academicJournals

Vol.8(7), pp. 85-96, October 2016
DOI: 5897/IJEAPS2065.0474
Article Number: 79DC78E61117
ISSN 2141-6656

http://www.academicjournals.org/IJEAPS

International Journal of Educational Administration and Policy Studies

Full Length Research Paper

Value chain, stakeholders analysis and technology: A holistic and integrated approach for determining the cumulative added value of education

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Received 5 August, 2016, Accepted 26 September, 2016

The research problem addressed in this study focused on the students' assessment issue. Although the assessment of student learning should form part of the curriculum of school programs, many educational institutions do not make student assessment part of their teaching and learning routines. A holistic and integrated framework, which encompasses an interdisciplinary approach, to determine the cumulative added value of education was developed. The study adopted value chain and stakeholders' analysis and expectations perspectives and the concepts of key success factors (KSFs) and key performance indicators (KPIs). Information technology (IT) is added and considered as an enabling factor. The framework was put into context to take into consideration the environment surrounding the education institutions and schools. The adopted framework would enhance the students' assessment system and improve the overall education system. The framework is flexible to the extent that it could easily be adopted in different local, national and global contexts in which pertinent value chains could be developed.

Key words: Education, value chain, stakeholders, technology, students assessment, added value.

INTRODUCTION

In all types of public and private sectors, worldwide, the management and policy makers are mainly working to satisfy the expectations, needs and desires of their stakeholders. The stakeholders` needs determine the main processes and activities to be performed, hence determining the nature of the underlying value chain. To know the extent to which the stakeholders` expectations are met, an appropriate system that measures, records, assesses and reports the actual performance (outcomes) should be implemented. The outcomes need to be communicated to the various stakeholders in a form of reports. The reports should cover the outcomes of the core and key activities in the value chain. The information provided should be relevant to each group or category of stakeholders that help them to evaluate the performance of the concerned organization. To ensure the effectiveness and efficiency of the processes of measuring, recording, assessing and reporting the performance of an organization, a proper information technology and communication systems should be implemented. Assuming the continuity of the business operations in the future, the information provided should

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reflect the pervious achievements and future leading indicators.

In education sector, the educators and policy makers know and broadly agree about what the stakeholders of education want form their students. Hence, they want to set high expectations and support all students to meet those expectations. They want to capture students' imagination and interest, help them take control of their learning, and enable them to learn in meaningful ways. They want them to develop all the skills they need for success, including 21st century skills such as critical thinking and problem solving, and non-cognitive skills like tenacity, grit, and persistence, Robert (2000). To determine the extent to which the education stakeholders` expectations are met, an effective and efficient system need to be adopted to measure, record and report the performance of the students on a continuous and cumulative basis. That is in addition to the performance of other parties involved in the teaching and learning processes.

Besides the personal and social benefits, education is supposed to prepare people for the work environment in order to keep the legacy of the country alive. Knowledge is not the only requirement for the work force. Personal skills, behavior, and attitude are what makes a person, and should continue with him till the day he/she departs this world. Higher education and vocational training are working non-stop to measure their students' outcomes as part of their pursuant of accreditation and quality education. The only source of students for such institutions is our general schools. It is only logical that we start the process of measuring these outcomes and be able to electronically track our students learning process from their start. Education must change to prepare students for success in life. The modern global economy doesn't pay a person for what he knows, because the Internet knows everything. The world economy pays him/her for what he/she can do with what he/he knows, Andreas (2000).OECD (2012) refers to successful learner-centric schools as innovative learning environments, and states that they share seven important traits innovative learning environments:

1. Make learning and engagement central.
2. Ensure that learning is social and often collaborative.
3. Are attuned to learners' motivations and emotions.
4. Are acutely sensitive to individual differences.
5. Are demanding for all learners but without excessive overload.
6. Use assessments consistent with learning aims, with a strong emphasis on formative feedback.
7. Promote connectedness across subjects and subjects, in and out of school.

By naming these learning environments, The Organization for Economic Co-operation and Development (OECD) is actually encouraging more involvement and engagement of stakeholders and deployment of technology in the learning process. The use of assessment system consistent with learning aims is crucial for the success of the education system.

According to high level international sources education systems are crucial for the productivity and future prosperity of societies (OECD, 1998, 2000, 2012). The Human Development Report (UNDP/DGVN, 2013) relates the level of education to human development and documents relevant challenges for significant parts of the world. This supports the ambitions to optimally manage education in order to improve well-being.

For school systems, the benchmark for success is no longer to be better than last year, but to measure up against the best performing systems in the world in a continuous and consistent manner.

Statement of the research problem

Today, student assessment in most countries mainly focuses on knowledge and how students comprehend math, science, and interact with computers. The core qualitative skills that the workforce and societies are looking for are not reflected in any transcript or in any kind of student report. Also, the complete segregation between higher education and general education in skills measurements is not really helping. An accumulation of skill measurements from general education to the work force, going through vocational or higher education should be established. Although the assessment of student learning should form part the curriculum of school programs, many educational institutions do not make student assessment part of their teaching and learning routines. They pay attention to student assessment only when preparing for accreditation. It is only logical that we start the process of measuring these outcomes and be able to electronically track and accumulate our students learning process from their start. The field of education administration, as well, lacks comprehensive models and frameworks that perceive students assessment as a chain of continuous processes and part of the curriculum.

Aim of the study

This paper is intended to introduce a holistic and integrated framework for providing a model for continuous and cumulative assessment of student learning at the different levels of the education process.

Literature review

This section summarizes the reviewed literature relevant

to the study. The literature review is conducted with the following aims in mind.
1. To know and understand the previous studies in the field of education administration attempted to tackle the research problem. Hence, accommodate our study.
2. To identify the gap in the relevant literature and show how this study can contribute in filling such a gap. Hence, justify the need for our study.
3. To explore how the issue might be handled by theories developed in other disciplines and see how we can benefit from them in conducting an interdisciplinary perspective study.
4. To select the appropriate theories, concepts and variables to use as a platform for constructing and developing our framework.
5. To define and operationalize the main variables and factors which represent the main components and pillars of the framework.
6). To determine which theories are supported or challenged by the findings and the outcomes of this study.

Procedures for literature review

Based on the research problem, the relevant literature had been reviewed through the following steps:

1. Determined the possible and appropriate research perspectives to tackle the research problem.
2. Identified the key factors and variables (dependent and independent).
3. Identified key words (namely: education system, value chain, stakeholders, education technology, student's assessment system, and added value).
4. Searched the internet for scholarly academic material, such as journal articles, that have undergone peer-review before being published. The search covered two types of database:
(i). Full text: containing materials from one publisher;
(ii). Bibliographic: containing journals from a number of different publishers worldwide.
5. The main databases and indices relied upon include:
(i). ERIC – website: http://eric.edu.gov
(ii). The Global Value Chains Initiative (GVCI)- website :https://globalvaluechains.org/about-us
(iii). Science direct- website: www.sciencedirect.com
(iv). OECD education – website: www.oecd.org/eduction
(v). UNDP - website: www.undp.org
(vi). U.S. Department of Education – website: http:/ope.edu.gov
(vii). BPTrend – website: www.bptrend.com
(viii). Overseas Development Institute (ODI) - website: http://www.odi.org
(ix). Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ) GmbH – Website :www.giz.de/privatesector
(x) International Journal of Emerging Research in Management and Technology (IJERMT)- website: www.ermt.net
(xi). Fedena- website : Fedena.com
(xii). Intel Education Study= website: http://www.study.intel.com

The value chain perspective and meaning

This section starts with knowing and understanding the term (value chain) which is the main independent factor or variable that, with other variables (i.e. stakeholders` expectations and information technology), would determine the type and features of the students` continuous assessment system to be developed in education institutions and schools.

Porter`s value chain

According to Porter (1985), the processes and activities taking place within the organization can be looked at as a chain of processes and activities (value chain) which are adding value to the product or service including after sale services. Porter classified the value – adding activities into two main categories: primary and support activities. The primary activities include inbound logistics, operations, outbound logistics, Marketing and sales and services. The secondary activities include procurement, human resource management, Information technology and infrastructure (i.e. accounting, legal, finance, etc.). Figure (1) shows Porter's value chain model

Other perspectives to value chain

Other scholars have also defined value chain like Kaplinsky and Morris (2000) who defines the value chain as " the full range of activities which are required to bring a product or service from conception, through the intermediary phases of production, delivery to final consumers, and final disposal after use.' Stonehouse and Snowdon (2007) defined value chain as "Porter`s techniques for understanding an organization`s ability to add value through its activities and their internal and external linkages. It allows managers to identify where value is currently added in the system. Hence, where there is potential to create further value in the future by reconfiguration and improved coordination of activities." Lynch and Baul (2004) defined value chain as "The value chain identifies where the value is added in an organization and links the process with the main functional parts of the organization". Some of these ideas were applied to education by Pathak and Pathak (2010).

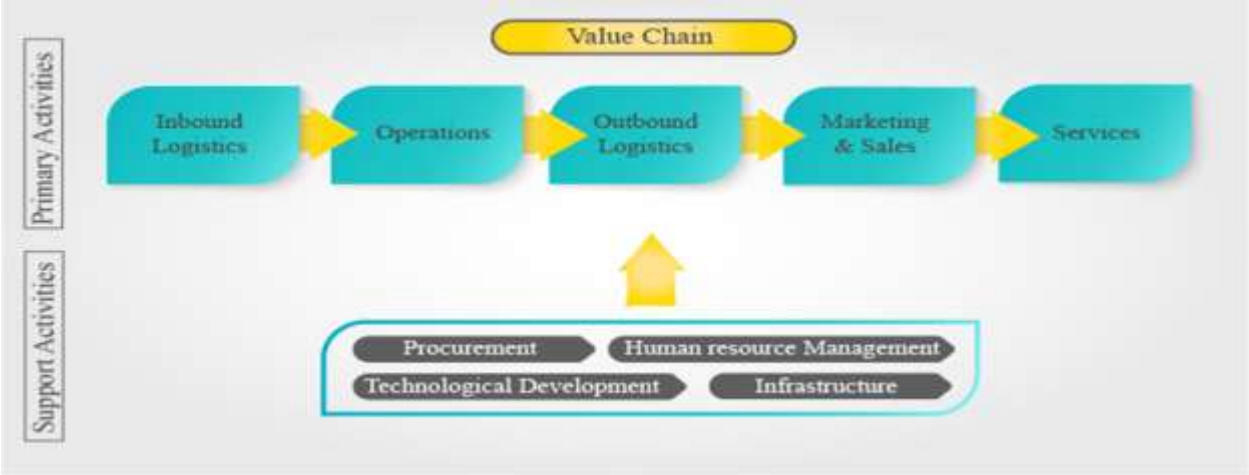

Figure 1. Porter's Model for Value Chain.

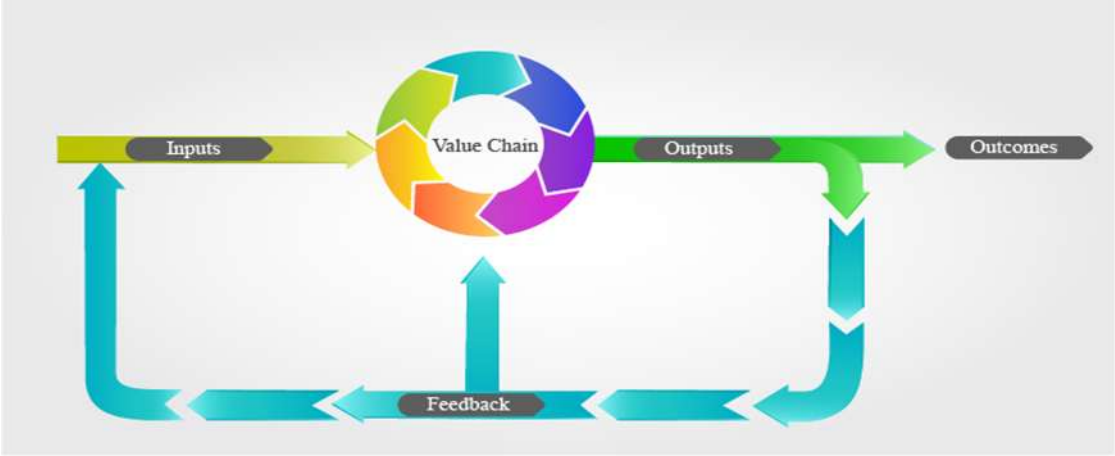

Figure 2. The general framework of value chain

They map and reconfigure the activities of Porter's value chain model within a single organization to a higher educational institution aiming to optimize the value added for the customers. Robert et al., (2013) take a broader perspective by using industrial value chains to derive skill maps for workforce development for selected industries. Figure (2) illustrates the general framework and concepts of the value chain.

Value chain perspectives: Studies in education and service sectors

Rathee and Rajain (2013) argue that the most important characteristics of a service chain is its clear integration with all functions that influence a company`s ability to provide services to its customers. The most relevant of these functions are sales and contract management, customer services and support. Many researchers have worked in the area of service value chain. These include Nooteboom (2006), Gabriel (2006), Thublier et al., (2010), Feller et al., (2006), Yale (2005) and lauridsen (2011).

Rathee and Rajain (2013) reviewed the following value chain models suggested to be applied in high education:

(i) Sison and Pablo (2000) model: This model suggests that although there is a seemingly infinite set of tasks that are performed in any modern – day University, these myriad tasks can be analyzed using the notion of a value chain. The value chain of a research university can be viewed as a network of activities centered on teaching,

research, and community service. These activities may be clustered into three major groups, namely, pre-education (Students recruitment), education, and post-education (graduate placement and alumni support).

(ii) Van der Merwe and Cronje (2004) approach: They introduced the “educational value chain” as a graphical tool that developers may use in re-engineering efforts to identify possible bottlenecks that are likely to occur, as well as providing a route to follow when determining the value added elements by technology. Further, support processes include those identified by Porter with student systems being the driving force behind technological innovations. E-learning and technology add value to the educational value chain even if it is not seen as a primary activity within the chain. The author determined that the value-chain approach for higher education can help detect where bottlenecks occur.

(iii) Makkar et al. (2008) framework: Calling their framework “value Co-creation model for Services”, these researchers illustrate necessary components within the higher education service industry with need to co-create value. Their perspective is that “When value is co-created it implies that both service providers and users are involved”. This justified in a context of considering the role of higher education, the socio-economic development of the country largely depends on the performance of our higher education institutions”. The value chain starts with investors` injection of capital, the service product designers who are often faculty or program creators, all service providers, staff and facilities, the infrastructure and supporting utilities, the target market of customers, citizens or people and those companies, communities or agencies that they belong to.

(iv) Pathak and Pathak (2010) model: They proposed reconfigured value chain in higher education in view of the paradigm shifts. Their model captures the increasing significance of support services, the emerging trend of teaching and learning in large part independent of the physical presence (that is, reducing level of contact). Marketing and sales service are considered part of the higher education value chain. Technology is regarded as an enabler as well as a creator of cost advantage and enhanced efficiency.

Depending on the business model, higher education institutions could identify the value drivers. The margins for each institution will depend on the configuration of the chain as well as the identified value drivers. Critical internal linkages and the paradigm shift are obvious as a lot of linkages are taking place between support services and primary services. In summary, the literature revealed the following points:

1. Most of the value chain based models contributing to the development of value chain in education focus on one level of education (i.e. higher education) separately from other levels of education. Hence, no attention is paid to the cumulative added value of education.
2. Few frameworks attempted to discuss the impact of involving the different stakeholders on the outcome of education.
3. Very little attention is paid to discuss the learning skills, knowledge and behavior expected to be acquired by the students at various stages in the education value chain and could be accumulated.
4. The frameworks and models developed to design value chain systems in education paid little attention to the assessment activities and processes needed to measure and evaluate the added value of education on a continuous basis.
5. Few frameworks identified technology as a primary activity in the value chain of education.
6. Very little attention is paid to the impact of social, cultural, regulations, national educational strategies within which the educational institution operates and how it can affect the development of the value chain, the desired outputs and the student’s assessment system.

METHODOLOGY

Background

During the last years, the authors of this paper are fully and directly engaged in the process of developing strategic plans and initiatives to improve and enhance the education system in Saudi Arabia at the general and the higher levels. The authors also have a long and rich experience in developing and implementing computerized solutions and systems for students’ assessment and for accreditation purposes in higher education institutions. Thus, the research problem addressed in this paper arose from a real world engagement. In view of that, the methodology adopted to tackle the research problem might appropriately explained, partially, in terms of phases through which the proposed framework was constructed.

Phases of the study

Phase 1

Theories and Concepts identification: for more than six months, the authors meet weekly wrestling with research problem and conducted brainstorming to clearly define its boundaries and discussing possible ways to deal with it. Although the research problem mainly relates to education administration and policy, the authors from the start realized the need for an interdisciplinary perspective. One way to do this is to think about how similar issues might have been informed by theories developed in other disciplines. Building theoretical frameworks based on the postulates and hypotheses developed in other disciplinary contexts can be both enlightening and an effective way to be fully engaged in the research topic” Frodeman (2010).

Based on Frodeman (2010) and other methodological views and perspectives, the authors initially thought about browning theories and concepts form disciplines other than education. Value chain

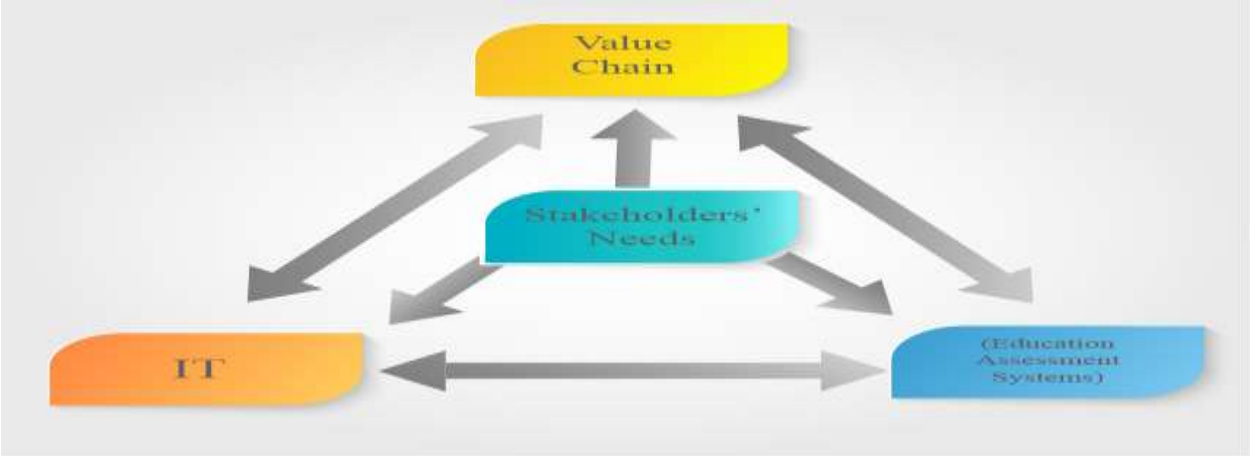

Figure 3. The conceptual framework.

was the first concept considered and then the stakeholders` analysis and expectation approach which are well-known and developed in the field of corporate strategic planning. Information technology is later considered as an additional enabling factor in developing a comprehensive and holistic framework.

Phase 2

Literature review: in this stage an intensive literature review was conducted to explore the existing theories in the field of education and business management. Studies applying the concept of value chain and the stakeholders` analysis and expectations approach were emphasized. The aim was to know any solutions or frameworks exist relating to the addressed research problem. By the end of this phase the main component and factors and the related concepts were determined and defined.

Phase 3

Framework development: in this phase the work embarked on determining and defining the main pillars of the framework and their substances and how they are interact and interrelate. The drafted framework has been presented and discussed over three meeting with professors in education. Their comments and remarks are reflected in the manuscript.

Conceptualization of the main components of the framework

Basically the framework developed is grounded on the interaction and interdependence between the value chain, students' assessment systems and information technology (IT). Stakeholders' and their expectations represents the driving and the independent variable in the framework. IT is a dependent variable enabling the interaction among the components of framework. Figure (3) illustrates the conceptual framework.

Education value chain

We suggest understanding the development levels of a student in the process of teaching and learning as a value chain with the pupil and student as the "object". This "object" will be developed in several different but consecutive institutions over several years. We aim to construct the development and education of students along a time perspective and put into context to reflect the impact of the surrounding internal and external environments. In this paper, we would like to address an education system as a multi-layered construct of various institutions that provide education. The system starts with kindergartens, as the first formal contact of a young person with institutional instruction. Then pre-school and primary school then continues with secondary education and vocational training. Increasingly higher relative shares of a cohort continue their education with one or two advancements in higher education and complete first college, then university degrees. After completing these education processes, the former student regularly enters the labor market and sometimes receives a professional education, either immediately or as an upgrade later on, e.g. as continuing education or "lifelong learning" concept. Figure (4) illustrates this education process as a value chain.

Stakeholders' expectations, needs and engagement

A stakeholder is an individual or group with an interest in the success of an organization in fulfilling its mission - delivering intended results and maintaining the viability of its products, services and outcomes over time. The typical stakeholders in education include: students, parents, faculty, teachers, employers, accreditation bodies, administration, regulatory authorities, investors, professional bodies, international organizations and institutions, international standards setters, academics, researchers, and the community at large. The stakeholders vary and might change depending on the level of education (i.e. chain) under study or focus. Stakeholders' engagement is about on-going collaboration focused squarely on what schools are there for - student learning - and about transparent dialog on the need that many schools face to improve student learning. It is not merely about involvement in social events, fund-raising efforts, or traditional involvement in activities such as parent training, homework assistance, and general volunteering. Stakeholders` engagement differs significantly across schools according to the school's location (Jenny et al., 2016).

Since different stakeholder groups will have different sets of

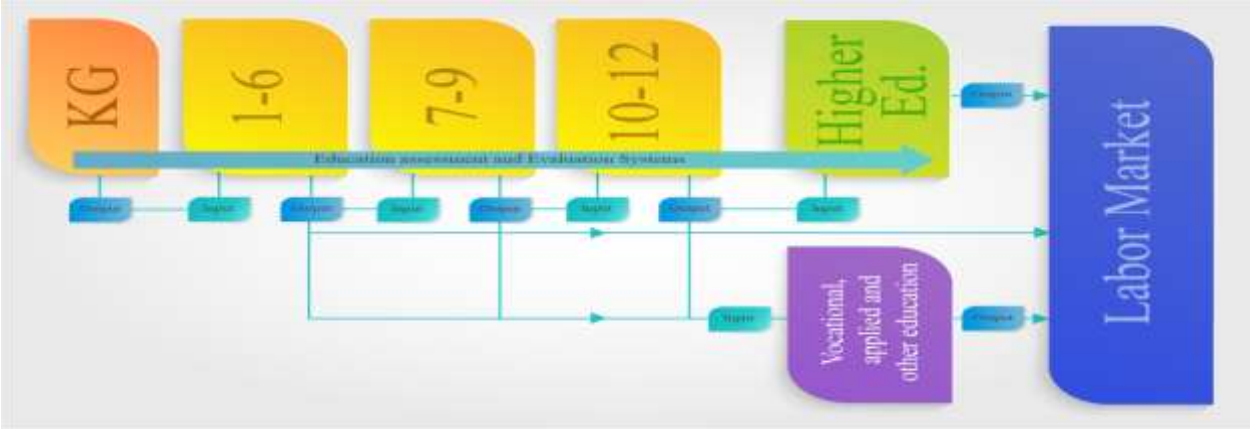

Figure 4. The education value chain

questions and concerns about education outcomes, it is wise to actively involve groups such as teachers, students, administrators, policymakers, parents, and community members in the planning and control processes. Working together, stakeholders can help enhancing education system`s effectiveness, efficiently and quality. The highest performance is found in the positive goal and task interdependence condition as well as more cooperative attitudes and greater personal social support (Andrea et al., 2016). Parents` engagement strategy adopted by higher education institutions would encourage students to decide to enroll in the marketed higher learning institution (Joseph and Ahmed, 2016).

Students' assessment and evaluation systems

Central to any type of education and at all levels (i.e. value chain) is the assessment of their outputs and outcomes focusing on measuring a stated objective (performance, behavior, or quality). The assessment systems use a range to rate performance which contains specific performance characteristics arranged in levels indicating either the developmental sophistication of the strategy used or the degree to which a standard has been met. The three functions of different types of students' assessment are:

Diagnostic: - to identify strengths and weaknesses.
Formative: - to provide feedback to students.
Summative: - to estimate performance for the purpose of (formal) assessment at the end of a course or unit of study.

In practice the types and functions of tests are not clear cut. For example, mid-course/unit formative assessments are often used as an element within multiple summative assessments. Educators have developed an extensive body of theory and an array of evaluation and assessment methods and techniques to assist in the identification of student learning styles and needs. Detailed and continuous evaluation and assessment is part of every educational program for student tracking students` achievement. The following are the main types of students` assessment and evaluation methods:

1. Grading systems.
2. Standardized tests.
3. Credit systems.
4. Experiential credit conversion.
5. Continuing Education Units (CEU).
6. Accreditation and quality assurance.
7. Rubrics.

Analyzing the types of learning which we require to take place has significant implications for the instructional design, assessment strategies and methods. Since assessment involves measuring it gives rise to problems in: Choosing a valid assessment instrument; finding a suitable unit of measurement; ensuring the test is measuring what it is supposed to measure and scorer reliability, especially if more than one marker is involved. Using valid statistical methods and drawing valid inferences from measures is vital.

Students assessment and Information Technology (IT)

Technology can be used for assessment purposes at various levels ranging from the management of the assessment information to a fully automated assessment system. Using technology for the management of assessment information can enable information to be presented in different ways to meet the needs of different audiences (such as teachers, students, course organizers and external examiners). Not only the quality of presentation of reports but more importantly the range and scope of their content can be improved by utilizing technology for this purpose.
Advantages in the use of IT for assessment include:

1. More frequent formative and summative assessment.
2. Staff can be alerted sooner to adapt their teaching.
3. Can spend less time marking.
4. Self-assessment; in the student's own time, at their own pace, when they are ready.
5. Increased student confidence.
6. Students like rapid results.
7. Electronic delivery of tests

Perhaps the most immediately obvious and most easily accessible use of technology to assist the assessment process is in the recording, analysis, general storage and management of results. A wide range of spreadsheets, statistical packages and database packages are available. Most of these packages readily accept the transfer of electronically stored data from other applications, aiding data acquisition and increasing the potential data analysis that can be carried out. Results from several assessments, courses or

modules can be collated quickly, easily and accurately for discussion at examination boards, and the volume of paper required for long term storage can be dramatically reduced. Further, any trends within the data can be fully explored, which in turn provides valuable feedback for the academic team. The use of electronic methods to store and manipulate data becomes pointless if the integrity of the data cannot be guaranteed. The manual entry of marks is particularly susceptible to error, time consuming and costly to check thoroughly. The use of data capture devices, such as an Optical Mark Reader (OMR) connected to a computer, can vastly reduce input errors, particularly the problem of number transposition on data entry

Once the student answers have been stored for a test, the responses can not only be scored but can be analyzed in a number of different ways, e.g. by individual question, groups of questions, all questions. Thus a variety of reports can be produced such as: the cumulative results of individual students; the results of groups of students including the mean, median and modal scores; graphs of results; analysis of each question including its reliability, facility value and discrimination factor.

Electronic assessment tools are unlikely to reduce significantly the burden of assessment, but they can be used to promote deeper and more effective learning, by testing a range of skills, knowledge and understanding over time. Using computers in assessment does not have to mean more multiple choice testing to the exclusion of other assessment techniques. A wide range of innovative assessment methods lend themselves to computer based implementation. Recognizing and appreciating the interdependencies and the importance of the simultaneous consideration of education as a value chain, stakeholders` expectations and needs and information technology, we can move to develop a holistic and integrated framework. The framework is to be applied in determining, measuring and assessing the continuous and cumulative core skills and knowledge acquired at the different levels of education (i.e. determine the cumulative added value of education to the student).The next section is devoted to construct and build up the framework. The framework proposed in this paper is not intended as a replacement for any existing education managerial tools. Rather, it provides a possible inclusive path for the strategic development and implementation of an effective and efficient students` assessment system.

The holistic and integrated framework for determining the cumulative added value of education

Pillars of the framework

The framework is built up of eight interrelated and interdependent pillars:

First, determine the educational level (s) targeted (i.e. pre-school, primary, intermediate, secondary schools, higher education).That is identifying the high level of the education value chain need to focus on. Then, identify the program under consideration within the education level.

Second, having identified the education high level of the value chain and the programs, the education institution(s) must be able to identify its key stakeholders. The starting point for deciding what to design, implement and assess is the answer to this question. Hence, decide what educational activities and processes needed: “Who are our [school/university/college] key stakeholders and what do they want and need?

Third, having identified the stakeholders and their needs and expectations, one can define the education targeted learning and teaching objectives and outcomes. Accordingly, the required education inputs processes (activities), outputs at the various stages in the education value chain system will be determined. This understanding will enable determining the specific knowledge, communication skills, reading skills, writing skills, interpersonal skills, technical skills, critical thinking, psychomotor, behavior. These knowledge skills and behavior represent the key success factors (KSFs). KSFs are the drivers of the learning and teaching which represent the focal factors or activities need to be closely planned and controlled to accomplish the targeted objectives. In turn, achieve stakeholders` needs, expectations and desires effectively and efficiently. As a definition, KSFs refer to “the limited number of educational activities in which satisfactory results will ensure successful performance for the students, course or program”.

Fourth, having identified the targeted learning and teaching objectives and outcomes within the value chain, the next step is to select the students to be admitted to the program. The students are the ‘object’ to be developed in several different but consecutive institutions over several years and whom/whose performance and output is critical for achieving the stated objectives and outcomes. Hence, determine the perspective(s) through which the assessment and evaluation system will be developed and implemented.

Fifth, based on the outcome of the previous stages, an educational institution need to determine the appropriate approach (i.e. strategies) to assess the performance and outcomes of the students enrolled. The approach (strategy) for assessment might be through grading, standardized tests, credits, credit conversion, and continuing education etc. The assessment and evaluation might be conducted by committee, peer- to peer, teachers, self- assessment, external examiners, employers, administration or by volunteer workers. A combination of approaches (strategies) might be adopted depending on the targeted outcomes and in the light of the following criteria:

1. Validity;
2. Comprehensiveness;
3. Reliability,
4. Objectivity;
5. Involvement;
6. Comparability;
7. Fairness;
8. Practicability;
9. Social responsibility.

Sixth, having selected the appropriate approach (es), tools, techniques and methods of assessment, the next step is to determine criteria and set standard for performance (KPIs). The performance indictors should be linked to desired outcome or key success factors (KSFs) (i.e. drivers) identified in stage (third) above.

Seventh, having identified the key performance criteria, descriptors, standards, and indicators (i.e. KPIs), what remains is to record and compare the actual performance against targeted outcomes. The stage is then ready to prepare reports determining variances, causes of variances and corrective actions to enhance performance in the future. Given the complex and knowledge based processes of education and the nature of knowledge transfer, feedback is an essential part of this process. Feedback from students indicates that the opportunity to work through questions is often considered to be very helpful in identifying areas of weakness in their knowledge, or in developing a confidence in their understanding of a subject. The computerized system should help tracking the performance of the student since kindergarten through all levels

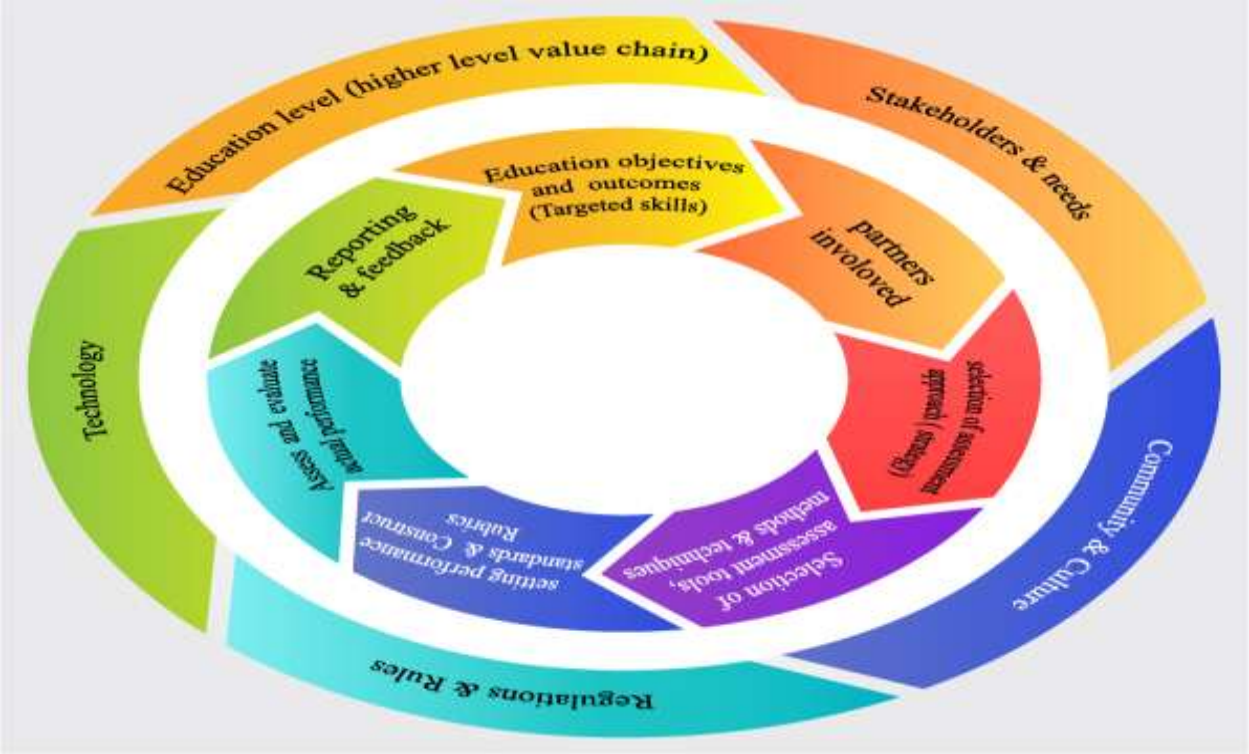

Figure 5. The Integrated Holistic Framework

(i.e. value chain) to determine the cumulative added value of education to every single student and at any time.

Eight, having developed the students` assessment system, the next step is to determine the sort of information technology (soft and hardware) and communication needed. The technology employed should fit all the activities and processes of the system. The system should provide the necessary information and reports for the various stakeholders. Background characteristics, self-constructs and school level variables can explain a large proportion of the variance in students' achievement, Anastasios et al., (2016).

The framework put into context

Of course, the education systems in general are subject of heavy regulation. But these regulations are influenced by various stakeholders. In addition social, cultural and economic factors contribute in determining the type of assessment system needed at different level of the value chain. That affect the required outcomes, assessment approaches, assessment methods, performance indicators, feedback and reporting. Accordingly, the framework pillars are put into context to reflect the impact of the surrounding environment in the design of the students' assessment system.
Figure (5) illustrates the integrated holistic framework.

RESULTS AND DISCUSSION

The main outcome of this study is the establishment of a holistic and integrated framework to be adopted in developing a continuous and cumulative students' assessment system. The framework is intended to help providing complete and cumulative information about the students' performance on continuous basis. Hence, contribute in enhancing the outcome of education at different levels of the value chain. Since it focuses on students, the framework would contribute to enhance the student-centered approach for teaching and learning. Thanks to the interdisciplinary perspective adopted in this study which enabled us to merges between education and corporate strategic theories and concepts and in developing such comprehensive and integrated framework. The methodology adopted in this study, we can claim is unique in that it helped in defining a problem from a real situation rather than from a hypothetical set up. The framework focuses on the simultaneous consideration of theories and concept form different disciplines and fields of knowledge in an attempt to provide a practical and simple solution which would not require gathering additional data or information. Most of the basic information required to build up the framework is, to a greater extent, available to the most of the education institutions. What is needed is a systematic analysis to the situation and put it into context of the surrounding environments.

All education institutions have a process for knowledge

transfer (education in a wide interpretation). More interesting from a value chain perspective are the outputs of the processes, the results of educational organizations. We could define a cross-impact and dependencies of education levels with stakeholders' need, education assessment systems and IT playing a central role in assessment and communication of outputs and outcomes. Ultimately, allow to observe how national strategic objectives are achieved. We can aggregate the data for each level and reconstruct a value chain for the education system in order to better understand the interdependencies between intangible assets of the whole sector as well as the relations between different levels of education.

Figure (4) suggests how a formal complete and integrated description of the education value chain and education assessment systems could be established. It cannot be assumed that all players in the value chain have a shared understanding, who their actual customer is, and what the customers' primary demands might look like. The impact of the surrounding environment on the design of students` assessment system is considered by putting the framework into context as shown in Figure (5).

The framework would provide teachers with data from formative assessments to identify learning problems and intervene in real time to optimize outcomes. IT also provides cost-effective tools to help increase collaboration, and build community trust through transparent communications.

Schools are complex systems. The incorporation of technology in the framework would facilitate sustainable progress. This means approaching technology deployment not as a device initiative, but as an education initiative. It means focusing on student learning and making changes across the educational system. We start by asking: What learning outcomes are we after? And then: Where and how can technology help us make that happen, especially in ways that it never could before, by facilitating new interactions and new supports. Educational technology initiatives also bring risks. Achieving the promise of technology requires more than simply deploying devices. If initiatives focus too much on technology and not enough on compelling usages that improve learning and teaching, the results will be disappointing.

Summary

The research problem addressed by this study focused on the students' assessment issue. Although the assessment of student learning should form part the curriculum of school programs, many educational institutions do not make student assessment part of their teaching and learning routines. They pay attention to student assessment only when preparing for accreditation. It is only logical that we start the process of measuring these outcomes and be able to electronically track and accumulate our students learning process from their start. The field of education administration, as well, lacks comprehensive models and frameworks that perceive students assessment as a chain of continuous processes and part of the curriculum. Recognizing the importance of the problem identified and the lack in comprehensive models or framework to tackle it, this study is devoted to construct a holistic and integrated framework for providing a model for continuous and cumulative assessment of student learning. An interdisciplinary approach was adopted by borrowing theories and concepts from corporate strategic field of knowledge merged with those existing in the field of educational and information technology. The study adopted value chain and stakeholders' analysis and expectations perspectives and the concepts of key success factors (KSFs) and key performance indicators (KPIs). Information technology (IT) is added and considered as enabling factors. The value chain perspective sees the educational system that accompanies students from early childhood to a job as continuous and interrelated, students centered, inputs, processes and outputs. Students are the 'object' on which the system is working. They are inputs and outputs of the system. The output of the first level (primary schools) becomes the input for the second level (secondary schools). Graduates from secondary level become input for the learning processes of the tertiary level and so on. The value chains perspective also applicable for students moving between grades within the same education level.

The holistic and integrated framework for developing and designing students` continuous and cumulative assessment system is based on eight pillars or stages. The road map for designing the system starts with identification of the main stakeholders and their expectations at the different education levels (i.e. value chain). Next, determine the desired learning outcomes in terms of knowledge and skills or, in other words, the learning drivers {i.e. key success factors (KSFs)}. Then, selection of the assessment approach (i.e. strategies), methods, tools, performance indicators, standards and criteria (KPIs). An appropriate computerized system should be deployed to ensure adequate, complete and timely records. Actual performance will be compared against standards or criteria in a continuous and cumulative basis to determine variances or deviations. Hence, provide relevant and timely information to enhance education system in terms of efficiency, effectiveness and quality.

CONCLUSIONS

Based on the results and outcomes of this study, the following conclusion could be reached:

- First, from a methodological point of view, it could be argued that the way in which the research problem been defined and tackled support the advocators of the interdisciplinary approach in research.
- Second, adopting the same reasoning followed in this study, local, national and global education value chain could be developed depending on the nature of the education institution, its collaboration and cooperation with other institutions and its surrounding environment.
- Third, from a practical and policy maker's point of view, the resulted outcomes (i.e. the framework) would enhance the students` assessment system. Ultimately, improve the performance of the overall education systems at the different levels and in the various education institutions. However, the following main benefits of the framework could be named:

1. Support students` centered – learning theory.
2. Encourage stakeholders' participation and evolvement.
3. Enhance effectiveness of education (link to desired outcomes).
4. Improve efficiency by employing technology (save time, effort) .Hence reduce cost.
5. Improve quality.
6. Provide relevant and timely information.
7. Enhance fairness and equity in evaluation.
8. Since talking about continuous and cumulative added value, thus enhance sustainability improvement (i.e. continuous cycle of innovation and improvement).
9. Enhance and Support the reality of lifelong learning.
10. Enhance creativity and innovation.

- Fourth: The education and learning tasks, activities and processes are challenging and interconnected, requiring strong collaboration among multiple stakeholders. Yet all are necessary, and a failure in any area can weaken the educational impact of the whole system. Success requires ongoing, long-term effort aimed at new goals, new approaches, and new ways of thinking about problems and opportunities.

Policy implications

Based on the methodology, outcomes and conclusions reached from this study, the following implications might be signaled out to the education policy makers:

1. To ensure the effectiveness of the education system, students` assessment system should be developed as an integral part of the curriculum rather than stand – alone system.
2. The students` assessment system need to be developed through the value chain and stakeholders` expectation perspectives.
3. The teaching and learning technology deployed should fit and enhance the implementation of students` continuous and cumulative assessment system.

Further research

The framework developed in this study represents the starting point in the effort to design and implement students` continuous and cumulative assessment system. More work is needed from researcher to:

1. Test the usefulness and the applicability of this framework in a real set up.
2. Develop more specific local, national and global education value chains and clusters in the context of the surrounding and different environments.

Conflict of interest

The authors have not declared any conflict of interest

ACKNOWLEDGEMENT

We would like to show our gratitude to Professor Mohyeldien Magzoub - King Saud bin Abdulaziz University for the Health Sciences and Professor Abuzar Al- Jelly – University of Khartoum for their valuable comments that greatly improved the manuscript . We are immensely grateful to Ghadah Al-Ghamdi – Tatweer Education Holding Company for her assistance in designing the charts. We also thank the reviewers for their insights and suggestions that improved the manuscript.

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