Perception on Multimedia Design and Technologies for Maternal Care Delivery among Health Experts in Ondo State, Nigeria

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Abstract

This study explored the perception on multimedia design and technologies for maternal health care delivery among health experts in Ondo State, Nigeria. Multimedia is a package that people relate with in day to day engagements. Its prevalence is so striking that the world seems to be incomplete without it. The population for this study was chosen through census. It consisted 226 health experts in Akure-South, Ondo State. Survey research design was adopted in which interview and questionnaire were used to gather response (from respondents). The responses formed part of the data for the study. Findings revealed that multimedia is application-oriented technology that thrives on human multi-sensory nature; therefore useful in training, learning and creation of persuasive instructional contents for healthcare. The study uncovered that multimedia design is under-utilised to develop multimedia applications rich in local contents. Hence, putting the opinions of the health experts into consideration, solution was proffered hinging on the strength of multimedia design and technologies. The solution will assist in maternal health care delivery in Ondo State; which is the area of concentration for this study. Nigeria as a nation will equally benefit from this kind of research that directly have impact on maternal health care.

Keywords: *Visual Design, Digital media and technology, IoT, Persuasive design, ICT, Information and Instructional Design, Multimedia*

Introduction

Multimedia design is a practise not meant solely for communication in which its dynamic power of influence cannot be underrated. Designing visual communication messages through multimedia is quite engaging and an exciting exercise; requisite skills in the digital arts, computer graphics, coding, data visualisation and media technologies are highly essential. Design could be an 'art' or a 'science' endeavour; but its outcome will eventually differ. While some scholars portray 'arts' as a craft and an aspect concentrating on aesthetics, science serves as a bed rock on which technology thrives. A perfect blend of the two where it is achievable solidifies multimedia art and design. In juxtaposing art and design, Webdesigner Depot (2009) claimed good design motivates and it is a skill while good art is a talent and it inspires. Interestingly, good art sends a different message to everyone but good design sends the same message to everyone. This is clear that multimedia design is a persuasive visual communication tool that can inspire people to take certain action even in health related activities.

Basically, healthcare involves activities in different forms to achieve and maintain a good health and hygiene practices. It can also be viewed as the provision of medical and related services so as to maintain a healthy lifestyle and most especially as stated by Encarta (2009) via the prevention and treatment of disease. In the same vein, maternal health care

encapsulate all activities of health that deals with mother and child as a family. Ordinarily, issues pertaining to mother and child have been a major area of concern for decades (both on the positive and negative side): breastfeeding, family planning, nutrition and pregnancy among others. Several scholars had researched in one way or another on all of these key issues such that Mrisho M, Obrist B., Schellenberg J. A., Haws R. A., Mushi A. K, Mshinda H., Tanner M., & Schellenberg, D. (2009) advised on strengthening already existing health solutions with a view to improving antenatal and postnatal care. This point is strongly in line with the plea of World Health Organisation (WHO) on maternal health care delivery for the realisation of Safe Motherhood Initiative (SMI).

It is worthy of mentioning that existing interventions also involve campaigns on health and fitness, maternal wellbeing in general using the platform of antenatal care (ANC) and postnatal care (PNC). Advanced countries are already utilising sophisticated technologies to achieve concrete health communication solution. A notable example reflected in the study of Rojas and Carnicero (2018) projecting how Europe can key into the advantages of big data to enhance its health information system. Big data solution effectively takes care of loads of information at a fast rate, hence users of health information and technology can easily conclude on salient decisions. China was also reported to advance its health systems via Artificial Intelligence (AI) during the global pandemic of 2020 while countries like USA are strengthening their coverage in digital communication and eHealth systems via satellite. A critical survey of what China did was the invention of technology that uses Artificial Intelligence to produce, within seconds, test results of blood samples taken to detect whether a patient is COVID-19 positive or negative (Wei, 2020). Some NGOs in the United State equally created a database and multimedia web app (COVID Data Tracker) for regular updates as corona virus cases soared higher. Notable media agencies tapped into the database to give evidence based report on the COVID-19 saga. Contrastingly, third world countries in Africa, Nigeria inclusive are still struggling to meetup with the demands of communication and technology as a therapy that can be tapped into to strengthen health care services (mother and child health care as well).

It has been established that ANC and PHC builds bond among the concerned mothers and the health professionals owing to the fact that health experts equally counsels and instructs the mothers on how to go about the pregnancy and even after the delivery, life of healthiness must be adhere to. Communication in this regard could be either oral (to counsel) or visual in nature (to instruct). Whichever way, mutual communication, understanding and relation must be set and realised between the duo, if not the whole efforts of the medical and health caregiver is bound to result in doom. Besides, communication could as well be simultaneous: audio-visual for both counselling and instruction. Digital communication tends to assist in taking afore mentioned two cogent areas (counselling and instruction) into another realm beyond imagination. Health services are incomplete without communication. No area of life endeavour is even a whole system without communication. Digital communication is a branch of electronic health system (eHealth); exemplified in multimedia design and technologies. The idea of eHealth is to boost health services via result oriented technologies such as the 'multimedia' – in which this is about many media elements coming together for a top-notch communication and multi-sensory experience. This can also be seen as the integration of different mediums at a time to drive communication and health solutions. By design, a lot of products of multimedia can make such a drive possible: Mobile applications, Virtual reality, Telemedicine, Multimedia Instructional Messages et cetera.

Electronic Art and Design: Aligning Multimedia Use with Goals of Healthcare

Arts - a field of endeavour has witnessed a huge transformation. In recent time, activities such as: bioengineering, robotics, data mining and machine vision et cetera normally attributed to 'Science-Engineering' are now finding their way into the arts (Böhlen, 2004). In one way or another, these areas of discipline are been linked to the arts; other real example is bio-ceramics which is the use of ceramics for treatment of bones. It is a fusion of Ceramic design and Biology (Sciences) to enrich healthcare. It is also worthy of mentioning 'Forensic Art' and 'Art therapy'; while the former is used in law and criminology, the latter is attributed to the medicals. Interestingly, a blend of the two brings to bare 'Forensic Art Therapy'; used for fact-finding, investigative in nature and can also medically, serve the purpose of intervention (Gussak, 2014). One noticeable feature in all these fields that embrace Art is imaging. Traditional methods were used before to resolve imaging but have been updated to align with modern technologies: such as 2D and 3D computer graphics imagery (Brinkmann, 1999). The ceramics employ digital art - sculpting, to create virtual models before the actual 3D ware. Some digitally rendered mixed media are equally multimedia presentations applicable in the medicals to serve the purpose of art therapy. This underscores the significance of digital transformation in arts and design. It points to the fact that another dimension to the practise of art cum design will continue to thrive especially with the introduction of 5G technology and Artificial Intelligence (AI).

However, in positioning multimedia design with the goal of health care, specifically in the area of resources (a factor in achieving the goals), it is essential to consider the empirically-based guidelines of Clark and Mayer (2002). Resources, for the sake of clarity can be in terms of consumables such as: oxygen, Safety kits, Gloves, bandage, syringe etc. and non-consumables e.g. information/ instructional health campaign materials. Information can be developed via imaging with other elements then weaved into multimedia story for visual communication. "*This is because design actively develops, maintains and evolves conventions, axioms and clichés to convey important messages*" (Harris and Ambrose, 2009). Clark and Mayer (2002), from the perspective of cognitive theory stressed on: multimedia principle, contiguity principle, modality principle, redundancy principle, coherence and personalisation principles. They are a set of detailed guidelines for multimedia design but in a bid to summarise it all, Donnelli, Dailey and Mandernach (2009), simplified that:

* Relevant, instructional graphics that will supplement written text should be incorporated into visual designs. This is to improve learning through the dual coding of verbal and visual information (multimedia principle).

* Graphics and text should be placed close together so that limited working memory is reserved for learning content rather than coordinating various visual components (contiguity principle).

* Audio should be integrated to explain graphics as audio enhances learning more than text by expanding cognitive resources to simultaneously tap both visual and phonetic memory (modality principle).

* Graphics should be supplemented solely with the audio rather than audio and redundant text to reduce cognitive overload (redundancy principle).

* Visuals, text and sounds that are not essential to instruction should be not be used as unnecessary information hinders learning by interfering with the integration of information (coherence principle).
* Conversational tone and/or a personalized learning agent should be sought for, to enhance learning via social conventions so as to listen and respond meaningfully (personalization principle).

It is obvious, human reasoning is key in processing visual message, the six principles is a subtle strategy in information encoding and decoding; so as to assist the brain in the permutation process. Simultaneously, that is the essence of media literacy which is the ability to access, analyse, evaluate and create media messages of all kinds (Media Literacy Project, 2016) so as to strengthen health information. Care will be easy when there is adequate information. Sadly, self-care can be hampered due to lack or inadequacy in health literacy (D'Andrea, 2010) which equally has to do with information. Institute of Medicine (2004) explained that the *"...capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions"* is nothing but health literacy. Thus, implementing cognitive theory in multimedia design for enhancement of knowledge and training in maternal health care delivery will serve as a right step in the right direction. Also, this is because, ordinarily, health system encapsulates not only organisations and people but also actions whose main aim is to promote, restore or maintain health (WHO, 2000)

For the sake of emphases, resources such as health enlightenment materials, loaded with visual messages can help in information management and dissemination especially in antenatal and postnatal care. Pregnant or potential mothers need attention for the right, timely assistance. Intervention can come up through counselling and giving relevant instructional information which will resultantly take care of the psychological and emotional need of the concerned mothers. On this note, further exploration and appropriate application of the theories will position the use of multimedia, perfectly, for the benefit of mankind and healthcare delivery. This is necessary amidst the goals of healthcare system which includes: good health for the citizens, meeting health expectations of the public, and proper funding of operations. At this juncture, it is pertinent to affirm that if progress will be recorded in the identified goals, then it depends on: provision of health care services, creation of resources, funding, and good management (WHO, 2000). Additionally, the purpose of health care is also to help each person achieve four major goals: avoidance of untimely death and disability, maintaining and promoting quality life, personal wellbeing and a good death (Mold, 2017). How will the goals be achieved without 'quality' information and communication flow or how will multimedia health resources be a 'result-oriented' visual solution if not positioned in line with the goals? The more reason for 'proper' use of digital designs taking into consideration, the cognitive concepts.

Technologies and Electronic Health (eHealth) Multimedia Solutions
Multimedia development is dynamic; which is a result of a blend of creative production, the arts and innovative technical presentation techniques provided by a range of IT platforms (Queensland Academy, 2016). Information and Communication Technology (ICT) is a method of using technologies in computing, electronics, and telecommunications to process and distribute information in digital and other forms (Encarta Dictionaries, 2009). With the application of ICT, human world seems much smaller and more inter-connected. Twenty-first century has witnessed a lot of inventions in the health sector; made possible through advancement and creative application of technology. eHealth is a broad term and a subset of

ICT. Innovatemedtec (2018) stated that it is the use of information and communications technologies in healthcare. Broadly defined, it is *"...the cost-effective and secure use of information and communication technologies in support of the health and health-related fields including healthcare, health surveillance and health education, knowledge and research."* (WHO, 2005)

In another clear term eHealth encompasses a wide variety of inventions such as: Electronic Health Records (EHR), Electronic Medical Records (EMR), Telehealth and telemedicine, Health IT systems, Consumer health IT data, Virtual healthcare, Mobile Health (mHealth) and big data systems used in digital healthcare (Innovatemedtec 2018). The emergence of the 'IoT' (i.e. Internet of things) has tremendously led to the idea of smart world. Smart health was ascribed by Karacay and Aydin (2018) to different digital imaging and medical instruments used in IoT-based healthcare services. Internet of Things simply refer to networking and interaction of many smart devices via information technologies; hence IoT is about communication, data gathering and sharing, and information (Atzori, Iera, and Morabito, 2010). Smart life through interactive applications are typical examples. The wearable technology also known as 'Smart life', can read rate of blood flow to detect blood pressure and body temperature for prompt action in case of irregularities. Apart from Smart health, Smart Agriculture, Smart Industry and Smart City are becoming the order of the day (Karacay and Aydin, 2018).
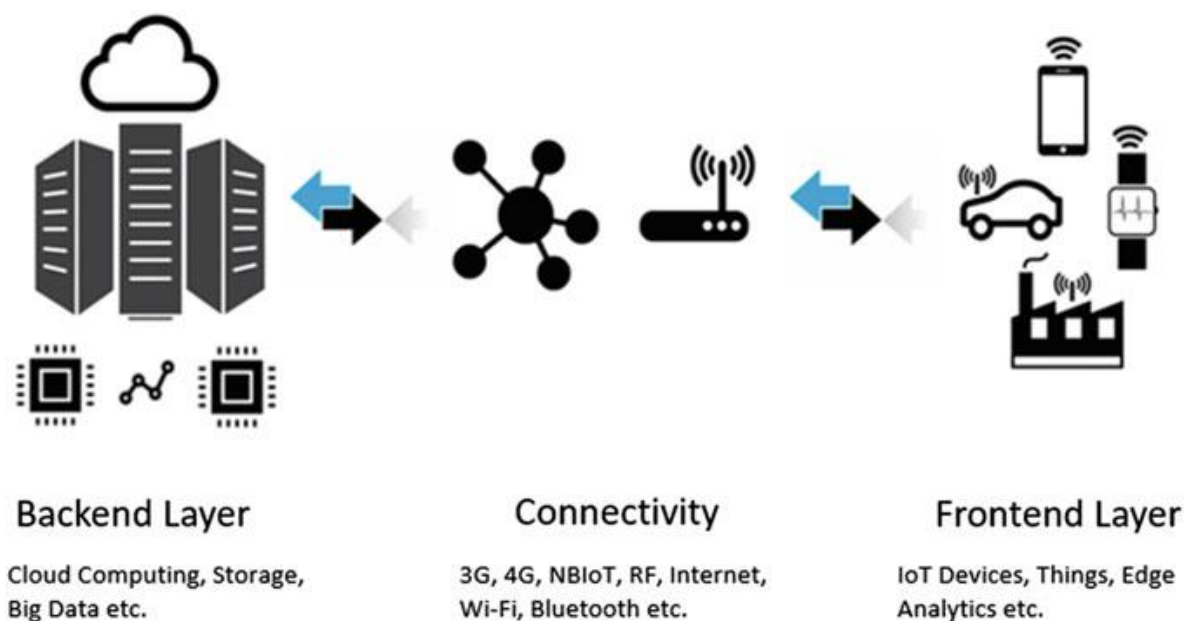

Backend Layer
Cloud Computing, Storage, Big Data etc.

Connectivity
3G, 4G, NBIoT, RF, Internet, Wi-Fi, Bluetooth etc.

Frontend Layer
IoT Devices, Things, Edge Analytics etc.

Fig.1: IoT (Internet of Things) Mode of Operation and Keywords
Source: Karacay and Aydin (2018)

In the same vein, another technology employed to advance health care delivery is called Additive Manufacturing (AM) Technology. It is a technique that uses Computer Aided Design (CAD) to easily create personalised designs, prototypes and 3D models. Parts of the model are then manufactured in bits. This allows manufacturing of complex forms that is unachievable with normal production methods (Beyca, Hancerliogullari & Yazici, 2018). The impact of this rapid prototyping technology is that, it creates avenue for rich and affordable personalised health solutions. Example as described by Singare, Dichen, Bingheng, Yanpu, Zhenyu, Yaxiong (2004) is a precise, beautiful surgical implants for the skull. Durable

custom-made protective garments and effective safety kits for medical personnel can equally be produced with the aid of AM technologies (Beyca, Hancerliogullari & Yazici, 2018). In all of these technologies, digital imaging, interface design for mobile healthcare (mHealth) and incorporation of media elements for visual design and communication remain a striking and binding feature.

Multimedia: Significant Features and Challenge

"Multimedia is an interdisciplinary, application-oriented technology that capitalizes on the multi-sensory nature of humans and the ability of computers to store, manipulate, and convey non-numerical information such as video, graphics, and audio in addition to numerical and textual information" (Ghinea & Chen, 2006). The world is filled with multimedia channelled through different forms to networked smart devices. The convergence of text, images, video, graphics, and audio makes time and distance not to be a barrier in communication since same content is accessible on different platforms (Muskingum College, 2016). Hence, as clarified by Ghinea & Chen (2006) multimedia is key in the realm of computer-to-human interaction and likewise, human-to-human communication. Pea (1991) added that communication in multimedia can be likened to face-to-face interaction in which when many media are attached to text, it yields clearer interpretation (even for abstract concepts) thus people have better understanding of the message.
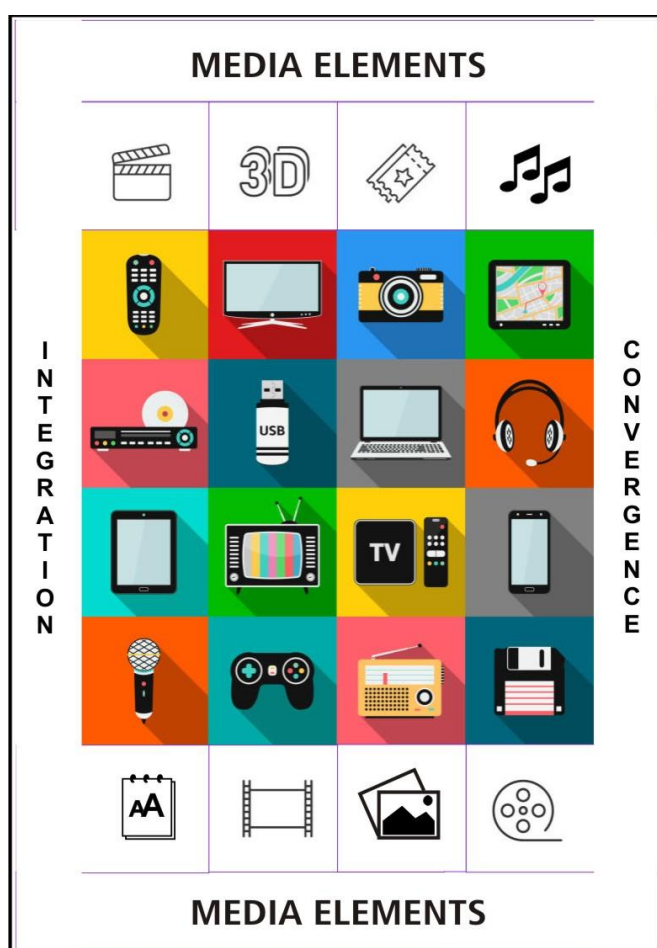

Fig. 2 (Infographics): Concept of Multimedia and Integration of Media Elements
Source: Author's compilation (2020)

Multimedia, using the design elements allows coordination of different external representations so as to create shades of meaning; this operational mode actually brings the fun (Pea, 1991 and Vaughan, 2011). At the same time, integrating the media elements and compiling the files (often times, relatively large) to achieve different perspectives for a meaningful message can be daunting. Multimedia design is about arrangement of parts to build orderly structure - a nested unit. It means considering properties of different files and screens (for distribution) among other features (Pea, 1991). This is a complex process with the many steps and sub-steps involved (Costello, Youngblood and Youngblood, 2012). Vaughan (2011) hinted that many multimedia presentations are too passive, signifying linear mode but activity-based presentations are better since they are engaging by design. Meanwhile, to develop either linear or non-linear visual product is even a difficult, complex task (Pea, 1991).

In another dimension, whether passive or active presentation, Muskingum College (2016); Costello, Youngblood and Youngblood (2012) queried that what is the essence of a beautiful visual without meaningful content. Also, a rich content poorly presented will make no headway as it will not be visually appealing to the viewer. These are challenges that must be resolved before venturing into multimedia design. Technically, distributed network, simultaneous rendering of different media, sequencing within media e.g. playing time-based frames in right order and correct synchronisation such as lip sync in audiovisual among others are difficulties that can be encountered in multimedia development. Multimedia products: educational/ instructional, information campaigns, Games etc. often time are distributed via a network; while poor and insufficient bandwidth will influence content design, sound knowledge of computer operations beyond the fundamentals is also required to operate web based instructions (Holden and Westfall, 2010).

Statement of Problem

The health professionals assume many roles and indulge in several medical activities, saving lives. Noticeably, their position in the society as a Counsellor and Instructor by the virtue of their job and responsibilities is quite sensitive. Some forms of visual communication aid not readily available, are needed to get the job done; such communication tools can be produced through multimedia design and technologies. This is essential for a shift so as to be at par with the standard in the global space especially at a moment of digital transformation. To be of world standard also means the mundane systematical and operational approach must change most reasonably as Osundina (2016) observed that Print is still prevalent for information management and resources in the hospitals. Also, there is no concrete computerisation of health information nor its department - Medical records units in hospitals in South-West, Nigeria (Osundina, 2016). Inferably, virtually medical/ health operations in the health facilities rely heavily on non-electronic Print media.

All these summed up, call for this research to know the opinions of the health and medical experts on adopting digital media for prenatal and puerperal activities. Knowledge is power, good health is wealth. Resultantly, the world will become a better abode for co-habitation with quality information and sound health.

Objectives of the study

The specific objectives of the study are as follows:
  i. To investigate mode of accessing multimedia instructional health messages and visuals.
  ii. To examine the role of multimedia as a delivery model in prenatal and puerperal activities.

Research Questions
i. What is the mode of accessing multimedia instructional health messages and visuals?
ii. What is the role of multimedia as a delivery model in prenatal and puerperal activities?

Methodology

The study adopted a survey research design to gather data from health experts in Akure-South Local Government Area of Ondo State, Nigeria. A pilot study revealed that there were 226 health professionals in the Local Government Area. This is according to Ondo State Ministry of Health, Akure, Ondo State. The selection of population sample was done by purposive sampling and census technique. EMath Zone (2014) disclosed that census which is a complete enumeration, is the process of getting response from the entire population of study. Hence, the entire health experts (from the whole 32 health facilities in Akure South, Local Government Area of Ondo State) formed the sample for this study. Purposive sampling was used because it is only from this set of professionals that the data needed for the realisation of the study objectives can be gotten. The instrument for data collection included the interview and a paper-based questionnaire on Maternal Health Care (MHC). The questionnaire was structured in the close-ended format. The collected data for the study were analysed using descriptive statistics: frequency, percentage and the mean. Data were presented with the aid of tables and chart. Using a Likert scale model, the questionnaire responses were given the identity of (4) = Strongly Agree, (3) = Agree, (0) = Uncertain, (2) = Disagree, and (1) = Strongly Disagree. These identities gave room for easy interpretation and justification for the statistical analysis of data obtained from the field.

Table 1: Frequency Distribution of Questionnaire Administered

Respondents	Ques. Admin.	Ques. Returned	Percentage
Doctors	5	4	80
Nurses	60	58	97
Midwives	71	68	96
* CHEW	90	90	100
Total	**226**	**220**	**97.3**

Source: Researcher's Fieldwork, 2020.   * *Community Health Extension Workers*

Table 2a: Mode of Accessing Multimedia Instructional Health Messages and Visuals.

S/N	Variable	Frequency	Percentage
	Mobile Device		
1	Smartphone / Tablet	203	92.3%
2	Desktop / laptop Computer	3	1.4%
3	All of the above	14	6.4%
	Total	**220**	**100%**

Source: Researcher's Fieldwork, 2020.

From Table 2a, most of the respondents used smartphone and tablets often as their means of communication and health information consumption. It has the highest number of respondents and percentage distribution of 203 (92.3%) out of 220 respondents, followed by people who used both the smartphone/ tablets and desktop/ laptop computer with the frequency and percentage distribution of 14 (6.4%) while the lowest number were respondents who solely used desktops / laptop computers with a frequency and percentage distribution of 3 (1.4%).

Table 2b: Foreign and Local Contents

STATEMENT (Variable)	SA	A	U	D	SD	Mean	R
Foreign visuals are prevalent and more than local contents in online instructional multimedia	80 (36.4%)	120 (54.5%)	12 (5.4%)	5 (2.3%)	3 (1.4%)	3.15	**A**

Note: SA = Strongly Agreed, A = Agreed, U = Uncertain, D = Disagreed and SD – Strongly Disagreed. **Remark (R);** *A = Accepted*   **Source:** Researcher's Fieldwork, 2020

In ascertaining the distribution rate of foreign and local contents via web platform, it was discovered in Table 2b that a total of 200 respondents (90.9%), agreed that foreign contents are common in online instructional multimedia compared to local contents/ visuals. Twelve (12) respondents were undecided while a total of 8 respondents (3.7%) disagreed.

Discussion
It is obvious from the result in Table 2a that it is not only compactness and mobility that led to the high increase in the use of mobile devices, but the ability to link up the internet. The assertion of Karacay and Aydin (2018) manifested, basically from the point that the Internet of things (IoT) has really led to the idea of smart world. Daily engagements have been influenced with the aid of the gadgets to connect to the internet for all manner of activities: entertainment, communication, information sharing etc. Internet of Things simply refer to networking and interaction of many smart devices via information technologies; hence IoT is about communication, data gathering and sharing, and information (Atzori, Iera, and Morabito, 2010). However, whether local or foreign contents **(Table 2b)**, it has been established that content is of great importance in multimedia compilation. Therefore, it must be presented in a visually appealing manner; to create and sustain interest of the user (Costello, Youngblood and Youngblood, 2012). Meanwhile, it can be fully resolved that the prevalence of foreign contents in online instructional media depicts under-utilisation of multimedia design; to create visuals/ multimedia application with local features for maternal health communication and information.

Table 3: Role of multimedia as a delivery model in prenatal and puerperal activities

STATEMENT (Variable)	SA	A	U	D	SD	Mean	R
A multimedia application can help in information dissemination and retention; thereby people are informed thus improve maternal health care education.	113 (51.4%)	105 (47.7%)	1 (0.5%)	1 (0.5%)	0 (0%)	3.49	A
Multimedia graphics: integration of texts, images, sound, video and animation can boost learning and training for health care delivery	100 (45.5%)	118 (53.6%)	1 (0.5%)	1 (0.5%)	0 (0%)	3.43	A
Concept of Multimedia							
A special skill is needed to use a digital health multimedia program	103 (46.8%)	113 (51.4%)	3 (1.4%)	1 (0.5%)	0 (0%)	3.41	A
Investment in man power, more health facilities including digital technology is advised.	130 (59%)	88 (40%)	1 (0.5%)	1 (0.5%)	0 (0%)	3.57	A

Note: SA = Strongly Agreed, A = Agreed, U = Uncertain, D = Disagreed and SD – Strongly Disagreed. **Remark (R);** *A = Accepted* **Source:** Researcher's Fieldwork, 2020

Table 3. Showed frequency, percentage and mean distribution on role of multimedia as a delivery model in maternal healthcare. With 3.0 as the computed mean, the decision rule was to accept any variable with a mean of 3.0 and above as positively perceived by the respondents while a variable having a mean below 3.0 is negatively perceived, hence rejected. In accessing the roles of multimedia in prenatal and puerperal activities, multimedia application can help in information dissemination and retention; thereby people are informed thus improve maternal health care education has the highest mean score of 3.49, followed by multimedia graphics: texts, images, sound, video and animation can boost learning and training for health care delivery (3.43). Concurrently, to get a clearer idea of multimedia practise and operations in line with the roles, a special skill is needed to use digital multimedia program (is rated with a mean of 3.41), while investment in man power, more health facilities including digital technology is advised was rated higher.
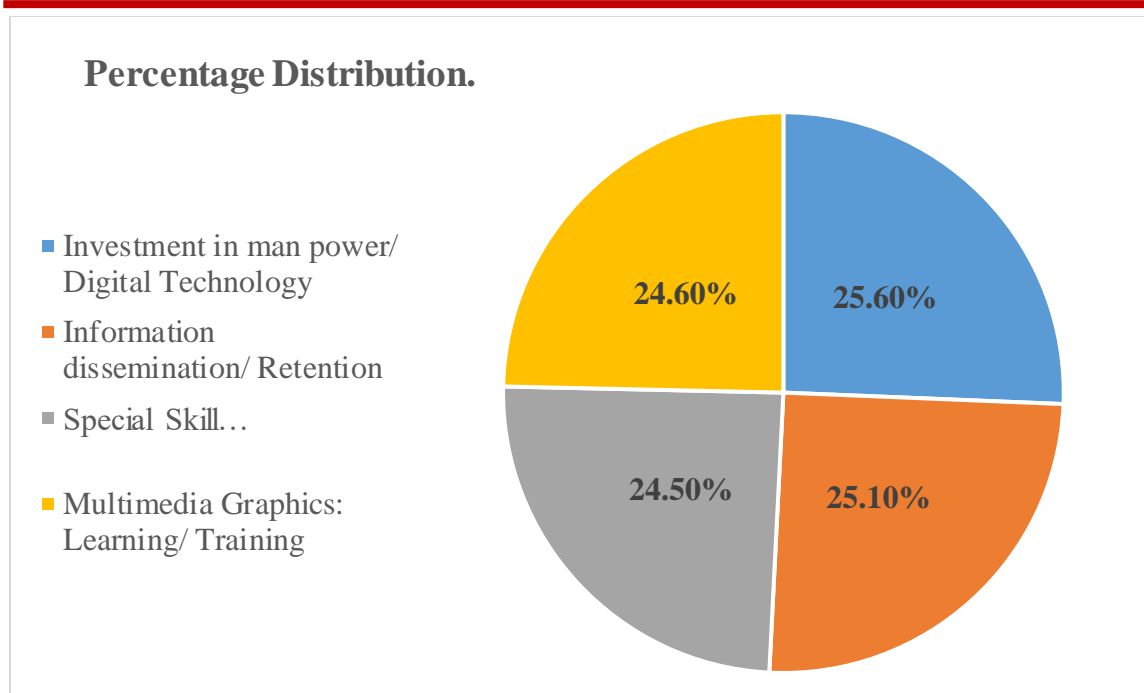
Percentage Distribution.

- Investment in man power/ Digital Technology
- Information dissemination/ Retention
- Special Skill…
- Multimedia Graphics: Learning/ Training

(Pie chart values: 25.60%, 25.10%, 24.50%, 24.60%)

Fig. 3 (Chart): Role of Multimedia as a Delivery Model in Maternal Healthcare
Source: Researcher's Computation, 2020

Discussion

All the variables have a mean that is above 3.0 thus they are valid. The validity tallies with the reaction of Ghinea & Chen (2006) that multimedia is key in the realm of computer-to-human interaction and even, human-to-human communication. Also, it is clear that the integration of texts, images, sound, video and animation (which is multimedia design) can boost learning and training for health care delivery. This is because multimedia through the design elements allow coordination of different external representations so as to create shades of meaning (Pea, 1991). Besides, 'multimedia' is "…*application-oriented technology that capitalizes on the multi-sensory nature of humans"* (Ghinea & Chen, 2006) thereby it exhibits positive influence. Meanwhile, despite the fact that special skill is needed to use a digital health multimedia program which has also been observed by Holden and Westfall, investment in man power and digital health technology is still advocated for. Holden and Westfall (2010) pointed out that sound knowledge of computer operations beyond the fundamentals is required to operate web based instructions.

Conclusion

The study explored the perception on multimedia design and technologies for maternal health care delivery among health experts in Ondo State, Nigeria. It has been discovered that multimedia dwells on multi-sensory nature of man, this makes it good for information dissemination and retention which is essential in learning. Hence, it can assist the medical/ health trainers in antenatal classes. Apart from that, multimedia graphics can be used to create persuasive contents to promote learning and also sensitise on better hygiene and healthy lifestyle. Meanwhile, further findings revealed that multimedia design is under-utilised to create multimedia applications and instructional contents especially with reference to local flavour.

Recommendation

In lieu of the findings from the research, the study therefore recommends that multimedia design and technologies should be properly adopted to enhance health campaign strategy for maternal healthcare delivery. Local contents should be weaved into multimedia applications to boost training and also assist the health caregiver in counselling. It is worthy of mentioning that multimedia design experts are to be engaged in the development process of the digital application. Finally, this study suggests quality investment in manpower and necessary facilities including digital technology. This is important to rise above obsolete technologies. The health personnel should also be sponsored for frequent trainings so as to be updated on the recent and emerging trends in line with their job as a caregiver, medical and health professional.

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