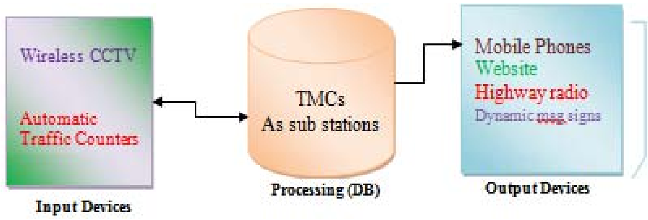

Figure 5: Dataflow diagram of the ITS system

9.3 Project Case Study (Owerri Municipal)

Owerri is a city located in Imo state in eastern part of Nigeria. It is not necessarily an industrialized city but known for its commercial activities. As the capital city of Imo state, its major public activities is built around public services and several private operations such as banks, Schools, major sales and distribution outfits, shopping mulls etc. Typically, Owerri is known as a center of Academic activities with four major tertiary institutions namely; Federal University of Technology owerri, Imo state university, Federal poly Nekede, Alvan Ikoku Colledge of education and Imo state polytechnic. These institutions coupled with lots of commercial activities only but characterizes the human and vehicle state as "congested" especially during peak hours. Also with located nearby towns of which most occupants find their ways to the city for work or for commercial activities. Owerri is also a major bypass for other major cities such as Onicha, PortHarcourt, Aba & Umuahia, therefore adding to the road network usage.

9.4 Brief Description of Owerri Road Network & Infrastructures.

I generated the city map using Google-map showing the road network of Owerri municipal, and also from a personal visit to the city I gathered the various major and arterial ways in the city. I discovered that most of the major routes are tarred with lots of inter-connected nodes or inner city roads, while construction of more roads are still be carried out by the state government.

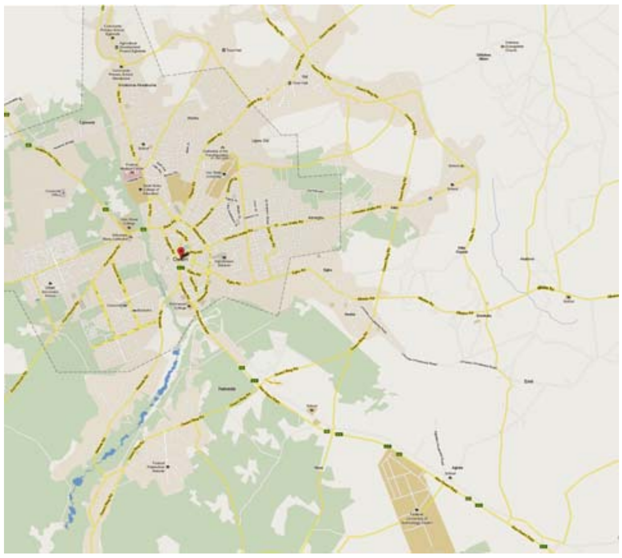

Figure 6: Owerri city map (From www.google.com/map)

Table 1: Road network in Owerri (tarred)

Express Roads	*Inter-State Roads*	*Inner-City Routes*	*Hotspots & Junctions*
Onitcha-Owerri rd.	Worldbank rds	Tetlow road	Assumpta –control
Portharcourt-Owerri rd	Orlu road	New owerri road (from control, opposite orlu road)	Orlu-Control junction
Aba-Owerri road	Orlu-works road	Nbaise-by douglas	FMC junction-bu orlu
Umuahia-Owerri road.	Bank road	School road (wethderal by douglas)	Douglas by bank road (from control)
	Control area	Douglas by Wethderal	Bank-by tetlow junction
	Wethderal road	New market to concorde road	Douglas-Nbaise junction
	Okigwe-IMSU road		Dan anyam stadium junction
	Umuoba-Urata road		Jerobin junction
	Egbu road		Wethderal by ITC junction
			Aba-Naze junction

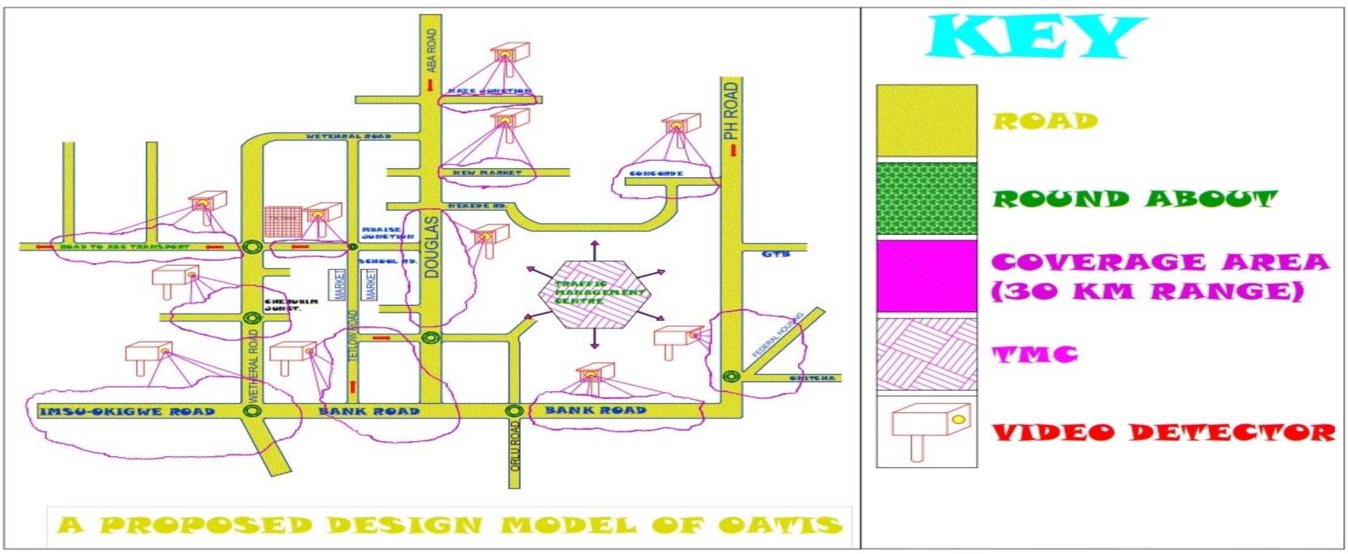

Figure 7: Proposed network model for owerii municipal

9.9.5 Inputs of Owerri ATS of the ITS model

For the deployment of Owerri ATIS the following input materials are needed;

a. Upgrading traffic signal controller equipment to support IP communication
b. Procurement of video management equipment and software applications.
c. Procurement of Advance Traffic Signal Management Software (recommended but not within the scope of this project modeling)
d. Procurement of CCTV cameras and supporting software
e. Procurement of dynamic message road signs & development of the controlling software.
f. The construction of three (3) distributed Traffic Management Centers in Owerri.
g. Upgrading traffic signal poles to support CCTV camera installation
h. Procurement of wireless communication network (broadband) as well as fibre optic cables for the networking of the field devices and the three traffic management centers.

9.6 Traffic Management Centre (S)

The Traffic Management Centers serve as the major point of connectivity between the array of field devices and the TMC. Real time information in the form of video and data is collected and analyzed at the TMC. Real time information on traffic conditions will be disseminated to the general public via local media, internet and smart phones

In my literature review of chapter two, I reviewed a lot of past works done on ITS, I discovered the Central control system of monitoring, processing and dissemination of information to the road users has a lot of bias and was criticized by most professionals in the field of ITS. Solutions preferred was the Distributed traffic control system, where the field dedicated devices are intelligently controlled by automated devices along the road network without having only one dedicated control center which stands the risk of failure. However, a consideration of the financial and technological involvements and suggest a decentralized traffic control system (for Owerri), which involves construction of three traffic control centers (to reduce cost government offices could be deployed) along major centers of Owerri municipal and all three centers linked up by the internet to communicate with each other for proper dissemination of information.

10. Conclusion

The rapidly increasing vehicle population in Nigeria, spurred by the population boom has contributed to the burden of traffic management in the Nation. No doubts, the government have employed various means such as contraction of more roads, initiating road safety rules and policies, etc to curb the problem but to no avail.

From this studies, little or nothing have been done in the field of ITS in Nigeria. As a matter of fact, majority of people in Nigeria knows little or nothing about Information technology's impact in the transportation sector, meanwhile most developed(and even developing countries) of the world have & are maximizing the benefits of ITS to solving traffic congestion.

The adoption of location and information based technologies both in vehicles, infrastructure, traffic management, and traveler information services continue to show drastic improvement in the effective and efficient mobility of people and goods.

However, the design and implementation of an intensive ITS program hinges on the following developments;

a. Technology: The development and implementation of ITS, is important to the successful management and operation of ITS in Nigeria. These technologies include Electronic equipments such as sensors, detectors, communication devices and global navigation satellite system (which we already have).
b. Cooperative effort: ITS can only be made possible in Nigeria through a cooperative effort between the Government, industries and private companies as well academic/research institutions. I strongly recommend the sponsorship of further research of ITS by students at various level to fully appreciate the potentials as well as the working modalities of ITS.
c. Modeling of Nigeria traffic: The pictorial model I developed captures the various elements of ATIS, with details of components deployed, but further studies must be carried out to modify or develop the real or ideal (practical) model that can effectively characterize the traffic situation in Nigeria or owerri in specific.
d. Supply Chain: seamless interconnectivity of the various branches of the transportation sector is essential to provide effective, efficient and secured movement of goods and services while improving the conservation of natural resources and reducing the environmental impact of effects of carbon emissions.
e. Human capital development: The need for a fully developed human capital for the effective deployment of existing and emerging technologies of ITS cannot be overemphasized.
f. Energy and sustainability: ITS deployment in Nigeria relies heavily in the energy and power sector of Nigeria. A close work with the energy sector is needed in the promotion of fuel efficient transport policies and practice.

11. Recommendation

As discussed in the chapter three of this work, Intelligent Transportation system can only be achieved through partnership and collaborative efforts of the concerned disciplines and institutions. It is not a one-man task. Being fully aware that the existing models of ITS as adopted in other developed countries may not work in the Nigerian context, I have taken it upon myself to review various models adopted by other Nations and have designed a Pictorial model as well as cost benefit analysis of the Owerri Advanced travelers information system to suite the financial and technological strength of the state.

However, a plethora of issues and challenges have to be tacked before Nigeria can have a fully operating ITA.

The following strategies are recommended for the effective deployment of ITS in Nigeria:

a. Establishing ITS standards applicable throughout the urban and rural sections of Nigeria.
b. Setting up between academics, industries and government agencies.
c. Repair of worn out roads in most urban and rural road networks as well as expansion (to a reasonable degree) existing road network to accommodate the large number of road users.
d. Setting up rules and regulations of traffic that would aid ITS implementation.
e. Setting up aggressive yet achievable short and long term goals for transportation system.

If ITS must be deployed in Nigeria, most importantly Nigerians (stakeholders) must be aware of the potentials presented by ITS and believe in the possibility of its deployment in Nigeria.

11.1 Future Scope

Intelligent transport system is a very important component of any society that seeks to grow its transportation sector. This work focuses more on the integration of Advance travelers' information system. Other areas which include the ITS enabled transportation prizing system, Advance public transportation system among others, are areas that could be worked on in future.

References

[1] Tylor & Francis, 'Intelligent Transportation System'. http://www.taylorandfrancis.com, 2010
[2] Stephen Ezell, "Explaining International IT Application Leadership: INTELLIGENT TRANSPORTATION SYSTEMS". The Information technology & Innovation foundation (ITIF), 2010
[3] Ghosh S, Tony S. Lee, "Intelligent Transportation Systems: Smart and Green Infrastructure Design" CRC Press, 2010.
[4] Sumit Ghosh, Tony Lee, Tony S. Lee, "Intelligent Transportation Systems: New Principles and Architectures" CRC Press 2000.
[5] Von Tomkewitsch, R, "Dynamic route guidance and interactive transport management with ALI-SCOUT". Vehicular Technology, IEEE Transactions, 1991 on (Volume:40 , Issue: 1) Page 45 – 50 ISSN :0018-9545
[6] Jimoh & Adeleke, "Potential benefits of intelligent transport system". Journal of Research Information in Civil Engineering, 2005.
[7] Wikipedia Encyclopedia, "Intelligent transport system", 2014
[8] DIRECTIVE 2010/40/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 July 2010. eur-lex.europa.eu, 2010.

Author Profile

Amadi E. C. Received the B.Eng in Electrical and Electronics Engineering from Abubakar Tafawa Balewa University, Bauchi in 2006 and M.S. degrees in Information Technology from Federal university of Technology, Owerri in 2012. He worked as a network engineer with the Nigeria Internet Registration Association from 2008 to 2009. He is currently an Assistant lecturer at the Federal University of Technology, Owerri.

Dr. Ahaiwe J., received the B.S. in Business with a minor in mathematics at the Agriculture and Mechanical university Alabama between 1977 and 1980. He has a Master of Science degree in Computer Science Technology in the same university between 1980 and 1983. Dr Ahaiwe J. got a PHD degree in Project Management Technology at the Federal University of Technology, Owerri where is currently a Senior Lecturer.

Etus C. Received the B..Eng in Electrical and Electronics Engineering with option in Electronics and Computer from Federal university of Technology, Owerri in 2005. He obtained an M.Eng. degrees in Computer Engineering from Federal university of Technology, Owerri in 2010. His areas of Interests are Computer electronics and software engineering. He is currently an Lecturer II with the Department of Information Management Technology, at the Federal University of Technology, Owerri.

Nnamonso O. AKPABIO, mnse, In 1997 he obtained ND in computer science from university of portharcout which gave room for direct admission in computer engineering department in university of uyo and graduated with bachelor of engineering (B.Eng) in 1997. 2010/2011 he got enrolled in FUTO FEDERAL UNIVERSITY OF TECHNOLOGY OWERI to study PGD in Information Management. Today, he is a master's degree student at the department of Information Management Technology Department, Federal University of Technology, Owerri, Imo state. He is a member Nigerian Society of Engineers. Also a member Institute of safety professionals of Nigeria.(ISPON).