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Digitalization of Transitional Learning Culture as an Institutional Framework for Knowledge Enhanced Industrial Economy

W. M. Shatona¹, B. Sharma²

wilkashatona@gmail.com ¹, info@iama-india.org ²

¹ Faculty of Art, Computing & Creative Industry,
Sultan Idris Education University, Malaysia.

² Professor and President, International Academic and
Management Association, Gurugram, Haryana, India.

Abstract

Advancements into efficient knowledge of digital infrastructures and their applications environment is a fundamental institutional framework for inculcation of innovative ideas that are suitable for enhanced knowledge of modern industrialization requirements. This competence maximization measure is necessary to fill perceived knowledge application gaps that are crucial in modern economic and industrial development. Consequently, there are challenges and pockets of resistance that are defined in this study as extrinsic and intrinsic factors to full digitalization of the transitional learning process. These factors delineate the digital natives from the digital immigrants and creates the opportunity for a community of digital citizens who are vested with the needed acumen to exploits technology possibilities beyond human perceptions. In order to optimize the gains of this community of digital frontliners, this paper examines the road blocks and structural constraints that has for a long time inhibited meaningful progress in the integration of ICT into all stages of cognitive learning, especially at the intermediate transitional stage in Africa and most of the developing world. On the basis of the findings of this paper, we posit that conscious and deliberate government and institutional efforts are necessary for the operational and efficient implementation of well-articulated digital enablement policies of State institutions. Thus, progress towards modern industrial and economic development is significantly dependent on early bridging of the perceived technology gap that resulted from the poor knowledge and application of digital infrastructures.

Keywords: *digital citizen, transitional learning, futuristic economic stabilization, integration of ICT, policy administrators, institutional factors, infrastructural contingencies, conceptual framework, dimensional components, structural relativities.*

1. Introduction

Transitional learning deals with intermediate processes of knowledge acquisition within the limits of structured public policies on education and human development. It is a policy framework that recognizes the final impacts of knowledge to industrial economy and societal development. When properly harnessed, transitional learning could be used to inculcate the ideals of national development under a well articulated program or curriculum or learning. Thus, it is a tool that can be used by top policy makers to initiate and implement strategic public policies that has potentials for long term planning, socio-economic development and futuristic stabilization. Transitional learning is thus directed at the intermediary ages of human development, where zeal and zest match timing and opportunities; and are further driven by perceived ambitions for achievements of set goals in cases where guidance and mentorship is fundamental.

Thus transitional learning opens a gale of opportunities that could be utilized to mold the minds of youngsters in the direction of early realization and activation of inherent potentials. Digitalization of this learning aptitudes thus imply the conscious articulation of processes and infrastructures that has the capacity for reorientation and mind stabilization of the learner; thus resulting the widening of opportunities for diversified application of the knowledge gained. Further, the process of digitalization of the intermediary learning conditions also create a possible foundation for a culture of continuous improvement and innovation which enables the learner to prepare for a future digitally driven economy.

In furtherance of the foregoing, institutionalization of this framework within the ambits of public policy directives also serves as the cerebral link to a digitally enhanced knowledge economy that has the capacity to sustain the growing pace of industrialization. At the heart of this process are industrial policy administrators whose training and experience attest to their passion for secured future of their nation states.

As would be seen in this paper, the roles of digitalization of transitional learning by way of public policy directives and support for appropriate ICT integration into the learning process at the intermediate age; would unveil the conscious efforts of developing states in the deliberate transformation of their limited human capacity and resources. This transformation drive in the face of abundant naturally endowed assets, aggregate to a pool of individual entrepreneurs with a mindset for successful international competition in terms of production of goods and services. Although the study focused on current digitalization of transitional learning practices in Namibia and other parts of Africa, its finding is a clear representation of what applies in most developing nations, if reliance could be placed on the divergent views expressed by various scholars whose studies on the subject matter were consulted.

2.0 Factors Influencing the Integration of ICT in Intermediate Schools

In support of the incidental factors that enhance transitional learning in middle age schooling, the paper shall view some crucial learning conditions that can strengthen public policy drive on the issue. These conditions shall be treated as influencing factors. Further, the factors shall also be viewed as supporting elements for the development of national digital economy. Implying that attitudinal changes in teachers and support staff are paramount to the determination of processes required for the integration of ICT into middle age educational framework.

Incidentally, other non-teacher factors are also equally important to explore; since successful integration of any knowledge cantered technology into classroom work warrants careful planning and depends largely on how well policymakers understand and appreciate the dynamics of such integration within the defined scope of application. Consequently, and as we shall find in the paper, controllable factors include computer application and appreciation competences, practical training, school or administrative support and teacher's theory of teaching and learning. These factors affect the learning process and further makes integration of ICT deliverables a difficult concept. In addition, as would be seen in this paper, less controllable factors include age, gender and teaching experience. This means that there are other controllable factors that are necessary for the actualization of the digital learning educational policy.

a. *Intrinsic Factors*

2.1 Age as an Intrinsic Factor Within the Scope of Digital Natives and Digital Immigrants

Intrinsic factors are those elements of learning that are internally inherent in humans. They are natural conditions of human cognition for which different age groups may portend different experiences and attitudes towards emerging technologies including ICT. In this regard, a study by Isleem¹ in Ohio public schools, asserted that *specialized applications* have the tendency of increasing the complexity of innovation which is required for technology to thrive. This view is in agreement with the findings of Rogers theory of diffusion², that complexity is a practical hindrance to adoption of technology. Although this concern indicated a negative predictive value in terms of age of learners in comparison with attendant complexity of the process, the results here are in consonance with Sahin-Kizil³, who showed that there was a negative correlation between the age of learners and teachers' attitudes towards ICT integration.

Consequent on the foregoing, Samak⁴ was of the view that young teachers are more biased towards the use of ICT than older teachers. In terms of how age influences ICT integration, the results have been variegated from one study to another. For instance, in a study in Malaysia Alazam *et al.*⁵ found out that age influenced ICT integration, thus implying that younger teachers had higher ICT skills than others. This information is very crucial to public policy administrators in the sense that a good understanding of social demographics in terms of application of the intrinsic factor of age to the appreciation of the relevance of ICT integration in modern learning conditions could redefine the policy priorities of the administrators. In a study in Namibia made by this author, capturing teachers in the age groups from 33 years to 57 years, it was found that the least experienced teachers had higher levels of ICT skills. A plausible explanation to this phenomenon, especially on how age influences ICT integration in the learning process could be found in the works of Peeraer & Van Petegem⁶, which found that there are *ICT natives*; these class of persons are born in a digital world, with active *digital immigrants* who were born before ICT took a foothold. Consequently, Hashim⁷ concluded that *digital natives* have greater ICT adoption and integration skills.

In view of the foregoing, it is noteworthy to mention that some studies have posited the idea that age does not influence ICT integration. In this line of reasoning, in studies conducted in Vietnam and Saudi Arabia respectively, Peeraer and Van Petegem [7] and Saleh Mahdi and Sa'ad Al-Dera⁸, pointed out that there is no significant influence of gender or age on ICT appreciation for integration. However, Peeraer and Van Petegem also cautioned that, the study of the influence of age and gender on ICT integration is a challenge that most research has failed to reach an agreement on. A similar finding of age having no significant influence on ICT integration into learning was reported in Nigeria by Jegede⁹, that higher education teachers in Nigeria did not find age to affect the time used on ICT. However, it is important to note that sample sizes and the methodology of these studies varied for very obvious reasons, for instance in a study by Saleh Mahdi and Sa'ad Al-Dera [8], there were 46 participants while for the Malaysian Study 346 participants were recorded [5]. This wide gap in terms of population study has a significant impact on the general findings of the respective studies.

2.2 Gender Confidence and Attitudinal Relativities

Gender confidence is a cardinal intrinsic factor that depends on gender complexities and orientations. Incidentally, studies have delivered divergent views on gender conditions, to which end, Alazam *et al.*, [5] Saleh Mahdi, and Sa'ad Al-Dera [8], pointed that male teachers possess higher levels of ICT skills than female teachers. In contrast, Jegede's study [9], averred that gender has no significant difference in ICT integration. Consequently, it is a widely held view that, although it may not be true, that men

are better inclined to use and appreciate ICT than women, it may be a fact that the feminine gender do possess some reluctance to try a new thing at the early stage and this fact may play some roles in the learning process at certain points. In this respect, the fact in issue is not the *ability level*, but the *confidence level*.

Given this line of thoughts, Shashaani & Khalili ¹⁰, points out that it turns out to be an issue of confidence, and the young women under their study are less confident in using an unknown computer application. This appears to be a natural approach to the female gender. On the other hand, Sadik ¹¹, identified the role of attitude, that male teachers have a more positive attitude with computers than female teachers who manifested high levels of anxiety in their attitudes towards computer and ICT in general, Samak [4] was also of this opinion. Instructively, in an earlier study, Chen (1986), observed that men have lower computer anxiety than women, perhaps due to the inherent adventuring instincts in men. In view of these findings, no study has conclusively indicated women's inherent incapability of learning to use the educational ICT applications.

2.3 Teaching Experience within Digital Learning Perceptions

Studies have shown that age and teaching experience are highly correlated, this important finding implies that policy implementation administrators are required to be guided by this all important view. Moreover, since age is negatively associated with ICT integration in teaching, it is more likely that teaching experience may also have a negative correlation with regards to ICT usage when deployed as a tool in teaching. This position was part of the findings in Samak's [4] work in 2006. Additionally, Albirini ¹³ posited that teachers that were advanced in age were discovered to possess lesser optimistic attitudes towards computers and digitally related learning and were less willing to integrate ICT into classroom learning conditions compared to new and fresh teachers. Conclusively, along with many studies in this respect, Kihzoza *et al* ¹⁴ opined that ICT integration is configured by many factors such as tutors' and teacher trainees' skills, available classroom technology integration and optimization competencies, etc.

The foregoing views notwithstanding, it should be noted that knowledge, beliefs and attitudes can build a sustainable culture that supports ICT as integral to teaching and learning. This view is not only supported by top administrative approach to diffusion of policy initiatives, it is characteristically relative to the findings that teachers with low ICT skills are likely to be slower in technology dissemination. Similarly, it should be noted that teacher's trainees with low technology preparedness face many hurdles in technology integration. Consequently, in a 2009 study, Yuksel *et al* ¹⁵ conducted an examination of "ICT skills, usage and perceptions of teacher educators." The data were obtained from 111 learners, and six learners were orally interviewed. The findings indicated that that most participants shared optimistic views towards ICT being implemented into teacher education programmes, implying that they are willing to deploy ICT applications in the learning process. Constructively, ICT competencies are usually very appropriate for learning.

Further, it is also important to note that teachers' perception of the value of technology affects ICT integration. These perception enthusiasts according to Mama and Hennessy¹⁶ were grouped into *constructivists* (that is the group that supports the use of ICT) and the *subversives* (the group that are apprehensive of the use of ICT). The interrelationship of the findings indicates that there is a positive correlation between resource person's perception and ICT integration. The crucial lesson here for digital policy stakeholders is the fact that irrespective of the varying perceptions and orientation of the teachers, the overriding interest of the learners in digitally driven economy should be paramount to policy administrators.

2.4 Influence of Learners' Backgrounds and Attitudes

The study observe that the background and socio-economic status of the average learner is an important factor that influence digitalization and ICT integration into learning conditions. In support of this understanding, in a 2016 study, Osakwe *et al*¹⁷ reported that teachers' perceptions towards ICT usage were positively disposed to policy implementation; in that regard and impliedly, there was a high usage of available ICT resources to aid in learning and teaching in the areas of their study of interest. Since learner's background is an important factor in their appreciation of the gains attainable from digitalization of learning and ICT integration, then the economic, socio-cultural barriers to ICT integration are more recorded in developing countries and have more negative impacts on the advancement of digital economy in those countries. Relatedly, in addition to the background and status of learners, Capuk¹⁸ emphasized that the personal knowledge of learners, social problems, social perceptions and cultural environments are important issues in to be considered by policy administrators in planning for digitalization of learning processes viz-a-viz ICT integration into learning process.

Pursuant to the foregoing, in a 2017 study in Spain, Flores *et al*¹⁸ found that female learners from high-class upbringing and backgrounds had higher ICT usage and awareness. The importance of this finding is that introduction of learning platforms could be integrated in such environments with significantly higher social awareness. Further, policy administrators are reminded that the fact that in situations where learners' perceptions of ICT usage are positive there will be high ICT integration with lesser costs and budget in train-the-trainer initiatives. Incidentally, Kordaki²⁰ reported that in some instances, learners' ICT usage is reduced to playing of computer games. This means that, in order to stimulate a better ICT integration benefit, there is a need to consider specific levels and nature of learner's previous knowledge with respect to ICT deliverables.

b. Extrinsic Factors

3.0 Skills and Competence

It is imperative to note that scholars and theorists who have undertaken studies in this line of knowledge have observed that instructors' ICT competences come from continuous training. Even though there are ICT skilled instructors and teachers, some may not know how to integrate ICT to credible instruction in the classroom. The correlation between training and teachers' attitudes towards ICT was positive as shown by Samak [4]. Consequently, an earlier study by Sadik [11] supports these findings by Samak; but however opined that, statistically trained instructors or teachers have greater positive attitudes toward ICT use and integration. Further studies have indicated that, as a professional development program it was essential to build the ability of educators and teaching staff to teach effectively, including the implementation of ICTs into to the rank or subjects they taught. The crucial concern of this view to policy administrators is that of long term planning within the confines of the strategic objectives of the State or institution.

Further, Flores [19] observed that, there is a need to invest on teacher training for the purposes of ICT integration into the leaning process. The importance of this view, border on the relative application of experiences acquired during the training and how these experiences could be articulated to achieve greater results in the drive for an optimized knowledge based economy. Consequently, inefficiency in teacher training coupled with low support for teachers' continuous learning hinders digitalization of knowledge acquisition processes and ICT integration. In this regard, the importance of teacher training to the advancement of digital culture is underscored on the basis that training

provides the teachers with the much-needed skills for ICT integration. Furthermore, Kordaki [20] observed that teacher training is essential, given the dynamics of varying ICT applications.

Substantially, Yasak & Alias²¹ found that effective use of ICT is achievable if training starts in the pre-service period. This view is crucial to the policy makers on the grounds that effective pre-service conditions helps the administrators to significantly evaluate the budget, resource availability and deployment conditions. This practical situation is also important to the in-process training and teacher assessment which significantly impacts on the learning process. Thus, in circumstances where school budgets are significantly constrained, Kreijns²² averred that, there is the likelihood of lower staff training.

As a concern of the policy administrator, all ICT instructors and teachers must be frequently trained and engaged in ICT inclined orientations as this practice enhances continuous efficiency in the application process. This means that teachers who are already familiar with ICT applications can apply for upgrade training or refresher course. In this line of reasoning, Ngololo²³ has argued that lack of pedagogical competencies can be solved through professional development. Although this view is a general perception for personnel development, suffice to say that an effective national digital migration effort would significantly rely on such an activity for positive results. In addition to Ngololo's views, notable scholars and administrators such as Tondeur *et al*²⁴, have noted that technology integration is hampered or hindered by low school capacity to deal with ICT integration; this means that non-availability of ICT infrastructures such as computers, networks, internet connections and power breakdowns are utilities that are crucial to effective ICT optimization.

3.1 Computer and ICT Competences

The study found that computer and ICT competences is an indication of how a person has mastered computer literacy and proficiency in using computers. In this regard, Gobbo and Girardi²⁵ in their study of twenty-four teachers from Italy indicated that competent teachers made greater use of ICT in their teaching activities more than less competent teachers. The implication of this finding is that teacher ICT competences are directly proportional to digital learning models. Thus, high computer and ICT competence will benefit users' self-efficacy, reduce the anxiety of using computers and encourage a positive attitude towards the use and ICT integration. Incidentally, Isleem [1] indicated that a positive correlation exists between computer competence and teachers' attitudes towards ICT. In an older study, Honey and Moeller²⁶ found that high-tech teachers adopt computer-based technologies in their classroom while low-tech teachers are reluctant to use information technologies.

An application of the foregoing view was drawn by Kitschner and Davis²⁷ who pointed out the following competency requirements for instructors in ICT education utilization. These are; personal use of ICT in instruction, mastering educational and assessment paradigms that make use of ICT in instruction, making use of ICTs as mind and teaching tools, understanding the policy dimensions of ICT use in the teaching system.

3.2 Teachers' Theories of Teaching as Applicable to ICT Migration Capacities

It should be noted that to the professional administrator, personal theories of teaching determine teaching methods, including how and what to teach. Thus, as observed, the Honey and Moller [26] study indicated that teachers who hold learner-centred beliefs tended to use computer-based technologies in their teaching practice. This means that instructors and teachers whose belief is teacher-centred are less likely to use computer technology in the classroom. Thus, policy

administrators believe that if teachers are made to have a better understanding of how computer-based technology transforms teaching outcomes with less effort to produce better results, their attitudes or perception may change. In this vein, a study in Namibia by Simon and Ngololo²⁸ indicated that teacher skills and attitudes; ability to serve as a role model; understanding of learner needs; versatile approaches to curriculum and lesson structure; different forms of classroom interaction with learners, along with the use of ICT and evaluation, are important components to ICT administrators and policy makers.

3.3 School Support and Leadership in ICT Development

Studies have indicated that most of the times, institutions of learning may procure computers and yet may not be able to use them for several months due to lack of qualified manpower or technician to perform the installation, train the users and implement maintenance procedures. In this regard, administrators of schools are required to incorporate these professional components into the strategy for policy actualization. This could be achieved by organizing of professional activities such as seminars, workshops, and conferences to encourage professional interactions among teachers and then use the occasions to implement the ICT installation strategy. It is further suggested that the more these activities happen, the more likely they will use computers in their teaching practice. However, it is interesting to note that in some cases the provision of all the technological resources does not automatically result in successful ICT integration. A case in point is found in the study of Kenyan schools which was conducted by Tondeur *et al* [24]; where the schools were provided with expensive digital equipment, but with little or no support for teachers; eventually, the ICT integration did not meet its set targets.

In the foregoing regard, the leadership of a school and its knowledge capacity is crucial in the integration of ICT; because, for successful ICT integration there is a real need to elevate ICT to the status of other subjects of leaning rather than making it an appendage of other subjects.²⁰ Thus, in this regard, according to Wart *et al*²⁹ leadership roles range from leadership adoption of processes that enable continuous learning, to recommendations for; and active support for ICT integration. This means that as a key policy observation, ICT integration requires resources and, in most cases, the leadership is tasked with decision-making on resource allocation. In addition, type of leadership and the nature of organizational structure influence ICT integration. As should be expected, Giotopolous *et al*³⁰ posited that in a decentralized decision making process, there is likely a better result for ICT integration, giving the fact that an effective school leadership support system play a pivotal role in ICT integration.

3.4 Influence of Institutional Factors

At the national and regional levels, for instance, in Namibia's tertiary institutes, Wambui and Black³¹ argued that low ICT integration is blamed on the non-availability of an official policy that regulates its development and implementation. Thus, the lack of such a policy complicates the monitoring and evaluation of the implementation of ICT policies.

To the contrary, French and Jordanian educational systems, are cited as examples of combinations with a comprehensive ICT policy that resulted in high ICT integration.²⁴ Thus, the discrepancy in education policy implementation with respect to ICT integration also indicate that education policies are constrained by vocational or economic rationale and orientation.²⁴ Thus, such policies do not represent a strong understanding of the societies of learners and teachers, and thus the attitudes of

ICT users and non-users. In some cases, ICT policies do not provide incentives for achieving desired ICT integration.

4.0 Infrastructural Contingencies and Conceptual Framework Incidental to ICT Integration

The study finds that critical digital infrastructures play an integral role in the integration of ICT into educational learning. Thus, ICT infrastructure can be divided into hardware and software.¹⁹ Hardware includes equipment such as computers and projectors; software includes intangible items such as Microsoft Office software. A study in Spain by Mama and Hennessy¹⁶, reported that the majority of teachers who participated in a study considered school with adequate infrastructure as a great opportunity for them to integrate ICT. This point goes to show that *where there is continues policy implementation, structural changes would always enable positive results.*

Pursuant to the opinion expressed above, the infrastructural relevance of the conceptual framework illustrated in figure 1 below, expresses the rationale behind the views of this study; and thus indicates the framework for the determinants of both the independent variable and dependent variable. On the independent variable, there is ICT Integration in education, on the dependent variable there is the intrinsic and extrinsic factors as well as the institutional environment that inhibits the progress.

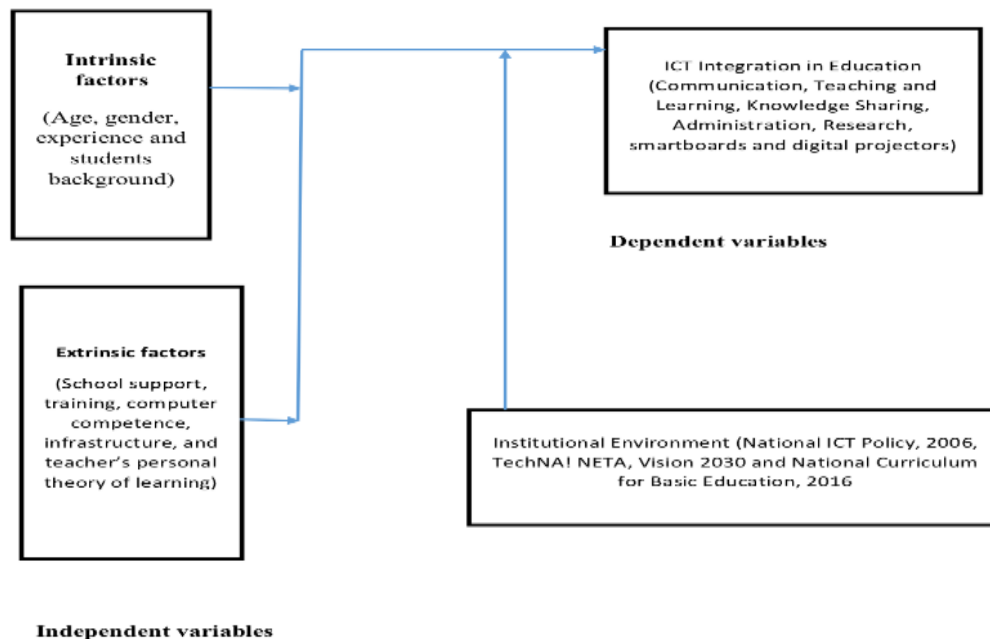


Figure 1: Conceptual Framework for Infrastructural Contingency
(Source: adapted from Gakenga, Gikandi and Kamau³⁴)

All identified variables in the conceptual framework on Figure 1 above are as informed by a review of the related literatures. Thus, figure 1 indicates that ICT Integration in education is determined by both intrinsic (less controllable) and extrinsic (controllable) independent variables as well as institutional factors at the state level, implying that official policy on ICT adoption should be a top priority government function. In this regard, intrinsic variables include age, gender and teaching experience. While extrinsic variables include training, computer competence, teacher's theories of teaching and school support. The conceptual framework presents the two factors that are instrumental when it comes to teaching and learning whereby both the intrinsic and the extrinsic factors have to be rightfully taken into consideration in the integration of ICT.

Intrinsic factors:

As could be seen above, intrinsic factors cannot be manipulated and cannot also be influenced directly.⁶ In view of this position, different age groups may have different experiences and perception towards technologies particularly ICT. No studies indicating women's inherent incapability of learning to use the educational ICT applications have been identified, but it is widely held, even though it may not be true, that men are better inclined to use and appreciation of ICT than women. Age and teaching experience are highly correlated and it is more likely that teaching experience may also have a negative correlation concerning ICT usage in teaching. Welfare generally differs across places, and incomes of people affect the amount of support given to the local schools.

Extrinsic factors:

Teachers' ICT and computer competence comes from training. Generally, competent teachers make greater use of ICT in their teaching more than less competent teachers. Thus, personal theories of teaching, determine teaching methods; how and what to teach. School support through provision of technicians to help with installations, training, maintenance skills and organizing professional seminars has a bearing on ICT adoption in teaching.

Institutional:

Finally, the lack of an ICT policy may complicate the regulation, monitoring and evaluation of the implementation of ICT programs in education.

4.1 Dimensional Components of ICT Integration and Teachers' Attitude

Based on the study conducted on 169 teachers within a Namibian Secondary Schools District, by this researcher, Spearman correlation was used to assess the relationship between ICT integration and teachers' attitudes and Table 1 below resulted.

Table 1 Spearman Correlation Coefficient, 'Q1'

Spearman ρ	No.of obs	Prob> t
0.2558	169	0.0008

Source: Survey output data from the study

As could be seen from Table 1 above, the test of H_0 : "I use the computer as a tool for demonstration working with presentations, I have made myself (e.g., PowerPoint)" and "I would like to know how the ICT integration system increases school competitiveness and reputation" indicated a Spearman's ρ correlation of 0.2558, which signposts a positive monotonic relationship so we can conclude that a greater strong agreement with ICT integration in the education system is associated with a positive attitude towards its adoption.

Thus, Prob> |t|=0.0008 of the output presents the two-tailed statistical significance (i.e., p-value) of the Spearman correlation coefficient. This implies that for this question, Spearman correlation coefficient is statistically significant because $p=0.0008$, which is less than $p<.05$ (a common threshold for statistical significance). Further, Table 1 findings above fit into Figure 2 plot below indicative of positive balance in the scatter diagram.

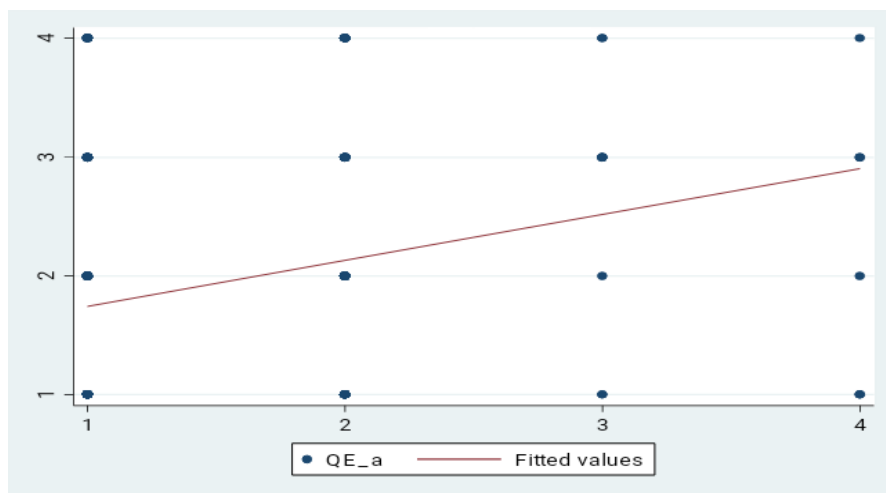


Figure 2 Scatter Plot of ICT Integration and Teacher Attitude (Source: Survey output data from the study)

4.2 Structural Relativities of ICT Integration and Teachers’ Perceptions

In furtherance of this study, a Spearman correlation coefficient was tested to assess the relationship between ICT integration and teachers’ perceived value of ICT benefits. Thus, the test of H_0 : “there is no significant correlation between teacher’s ICT skills and factors in ICT integration” produced the result of Table 2 below:

Table 2: Spearman Correlation Coefficient, ‘Q2’

Spearman, ρ	No. of obs	Prob> t
0.2500	169	0.0010

Source: Survey output data from the study

Table 2 above indicate that the Spearman ρ of ‘Q2’ is 0.2500 and points to a positive monotonic relationship; so we can safely conclude that a greater strong agreement with ICT integration in the education system is associated with instructors or teachers perceived value of ICT and its applications. Hence, Prob> |t|=0.0010 of the output presents the two-tailed statistical significance (i.e., p-value) of the Spearman correlation coefficient. Thus, Spearman correlation coefficient is statistically significant because $p=0.0010$, which is less than $p<0.05$ (a common threshold for statistical significance).

As could be seen from canvassed literatures above, teachers’ perception of the value of technology affects ICT integration was grouped into Constructivists- that is the group that supports the use of technology and the Subversive, the group that feared the use of ICT.¹⁶ In line with our findings, Kim *et al*,³² drew a conclusion that there is a positive correlation between teacher perception and ICT integration. Under this contextual framework, Jones and Preece³³ announced that both learners and instructors need to figure out how to trust the value of technology innovation for mechanical execution to improve the take-up and diminish protection from innovation. Consequently, industrial educators were certain and equipped in utilizing different ICT instruments to manufacture their trust in the innovation.

In view of the foregoing, a scatter graph in Figure 3 below indicate that the relationship displayed in the scatter graph plot is positive and monotonic. This serves to validate a very important assumption for the Spearman Rank-Order Correlation test.

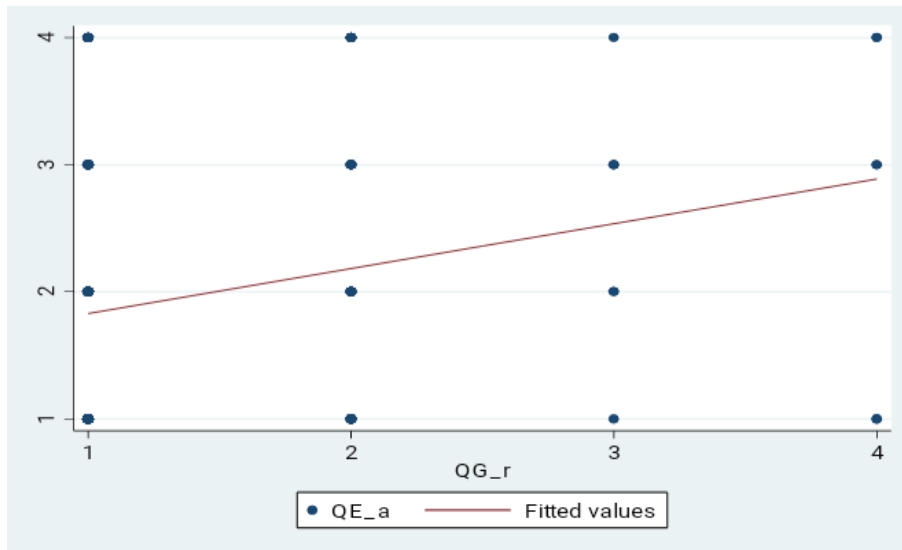


Figure 3. Scatter Plot ICT Integration and Teacher Perceptions (Source: Survey output data)

4.3 Heuristic Adaptability of ICT Integration for Teachers ICT Skills Evaluation

A Spearman's correlation coefficient was used to evaluate the relationship between ICT Integration and Teacher' ICT skills. The test of H_0 : "there is no significant correlation between teacher's ICT skills and factors in ICT integration", yielded the result below:

Table 3 Spearman Correlation Coefficient, 'Q3'

Spearman, ρ	No. of obs	Prob > t
0.3201	169	0.0000

Source: Survey output data from the study

Spearman's ρ of 0.3201 indicated a positive monotonic relationship so we can safely conclude that a greater strong agreement with ICT integration in the education system is associated with teachers' ICT skills. Thus, the Prob> |t|=0.0000 of the output presents the two-tailed statistical significance (i.e., p-value) of the Spearman correlation coefficient. Thus, Spearman correlation coefficient is statistically significant because $p=0.0000$, which is less than $p<0.05$ (a common threshold for statistical significance).

These findings thus agree with Kihiza *et al* and Tondeur *et al*, who showed that ICT integration is configured by tutors or teachers' trainee skills, classroom technology integration and competencies of technology use and other related resources. This information is crucial to industrial administrators whose specialized function in this field is to structure the study curriculum on the basis of this understanding.

In the foregoing regard, the study found that expert preparation and improvement allude to numerous kinds of instructive encounters for the teachers in the learning and application of new information and skills that will improve educator's personal work. Most likely, preparing an expert advancement program for educators would enable them to have chances to gain more knowledge and skills. Additionally, such projects will guarantee that educators will be up-to-date on training data acquisition and execution of emerging training models; and that educators are brought in tune with innovations and relevant digital assets that help in the improvement of learner instruction activities.

The preparation that is provided for by the government will create a platform for instructors to overhaul their abilities and information skills set; which will enable the sharing of information with appropriate users while interfacing with the most recent changes in the instructional field. As should be expected, instructors' dispositions and aptitudes had impacted on their discernment on training and decided their instructing style. Subsequently, the component of ICT has been incorporated as one of the transformational moves in the Namibian education blueprints.

The following Figure 4 is a scatter plot that helps us to visualize the direction and integrity of the tested hypothesis.

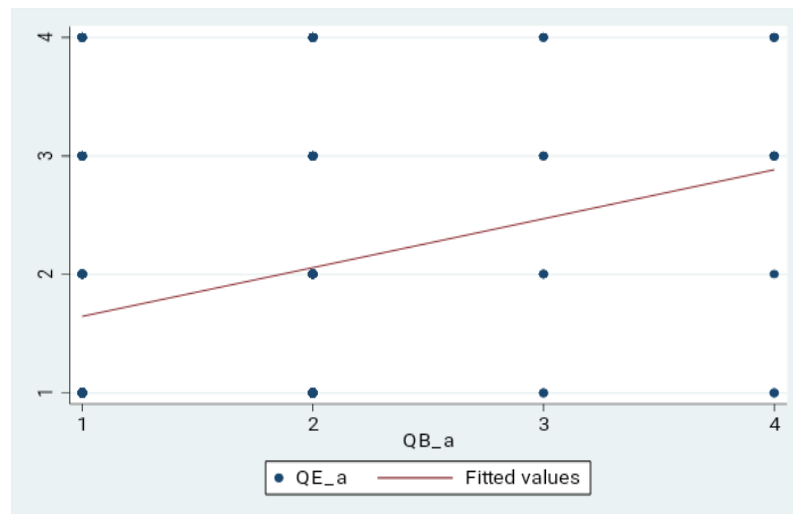


Figure 4. Scatter Plot ICT Integration and Teachers Skills Competencies (Source: Survey output data from the study)

Conclusion

It was important for the study to identify various literatures that relate to the subject matter. The generally positive findings of teacher technology preparedness as discussed above would seem to augur well for national broadband policy objectives. However, as the study shows, there are clearly some requirements for teacher training and empowerment that need to be addressed, if the teaching and learning objectives would be actualized. More than half (and in several cases substantially more than three-quarters) of the teachers surveyed indicated that they felt discomfort with respect to:

- i) the challenges inherent in teaching learners through ICT;
- ii) their ability to solve the technical problems that will inevitably arise; and
- iii) having the necessary personal ICT skills to use ICTs for learning and to create artefacts

All three elements need to be addressed through teacher training if the intermediate school system are to succeed under emerging global knowledge economy. The identification of these three elements is

a practical contribution that this research offers to understanding how to optimise the use of digital technologies and ICT in rural schools.

As discussed, there are compelling digital natives and digital immigrants who are required to have functional and critical thinking skills and well positioned to make comparative gains from emerging knowledge based digital economy. In this regard, basic reasoning aptitudes and data management education in addition to media and ICT proficiency is crucial to modern educational development, since they form the kernel of ICT integration into intermediate and middle age learning. Consequent on this, policy makers and educational administrators are required to empower the digital natives and specialists in order to secure those practical and basic reasoning abilities. This indicates that instructors and teachers in intermediate or transition school environments must be competent in the use of ICT platforms.

Thus, they should be set up to furnish their understudies with technology-supported learning chances, to help understudy the learning process. Thus, considered views of scholars in this field have indicated that under *creative education*, it is essential for all instructors to meet the instructive needs of the new ages. They have likewise discovered that teacher's technological competency is decidedly identified with the execution of their *inventive education ideologies*. In view of this situation, educators must be capable of utilizing ICT in their group exercises to improve instruction and learning process. The study hence focused on teachers' characteristics on ICT adoption but we also found out from good number of scholars that support systems at teaching institutions such as from the School Administrators and Principals are equally important in the digitalization of learning conditions, general ICT integration and continuous application.

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