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EFFECT OF 4TH INDUSTRIAL REVOLUTION ON ACCOUNTING INFORMATION: A SURVEY OF ACCOUNTANTS IN BIDA METROPOLIS

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Abstract

This study established a link between industry 4.0 and accounting information as expressed by Accountants in Bida Metropolis of Niger State, Nigeria. To achieve the objective of the study, five hypotheses were put forward that led to the preparation and validation of a questionnaire with five indicators each for dependent and independent constructs. Accounting information is the dependent construct while the industrial revolution 4.0 is the independent construct. Partial Least Square-Structural Equation Model of Smart PLS 3.0 was used to analyze data. The results show that there is significant positive relationship between the five chosen indicators of I4.0 ie Big Data (BG), Cloud Computing (CC), Artificial

Introduction

Ideally, as a contribution to the frontier of knowledge, prior studies should have established the relationship between numerous industrial revolutions the world had experienced with accounting information. It is a fact that accounting practice doesn't exist in isolation of its environment. Whatever is the practice of accounting, there is supposed to be scientific conclusions about it and the industrial revolution (which is a bunch of development in facets of lives, technological, social, economic, cultural wise) in which it is been put to serve. Unfortunately, research failed to establish the relationship between the two concepts other than unsubstantiated

Intelligence (AI), Smart Factory (SF) and Internet of Things (IoT) with the five chosen indicators of accounting information ie Internal control System (ICS), Financial Reporting Quality (FRQ), improve Performance Measurement (IPM), Effective financial Transaction process (EFT) and Better Decision Making (BDM). This finding implies that the quality of accounting information improves as industrialization advanced. The study, therefore, recommends that efforts should be geared toward continuous research into information and technology aspects of accounting. The study suggests that more empirical studies should be undertaken within this area for more literature.

Keywords: *Accounting-information, Big-Data, Cloud-computing, Industry 4.0, Smart PLS,*

theories. Accounting as a language of business ought to have substantiated its relationship with the components of its environment in which it exists in providing the information.

The information ability of accounting has been living with human beings from time immemorial. Financial records and documentation were done in the best way known to our ancestors using such things as a commitment to human memory, write-ups on stones, leaves, bones, etc upon which information was communicated to the interested parties. Historically, the modern-day accounting has it root traced to Fr Luca Pacioli in 1494 -though there were others before him- the principle of double-entry was first documented by Pacioli in his book (Smith, 2013). This is before the 1st industrial revolution, where at that time individual efforts give support to production activities and modern practice of accounting ie debiting and crediting was just been discovered with documentation and calculations were done manually through the use of cards and pens.

Accounting and its practitioners exist in an environment influenced by many factors such as socio-cultural, technology and economic among other practices. There is no doubt that change(s) in environmental factor(s) affect accounting practice and its output. Thus, communicating financial and non-financial information to the stakeholders is one of the outputs of accounting. Industrial revolution -which is a change in the production system from less advantageous to a more advantageous type(s) - has something to offer to the

field of accounting that could shape its quality. The industrial revolution has risen from the first revolution to its present fourth revolution. It is believed that each revolution which is mostly technological-based influences the practice of accounting and subsequently the quality of information. This can be seen from the practice of accounting traced back to it early periods when (as aforementioned), entries were made and records kept through the uses of pens, cards and calculations manually done and gradually improve as industry revolutionized into uses of calculators, ledgers to electronic means of executing accounting tasks via the use of computers up to present day where there are more influence of technological innovations such as internet of things (IoT), Cloud computing (CC), Big data (BD), smart factory (SF) and allied development in information communication and technology,

Industrial revolution in its real meaning is the "change in social and economic organization resulting from the replacement of hand tools by machine and power tools and the development of factories and large-scale industrial production: applied to this development in England from about 1760 and to later changes in other countries" (Yourdictionary (n.d.)). In essence, it means a change in the home-based hand-made form of production to a system where machines were used in a much more organized set up (factories) as opposed to homes. The revolution in the industry which continues to shape accounting practice started from the first revolution from 1780 to 1880 and occurred in stages across the world. The industrial revolution occurred when machines were used in a coordinated way to make goods (Schwab, 2016). Thus the 1st revolution was characterized by the increased use of mechanical devices. The 2nd industrial revolution (1890-1970) is characterized by uses of electrical and petroleum devices. During the Second Industrial Revolution, the existing manufacturing and production methods improved (Vale, n.d). Third industrial revolution (1971-2010) third revolution is featured with digital Manufacturing of goods and services for the first time, there was increase in software, web surfing, etc (The Economist, 2012), digitalization with the aid of microelectronics and automation with the sole purpose of flexible manufacturing of variety of goods but without flexibility of quantity of production and thus the fourth industrial revolution also known as industry 4.0 became eminent. Industry 4.0 (I4.0) was first pronounced in Hannover (Germany) Fair in 2011, 'activated by the development of Information Communication Technology (ICT) with the technological basis of smart

automation of cyber and physical systems with decentralized control and advanced connectivity like the internet of things (IoT devices). The industry 4.0 overcomes the inherent lapses of the 3rd industrial revolution and leads to production systems that allow flexible, mass, custom production as well as flexibility in production quantities' (Lydon, 2014).

Accounting information is consisting two words ie accounting which is an act of recording, classifying, summarizing and communicating financial transactions in terms of money to those that have the right to (Olise & Alhassan, 2013). Accounting provides users (internal and external) with financial and non-financial information to aid them in numerous decisions making. Accounting information is the end product of accounting processes which are usually reported under different headings in the financial statements, such as income statement, statement of financial position, statement of changes in equity, statement of cash flow, etc. Wood and Sangster (2000) link accounting information to the process of measurement and communicating the economic activities of an entity in such a way that it will permit the users to make an informed judgment.

Theoretically, there is no doubt that the successive industrial revolution brought about positive change in various facets of our environment from economics, social to culture including accounting as evidence in various application packages, cloud computing, and big data, etc that are features of I4.0. The question that is the foundation of this study is that, to what extent has I4.0 impacted accounting information in this contemporary time? Empirically, therefore, this study intends to establish for Bida metropolis whether or not I4.0 impacted on accounting information.

To the best of the knowledge of these researchers, few studies are bound relating industry 4.0 to other areas such as productivity (see Hamdan, 2018; Nagy, Oláh, Erdei, Máté & Popp, 2018; Müller, Kiel & Voigt, 2018; Hirschi, 2017; Rojko 2017; Burritt & Christ 2016; Schwab, 2016), unfortunately, there are paucity of studies linking the industrial revolution (industry 4.0 in particular with its innovative characteristics) to any part of accounting. This is considered to be a serious gap in knowledge and as such motivated these researchers to key into bridging this gap, and consequently this study seen as a contribution to knowledge.

For this purpose, I4.0 is the Independent construct with the internet of Things (IoT), Big Data (BD), Smart factory (SF), Cloud Computing (CC) and

Interconnectivities (IC) as indicators. While Accounting Information (AI) is the dependent construct with indicator variables as Better Decision Making (BDM), Internal Control System (ICS), Financial reporting Quality (FRQ), Improve performance Measurement (IPM) and Enhanced Financial Transaction Processes (EFT).

The major objective of this study is to establish a link between industry 4.0 and accounting information as expressed by Accountants in Bida Metropolis of Niger State, Nigeria. Specific objectives include to;

i. Establish whether or not I4.0 leads to better decision making for organizations in Bida Metropolis
ii. Find out whether or not I4.0 leads to effective internal control for organizations in Bida Metropolis
iii. Prove whether or not I4.0 improves financial reporting quality for organizations in Bida Metropolis
iv. Prove whether or not I4.0 improves performance measurement for organizations in Bida metropolis
v. Establish whether or not I4.0 leads to enhance financial transaction processes for organizations in Bida Metropolis

To achieve the above objectives, the following hypotheses were put forward;

H01: I4.0 does not lead to better decision making for organizations in Bida metropolis
H02: I4.0 does not lead to effective internal control for organizations in Bida Metropolis
H03: I4.0 does not improve financial reporting quality for organizations in Bida Metropolis
H04: I4.0 does not improve performance measurement for organizations in Bida Metropolis
H05: I4.0 does not lead to enhanced financial transaction processes for organizations in Bida Metropolis

The genesis of industry 4.0: According to Rojko (2017) industrial revolution passed through processes ending at industry 4.0. The processes that he called 'through industrial revolutions' described transition from one method to another method and rationale behind each revolution as follows; 1st industrial revolution transit from manual work to mechanization with the

sole aim of improved quality of life, with inherent lapses 2nd industrial revolution was ushered in. 2nd industrial revolution was triggered by electrification with the main aim of industrialization and mass production, with its lapses 3rd revolution became necessary. The 3rd industrial revolution was characterized by 'digitalization with the introduction of microelectronics and automation, aiming at flexible manufacturing of a variety of goods, without the flexibility of quantity of production Industry 4.0 became necessary. Industry 4.0 was first heard of in Hannover Fair in 2011, activated by the development of Information Communication Technology (ICT) with the technological basis of smart automation of cyber and physical systems with decentralized control and advanced connectivity like the internet of things (IoT devices). The industry 4.0 overcomes the inherent lapses of the 3rd industrial revolution and leads to production systems that allow flexible, mass, custom production as well as flexibility in production quantities.

Concept of industry 4.0: According to Davies (2015) and Kagerman (2015), industry 4.0 is a unification of various advances in technology that support an increase in the level of digitalization of businesses. It is a bunch of improved digital devices that give rise to continuous improvement at various managerial levels. Industry 4.0 is "driven by improved data gathering processes enabled by transistors in integrated circuits doubling in capacity every 2 years (called Moore's Law), thereby lowering the cost of digital electronics, reducing the size of components, facilitating portability and the increasing availability of data through connected machines" (Deloitte, 2015). On the contrary, some researchers (eg Baur & Wee, 2015; Deloitte, 2015) hold the view that industry 4.0 is a future technology. Proponents of this view opined that I4.0 is a bunch of advances to be achieved later. To them, I4.0 is a vision of industry as it could be in the future or rather an aim to work towards, and not the industry of the present. Initially, Industry 4.0 was seen as a way for Germany to maintain a competitive advantage over emerging economies that have lower labour costs (Davies, 2015). The notion quickly spread in the European Union, the USA, and Asia/Pacific regions, especially in China, Russia, and Brazil (Staufen, 2016). Industry 4.0 could encourage improved transfers of data between silos and in supply chains leading to environmental and monetary gains from improved management. Data to assist with transfers between different departments, or between parties in a supply

chain would be available from infrastructure investments in networked digital information and communication technologies (Davies, 2015).

This fourth industrial revolution has been promoted as providing annual efficiency gains from resource productivity in manufacturing of between 6 and 8% (Davies, 2015), greater capital intensity and more flexible models of work organization (Germany Trade & Invest, 2014) through improvements in the machine to machine information and communication technologies. Nonetheless, in Switzerland, the anticipated relative advantages over low labour-cost developing country production are now recognized as unlikely to stem the flow of offshore activities (Deloitte, 2015), with the future direction of Industry 4.0 development viewed as speculative at best (Gray & Hughes 2016). Furthermore, competition from China is accompanied by proposed moves towards becoming the world's leading industrial power by 2049, when the country turns 100 (Staufen, 2016). China intends to catch and overtake other countries soon and recognizes networked production, in which machines and parts are engaged in an ongoing exchange of information, to be essential (Staufen, 2016). But progress is limited by the lack of standards for the language used by chips to communicate with each other, lack of know-how, poor legal standards for data protection which will slow take-up, and insufficient capital to invest in technology (Staufen, 2016). Nevertheless, China is putting its full weight and funding behind the integration of industrialization and information (Wübbeke & Conrad, 2015).

Characteristics of Industry 4.0: These are features of industry 4.0 some of which questionnaire variables for this study are based on IV. They are the Internet of Things (IoT) which is the network of physical devices (things) embedded with networked microchip technology, software, sensors, and controllers enabled to collect and exchange data. (Deloitte, 2015). The next is interoperability and connectivity: which means with an Industry 4.0 digitized smart network setting "machines are connected as a collaborative community" (Lee 2014, p. 3) exchanging massive quantities of actual data available in real-time, not estimated, averaged or influenced by human involvement. Such data is referred to as providing 24/7/365 digital real-time transparency of performance measurement and reporting both for managers and external stakeholders (Seele, 2016). This means data is available immediately (real-time) at every moment of every day (24- hour, 7-day a week and 365-day a year). "Availability of real-time data is already being

promoted through the introduction of XBRL as a financial reporting language to improve accuracy, reliability and, in consequence, comparability, of reported data and could be extended to non-financial data" (Burritt & Christ, 2016)

Four design principles of Industry 4.0: The following design principles, identified by Hermann, Pentek, and Otto (2016), define the technology and approaches that makeup Industry 4.0: Interconnection; with wireless communication technology and the capabilities of the IoT, you can now connect machinery, sensors, and other devices to the people tasked with monitoring your process for effectiveness and efficiency. Information transparency; the transparency afforded by Industry 4.0 technology provides operators with vast amounts of useful information needed to make appropriate decisions. Decentralized decisions; interconnection and information transparency allow for operators to make decisions both inside and outside of production facilities. This ability to combine local and global information at the same time helps to drive better decision-making and increase overall productivity. Technical assistance; industry 4.0 shifts the role of humans from an operator of machines to a problem solver and decision-maker. Assistance systems are designed to support operators that need to make informed decisions to solve urgent problems on short notice.

According to Epicor (2019), there are hundreds of concepts and terms that relate to IoT and Industry 4.0, according to him there are 12 foundational words and phrases pertinent to defining I4.0. However, the following that relates to the objective of this study was reviewed: IoT: a concept that refers to connections between physical objects like sensors or machines and the Internet. Big data; refers to large sets of structured or unstructured data that can be compiled, stored, organized, and analyzed to reveal patterns, trends, associations, and opportunities. Artificial intelligence (AI); is a concept that refers to a computer's ability to perform tasks and make decisions that would historically require some level of human intelligence. M2M; this stands for machine-to-machine, and refers to the communication that happens between two separate machines through wireless or wired networks. Digitization; refers to the process of collecting and converting different types of information into a digital format. Smart factory; is one that invests in and leverages Industry 4.0 technology, solutions, and approaches. Cloud computing; refers to the practice of using interconnected remote servers

hosted on the Internet to store, manage, and process information. Real-time data processing; this refers to the abilities of computer systems and machines to continuously and automatically process data and provide real-time or near-time outputs and insights. Cyber-physical systems (CPS); also sometimes known as cyber manufacturing, refers to an Industry 4.0-enabled manufacturing environment that offers real-time data collection, analysis, and transparency across every aspect of a manufacturing operation.

Above are characteristics that are theoretically linked to I4.0 and as such, they form part of indicator variables for the IV.

Conceptual Framework: This study uses I4.0 as the independent construct while accounting information is the dependent construct. As already observed, there is almost no study of this nature associating I4.0 to accounting information as such there are no known usually used variables for measurement of I4.0. As such the researcher looking into the unobservable nature of the two constructs decided to adopt the following indicators as proxies for the two constructs and conceptualize the relationship as follow:

I4.0 is proxy by cloud computing, smart factory, big data, Internet of things and Artificial intelligence while to measure accounting information variables used by Sajady, Dastgy and Nejad (2008) were adopted for this study as follow; internal control, decision making, performance evaluation, good transaction processing system and quality financial reporting. In consonance with the theory of economic growth, there is no doubt that the i4.0 would be positively associated with accounting information. This is so because it is a general belief that improvement/progress is a factor that motivates change from the existing system to a better system. As industry revolutionized it comes along with positive changes to the components of its environment which accounting is part of.

Theoretical Framework: There are many theories related to the objective of this study. Theories such as the theory of change (ToC), economic growth theory and theory of technology. The theory of change according to the Center for the theory of change (2019) has no defined historical period or propounder but appeared in publications as far back to the late 1950s. According to Brest (2010) theory of Change defines long-term goals and then maps backward to identify necessary preconditions. This theory relates to this study since the study is on the effect of the change from the 3rd industrial revolution to the 4th. While economic growth theory holds that economic

growth is that investment in human capital, innovation, and knowledge are significant contributors to economic growth (Wikipedia, 2019). Theories of technology 'attempt to explain the factors that shape technological innovation as well as the impact of technology on society and culture' (Wikipedia, 2019) in this instance I4.0 is an embodiment of development in technology, social, cultural and economical which are positively affecting the environment as such also guide this study.

The theory of change is adopted to guide this study because of it meet-up with the objective of this study. Since I4.0 objective is geared toward, improving societal components including accounting practice

Review of Empirical Studies and a priori expectation: As stated earlier on, research publications linking industrial revolution to accounting information, in general, are scanty, however, the following related publications were reviewed as they relate to one or more of the indicator variables. Sajady, Dastgy, and Nejad (2008) conducted a related study titled 'evaluation of the effectiveness of the accounting information system using the primary source of data. The results indicate that the implementation of accounting information systems in the selected companies caused the improvement of managers' decision-making process, internal controls, and the quality of the financial reports and facilitated the process of the company's transactions. The results did not show any indication that the performance evaluation process had been improved. Similarly, Abubakar (2015) in his research project titled 'accounting information as a tool for management decision making a case study of First Bank of Nigeria Plc Abdullahi Fodio Road Branch Sokoto, through the uses of primary data established that accounting information is a tool for management decision making.

Ghasemi, Shafeiepour, Aslani, and Barvayeh (2011) in their article, attempted clarifying the impact of technology (IT) on modern accounting systems, through content analysis, they established that IT positively impacted modern accounting particularly in the area of managerial decision making.

The a priori expectation is that the I4.0 is positively linked to accounting information and as such null hypotheses are expected to be rejected.

METHODS

This study utilized a cross-sectional survey design. This is because data were gathered through the use of a five-point Likert scale questionnaire with the

response from strongly disagree (1) to strongly agree (5). The targeted population is made up of professionals, industrial and academic accountants / internal auditors spread across the Federal, State and Local government institutions in Bida metropolis. The study believes that these respondents are in the best position to give valid responses that would lead to the achievement of the objective of this study. Due to time constraint, a convenient sampling procedure was used and 122 questionnaires were successfully distributed among the targeted population and 76 respondents returned their questionnaires at the stipulated time and that form the basis for data analysis. Having passed through two validation test procedures the questionnaires were administered on the targeted population through the help of five (5) research aids.

Partial Least Square – Structural Equation Model (PLS-SEM) of Smart PLS 3.0 was employed to analyze data. PLS-SEM is suitable for this study given the fact that the dependent and independent constructs are latent variables with more than one indicator measuring them. As suggested by Hair, Hult, Ringle, and Sarstedt (2016) the measurement model assessment (tests for convergence validity & discriminant validity) was evaluated, followed by interpreting the path coefficients (generated via PLS algorithm and bootstrapping to assess the indicator's t-statistic, level of significance and test of hypotheses). A bootstrapping procedure with 5000 samples was used and was examined; this procedure was performed by the PLS-SEM

Reporting the Measurement Model from Smart PLS: to validate the measurement models, the researcher followed already established procedure by PLS-SEM reflective models (Hair et al 2016) first of all a convergence validity test was conducted. Convergent validity (reliability) is the degree to which multiple items meant to measure the same concepts/constructs are in agreement. As suggested by Hair et al (2016) factor loadings (FL), composite reliability (CR) and average variance extracted (AVE) are used to assess convergence validity. Cronbach's Alpha has been the traditional technique for the test of reliability but due to its lapses, researchers favour the uses of composite reliability (CR) though sometimes the difference is negligible (Hair et al, 2016). Hair, Sarstedt, Pieper, and Ringle (2010) suggested that Cronbach's Alpha should be 'greater or equal to .80 for a good scale, .70 for an acceptable scale, and .60 for a scale of exploratory studies.

TABLE 1: Construct reliability and validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
ICS	0.55	0.49	0.58	0.27
BDM	0.71	0.76	0.87	0.79
EFT	0.41	0.51	0.70	0.46
FRQ	0.65	0.64	0.76	0.36
I4.0	0.66	0.68	0.79	0.43
IPM	0.60	0.62	0.78	0.54

Source: Researcher's computation 2020

From table 1 above, at 0.70 (Carmines & Zeller, 1979) thresholds, all the constructs passed the internal consistency reliability test except for ICS. On the issue of convergent validity and discriminant validity (multicollinearity) Average Variance Extracted (AVE) with 0.50 threshold (Fornell & Larcher, 1981), Fornell-Larcker criterion and heterotrail-monotrait (HTMT) both with the threshold of 0.85 were considered. Using AVE only two constructs ie BDM and IPM scale through others failed but from table 2 below all the constructs were adjudged successful, however, Henseler, Ringle, and Sarstedt (2015) states that Fornell-Larcker criterion in some cases has been found as not reliable for discriminant validity for variance-based PLS-SEM and therefore this study resort to uses of heterotrail-monotrait (HTMT) criterion with the following results in table 3 showing that issue of discriminant validity was resolved except for I4.0 and EFT

TABLE 2: Fornell-Larcker Criterion: Discriminant Validity

	ICS	BDM	EFT	FRQ	I4.0	IPM
ICS	0.52					
BDM	0.78	0.88				
EFT	0.61	0.71	0.68			
FRQ	0.48	0.39	0.41	0.60		
I4.0	0.81	0.75	0.81	0.56	0.66	
IPM	0.42	0.45	0.55	0.54	0.68	0.74

Source: Researcher's computation, 2020

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TABLE 3: Heterotrait-Monotrait Ratio (HTMT)

	ICS	BDM	EFT	FRQ	I4.0	IPM
ICS						
BDM	0.78					
EFT	1.06	1.26				
FRQ	0.65	0.55	0.75			
I4.0	0.87	1.00	1.40	0.70		
IPM	0.62	0.78	1.12	0.78	1.06	

Source: Researcher's computation, 2020

Since the data is not a time series data the test for stationarity is not required. As to the Goodness of fit (GoF) is "used to evaluate the overall fit of the model" (Tenenhaus, Vinzi, Chatelin, Lauro, 2005). The closer the GoF to 1, the better the fit of the model under consideration, GoF allows us to conclude the explanatory power of the model, however, Hair et al (2017) warned that researchers should be very cautious to report and use the model fit, that the criteria are still in it early stage of research.

RESULTS

Under this sub heading, results obtained from both descriptive and inferential statistics are reported and discussed in the light of extant literatures.

Descriptive results: Table 4 shows the descriptive statistics of the constructs' indicators. SPSS v16 was used ab initio in the collation of data and managing the issues of missing data. From results table 4, the data obtained from all the indicators are normally distributed given that indices for Kurtosis and Skewness fall within the range of -+3 and -+2. While any disclosed Mean value above 3 favours H1, any value from 3 and below favours H_0 however, the inferential statistics will have it say in the test of hypotheses. Minimum and maximum values of 1 and 5 respectively show that there is no case of data entry error(s).

TABLE 4: Descriptive statistics

ID	No.	Missing	Mean	Median	Min	Max	St Dev	Kurtosis	Skewness
RQ1a	2.00	322.00	2.62	2.00	1.00	5.00	1.26	-1.06	0.40
RQ1b	3.00	322.00	2.41	2.00	1.00	5.00	0.92	0.28	0.43
RQ2a	4.00	322.00	2.43	2.00	1.00	5.00	0.94	0.12	0.39
RQ2b	5.00	322.00	2.95	3.00	1.00	5.00	1.45	-1.41	0.23

RQ2c	6.00	322.00	2.37	2.00	1.00	5.00	1.39	-0.81	0.77
RQ2d	7.00	322.00	2.40	2.00	1.00	4.00	0.89	-0.45	0.61
RQ2e	8.00	322.00	2.61	2.00	1.00	5.00	1.14	-0.68	0.61
RQ3a	9.00	322.00	2.87	3.00	1.00	5.00	1.51	-1.40	0.25
RQ3b	10.00	322.00	2.90	2.00	1.00	5.00	1.68	-1.72	0.17
RQ3c	11.00	322.00	3.08	3.00	1.00	5.00	1.38	-1.43	0.16
RQ3d	12.00	322.00	3.26	3.00	1.00	5.00	1.41	-1.49	-0.02
RQ3e	13.00	322.00	3.66	4.00	1.00	5.00	1.49	-0.87	-0.77
RQ3f	14.00	322.00	3.75	4.00	1.00	5.00	1.19	-0.31	-0.68
RQ4a	15.00	322.00	2.96	3.00	1.00	5.00	1.12	-0.88	-0.09
RQ4b	16.00	322.00	2.95	3.00	1.00	5.00	1.16	-1.02	0.00
RQ4c	17.00	322.00	3.03	3.00	1.00	5.00	1.15	-1.24	0.00
RQ5a	18.00	322.00	3.20	3.00	1.00	5.00	1.08	-0.74	-0.34
RQ5b	19.00	322.00	2.63	2.00	1.00	5.00	1.27	-1.11	0.37
RQ5c	20.00	322.00	2.80	3.00	1.00	5.00	1.06	-0.84	0.27
CC	21.00	322.00	3.16	3.00	1.00	5.00	1.34	-1.26	-0.06
IoT	22.00	322.00	2.43	2.00	1.00	5.00	0.94	0.12	0.39
AI	23.00	322.00	2.96	3.00	1.00	5.00	1.12	-0.88	-0.09
BD	24.00	322.00	3.22	3.00	1.00	5.00	1.07	-0.68	-0.40
SM	25.00	322.00	2.95	3.00	1.00	5.00	1.45	-1.41	0.23

Source: Researcher's computation, 2019

Reporting the Structural Model from Smart PLS: Test of hypotheses is the next in line following the successful test for the measuring instruments; this is reported in Table 5 below

TABLE 5: Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Decision
I4.0 -> ICS	0.81	0.82	0.05	17.04	0.00	Accept H_1
I4.0 -> BDM	0.75	0.76	0.04	17.52	0.00	Accept H_1
I4.0 -> EFT	0.81	0.81	0.04	18.76	0.00	Accept H_1
I4.0 -> FRQ	0.56	0.58	0.07	8.53	0.00	Accept H_1
I4.0 -> IPM	0.68	0.69	0.07	10.26	0.00	Accept H_1

Source: Researcher's computation, 2020

Of the hypothesized adoption factors, the results are displayed in table 5 above and are also depicted in fig 1 below. The results show that I4.0 has

significant positive effect on the five (5) constructs of accounting information. Ie internal control system (ICS), Better Decision Making (BDM), Effective Financial Transaction processing (EFT), Financial Reporting Quality (FRQ) and Improve Performance Measurement (IPM). Thus hypotheses 1 to 5 were all accepted.

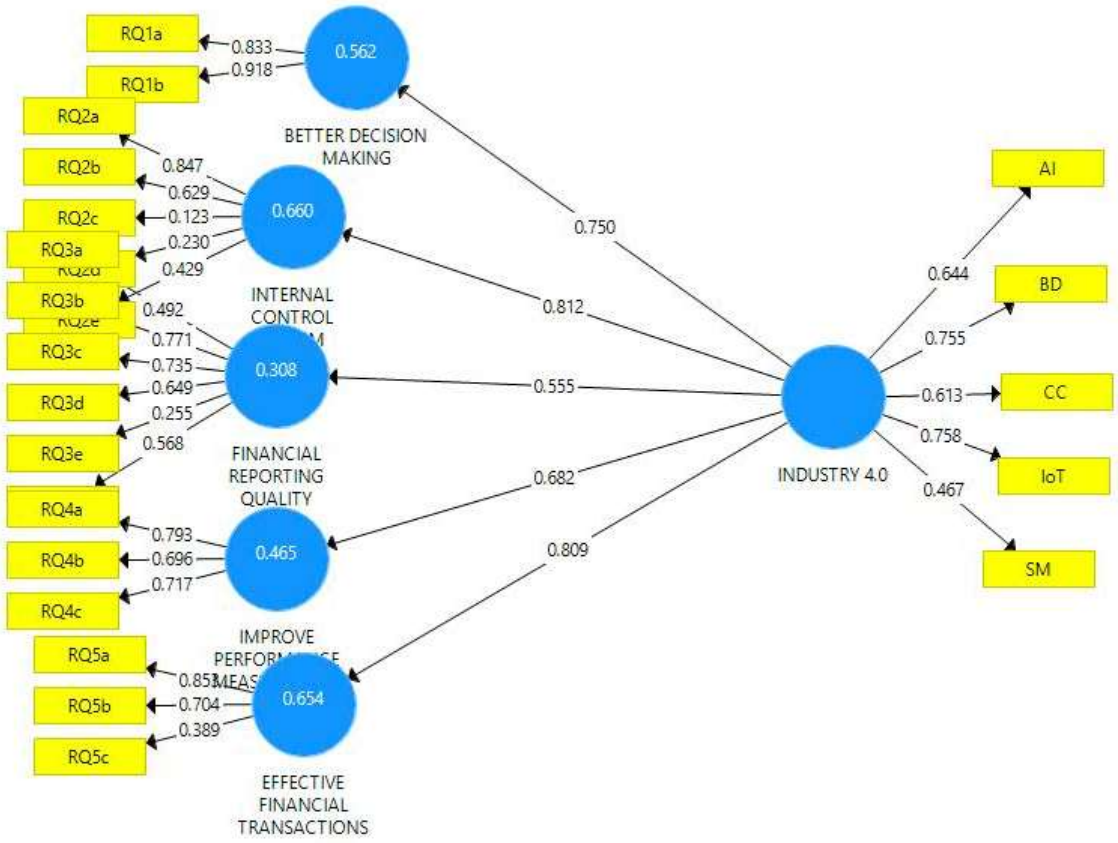

FIG 1: Chart of dependent and independent constructs

Assessment of R^2 reflect the stage or contribution to the latent constructs that account variance and for those reason asses the regression functions goodness of fit (Backhaus, Erichson & Pinke 2006) R^2 values for endogenous latent variables are assessed as follows: 0.67 substantial 0.33 moderate 0.19 small. While according to According to Cohen (1988), R^2 values for endogenous latent variables are assessed as follows: 0.26 substantial, 0.13 moderate, 0.02 weak.

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TABLE 6: R Square Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ICS	0.66	0.67	0.08	8.70	0.00
BDM	0.56	0.57	0.06	8.85	0.00
EFT	0.65	0.66	0.07	9.57	0.00
FRQ	0.31	0.35	0.08	4.12	0.00
IPM	0.47	0.48	0.09	5.24	0.00

Source: Author's computation, 2020

From table 6 and 7, in line with suggestions of Backhaus, et al., (2006) all the R squares for the dependent constructs falls within the range that is adjudge acceptable with FRQ (0.31) and (0.31 adj R^2) and as such it can be concludes that the indicators are good measures of their respective constructs

TABLE 7: R Square Adjusted, Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ICS	0.66	0.67	0.08	8.67	0.00
BDM	0.56	0.57	0.06	8.81	0.00
EFT	0.65	0.66	0.07	9.53	0.00
FRQ	0.31	0.34	0.08	4.08	0.00
IPM	0.46	0.48	0.09	5.21	0.00

Source: author's computation 2020

Discussions**:** All the results go in line with the a priori expectation that I4.0 affect the accounting information. These results also concur with the available empirical findings of and in line the reviewed theories. This is so because different types of decision making such as long and short-term financing and investment decisions are enhanced due to new developed ideas such as big data, cloud computing etc. upon which accounting decision are based to lead to good accounting information. Indicators of I4.0 are also impacting on quality of financial reporting because financial report is an output of accounting system which is directly affected by indicators of I4.0. Indicators such as cloud computing, smart factory etc this will positively affect the users of financial reports. Improvement of performance measurement variables

such as earnings per share, sales value, share price, dividend per share also directly has a link to I4.0. I4.0 through accounting software etc lead to of effective transaction processing that is devoid of negativities etc. relationship between I4.0 and internal control system is also established. The study established that numerous control such arithmetic and accounting control, approval control, management control, organizational control, supervision control etc are more effective with I4.0 indicators

CONCLUSION

Based on the findings, it can be concluded that I4.0 which is an embodiment of new development leads to better decision making which also leads to good accounting information. The study established that I4.0 lead to improve performance measurement, lead effective financial transaction processing. I4.0 with its indicators leads to the production of the quality financial report and various internal control systems are not left out. I4.0 also contributes positively to the process of producing the financial report ie transaction processing which is a daily event.

Based on the findings, the following recommendation is put forward. That since there is established a positive link between the industrial revolution and accounting information, efforts should be geared toward continuous improvement and research so that new development, advancement in technology, economic, social and culture are well-positioned.

Suggestion for further study: The study also recommends that more empirical studies should be undertaken within this area of interest to make literature on it available. The scope could be expanded; secondary sources of data could be used as well. Other constructs and indicators other than those used in this study could be used in subsequent researches.

REFERENCES

Abubakar M. D. (2015). Accounting information as a tool for management decision making: A case study of FBN Ltd Abdullahi Fodio Road Branch Sokoto. An MBA project submitted to Business admin dept UDUS Sokoto

Backhaus K, Erichson B & Pinke W. (2006): Multivariate Analyse method. Retrieved on 29 June 2019 from https://www.researchgate.net/publication/235655523_Multivariate_Analyse methoden

Baur C, Wee D (2015) Manufacturing's next act., Available at http://www.mckinsey.com/insights/manufacturing/manufacturings_next_act Accessed 22 July 2019

Brest P. (2010). The Power of Theories of Change". Stanford Social Innovation Review. Spring. https://ssir.org/articles/entry/the_power_of_theories_of_change

Burritt RL, & Chris S (2016) Towards a comprehensive framework for environmental management accounting—Links between business actors and environmental management accounting tools. Aust Account Rev 12(27):39–50

Carmines E. G. & Zeller R.A. (1979). Reliability and validity assessment; sage: Newbury Park, CA, USA

Center for the theory of change (2019) http://www.theoryofchange.org/what-is-theory-of-change/toc-background/toc-origins/

Cohen, J. (1988) Statistical Power Analysis for the Behavioral Sciences. Lawrence Erlbaum, Mahwah, NJ

Davies R. (2015). Industry 4.0. Digitalization for productivity and growth. Retrieved on 29th June 2019 from http://www.europarl.europa.eu/RegData/etudes/BRIE/2015/568337/EPRS_BRI(2015)568337_EN.pdf

Deloitte (2015) Industry 4.0. Challenges and solutions for the digital transformation and use of exponential technologies. Deloitte AG, Zurich

Epicor ERP (2019). Epicor Enables the Connected Enterprise with Latest Version of Epicor ERP. Retrieved on 29 June 2019 from https://newsroom.epicor.com/epicor-enables-the-connected-enterprise-with-latest-version-of-epicor-erp/

Fornell C. & Larcher D.F.(1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. J. Mark Res

Germany Trade and Investment (2014). Industrie 4.0 Smart manufacturing for future retrieved from http://www.inovasyon.org/pdf/gtai.industrie4.0_smart.manufact.for.future.july.2014.pdf

Ghasemi M, Shafeiepour V, Aslani M and Barvayeh E. (2011). The impact of Information Technology (IT) on modern accounting systems. Retrieved on 29 June 2019 from https://www.researchgate.net/publication/257714762_The_impact_of_Information_Technology_IT_on_modern_accounting_systems

Gray J & Hughes M (2016) Insight. Industry 4.0: It's The Future, But We've Been There Before. Digital Transformation. Hitashi Consulting, Dallas

Hair, Hult, Ringle & Sarstedt (2016). A Primer on partial least square structural equation modeling (PLS-SEM); sage: thousand Oaks, CA, USA.

Hair, Sarstedt, Pieper, and Ringle. (2010). The use of PLS-SEM in strategic management research: A review of past practices and recommendations for future applications. Long-range plan

Henseler J. Ringle C.M. & Sarstedt M. (2015). Using PLS path modeling in advertising research: Basic concepts and recent issues. In the handbook of research on international advertising; Okazaki S. Ed; Edward Elgar Publishing: Cheltenham

Hermann M, Pentek T & Otto B. (2016). Design Principles for Industrie 4.0 Scenarios. Publisher: IEEE. Retrieved on 29 June 2019 from https://ieeexplore.ieee.org/document/7427673/references#references

Kagermann H. (2015). Change through Digitization—Value Creation in the Age of Industry 4.0. Management of Permanent Change pp 23-45. Retrieved on 29 June 2019 from https://link.springer.com/chapter/10.1007/978-3-658-05014-6_2
Lee J, (2014) Service Innovation and Smart Analytics for Industry 4.0 and Big Data Environment. Procedia CIRP 16:3–8
Lohmöller, J.-B. (1989) Latent Variable Path Modelling with Partial Least Squares. Physica, Heidelberg
Lydon B. (2014). The 4th Industrial Revolution, Industry 4.0, Unfolding at Hannover Messe. Retrieved on 29 June 2019 from https://www.automation.com/automation-news/article/the-4th-industrial-revolution-industry-40-unfolding-at-hannover-messe-2014
Olise A. A & Alhassan K.A (2013). Principles of Accounting. Bida: Blessed printers
Rojko A. (2017). Industry 4.0 Concept: Background and Overview. Retrieved on 29/June/2019 from https://online-journals.org/index.php/i-jim/article/view/7072
Sajady, H., Dastgy M. and Nejad M. (2008). Evaluation of the effectiveness of accounting information systems. Retrieved on 29 June 2019 from international journal of information science and technology
Schwab K. (2016). The Fourth Industrial Revolution: what it means, how to respond. Retrieved on 29/June/ 2019 from https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/
Seele P (2016). Digitally unified reporting: how XBRL-based real-time transparency helps in combining integrated sustainability reporting and performance control. J Clean Prod 136(Part A):65–77
Smith M. (2013). Pacioli: The Father of Accounting. A&M University-Corpus Christi O'Conner Building - Room 333 6300 Ocean Drive, Unit 5808 Corpus Christi, TX 78412-5808.
Staufen AG (2016) China – Industry 4.0 Index 2015. Industry 4.0 and Lean., Available at http://www.staufen.ag/fileadmin/hq/survey/STAUFEN.-studie-china-industrie_4_0-index-2015-EN.pdf Accessed 3 May 2019
Tenenhaus M, Vinzi VE, Chatelin YM, Lauro C (2005) PLS path modeling. Comput Stat Data Anal 48(1):159–205
The Economist (2012) retrieved on 22/07/2019 https://www.economist.com/leaders/2012/04/21/the-third-industrial-revolution
Vale R. (nd). second-industrial-revolution-the-technological-revolution. retrieved on 22/07/2019 from https://richmondvale.org/en/blog/second-industrial-revolution-the-technological-revolution
Wikipedia (2019). Free online encyclopedia
Wolk, H. I.,.Francis, J.R & Tearney, M.G. (1992). Accounting Theory: A Conceptual and Institutional Approach, (3 rd ed).Cincinnati, Ohio. South-Western Publishing Co.
Wood F. & Sangster A (2000). Business Accounting. International edition. UK

Wübbeke J & Conrad B (2015) Industrie 4.0: Will German Technology Help China Catch Up with the West? China Monitor 23:1–10 your dictionary (nd). Industrial Revolution. Retrieved July 20th, 2019, from https://www.yourdictionary.com/Industrial-Revolution

APPENDIX 1: COPY OF QUESTIONNAIRE:

1= Strongly Disagree. 2=Disagree. 3=Undecided. 4=Agree. 5= Strongly Agree

S/N	RESEARCH QUESTION 1: I4.0 and Decision Making	1	2	3	4	5
RQ1A	I4.0 lead to better short term decision making					
RQ1B	I4.0 lead to better long term decision making					
	RESEARCH QUESTION 2: I4.0 and effective internal control					
RQ2A	I4.0 lead to effective authorization and approval control					
RQ2B	I4.0 lead to effective arithmetic & accounting control					
RQ2C	I4.0 lead to effective management control					
RQ2D	I4.0 lead to effective physical control					
RQ2E	I4.0 lead to effective supervision control					
	RESEARCH QUESTION 3:					
RQ3A	With I4.0 your understand-ability of financial reports is enhanced					
RQ3B	With I4.0 the usefulness of financial report increases					
RQ3C	I4.0 contributes positively to relevance of financial report					
RQ3D	I4.0 contributes positively to consistency of financial report					
RQ3E	I4.0 contributes positively to comparability needs of financial report					
RQ3F	With I4.0 objectivity of financial report is ensured					
	RESEARCH QUESTION 4: I4.0& improve performance measurement					
RQ4A	I4.0 improves Return of Investment					
RQ4B	I4.0 improves earnings per share					
RQ4C	I4.0 improves dividend per share					
	RESEARCH QUESTION 5: I4.0 & enhanced financial transaction processes					
RQ5A	I4.0 enhances receipts & payments flexibility					
RQ5B	I4.0 enhances receipts & payments efficiency					
RQ5C	I4.0 enhances receipts & payments effectiveness					
AI	I4.0 & artificial intelligence					
BD	I4.0 & Big Data					
CC	I4.0 & Cloud computing					
IoT	I4.0 & Internet of Things					
SM	I4.0 & Smart Factory					