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NEEDS DRIVEN RESEARCH IN AUTOMOBILE ENGINEERING AND TECHNOLOGY FOR SUSTAINABLE INDUSTRIAL AND NATIONAL DEVELOPMENT IN BAYELSA STATE, NIGERIA

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Abstract

This study employed descriptive survey research design. The study was conducted in Bayelsa State, Nigeria. Two research questions were formulated to guide the study. The population of the study comprised of 30 respondents. A simple random sampling technique was used. A structured questionnaire was used as instrument for data collection. the instrument was sub-divided into 2 sections, section A and B. Section A, contains 16 items and section B, contains 22 items, making a total of 38 items on a five-point scales, ranging from strongly agreed = 5, agreed = 4, undecided = 3, disagreed =2 and strongly disagreed = 1. The instrument was validated by three experts. Cronbach alpha reliability coefficient index was used to determine the internal consistency of the instrument. The reliability coefficients obtained for the two segments of the questionnaire were 0.78 and 0.86. The overall reliability index for the instrument was 0.82. Data were analyzed using mean and standard deviation, any items with the mean score of 3.50 and above were regarded as agreed and accepted, while any item with the mean score less than 3.50 were regarded as disagreed and not accepted. The results revealed among others issue of brain drain, non-cohesion between educational curriculum and industries, non-aligning research objectives with specific societal needs. It was recommended among others that government should establish national research priorities aligned with development goals.

Keywords: Automobile technology, engineering and technology, needs-driven research

Introduction

Automobile technology applies scientific knowledge in the design, construction, operation, and maintenance of vehicles. It is an important trade within industrial technical education, with programs in tertiary institutions aimed at producing skilled technologists (Poripo, 2024). According to the National Board for Technical Education (NBTE, 2003), an automobile technologist must be competent in testing, diagnosing, servicing, and repairing automobile systems in line with manufacturers' specifications. Similarly, Poripo et al. (2020) emphasize that automobile education involves not only technical training but also the acquisition of scientific knowledge and problem-solving skills needed for industrial and engineering development.

Engineering and technology are foundational to modern progress. According to Paul, et al (2018) & Ekpiwhre, (2008) Technology refers to the practical application of knowledge and the use of tools, techniques, systems, and organized methods, including the creation of tangible products like clothing. It plays a vital role in enhancing human capacity to interact with and adapt to the natural world. Engineering, on the other hand, applies science and mathematics to design and operate systems while balancing societal needs, costs, and environmental sustainability. Both fields have driven industrialization, economic growth, and cultural advancement but also pose challenges such as environmental degradation and resource depletion. In Nigeria, the national education policy (FRN, 2014) stresses training manpower in engineering, applied sciences, and technology to support industrial and economic development. However, polytechnic and technical education remain undervalued

compared to university education. As Victor (2009) notes, this neglect has contributed to a shortage of skilled technicians and hindered technological progress.

A critical challenge in developing nations, including Nigeria, is the disconnect between academic research and practical societal needs (Ayoade & Abimbola, 2020). Traditional academic inquiry often prioritizes theory over real-world application, limiting its impact. Needs-driven research focused on addressing pressing developmental, industrial, and societal problems offers a solution. This approach ensures scientific output is relevant, applicable, and aligned with national priorities (Aina, 2010). Schot and Steinmueller (2018) argue that addressing these multifaceted challenges demands not only technical expertise but also a deliberate alignment of research priorities with the socio-economic and environmental realities of each country. Together, these perspectives highlight the strategic importance of aligning engineering and technological research with pressing national and global development imperatives (Lee & Lim, 2001). Schot and Steinmueller (2018) argue that addressing these multifaceted challenges demands not only technical expertise but also a deliberate alignment of research priorities with the socio-economic and environmental realities of each country.

International organizations such as UNESCO (2021) and OECD (2019) emphasize aligning research with development goals, particularly those outlined in the UN's Sustainable Development Goals (SDGs). These include clean energy, sustainable industrialization, and resilient infrastructure. Global examples, such as South Korea's R&D strategy (Lee & Lim, 2001), show how research closely tied to industrial needs can drive rapid economic transformation. Bozeman and Sarewitz (2011) argue that the traditional model of isolated, curiosity-driven research has limited capacity to address urgent societal demands, particularly in the context of rapidly changing technological and economic landscapes. Clark (2007) reinforces this position by highlighting the persistent misalignment between academic research outputs and the operational needs of industry and policy-making. In the fields of engineering and technology, aligning research with national development priorities has proven particularly beneficial (Etzkowitz & Leydesdorff, 2000).

Nigeria's underinvestment in technical education and misaligned research agendas have contributed to persistent challenges such as failing agricultural systems, collapsing manufacturing industries, unreliable power supply, and economic vulnerability due to oil dependency (Esho, 2008). Without strengthening indigenous innovation and research relevance, Nigeria risks falling further behind in global competitiveness. To address these challenges, Nigeria must: Promote technical and vocational education as equal in value to academic education. Align research with societal and industrial needs through needs-driven strategies. Strengthen policies linking engineering, education, and national development goals. Invest in sustainability-focused innovation, ensuring economic resilience.

Automobile technology, engineering, and research play interconnected roles in economic and social development. While Nigeria faces significant barriers due to neglect of technical education and lack of alignment between research and industry, adopting a needs-driven research framework offers a pathway toward industrial growth, technological innovation, and sustainable national progress. Ultimately, the nation's strength lies in its capacity to harness education, engineering, and technology to solve pressing developmental challenges.

Statement of the Problem

In developing nations such as Nigeria and across Africa, however, a persistent gap remains between academic research outputs and the practical needs of industries and society. This disconnect significantly limits the contributions of research to meaningful national development outcomes. To bridge this divide, needs-driven research guided by pressing developmental, industrial, and societal challenges has emerged as a critical strategy. The persistent disconnect between academic research agendas and real-world demands often results in the inefficient translation of scientific knowledge into practical applications among engineers and technologists. However, in the fields of engineering and technology, especially automobile and metalwork technology, aligning research with national

development priorities has proven particularly beneficial to nations. Hence, this study is to investigate the needs-driven research in automobile engineering and technology for sustainable industrial and national development in Nigeria.

Research Questions

The following research questions were answered to guide the study.

1. How does non-cohesion between educational curriculum and industries misalignment affects academic research and automobile engineering and technology?
2. How do investments in engineering and technology create positive impact for needs-driven research on industrial development in automobile engineering and technology in Bayelsa State?

Methodology

This study was conducted using descriptive survey research design. A structured questionnaire titled: needs driven research in engineering and technology for sustainable industrial and national development was used as instrument for data collection, the instrument was sub-divided into 2 sections, section A and B, with each section contains 16 items, making a total of 32 items on a five-point scales, ranging from strongly agreed = 5, agreed = 4, undecided = 3, disagreed =2 and strongly disagreed = 1. The study was conducted in TVET institutions in Bayelsa State, Nigeria. The population of the study comprised of 50 Lecturers and 15 Industry-based experts making a total of 65 respondents in Bayelsa State Institute of Entrepreneurship and Vocational Training, Elebele, Bayelsa State Polytechnic Alebiri, Isaac Jasper Boro College of Education Sagbama, and International Institute of Tourism and Hospitality Management, Opolo. No sampling was carried out, as the entire populations were studied. The instrument used for collection of data in this study were validated by three experts from the Ignatius Ajuru University of Education, Port-Harcourt. In determining the reliability of the research instrument, the researcher administered 22 copies of the instrument to 22 staff of the Government Science and Technical College, Okaka, Bayelsa State. Statistical Package for Social Sciences (SPSS) version 20.0 was used to analyzed the data collected from the respondents. Cronbach alpha reliability coefficient index was used to determine the internal consistency of the instrument. The reliability coefficients obtained for the two segments of the questionnaire were 0.82 and 0.74. The overall reliability index for the instrument was 0.78. These indicated that the instrument was reliable. Data were analyzed using mean and standard deviation, any items with the mean score of 3.50 and above were regarded as strongly agreed or agreed and accepted, while any items with the mean score less than 3.50 were regarded as strongly disagreed, disagreed and not accepted.

Results

Research Question 1

What are the misalignments between academic research and industrial needs in automobile engineering and technology in Bayelsa State, Nigeria?

Table 1: Misalignment Between Academic Research and Industrial Needs in Automobile Engineering and Technology

S/N	Items	M	SD	Remarks
1	Issue of brain drain	3.61	0.68	Agreed

2	Non-cohesion between educational curriculum and industries	3.57	0.52	Agreed
3	Non-aligning research objectives with specific societal, economic, and industrial needs	3.71	0.68	Agreed
4	Non-centering research activities on pressing local challenges	3.59	0.67	Agreed
5	Lack of stronger linkages between research institutions, industries, and policymakers	3.69	0.46	Agreed
6	The absence of cohesive national research strategies	3.80	0.61	Agreed
7	Undermining efforts to align research with development priorities and practical outcomes	3.79	0.34	Agreed
8	Curriculum not aligned with local challenges and opportunities	3.54	0.50	Agreed
9	Lack of deliberate alignment of research priorities with the socio-economic needs of the nation	3.69	0.46	Agreed
10	Lack of deliberate alignment of research priorities with the environmental realities of the nation	3.59	0.47	Agreed
11	The absence of cohesive national research policies	3.50	0.57	Agreed
12	Lack of innovation hubs and technology parks	3.71	0.82	Agreed
13	The gap between academic research and industrial application	3.67	0.70	Agreed
14	Lack of transformation of research outputs into commercially viable products and services	3.71	0.82	Agreed
15	Industry representatives frequently described academic research as overly theoretical and lacking immediate applicability	3.67	0.70	Agreed
16	Lack of continuity in needs-driven research	3.77	0.61	Agreed

Note. *M = Mean; SD = Standard Deviation*.

The result in Table 1 above shows that respondents agreed to all the 16 items as misalignment between academic research and industrial needs in Automobile Engineering and Technology in Bayelsa State, Nigeria. The Table 1 also shows that issue of brain drain, non-cohesion between educational curriculum and industries, non-aligning research objectives with specific societal, economic, industrial needs and lack of transformation of research outputs into commercially viable products and services. It also revealed that lack of stronger linkages between research institutions, industries, and policy makers are among the factors that causes misalignment between academic research and industrial needs in engineering and technology in Nigerian institutions.

Research Question 2

What are the positive impacts of needs-driven research on industrial development in automobile engineering and technology in Bayelsa State?

Table 2: Positive Impact of Needs-Driven Research on Industrial Development in Automobile Engineering and Technology

S/N	Items	M	SD	Decision
1	Investments in engineering and technology always pay off	3.61	0.68	Agreed
2	Investment heavily in people, infrastructure, and factories	3.57	0.52	Agreed
3	Carefully designed plans and strategies	3.71	0.68	Agreed
4	Indigenous scientists, technical experts, and engineers should be provided with incentives	3.59	0.67	Agreed

S/N	Items	M	SD	Decision
5	There should be an enabling environment that will encourage engineers and technologists to stay and develop our economy	3.69	0.46	Agreed
6	Students and professionals who leave the country for further education and training should return	3.80	0.61	Agreed
7	Industries and institutions should invite foreign experts to train staff using available technology rather than sending them abroad	3.79	0.34	Agreed
8	Foreign technology should be transferred to institutions	3.54	0.50	Agreed
9	Information and results of research that are readily available in our institutions should be implemented	3.69	0.46	Agreed
10	Business contacts, initiating research, and commercial projects should be facilitated	3.59	0.47	Agreed
11	Providing better incentives for skilled and research experts	3.50	0.57	Agreed
12	Technical and engineering professionals should be encouraged to practice their professions rather than moving into other trades	3.71	0.82	Agreed
13	The idea of foreign technology and technology transfer should not be the "cut and paste" approach	3.67	0.70	Agreed
14	Ensuring that research outcomes are not only innovative but also scalable and implementable within the target society	3.71	0.82	Agreed
15	Coordinated effort involving policymakers, research institutions, industry stakeholders, and international partners to create an enabling environment for impactful, needs-driven research	3.67	0.70	Agreed
16	Establishing structured partnerships between academic institutions and the private sector ensures that research activities address real-world challenges	3.77	0.61	Agreed
17	Joint research projects, industry-sponsored internships, and co-funded innovation programs	3.51	0.64	Agreed
18	Formulate and implement policies that prioritize needs-driven research	3.54	0.50	Agreed
19	Align research agendas with development priorities in critical sectors	3.57	0.52	Agreed
20	Incentive structures should reward research that leads to practical applications	3.59	0.47	Agreed
21	Strengthening the capabilities of researchers through training in grant writing, intellectual property rights, and commercialization strategies	3.80	0.61	Agreed
22	Supporting institutions with the tools and knowledge needed for research translation	3.71	0.82	Agreed

The result in Table 2 above shows that respondents agreed to all the 22 items as positive impact of needs-driven research on industrial development in Automobile Engineering and Technology in Bayelsa State, Nigeria. Data in Table 1 also shows that, Investments in Engineering & Technology always pay off, indigenous scientist, technical experts and engineers should be provided with incentives. There should be enabling environment that will encourage engineers and technologists to stay and develop our economy. It was also revealed that coordinated effort involving policy makers, research institutions, industry stakeholders, and international partners to create an enabling environment for impactful, needs-driven research should be encouraged. Supporting institutions with the tools and knowledge needed for research translation are among the positive impact of needs-driven research on industrial development in engineering and technology in Bayelsa State, Nigeria.

Discussion

The result in Table 1 above shows that respondents agreed to all the 16 items as misalignment between academic research and industrial needs in engineering and technology in Bayelsa State, Nigeria. Findings of this study is in line with study of Clark (2007) who stated that, the persistent misalignment between academic research outputs and the operational needs of industry and policy-making. This disconnects, he notes, results in suboptimal knowledge transfer and a significant lag in the translation of research into practice ultimately hindering innovation and development outcomes. Such inefficiencies are particularly detrimental in low- and middle-income countries, where resource constraints demand maximum return on research investment.

The result in Table 2 above shows that respondents agreed to all the 22 items as positive impact of needs-driven research on industrial development in engineering and technology in Bayelsa State, Nigeria. The study's findings underscore the pivotal role of needs-driven research in advancing industrial and national development. Countries that effectively align their research and development (R&D) strategies with broader socio-economic goals tend to achieve more resilient and sustainable industrial growth. This finding is in agreement with Schot & Steinmueller, (2018) who stated that potential demands, comprehensive institutional reforms that foster collaboration, enhance accountability, and ensure responsiveness within the research ecosystem. Engineering schools and faculties, in particular, must be empowered with both the autonomy and responsibility to orient their research toward addressing national priorities such as renewable energy, resilient infrastructure, and digital manufacturing. This shift requires more than academic intent; it calls for structural support and strategic alignment with national development agendas.

This finding is also supported by Etzkowitz & Leydesdorff, (2000) who said governments and funding bodies play an essential role in shaping a demand-responsive research environment. By providing targeted grants, establishing innovation clusters, and offering tax incentives for industry-academic partnerships, they can stimulate a culture of practical innovation and applied problem-solving. These mechanisms can help bridge the persistent gap between academic research and industrial needs.

Conclusion

Needs-driven research in engineering and technology serves as a powerful engine for industrial advancement and sustainable national development, especially in low- and middle-income countries. When research efforts are closely aligned with real-world challenges and development priorities, the outcomes are more likely to generate impactful innovations that improve livelihoods, boost productivity, and contribute to achieving the Sustainable Development Goals (SDGs). To harness this potential, countries must enact policy and structural reforms that encourage stronger linkages among academia, industry, and government. This includes creating enabling environments for innovation, offering robust funding mechanisms, and reinforcing institutional capacities. Without such concerted efforts, the transformative potential of engineering and technology will remain largely untapped.

Recommendations of the Study

To strengthen needs-driven research in Automobile Engineering and Technology, particularly in the context of sustainable development, the following strategic actions are recommended:

1. Government should Establish National Research Priorities Aligned with Development Goals.
2. Reform Institutional Incentives and Governance

References

Aina, T. A. (2010). Beyond reforms: The politics of higher education transformation in Africa. *African Studies Review.*

Akpan, G. E., & Chuku, C. (2014). Natural resources, human capital and economic development in Nigeria: Tracing the linkages. *Journal of Economics and Sustainable Development, 5*(21), 1–12. www.iiste.org.

Ayoade, O. B., & Abimbola, O. A. (2020). Industry-academia collaboration in Nigerian universities: Challenges and prospects. *African Journal of Science, Technology, Innovation and Development, 12*(4), 457–465. https://doi.org/10.1080/20421338.2020.1718809

Bozeman, B., & Sarewitz, D. (2011). Public value mapping and science policy evaluation. *Minerva, 49*(1), 1–23. https://doi.org/10.1007/s11024-011-9161-7

Clark, N. (2007). Science, agriculture and research in Africa: A review of donor support. *IDS Working Paper 294.* Institute of Development Studies.

Development, Security, and Cooperation (DSC). (2007). *Mobilizing science-based enterprises for energy, water, and medicines in Nigeria.* National Academies Press. https://www.nap.edu/openbook.php?record_id=11997&page=1

Docquier, F., & Marfouk, A. (2006). Brain drain in developing countries. *World Bank Economic Review, 21*(2), 193–218. https://doi.org/10.1093/wber/lhl009.

Ekpiwhre, G. (2008). Utilising science and technology to drive Vision 2020. *Punch Newspaper Publications.* [Speech delivered at Tinapa Resort, Calabar, Diaspora Day].

Enebeli, E. E. (2010). Causality analysis of Nigerian electricity consumption and economic growth. *Journal of Economics and Engineering, 4*, 80–85.

Esho, M. A. F. (2008). A keynote address delivered at the opening ceremony of the 4th International Conference of the Schools of Science, Engineering and Environmental Technology. The Federal Polytechnic, Ede.

Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and "Mode 2" to a triple helix of university-industry-government relations. *Research Policy, 29*(2), 109–123. https://doi.org/10.1016/S0048-7333(99)00055-4

Fayinka, F. A. (2004). Food security in Nigeria: Challenges under democratic dispensation. *Federal Offices of Statistics (FOS).*

Federal Republic of Nigeria. (2014). *National policy on education* (Revised). Lagos: NERC.

Lee, K., & Lim, C. (2001). Technological regimes, catching-up and leapfrogging: Findings from the Korean industries. *Research Policy, 30*(3), 459–483. https://doi.org/10.1016/S0048-7333(00)00088-3

National Research Foundation. (2020). *Research for development: A framework for impact.*

OECD. (2019). *OECD science, technology and innovation outlook 2019.* OECD Publishing. https://doi.org/10.1787/9b3b9a24-en

Paul, B. N., Allhassan, A. N., & Andah, M. (2018). Engineering and technology for sustainable economic development in a recessed economy. *Journal of Research in National Development (JORIND), 16*(1), 94–108. www.transcampus.org/journal; www.ajol.info/journals/jorind

Poripo, J. (2025). Impact of artificial intelligence (AI) in the teaching and learning of skill-based education in TVET institutions in Bayelsa State, Nigeria. *Journal of Centre for Technical Vocational Education, Training and Research (JOCETVETAR), 7*(1), 120–131.

Poripo, J. (2024a). Impact of multiple stress management intervention on motivation and academic performance of automobile technology education students in universities in South-South, Nigeria. *Sagbama Journal of Science and Technical Education (SAJOSTE), 1*(2), 47–52.

Poripo, J. (2024b). Impact of vocational facilities in the teaching and learning of vocational andtechnical subjects in vocational institutions in Bayelsa State, Nigeria. *International Journal of Tourism and Technology, 2*(1), 1–9.

Poripo, J., Ede, E. O., Nwaodo, S. I., & Youdiowei, B. T. (2020). Effect of multiple stress management intervention on stress and academic performance of automobile technology education students in universities in South-South, Nigeria. *Engineering Applied Sciences, 15*(9), 2121–2127.

Poripo, J., Youdiowei, B. T., & Okardi, B. C. (2016). Development of instrument for assessing students' practical skills in fault diagnosis and repairs of motor vehicles in technical colleges, Bayelsa State, Nigeria. *Journal of Issues in Professional Teacher Education, 11*(2), 130–149.

Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy, 47*(9), 1554–1567. https://doi.org/10.1016/j.respol.2018.08.011

UNESCO. (2019). *Engineering for sustainable development: Delivering on the sustainable development goals.* UNESCO Publishing.

UNESCO. (2021). *UNESCO science report: The race against time for smarter development.* UNESCO Publishing.

World Bank. (2021). *The role of technology and innovation in economic development.* World Bank Group.

World Bank. (2022). *World development indicators.* https://data.worldbank.org