a relatively general model of adaptive capacity might also be taken as another theoretical contribution.

In addition to its theoretical contribution, this study offers a useful instrument with high validity to any or all practitioners or consultants seeking to better understand, prepare for, or enhance an organization’s adaptive capacity. Indeed, this measure might even be useful in assisting strategic leaders to “compete for the future” (Hamel and Prahalad, 1994) and/or allow change consultants to provide more evidence-based assessment and recommendations (Armenakis and Burdg, 1988). Perhaps, this is why Welch (2005) argued that the ability to lead organizational change successfully is the key to trophy in the twenty-first century.

Furthermore, identifying more important and specific contributors for adaptive capacity might shift the change management theory, models and researches towards assessing and intervening change management through these specific constructs. However, since the findings are context specific, the theoretical links might not be replicable.
Finally, shifting change management from leading to receiving point of view might be another theoretical contribution beyond its practical benefit. Then, this perspective encourages leaders and organizations to think the other way round and ask questions like - do we have the competence to implement and benefit from this change initiative? Do we have fertile ground to install the change initiative in our system? What are our gaps that hinder from making successful changes? e.t.c.

9. Future Direction

Organizational change is a complex, context-specific phenomenon (Pellettiere, 2006). Lawler and Worley (2006) suggested that organizational change capability is the new and increasingly important strategic imperative of the twenty-first century. This research also suggests that environmental uncertainty demands higher levels of adaptive capacity, future research might attempt to link adaptive capacity to specific environmental conditions to better understand how to change more effectively. This research might also be further strengthened to accept and ensure the value of the framework this research has used. The model used does not consider the size of the changes being undertaken (Kerber and Buono, 2005) so, future research may identify whether a quantum or incremental change has any moderating impact on adaptive capacity and institutional performance.

Finally, the data used in this study were all collected in Ethiopian universities. As Trompenaars and Wolliams (2003) point out, change is often viewed differently in different cultural contexts. Nonetheless, the adaptive capacity construct identified in this study offers a promising new measure for analyzing an important dynamic capability within the complex adaptive systems perspective. This is expected to assist organizational scholars interested in the relationship between organizational change and institutional capacity for change. However, more assessment should be made to answer specific factors related to adaptive capacity. Even though this is not sufficient, this study may give potential insight about the necessary dimensions and specific criteria to implement change initiatives successfully.

10. Limitations

The basic limitation of this study is the problem of sufficient supporting literature from other similar local research findings, conducted to see the practical linkages and other scholars’ perception of the approach. Besides, this research might probably have a limited transferability to other organizations because the sample of this study was focused on a university setting. Future studies should attempt to collect more precise, longitudinal data to test the approach. More quantitative and qualitative data on the issue might enrich the research’s finding and it would have been best if students were included.

Finally, the researcher feels that this research should be further strengthened to answer how empirically adaptive capacity can improve the change implementation process. Even the research could be extended to address the performance improvements, improved service, customer satisfaction and other issues following successful changes. It is also possible to relate adaptive capacity to incremental or transformational change.

However, this study might provide all rounded insight into the intricacies of change implementation and institutions adaptive capacity.

References


Notes
Note 1. Modularization is a module based instructional delivery approach aimed at helping students to individually grow and develop at their own paces (Kandaro, 2013).

Note 2. Composite variable is a linear combination of several variables (Hair et al., 2017).

Note 3. A type of indicator used in formative measurement models. Composite indicators form the construct (or composite) fully by means of linear combinations. Therefore, composite indicators do not need to be conceptually united (Hair et al., 2017).

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