Disruptive Technology of the Banking and Finance Market: Pedagogical guide to its labour design.

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ABSTRACT

The paper critically examines the elementary drivers of the technologically driven financial market, with a special focus on the fragile financial market, and evaluates the expected impact of emerging disruptive technology of the fourth industrial revolution. It then proceeds to make a subjective proposition of policy framework and pedagogical guidelines required for its successful management under a sovereign economy. The phenomenon under study resulted in a theoretical proposition of a labour competency and assessment index model to assess labour capacity of any technologically driven industrial market.

***Keywords*:** Disruptive Technology, Banking and Finance, Labour Capacity, Policy, Pedagogy

***JEL Code*:** O17, O25, O31, O32, O33, O35, O38

A. BACKGROUND OF STUDY

The term 'Disruptive Technology' according to Christensen (1997), is a phenomenon by which, an innovation does transformations to an existing market or sector by introducing simplicity, convenience, accessibility, and affordability, where complication and high cost are the status quo. The paper therefore submits the three major reasons resulting in the promotion of disruptive technology of any economic market, which are;

i. When the business model introduced, enable low-end customers or new segments of customers to patronize.

ii. When the quality demand of the value network presents prosperity to the network of suppliers, customers, and distributors.

iii. When the disruptive technology has the ability to grant affordable and accessibility of product to a wider audience.

As Vassallo (2020) did argue, disruptive technology is undeniable the top list drivers of the unprecedented changes in the business performance today. In the financial market, a new emerging operating model by "Automations", which is a unification of multiple technologies, including advanced analytics, clouds application, Block Chains, Machine learning and others, is leading the financial institutions to shift from traditional processing to strategic partnering. Consequently, championing a financial institution to the future by desisting from, providing reactive answers to unforeseen problems, but rather holding the ability to deliver predictive insights to drive economic growth. It is further observed that the leading driving forces of disruptive technologies in the financial market are as follows;

- Block chain and Distributive Ledgers in Banking System
- Machine learning and Financial Market
- Banking and Finance Process Automation
- Cloud Technology and Financial System

[i] Block Chain and Distributed Ledgers in Banking System:

This type of disruptive technology promotes a growing list of records called blocks linked together using cryptography, time stamp and transaction data, which makes it resistant to modification of their data, once recoded. And typically managed by a peer-to-peer network for use as a publicly distributed ledger and considered secured by design. The effort of this technology is to replace the traditional ledger account format, with a digital ledger, consisting of transactional records called blocks across many computers, so that any involved block cannot be altered retroactively without the alteration of all subsequent blocks. Which allows participants to verify and audit transactions independently and relatively inexpensively. Which has become an answer to solving a long standing problem of double spending as argued by (Catalini and Gans, 2016: Armstrong, 2016).

[ii] Machine Learning and Financial Market

This type of disruptive technology deals with the application of computer algorithms that can improve automatically based on experience by the use of data. It builds a model based on sample data in other to make predictions or decisions without explicitly programmed to do so, as submitted by (John, R. et al,1996). In its application across business problems, machine learning is also referred to as predictive analytics.

The use of Machine learning helps to detect anomalous items such as bank fraud. Rule base Machine learning helps to discover regularities between products in large-scale transaction data recorded by Point-of-Sale systems in supermarkets to guide accurate decision making.

[iii] Banking and Finance Process Automation

Alkhaldi (2021), did argue, human error in the financial sector results in 25,000 hours of avoidable work on an average per a firm, and costs $878,000 per year. Therefore, the emergence of the robotic application is to augment human efforts by automating repetitive

manual processes, and allowing the employees to focus on more critical tasks to gain a competitive advantage. On this very basis, the adoption and implementation of intelligent automation through an addition of artificial intelligence technology, enable the robotic process automation to handle complex processes by understanding human language, recognize emotions and adapt to real-time data. This helps firms scale operations seamlessly when needed, saves time, cuts down expenses, minimizes IT department interference in main business operations, increases human employee efficiency and reduces human error. The Robotic Process Automation is currently useful in the area of report generation, Accounts payable, Mortgage processing, Customer Management and Fraud detection in Banking and Finance system, etc.

[iv] Cloud Technology and Financial System

Cloud Technology defined by Partha Pratim (2018), is the on-demand availability of computer system resources and computing power, without direct active management by the user. The technology relies on sharing of resources to achieve coherence and economies of scale. The use of certain features of Cloud technology, like Clouds software services, Mobile back-end services, Server-less Computing, which all helps to facilitate quick online financial services with minimized infrastructure cost. The downside is that a firm may have limited customization options, when relying on public clouds to deliver cheap services under economics of scale.

[v] The Relevance of the Study

This very study is essential on the reason that the advancement of any economy by disruptive technology could be successful and sustainable under the condition of quality labour force serving as a fulcrum in discharging such services. And the consideration of human resources development for the labour market never emerges in a vacuum, but is guided by quality pedagogical instruction from the Center of higher learning. The essence

and foundation of this study is to theoretically outlay policy architecture and pedagogically framework to address the demand to the labour design for the disruptive technological transformation of the financial market, with a special focus to the fragile economic system.

B. LITERATURE REVIEW

Bruckner, et al. (2017) put forward that, out of their findings, the estimates of the share of jobs at risk of being automated vary widely, and can reach staggering numbers of over 80%. And further argued that Artificial Intelligence (AI) and other new technologies will continue to benefit higher skilled workers, with a high degree of flexibility, creativity and strong problem-solving and interpersonal skills.

The study further observed that the low and medium skilled workers, both in manual and cognitive jobs, are expected to face further pressures from capable machine learning and AI software's. Which must be emphasized, in any economic system, the technology replaces certain tasks rather than complete occupations, and sometimes creates new jobs that demand a new set of skills from workers. The study further advances that both job destruction and job creation are determined not only by technological feasibility, but also of the economies, legal, regulatory or socio-political factors as pose by (Brucker et al, 2017).

The technological challenges also contribute to a shift away from the traditional work arrangements to 'contingent work'. Which basically, increases work flexibility and gainful employment opportunities. And results in non-standard work arrangements that cause workers to bear employment and income risks. The author hereby puts forward, what is described as the fourth industrial revolution, is a quantification of different technologies and 'Capabilities' that could become transformative for almost any industry, and every country. And therefore, expect such technological innovation especially within the

financial market, will enhance productivity of workers and create new forms of product and markets, thereby generating new jobs with entirely new professions to emerge in the longer run. With such expected shifts benefiting high-skilled workers, with a high degree of flexibility, creativity, strong problem-solving and inter-personal skills.

The author posits that the influence of technology on economies is not preordained and could be shaped by policies at the local, national and even at the global level. Hence, the role of government policies and institutions is eminently crucial. (Geeds, 2005) predicate that technology, institutions and society tend to evolve together. And argued, technology becomes transformative when they evolve into General Purpose Technologies (GPTs) that enable productive gains across many sectors of the economy. (Bresnahan and Trajtenberg, 1995) pose, past waves of industrialization have been associated with pervasive GPTs, which resulted in growing returns-to-scale. The breakthrough in many areas of technology is spurred by the growing ability of Artificial Intelligence to autonomously solve complex problems, as submitted by (Davis, 2017). The current possibility has emerged due to increasing computational power at decreasing costs, rapidly growing datasets via its development mechanism, and advances in deep machine learning algorithms. Evidence of the past revolution indicates that the combination of the new technologies and the conditions that allow their widespread use, play the cardinal role in the transformation of labour market and social structures (UN DESA, 2016).

The World Economic Forum has characterized Artificial Intelligence (AI) as the cornerstone of the Fourth Industrial Revolution. With (Schwab, 2016) asserting that the growing ability of software-based systems to mimic aspects of human intelligence is a historic development in the automation process. So whereas the first industrial revolution; the steam engine was applied to tasks that require muscle power, the AI of the fourth industrial revolution has been applied to tasks that require brain power. As argued in the

works of Bruckner et al, (2017), AI has been used commercially since the mid-1990's to assist in a variety of decision-making tasks, such as fraud detection. However, progress in AI as at 2010, is driven by the confluence of the following factors;

- Growing availability of large datasets from commerce, social media, science and other sources
- The development of better Machine learning, algorithms and techniques
- The Increase in computational power

(Aron, 2015) present that 'AI' algorithms have outscored humans in identifying objects and faces in two popular tests. Acknowledging the fact that, technology places a major role in the replace of human labour for certain tasks. In an extreme scenario, widespread automation enabled by advanced technologies could cause unemployment and social upheaval. However, the net effect on the labour market conditions does vary depending on the type of technology, the speed of its diffusion, country-specific conditions, policies and institutions. (Mokyr et al, 2015) submit a historical evidence of the 18th Century industrial revolution and established that the greater use of computers and robots, enabled by technological progress, facilitated the creation of new products and services. And as a result, uplifted productivity and GDP growth, and created new occupations on a large scale. However, evidences suggest, the actual impact of technology change in jobs does depend on the economic response to change in labour and capital cost, as well as industrial characteristics, trade policies and Institutional conditions.

Reports across countries and regions of the world suggest that the service sector as in general, exhibited the most dynamism, encompassing a diverse range of jobs. While highly skilled-intensive services jobs such as ICT, computer systems design, finance and other business services have generally been on an increasing trend, their share in the overall

employments, remains low particularly in developing countries. The greater use of computers during the digital revolution has further shifted job requirements towards more cognitive attributes, de-emphasizing the physical skills. As observed, it is very difficult to separate the effects of technology from that of other structural shifts, such as changes in Institutional systems and social norms, the globalization of production and markets, labour, education and tax policies. While evidences indicates, technological progress has contributed to job destruction over the two centuries, new technology has helped to create jobs, many of which are in new sectors and industries. Which evolve skill-sets demand by the labour market. Bessen (2016) adduce that, new technologies substitute workers only in specific tasks, but do not necessarily eliminate entire occupations. He further argued, only 270 occupations listed in the 1950's US census have been eliminated by 2010 due to automation. Rather than eliminating occupations, technology changes how jobs are performed and the number of humans needed to carry them out.

(Acemoglu and Autor, 2011: Cortes, Jaimovich and Siu, 2016) empirically classified tasks under technological changes along two dimensions; 'manual' versus 'cognitive' and 'routine' versus 'non-routine'. (Autor, Levy and Murnane, 2003) described 'routine tasks' as the tasks that are based on well-understood procedures, and can be described by clear rules and algorithms. 'Non-routine tasks' by contrast, require flexibility, creativity, complex problem-solving or human interaction. Technological advancements in the past decades, which is in the area of computer processing speed have primarily led to the automation of routine tasks. This has led to a decline in occupations that mainly involve routine activities both manual and cognitive.

Stewart et al. (2015) posit that in recent decades, there is an increase in demand for workers that perform non-routine and cognitive tasks particularly in knowledge-intensive industries, with a special emphasis on management consultants, business analysts and

information technology managers. The above kind of jobs, have been among the fastest-growing occupations in England and Wales in early 1990's.

Since 1980's employment has shifted away from middle-wage jobs, towards both high-wage jobs and low-wage jobs. This "hallowing out" of the middle wage distribution was extensively documented for the United States (Autor, Katz and Kearney, 2006: Acemoglu and Autor, 2011). With the same report documented for the European countries by (Goos, Manning and Salomons, 2014).

In the developing countries, the concern is shifted to the impact of technological progress on the informal sector, which dominates in terms of employment in such economies, particularly in the rural areas, household- enterprises and small scale producers and service providers, where informal employment is most prevalent. A concern with the new waves of technological change has been raised in relation to the impact of automation in production, which may lead to the displacement of workers in formal occupations, thus, increasing the incidence of informality and precarious work arrangements. In succinct response to such concerns and anxiety (Garcia-Murillo and Valez-Ospina, 2017), submit that information and communication technologies can make an important contribution to expand the scale of production among house hold enterprise, and small scale firms, leading to the creation of new businesses. La Porta and Shleifer (2014) further advance, an extensive use of ICT can contribute to the expansion of the formal sector and consequent decline of the informal sector in both relative and absolute terms. Which was further put forward by (Senzu, 2021) on the adoption of technology to promote financial inclusion to indirectly shrink-out the informal sector enterprise-financial transactions, creating the chance of informal household businesses formalizing their enterprise operations.

C. METHODOLOGY OF THEORETICAL DESIGN

This section of the paper discusses the methods that set out the framework, and guide towards the theoretical design in the concept of policy framing and pedagogical guide for the 'developing financial' market, as well as required labour competence and assessment metrics for the fourth industrial revolution of financial systems. Steiner (1988), put forward, theory that meets certain standards is knowledge. And knowledge however, is recorded of knowing as the body of expressed true beliefs. Therefore, theory can be fact as well as true. (Sekeran, 1984) posits, the hallmarks of highly esteemed social science research are the development of, and the reliance upon, sound theory, which is necessary to ensure rigour and believability. Theory building as a formal scientific process is relatively rare, even in the more matured social science study (Bourgeois, 1979). The formal notion of grounded theory building in the social science field is a little over four decades old. The landmark work has been published by Glaser and Strauss (1967). (Abend, 2008: Swanson, 2013) pose that theories are formulated to explain, predict and understand phenomena, and in many case challenge and extend existing knowledge within the limits of critical bounding assumptions. Therefore, the theoretical framework is the structure that can hold or support a theory of research study; it introduces and describes the theory that explains why the research problem under study exists. Jacard and Jacob (2010) assert that theory should be seen as a conceptual basis for understanding, analysing, and designing ways to investigate relationships within social systems. Alan and Randy (2005) thereby argued that methodology should meet the following two criteria;

- Most appropriate to achieve objective of the research
- It should be possible to replicate

(Brown, 2006) advanced further, methodology is a philosophical framework, which the research is conducted or the foundation upon which the research is based. Therefore, the method adopted for the theoretical construct was inductive reasoning, but under a careful observation of phenomena underplay, within the universal laws of society and the behaviour of its people. With the interpretation of such natural phenomenon adhering to the principles governing hermeneutical traditions as argued by (Denzin and Lincoln, 2005) that interpretivist approach rooted in dialectical and hermeneutics is based on the belief that knowledge claims by individuals about social reality are socially and mentally constructed. The paper thereby seeks to uphold a 'surrogate model' as it is a methodological concept in the phenomenon of study; relying on the definition of 'surrogate' by Maki (2018), which he argued that such a model is a simplification structure, which attempts to match some complex reality, and can be judged by the degree of resemblance it achieves to the real world.

THEORY OF POLICY FRAMEWORK AND PEDAGOGICAL GUIDE FOR THE DEVELOPING FINANCIAL MARKET

The purpose of this sub-topic is to propose two thematic theoretical concepts for disruptive technology emerging within a developing financial environment, which are

i. Disruptive Technology and Policy Framework for the 'developing financial' market.
ii. Disruptive Technology and Pedagogical framework for the 'developing financial' market.

[i.] Disruptive Technology and Policy Framework for the developing financial market

Although technology, as a major force of disruption, is the main engine of productivity growth, however, its impact on the labour market especially the financial market and to

some extent income distribution, ultimately depends on the Institutions and Policies that are in place at the national, as well as the global level. (Mazzucato, 2013) posits, Government plays a crucial role in fostering innovation-led growth as a catalyst, not only as a facilitator.

Government being a facilitator requires creating an environment to ensure the development adaptation and diffusion of new technologies appropriate to their own country context. Therefore, to institute an effective policy framework and measures, the following guidelines are required;

- The State should initiate policy support of National and Private Institutions of Research and Innovations.
- The State is to make provision of relevant infrastructures to direct the technological eruption.
- The State should initiate policy support to business incubators that enables start-up firms to bring new technologies to the market.
- The State should initiate policy support to facilitate networks of firms and non-state actors towards a unified productive system.
- The State should institute a policy for effective subsidies or tax incentives for consumers as preferential regulatory measures to promote adoption and diffusion of new technologies.
- The State should adopt the skill of sector-specific policy design as technological upgrading, as well as policy targeting.
- The State should promote a policy of antitrust, and lack of competition among firms.

- The State playing a crucial role in educational policy, should address the adaptation of education curricula that reflect the skills demand of the near future on a timely basis.
- The State should engage in proactive policy initiatives to address the consequences of new technologies, in other to reduce vulnerabilities and expand the social protection system.

[ii] Disruptive Technology and Pedagogical framework for the 'developing financial' market

Educational systems and training centers must prepare workers to be flexible and, to develop new skills in response to rapid changes brought by new technologies. Which should be grounded in a policy to hire and retain quality educators, proper funding to educational institutions, and high standards of student achievement assessment and measurement mechanism. Furthermore, adopting standard methods to distinguish students who have the capacity and skill for lifelong learning from the others, to guide in instituting educational support policy targeting. Below are the outlined measures and frameworks for a National pedagogical design;

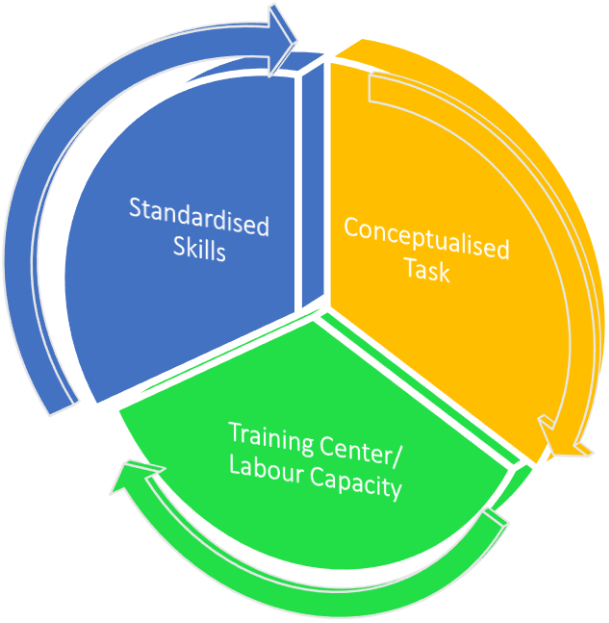
- The State should be committed and proactive in the policy design of public expenditures on active labour market programmes in a form of training and job search.
- The State should engage in educational incentives and policy initiatives to strengthen the right of workers in a non-standard work arrangement through legal and tax reforms.
- The State should initiate an educational systems and policy mechanism that ensures that new emerging technology of the global level is proactively

employed within the context of the local economy towards sustainable development to thwart away it potential disadvantages.

D. THEORY OF FOURTH INDUSTRIAL LABOUR COMPETENCY AND ASSESSMENT INDEX MODEL

This section of the paper examines what constitutes labour competency and the mechanism of assessment as a model index to address realistic challenges of the labour market performance, which is an attempt to resolve the gab that the human development index [HDI] fails to address under the emerging fourth industrial revolution. Leonard (1999) argued that the widely accepted concept of labour competency defines the effective ability to perform fully identified labour activities successfully. Therefore, the theoretical essence of this section of the paper is to establish a model to define the elements that constitute competency in the labour market for assessment and indexing. Below is the proposed structure of the model;

Fig. E1.
Labour Competency and Assessment Index Structure



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DEFINITION OF MODEL INDICATORS

- **Conceptualized Task**: This indicator examines the activities and requirements of workers, together with the skills, knowledge, aptitudes and responsibilities that are required from the worker to accomplish the task. Therefore, well conceptualized tasks towards a standardized skills requirement are rated as (1.0) and further termed by this paper as [high-job-responsibility] in assumption, while a weaker task definition with poor industrial clarity and expectation of labour requirement is rated below (0.5) will be termed by the paper as [low-job-responsibility] as a proportional estimate.

  Below is the prescribed scale structure;

  - Standardized Task (ST) = (0.8-1.0)
  - Average Standardized Task (AST) = (0.5-0.7)
  - Unstandardized Task (UT) = (0 – 0.4)

CT ……..Eq.1

The paper propose that to measure the conceptualized task of a labour market in the context of unstandardized to standardized should range from a probability measure of (0 -1.0)

- **Standardized Skills Computation**: This indicator examines workers with a higher degree of flexibility, creativity, strong problem solving and inter-personal skills. This index factor, will depend on the qualification level of the candidates and time period of schooling established as Educational Index (EI).

$$(EI) = \frac{\left(\frac{EYSI}{18}\right)+\left(\frac{MYSI}{15}\right)}{2} \quad \text{…….Eq.2}$$

MYSI – Mean Years of School Index

EYSI - Expected Year of School Index

UNESCO Institute of Statistics (2010)

In the computation of (EI), the paper will propose the assumed 'Mean Years of Schooling' [MYSI] should be pegged on 25 years. While the 'Expected Years of Schooling' [EYSI] is required to be pegged on 23 years in fragile economic settings, however, in the real structure modelling, the statistician could express disparity based on actual factors of the country's understudy.

- **Training Center [Labour Capacity]**: This indicator for the purpose of the model design, examines the Candidate University, which he/she graduated from through the QS world ranking, using the raw percentage score allocated for the training center. This method should only be adopted, as proposed in this paper, when the candidate is fresh to the labour market, with no experience and historic market performance to rely upon to conduct the labour capacity assessment.

  However, when the candidate serves the labour market for a minimum time period of three (3) years, the candidate's labour market performance is historically measurable and eligible to be used for the computational analysis, as an appropriate and alternative method in replace of the QS University ranking metrics for labour capacity assessment. And the methodical process is evaluated as follows;

  The four major elements to be relied upon for assessment of labour capacity are defined below and obtained from the labour market via the employer or the institutional appraisal of the candidates.

  Therefore, the Minimum Expected Working Years for computation of candidate labour capacity should be pegged at (3) years under a probability estimate of the factors below;

  - Flexibility [FL] = (0-1.0)
  - Creativity [CR] = (0 -1.0)
  - Problem Solving [PS] = (0 -1.0)

- Interpersonal Skills [IS] = (0 – 1.0)

Under [Labour Capacity] measurement two methods are adopted depending on prevailing conditions as outlined above;

[**Method-one**]

The measurement of Labour Capacity of a candidate depends solely on the [**Quantitative Ranking**] of the Employee graduated College under a global score, in the percentage converted to a probability score from (0-1.0). That means if a college scores 40% on the Global ranking, the graduated potential employee is credited with the 40% as (0.4) labour capacity performance, as a probable estimate of performance prior to entering the job market. It must be noted, there are some colleges, which are statistically unranked due to performance at the global level, when their percentage rate of ranking passes below 20%. Such Colleges could be computed with an average hypothetical rate of [0.1] to replace a Labour Capacity Performance Index of the potential employee prior to entering the job market, holding the assumption of being an alumnus of that College.

[**Method-Two**]

The measurement of the Labour Capacity, in fragile economic settings; having the candidate served not less than three (3) years of working experience within such a market, with a probable historical labour performance of the market attainable through Institutional performance appraisal reports, then the Labour Capacity assessment will be computed with the model below as;

LC……. Labour Capacity Measurement

FL……..Flexibility performance of employee at the Job market

CR…….Creativity performance of employee at the Job market

PS……..Problem Solving performance of employee at the Job market

IS……..Interpersonal Skill of employee at the Job market

Ω ……..The minimum years served at the Job market by the employee in the period of assessment.

All these units of appraisal assessment will be computed with the below developed model termed by this paper as 'Employee Capacity Measurement'.

$$LC = (FL + CR + PS + IS)\left(\frac{1}{\Omega}\right) \text{ ……..Eq. 3}$$

The paper thereby arrives to the final computation model of the *Labour Competency and Assessment Index* (Ψ) as follows;

CT……Conceptualized Task Index of Employee

EI……..Educational Index of Employee

LC……. Labour Capacity Index of Employee

The model proposes that the entire lifetime employee labour history of performance and competency should aim towards a probability scale of [1.0] from [0] of no working experience.

Hence, the computation model of the *Labour Competency and Assessment index* of a disruptive technological environment is presented as;

$$\gg \boldsymbol{\Psi} = \left(\frac{\mathbf{1}}{\boldsymbol{CT+EI+LC}}\right)(\boldsymbol{\Omega}) \text{ ……Eq. 4.0}$$

Though the model and its computational analysis could be effective and useful as *Labour Competence and Assessment Index* (LA) of any sovereign economy, to the extent of assessing any industrial sector. However, the paper's foremost priority was to address the concern of the technological waves of the financial market in the developing economies, with the model's utmost intent to examine the labour competency drive in the emerging

disruptive technological environment. The above proposed Equation (4) could also be called under this paper as (Employee Competency and Assessment Index)

E. CONCLUSION AND RECOMMENDATION

For a developing economy to productively operate successfully, and sustainably in economic performance amidst disruptive technology, requires that the government set out the infrastructure and operational mechanisms that could easily and proactively conceptualize any emerging technological waves at the global level to the national advantage. Such an effort requires a competent set-up of implementation institutions, quality policy designs and quality high learning institutions to guide the labour market to develop an appropriate skill-set. Finally, the effort of government to prioritize its funding in Research and Innovation as a complimentary incubator for the labour market beyond the mainstream academic process of students' development.

As the disruptive technology emerges in an economy for greater benefit, it must be anticipated that it is associated with some level of disadvantages to the labour market, which the paper further recommends, inquiry be made into the phenomenon of social protection and welfare distribution of non-standard workers of firms in developing economies.

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