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Relationship between Competency Skills of Bus Vehicle Body Builders and Crashworthiness of School Bus in Nairobi County, Kenya

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Abstract:
In Kenya, thousands of vehicles are involved in vehicle collisions or crashes every year resulting in fatal accidents and severe injuries to the passengers. This research therefore attempted to fill the gap by focusing on school bus vehicle body crashworthiness. The specific objective was the influence competency skills had on crashworthiness of school bus in Nairobi City County. This study adopted, Mathematical Framework theory. The pragmatic paradigm and explanatory research design were used. The target population was 1500 respondents from bus body building firms and government regulatory institutions. The sample size was 315 respondents. Questionnaires, interview schedules and observation were data collection instruments. Expert judgment was used to establish validity of the questionnaires. Cronbach's Alpha Coefficient used to determine the reliability of the research instrument. The data collected was analyzed using descriptive and inferential analysis with the aid of SPSS V22 software. The coefficient of determination (R squared) of .601 showing that 60.1% of the variation in crashworthiness of a bus can be explained by competency skills. There was a positive significant influence of competency skills on crashworthiness of a bus (β=0.833 and p <0.05). The competency skills had a positive significant influence on crashworthiness of a bus. The company hugely develops the skills and knowledge of its employees to work on new vehicle technologies, including manufacturer – specific training, company motivates its staff through sector specific skill expansion. The company should always motivate its staff through sector specific skill expansion and apprenticeship system remains our company's preferred way of complementing skills formation.

Keywords: *Competency, skills, vehicle body, builders, crashworthiness, school bus*

1. Introduction

In fact, the first systemic and scientific investigation of this subject was applied between 1879 t to the train axles, and the first was to be applied to railway axles. The crashworthiness is an engineer's term used to define the ability of the structural vehicle to protect its occupants during impact (Jones, 2003). In other words, collision resistance improves the structure's crash efficiency by sacrificing it under influence to prevent accidents for its occupants (Jones 2003). One of the primary variables contributing to worldwide road crash injuries is the growing amount of motor cars. A great deal has been achieved about exposure and development to risk but not sufficient to alleviate the threat.

Roof Crush Resistance has created a minimum roof-resistance requirement in the US for "reducing fatalities and accidents owing to crushing roof into occupancy during over-the-counter accidents" (the Federal Motor Vehicle Safety Standard (FMVSS) No. 216. This experiment involves pushing a rigid platform at steady velocity on one side of the ceiling. The test was conducted in 1973 and stayed fundamentally unchanged until 2009 (National Highway Traffic Safety Administrator, 2012) when an updated rule was announced. There is an important connection between roof force and injury risk in roll-over accidents (Brumbelow, Teoh, Zuby, & McCartt, 2009).

In recent years studies on crash resilience and vehicle security have attracted attention with an emphasis on passenger vehicle security inquiry (Prochowski et al. 2011, al-Thairy and Wang 2014). However, the amount of road fatalities in 88 nations has decreased to 1.24 million annually–but the complete amount of road fatalities continues unacceptable elevated. The worldwide general fatality rate for highway traffic is 18 per 100,000 people. The largest annual death tolls in middle-income nations are 20.1 per 100 000, with the lower to 8.7 per 100 000 for high-income countries (World Health Organization, 2013). Bus transit is considered the safest way of transportation for medium and long distances. Nonetheless, with car numbers, the number of bus accidents and victims has risen. The most hazardous bus crash scenarios are known as rolling crashes (Matloscy, 2007). Even as a rare case, only 4-5% of all bus crashes are reversed, almost 50% of all severe and fatal injuries are caused (Gepner, 2014; Martinez et al., 2013). It is not easy to access statistical data on cutting bus accidents.

Road safety, killed more than 1,2 million people every year (WHO 2004), is a significant issue globally. While only 0,4% of the overall amount of crashes with college busses (SB) have happened in Alberta during the last century. With

regard to safety and the intensity of the emotions of college children, these collapses tend to receive disproportionate media and community attention. SB security is a major problem in society since parents put their trust in schools or SB drivers to securely transport their children from and to school.

About 6,000 SBs operating in Alberta, Canada, cover over 76 million kilometers each year, and are regarded one of its safest methods, transporting roughly 126,000 rural learners and 139,000 urbans (Opus Hamilton 2008). The percentage of injury-induced SB crashes in Alberta is 13.7% while the percentage of total injury crashes in Alberta is 15.2% (Opus Hamilton 2008). This means that the risk of SB collisions is somewhat smaller, leading to injury in comparison with all collisions. SB accidents nevertheless happen, with tragic effects at times. There is also a tendency to follow public demand for actions not supported with theory or evidence. Every SB collision is therefore a cause for concern, especially if it causes losses in our most vulnerable population.

Road accidents in Tanzania grew by 44 per cent between 1990 and 2000, according to Museu, Mcharo and Lashabai (2002). A total of 56 percent of wounded travelers followed by 25 percent of pedestrians. Eastern Africa has seen similar patterns. Over 50 percent of all unpaved driving accidents were ascribed to Tanzanian police, and around 15 percent of all crashes were caused by unroad worthy cars. Alcohol abuse in Zambia was ascribed to Tanzania's police only by 1% due to accident, while its Zambia counterparts discovered 30% of highway crashes (RTA) had elevated BACs. Some of them most likely could have been alcoholic-driven by the reckless drivers who have caused over 50% of Tanzanian crashes.

In Kenya, Muyia claimed that accidents were three times higher than in 1963, to 10,106 in 1989, and to 11,785 in 1994, in 1995. 2014 murdered, 6650 severely wounded and 11,094 minor wounds were reported in the case of such incidents. The causes of the accidents included sensitive driving, unsustainable cars and bad road conditions. Odero, Khayesi and Heda (2003) note that almost 3000 deaths take place annually on Kenyan highways.

A qualified staff specializing in car maintenance, repairs and alteration were identified by Hiller and Coombes (2004). An automotive mechanic may know all of the components of a range of car models, or he may specialize in a particular field of automotive skills or in a particular car model or brand. He has precise diagnoses and repairs of vehicle issues (US Occupational Guide 2011-2012).

Osuala (2004) points out that competition is a significant driver of efficiency and policies to enhance manufacturing, service and quality of products. Consequently, both employability and technical abilities for running an automotive workshop must be available in the car mechanic. Employability abilities are the fundamental abilities and abilities required to get, maintain and do a job well (Robinson, 2000). Osuala (2004) looks at the set of these skills and summarizes the following: communication skills, computing and cultural skills, personal reliability: personal management, morality and professional maturity, skills of financial adaptability; problem solvers; employability and job-creation; and groups and organizational skills.

The technical competences needed for the performance of a particular job on the opposite hand are related competence (Robinson, 2000).In addition, Arul & Kavi (2002) stated that technical skills include knowledge, expertise in specialization as well as the use of tools and techniques. In different occupational areas, skills in engineering, engine maintenance, auto design, automotive electrics / electronics, volcanics, steering and suspension systems are essential. The skills of this program include safety and safety, basic machine operational capabilities and sophisticated machinery, professional writing, newsletters and drawing / sketching skills in Nwoji and Osinem (2010).

The security of vehicles in Kenya is a severe issue with more than 12,000 accidents per year. About 3, 000 deaths and 9,000 severe injuries have been reported to occur every year in about 26,000 car accidents. This means over 33 accidents and 9 deaths every day. The United Nations World Road Safety report points out that highway traffic accidents in Kenya represent the third cause of death in the following countries: malaria and HIV / AIDS. On the global stage, approximately 1.2 million individuals suffer road accidents and up to 50 million wounded around the world. In terms of the loss of Disability Adjusted Life Years (DALYS) in terms of death and injuries from road accidents, worldwide rank 9th among the major causes of diseases (UN World Report, 2010).

In a recent Kenyan local newspaper report, or article titled “Why many buses have turned mobile coffins” the reporter argues that all passenger vehicles on Kenyan roads fell short of body construction standards, that is the buses are not built to the required standards and hence they collapse on impact. Moreover, the use of inferior materials and poor workmanship by welders or fabricators, that ignores the requisite spacing of frames that should support the bus body have been reported as major reason for minimal survival in bus passenger crashes (Bergeron 2018).

In Kenya, there is growing concern by customers and stakeholders over the design of bus vehicles and the levels of crashworthiness based on past vehicle collisions or accidents. Bus vehicles involved in accidents according to experts, indicate that the design is substandard and moreover, the weight of the material is a great determinant of how safe a vehicle is, therefore rendering vehicle occupants or passengers more vulnerable to fatalities and serious injuries. According to experts, vehicles should be serviced before setting out on a long journey to ensure that they are roadworthy (Mwithimbu, 2014).

In Kenya, each year, tens of children are treated in hospital emergency rooms for injuries associated with school buses. Then there are the unlucky ones such as the ten school children that perished in Mwingi after successful Coast holiday tour. With parents opting to live further from their schools of choice, the need for school transportation has created an unprecedented demand for the service. A high percentage of school going children depends on a form of school transportation for their daily commute. Not all the school bus transport system meets the required safety standards.

According to NTSA operative, school buses involved in collisions based on previous experience, a school bus on impact or from impact, it is evident or clear that the body structure of the bus is weak and therefore not to the recommended

manufacturing vehicle body standard (Moses, 2018). This being a vehicle body safety aspect, it is very critical that it is studied and understood in order to set a safe and effective system which conforms to the design rules and standards.Therefore, there was need to determine the relationship between competency skills of bus vehicle body builders and crashworthiness of school bus.

2. Literature Review

2.1. School Bus Crashworthiness

The efficacy of seatbelt use on the intercity coach's crash-like rollover was examined by Guler, Elitok, Bayram & Stelzmann (2007). Authors tried to assess the danger of passenger injury and compare the use of seatbelt in the course of rollover accidents. In all the instances studied, the writers used a Hybrid III 50th projectile LSTC dummy model to assess passenger injury. Passengers without seatbelts,2-point lap belt, a 3-point shoulder belt were regarded passenger restraints. The use of seatbelts during rollover tests has reduced the projection, expulsion and injury of bus passengers. Ko, Shin, Jeon & Cho, (2009) carried out a research in the low-floor composite sandwich-filled bus' crashworthiness and rollover features. Composed of aluminum wave and fiberglass epoxy sheets, the composite integrated in the car framework. Two scenarios, a frontal effect of 60kph and the ECE-R66 roll-off were examined in the article. Although composite samples have been tested for the material properties, no thorough validation efforts have been provided. In order to increase crashworthiness during rollover accidents, the Ozcanli and Yilmaz (2014) explored the impacts of the foam applications for the bus framework. Although the application of foam to the structural beams decreased the bus deformation, the findings have been small (0.25%).

Iskandar and Li (2013) examined the impact of aging on rollover crash-resistance of buses, such as corrosion and mechanical deterioration. Authors used accessible information on corroded metals ' mechanical characteristics and applied these features to the current bus FE Model. Conclusions indicate a substantial aging impact on the crashworthiness of the car and decrease the safety of the bus occupant.

Computational and experimental experience has shown that the crashworthiness of buses constructed by distinct producers varies greatly. The differences can be affected by many structures like: a tube chosen for a steel cage (sectional size, thicknesses, open versus a closed cross section), pipes, wall-to-floor, roof connections, outside layer (size, materials, connection to a cage) and other connections (Boyanowski, 2010). These variations are also subject of different structural features. The structural deterioration of the old bus is the primary cause of accident concern in terms of crashworthiness. Many elements, such as operating schedules, climate and loading impacts, have led to the degradation of structural integrity. To enhance the crash layout, the various factors that affect the crash process must be understood. Various key elements of crashworthiness design were outlined in the following, and relevant works were discussed.

2.2. Competency skills and Bus Crashworthiness

The latest influx of car imports into the nation resulted in the need for a car-workshop in the Minna metropolis of the nation and particularly as a consequence of the city's peculiarity for extremely qualified professionals. Employers and technicians necessary for the work experience make strides when their workshops are formed. As a result, their standard of living in specific improves and the country's financial development / advancement in general.

TVET is a form of education intended to equip people with skills in occupational trades with a view to Nigeria's technological and economic development. TVET is defined by the Federal Government of Nigeria as the complete word referring not only to overall education, technology studies and associated sciences, but to the development of practical skills, attitudes, understanding and information pertaining to professions in multiple financial and social life industries, as well as to those elements of the training process.

TVET's goals under FGN (2004) include: training for the growth of employees in applied sciences, technologies and businesses, especially in the craft industry, the sophisticated craft and technically; offering the required technological expertise and abilities for farming, trade and financial growth; acquiring technical and professional abilities and offering education and training. In order to achieve such goals, formal vocational institutions such as polytechnic, monotechnic and technological colleges in Nigeria have a key role to play (National Council for Technical Education, 2011).

Technical Colleges are the main professional institutions in Nigeria, according to Okoro (2006), which are intended to prepare people for the development of practical abilities, abilities and attitudes needed from sub-professional abilities and engineers. It is able to provide for the provision of human requirements via the use of equipment and instruments. Appropriate use of instruments, equipment or machinery, however, needs technological expertise. The technical expertise used for developing and handling manufacturing equipment, machinery and methods for production procedures can be defined as technical expertise.

Osinem (2008) states that the technological competence is a form of knowledge that requires excellent knowledge and knowledge in a particular activity, in particular in respect of techniques, procedures or processes. Medina (2010) described technological abilities as abilities or technical abilities relating to a worker's sector, be it engineering or technical. Medina has also indicated that technological expertise is hard-working abilities linked to the use of instruments, work-related machinery and all technical issues.

An extensive rollover test assessment for transit buses was provided by Bojanowski, Kwasniewski and Wekezer (2013). For growth of the bus FE Model, the authors showed a comprehensive method of validation and verification. Check was conducted by energy balance assessment. Hierarchical validation was performed through a number of bus component validation tests. A fresh bus deformation measurement during a rollover was implemented (Deformation Index, DI) as a

quantifier for the deformation of the bus. In the last few years, many scientists have benefited from the increasing computer resources and the optimization of bus structure has become a common subject in the scientific community. The success or failure of any company relies very much on the abilities of the company's operator. Unfortunately, individuals do not recognize their position in the creation and success of their company, such as their employability and technical abilities, such as the automotive workshop, hence the need to study employability and technical expertise required to set up a car workshop to enhance work creation, enterprise growth and wealth generation.

2.3. Theoretical Framework

A mathematical framework theory was embraced in this research. The Decisive Design View suggests that a great deal of design includes decision making and that decision support technologies used in engineering should provide reliable guidance. It's a non-trivial situation that needs design methods to follow mathematical decision theory. Only thus can paradoxical results be prevented, in which a design method can suggest the worst alternative. Hazelrigg (1998, 1999) utilized their outcomes to establish an engineering design structure based on decision-making theories, thus expanding the previous job of individuals such as Myron Tribus (1969) and Andrew Sage (1977).

The Hazelrigg framework seeks to provide an independent method for order alternatives in the context of engineering design. The framework admits in the context of the theory of decision that other technological considerations cannot: (1) all design alternatives are made under severe uncertainty and dangerous conditions; (2) the decision makers (not the customers or stakeholders) have preferences that play an important part in decision making. In order to guarantee the validity of an uncertain measure under uncertainty and risk, Hazelrigg uses therefore the preference of the Chief Executive Officer or other decision makers for a valid scalar measure (usually net present value of a design-produced money flow), together with the principle of utility of von Neumann-Morgenstern.

The early implementations of these ideas for engineering design are Greenberg and Hazelrigg (1974). Thurston et al. (1994) for example recently used utility theory, and many more recent papers applied decision theory in engineering design, although mostly they were not worried about decision-makers ' insecurity and risk attitudes.The axioms of von Neumann and Morgenstern were used by Marston and Mistree (1997), but they promoted extra fields (e.g., subjectivity in options and designer preferences). The adequacy and usefulness of decision-making design is assessed in a latest article by Thurston (2001).Of course, in forming an objectives function–usually benefits for the designer's business, the desirability of a design to clients expressed in readiness to pay is a significant factor.

Kenneth Arrow, the Nobel laureate in 1951, produced extremely significant outcomes for engineering. Arrow sets out six criteria for choice, such as: If, in all conditions and each measure, Alternate A would be preferred to Alternative B, then B should not be selected over A. The Report further shows that there are three or more choices and three or more selection criteria (i.e. voters) that no selection procedure can be guaranteed to produce a valid result. The impossible theorem of Arrow points to the risks of naïve multi-function decision-making procedures involving many engineering design methods. Haunsperger and Saari (1991) based on Arrow's results have given countless paradoxical examples showing how naive techniques of helping decisions are failing.

Dyer and Miles (1976) can find an early implementation of these concepts to engineering design. The latest study by Allen (2001) points out that, in connection with von Neumann and Morgenstern in decision-making under uncertain circus, weakness of Arrow's axioms enables future results of a group choice with a risk averse. Scott and Antonsson (1999) claim that although a big proportion of people take part in a design process, engineering design is closer to decision making on various criteria than the theory of social choice.

3. Research Methodology

Pragmatism has been taken as the philosophical basis of the strategy to studies. No system of philosophy or reality is dedicated to pragmatism. Pragmatist scientists concentrate on the research problem's "what" and "how" (Creswell, 2009). While pragmatism is seen as the paradigm of the philosophical structure underlying the study of mixed methods (Tashakkori & Teddlie, 2010), some mixed method scientists are philosophically aligned with the transformative paradigm (Mertens, 2005). Mixed techniques are a method of studies that combines or links qualitative and quantitative types. It includes philosophical assumptions, the use of qualitative and quantitative methods and the combination of the two studies. It includes the use of both methods in conjunction with each other in order to increase the general potency of a research to either qualitative or quantitative (Creswell, 2009).

This study adopted explanatory and descriptive research designs as it seeks to explain the phenomena under study by testing hypotheses and by measuring relationships between variables. Studies identifying causal relationships between factors use explicative design, according to Saunders et al. (2011). The design is also considered suitable for the research because it allows the research to be conducted in the nature and allows the investigator to use likelihood samples. This was quantitative in nature and tests of hypotheses by measurement of variable interactions. The design of the explanatory research was appropriate, because the research focused primarily on the quantification of a relation or comparison of groups to define a relation of cause and effect. The study area for the proposed research study was Nairobi City County. Nairobi is the principal industrial centre of the country. Nairobi is the East Africa's most populous city (3.5 million). Nairobi is a major business hub and many Aid agencies headquartered here as well. Nairobi has a modern city centre, some beautiful suburbs, as well as Africa's largest slum. The city is built on a plateau and it stays pleasantly cool year-round. Based on the foregoing facts about Nairobi city, the researcher found the location conducive for the research study since most of the organizations for the intended research are situated right in the city and county of Nairobi. According to recent update by NTSA (National Transport and Safety Authority) in reference to vehicle road accident

fatalities, Nairobi County remained the county with the most fatal crashes in 2015.Nairobi county contributed 22% of all the national fatalities in the year 2015.The update report also indicated/ noted that Nairobi County contributed the highest number of fatalities in the previous year, that is 2014.

The target population was fifteen (15) registered bus vehicle body design companies with a total of 1500 employees comprising of technicians, supervisors and managers. Based on information from KABM (Kenya Association of Bus Manufacturers), it was established that there are almost twenty (20) bus vehicle body manufacturers operating in Kenya. Out of the twenty bus vehicle body manufacturers, only fifteen companies were legally registered to operate as at December, 2018. Bus Vehicle Body Manufacturers in Kenya include Labh Singh and Harman Singh, Dodi Auto Tech, Banbros, CFG (Central Farmers Garage), Master Fabricators, KCI (Kenya Coach Industries), Truck World, Malva, Choda, Highlands, Kenya Vehicle Manufacturers, Toyota (Hino), CMC (Man, UD), Simba Colt (Fuso, Mitsubishi), and Isuzu. Representative from the following organizations were also considered namely: National Transport and Safety Authority (NTSA), Motor Vehicle Inspection Unit, Kenya Bureau of Standards (KEBS), National Police Service (National Traffic Police Headquarters) and Ministry of education staff (Public Schools) were also involved in this research study.

The study utilized purposive sampling to select fifteen (15) operations managers and 36 supervisors as they deal with the daily running of the school bus vehicle building in the bus construction firms. Situated with simple random samples, 240 engineers were selected and the sample provided an equal opportunity for all participants to be included. Use 95 percent confidence level of Yamane's (1973) sample size formula, P= 0.05. A sample size of 315 participants was chosen from the target population of 1500.

Research tools help a scientist to gather data used to respond to research issues in a study. A questionnaire includes a number of issues that research participants can answer in a number of ways. For information collection, a questionnaire was chosen because the questions, formulations and sequences are fixed and identical to all participants. The questionnaire consisted of two components: firstly, information about the respondents ' background and secondly, questions concerning the studies. The questionnaires were given to executives, supervisors and engineers in bus construction companies. An interview is an interview with two or more persons. Normally a single person who asks questions controls the interview. Based on Kumar (2012), the benefits are that the researchers could clarify any inquiries relating to the issues through a structured interview. The NTSA, KEBS, MOE, the Motor Vehicle Inspection Unit and the Kenya police headquarters gathered data from a structured interview manual. In Nakuru County, the investigator conducted a pilot study between two bus body building companies before the real information collection work was done. Twenty participants included executives, supervisors and technical personnel. The instruments were flown using people from Nakuru who were interviewed and compared with the area of research. The aim of the pilot study was to enable the researcher to determine whether instruments were reliable and valid and to familiarize himself with the management of the questionnaires. The validity of the tool was determined by studying with managers, lecturers and peers the objects in the tool. In order to assess the validity of the content of the instruments, measures and elements of the research were identified that provided sufficient coverage in accordance with the study aims. To verify the validity of the face, experts were provided with study tools to receive suggestions. The researchers were helped to assess the validity of study tools through advice provided by these specialists. The recommendation included proposals, clarifications and other inputs.

The trustworthiness of the data collection instrument is the ability to produce the same results consistently when the same persons are measured repeatedly under the same conditions. The test-retest technique was applied to test the reliability of the device to be used in the research, involving the same devices being administered by the same participants two times in length. Questionnaires were administered, collected data was analyzed using SPSS to determine the Cronbach's Coefficient Alpha. Cronbach's Coefficient Alpha was used to determine the reliability of the research instrument by correlating results from the two scores. A reliability coefficient of 0.7 was obtained. This showed that there was a strong relationship between the first and the second scores obtained after the instruments were administered.

The investigator carried out data cleaning after all information was obtained and then corrected to enhance the quality of the answers. Incomplete or incorrect answers were detected. For analysis using the Social Science Statistical Package (SPSS V. 22), the data were classified, coded, and entered into the computer. The questionnaire information has been evaluated using both descriptive and inferential techniques. Average and standard deviation, frequencies and percentage are descriptive statistics. Linear regression analyzes comprise inferential statistics. Using tables and charting, the data was provided. The Hypotheses have been tested by linear regression analysis.

4. Results

The Regression model shows that 60,1 percent of the variation in bus crash durability can be explained through skill competencies with the determination coefficient (R squared) of the.601. The adapted R sq. of.599 shows that the abilities excluded by the continuous variable explained that the variation of the bus ' crashworthiness by 59.9% can be explained by other variables excluded from the template in Table 1. The normal estimate mistake (.372) indicates a tiny deviation from the line of best fit of the independent variables.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.775[a]	.601	.599	.37182	.601	338.504	1	225	.000

Table 1: Model Summary

a. Predictors: (Constant), Competency skills

The regression model with the ability as a predictor (F= 338.50, p= 0.000) demonstrates that the connection between competence and crash resilience of a bus is important. At least, the pitch (β coefficient) is not nil, as shown in Table 2. This means that the skill and crashworthiness of a bus has an important connection.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	46.799	1	46.799	338.504	.000[b]
	Residual	31.107	225	.138		
	Total	77.906	226			

Table 2 ANOVA of Crashworthiness of a bus
a. Dependent Variable: Crashworthiness
b. Predictors: (Constant), Competency skills

In order to test the hypotheses of the research, the β-coefficients were produced through the regression assessment from the template for abilities. A beneficial factor, showing favorable connection to the crashworthiness of a bus, was the β value for abilities. Table 3 provided the β-value estimates and the predictor's contribution to the model.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.310	.157		1.970	.050
	Competency skills	.833	.045	.775	18.398	.000

Table 3: Coefficients of Crashworthiness of a bus
a. Dependent Variable: Crashworthiness

The study had hypothesized that there is no significant influence of competency skills on crashworthiness of a bus. The study findings depicted that there was a positive significant influence of competency skills on crashworthiness of a bus (β_1=0.833 and p <0.05). Thus, competency skills increased crashworthiness of a bus. The null hypothesis (Ho) was rejected. Competency skills had positive influence on crashworthiness of a bus.

Skills affect the crash resilience of a bus favorably. Arul & Kavi (2002) agrees that technical abilities are needed in distinct fields of the automobile industry, including motor maintenance, repair and maintenance, auto-body building; auto electronics, volcanics, steering and suspension, braking system, automotive air conditioning and other applications.
Employability abilities and non-technical abilities play an important role in the efficient and successful involvement of an individual in contemporary workplace (Common wealth of Australia, 2006).Displaying the motor, removing and installing the cylinder head correctly; flywheel service; removing and installing the oil pump, correctly cleaning the furnace, inspection of external and internal leaks in the cooling system etc. is extremely required by the auto mechanic to perform efficiently. Based on the outcomes of management skills needed to set up a tiny vehicle workshop. In establishing a workshop on auto mechanics, it was shown that activity planning, activity oversight and control, activity coordination, decision-making, communication and management are all of a great need. In support of that perspective, Osuala (2004) said that the management role is to provide a corporate institution with governance and guidance.

5. Conclusion

The research found that abilities affect the crashworthiness of the school bus significantly. Companies greatly develop their employees ' abilities and expertise in working on new technology of vehicles including for manufacturers–particular training, businesses motivate their employees through sectoral skill development and their training scheme remains the preferred complementary method of training for their company.The interview with bus vehicle body construction firms indicated that body builders' special skills and competencies required before recruitment of new staff include mechanical production technology, fitting and fabrication and be of grade tests minimum and with vast experience. The body building employees should have the required technical skills in different occupational areas of auto mechanics.

6. Recommendation

The management of bus body construction companies should always develop skills and knowledge of its employees to work on new vehicle technologies, including manufacturer – specific training. The companies should always motivate their staff through sector specific skills expansion, while augmenting apprenticeship system in their companies as a way of complementing skills formation.

7. References

i. Al-Thairy, H., & Wang, Y. C. (2014). Simplified FE vehicle model for assessing the vulnerability of axially compressed steel columns against vehicle frontal impact. *Journal of Constructional Steel Research*, *102*, 190-203.
ii. Arul, J. M., & Kavi, K. M. (2002). Scalability of scheduled data flow architecture (sdf) with register contexts. In *Fifth International Conference on Algorithms and Architectures for Parallel Processing, 2002. Proceedings.* (pp. 214-221). IEEE.
iii. Bergeron, M. (2018). Crash Collision Analysis: Evaluation Road Safety in Austin, Texas 2014-2016.
iv. Bojanowski, C. (2010). Verification, Validation and Optimization of Finite Element Model of Bus Structure for Rollover Test. *Florida State University*.
v. Bojanowski, C., Kwasniewski, L., & Wekezer, J. W. (2013). Comprehensive rollover testing of paratransit buses. *International journal of heavy vehicle systems*, *20*(1), 76-98.
vi. Brumbelow, M. L., Teoh, E. R., Zuby, D. S., & McCartt, A. T. (2009). Roof strength and injury risk in rollover crashes. *Traffic Injury Prevention*, *10*(3), 252-265.
vii. Creswell, J. W. (2009). *Research design: Qualitative, Quantitative, and Mixed methods approaches.* 3rd ed. University of Nebraska-Lincoln: SAGE Publications, Inc
viii. Dyer, J.S., and R.F. Miles, Jr. (1976). An actual application of collective choice theory to the selection of trajectories for the Mariner Jupiter/Saturn 1977 project. *Operations Research* 24:220–224.
ix. Federal Government of Nigeria (2004). National Youth Policy Available: http://www.thepresidency.gov.za/docs/policy/national youth policy.pdf. (Retrieved 20/1/18)
x. Gepner, B. D. (2014). Rollover Procedures for Crashworthiness Assessment of Paratransit Bus Structures. *International Journal of Automotive Technology*, *15*(4), 581-591.
xi. Greenberg, J.S., and G.A. Hazelrigg. (1974). Methodology for reliability-cost-risk analysis of satellite networks. *Journal of Spacecraft and Rockets* 2(9):650–657.
xii. Guler, M. A., Elitok, K., Bayram, B., & Stelzmann, U. (2007). The influence of seat structure and passenger weight on the rollover crashworthiness of an intercity coach. *International journal of crashworthiness*, *12*(6), 567-580.
xiii. Haunsperger, D.B., and D. Saari. (1991). The lack of consistency for statistical decision procedures. *The American Statistician* 45:252–255.
xiv. Hazelrigg, G.A. (1998). A framework for decision-based engineering design. *Journal of Mechanical Design* 120:653–658.
xv. Hazelrigg, G.A. (1999). An axiomatic framework for engineering design. *Journal of Mechanical Design* 121:342–347Hiller and Coombes (2004)
xvi. Iskandar, A. H., & Li, Q. M. (2013). Ageing Effect on crashworthiness of bus rollover. In *9th European LS Dyna Conference*.
xvii. Jones, N. (2003). Several phenomena in structural impact and structural crashworthiness. *European Journal of Mechanics-A/Solids*, *22*(5), 693-707.
xviii. Jones, N. (2003). Several phenomena in structural impact and structural crashworthiness. *European Journal of Mechanics-A/Solids*, *22*(5), 693-707.
xix. Kumar, V. (2012). *101 design methods: A structured approach for driving innovation in your organization*. John Wiley & Sons.
xx. Marston, M., and F. Mistree. (1997). A decision-based foundation for systems design: A conceptual exposition. Proceedings of the CIRP 1997 Conference on Multimedia Technologies for Collaborative Design and Manufacturing, October 8–10, Los Angeles, Calif., pp. 1–11.
xxi. Martínez-Ruiz, V., Lardelli-Claret, P., Jiménez-Mejías, E., Amezcua-Prieto, C., Jimenez-Moleon, J. J., & del Castillo, J. D. D. L. (2013). Risk factors for causing road crashes involving cyclists: An application of a quasi-induced exposure method. *Accident Analysis & Prevention*, *51*, 228-237.
xxii. Matolcsy, M. (2007). The severity of bus rollover accidents. In *20th Conference ESV. Proceedings* (No. 07-0989).
xxiii. McQuaid, J., & Jones, N. (1999). A re-examination of Andrews' research on impact resistance of railway axles. *International journal of impact engineering*, *22*(7), 727-738.
xxiv. Medina, R. (2010). Upgrading yourself—technical and nontechnical competencies. *IEEE Potentials*,29,10.
xxv. Mertens, D. R. (2005). Rate and extent of digestion. *Quantitative aspects of ruminant digestion and metabolism*, *2*, 13-47.
xxvi. Museru, L.M., Mcharo, C.N., Leshabari, M.T. (2002). Road Traffic Accidents in Tanzania: A ten-year Epidemiological Appraisal. *East and Central African Journal of Surgery*, 7(1), 23 – 26. Retrieved on May 12, 2018; http://www.bioline.org.br/request?jso2003
xxvii. Muyia, N. (1995). The Forgotten Workers: The Case of Public Service Drivers in Eldoret Town, Kenya.
xxviii. Mwithimbu, K. (2014, March 26). *Design of buses blamed for deaths*. Daily Nation, pp 9 to 11.
xxix. National Board for Technical Education (NBTE), (2011). Motor vehicle mechanics work. National Technical Certificate Curriculum and Module Specifications. Kaduna, NBTE.
xxx. National Highway Traffic Safety Administration (2012), *NHTSA Announces Final Rule Requiring Seat Belts on Motorcoaches* [Homepage of NHTSA], [Online]. Available: http:// www.nhtsa.gov/
xxxi. Osinem, E. C., & Nwoji, U. C. (2010). Students industrial work experience in Nigeria. *Concept, Principles and Practice: Cheston Agency Ltd*, *104*.

xxxii. Odero, W., Khayesi, M., & Heda, P. M. (2003). Road traffic injuries in Kenya: magnitude, causes and status of intervention. *Injury control and safety promotion*, *10*(1-2), 53-61.

xxxiii. Okoro, O.M. (2006). *Principles and Methods vocational and technical education*, Nsuakka: University Trust Publishers.

xxxiv. Opus Hamilton. (2008). *Review of School Bus Collisions in Alberta.* Opus Hamilton Consultants Ltd., Calgary,

xxxv. Osinem, E. C., & Nwoji, U. C. (2010). Students industrial work experience in Nigeria. *Concept, Principles and Practice: Cheston Agency Ltd*, *104*.

xxxvi. Osuala, E. C. (2004) *Business Management.* Onitsha: Cape publishers.

xxxvii. Özcanli, M., & Yilmaz, M. (2014). Effect of foam application in bus structure for conservation of residual space during rollovers. *International journal of heavy vehicle systems*, *21*(1), 56-63.

xxxviii. Prochowski, L., Zielonka, K. and Zuchowski, A. (2011), The analysis of occupant motion in frontal barrier impact of a chassis frame vehicle, *Journal of KONES Powertrain and Transport*, 18(1), 491-502.

xxxix. Allen, B. (2001). On the possibilities for optimal collaborative engineering design under uncertainty. *In Proceedings of Optimization in Industry* II-1999, New York: ASME Press.

xl. Robinson, J. P. (2000). Technical and Employability Skill in the work Place. *The workplace* 5(3), 1-3 Retrieved on February, 2018 from workforce/ publications/employability-skills. PDF.

xli. Saunders, M., Lewis, P., & Thornhill, A. (2011). Formulating the research design. *Research methods for business students*, *2007*, 130-161.

xlii. Sage, A. P. (1977). *Systems engineering: methodology & applications.* IEEE Computer Society Press.

xliii. Scott, M.J., and E.K. Antonsson. (1999). Arrow's theorem and engineering decision making. *Research in Engineering Design* 11(4)218–228.

xliv. Tashakkori, A., & Teddlie, C. (2003). *Sage handbook of mixed methods in social & behavioral research*. sage.

xlv. Thurston, D.L. (2001). Real and misconceived limitations to decision-based design with utility analysis. *ASME Journal of Mechanical Design* 123(2):176–182.

xlvi. Thurston, D.L., J.V. Carnaham, and T. Liu. (1994), Optimization of design utility. ASME *Journal of Mechanical Design* 116(3):801–808.

xlvii. US Occupational Outlook(2012-2013): *Occupational Outlook Handbook*. Retrieved on 24th April 2013 from http://www.bls.gov/ooh/

xlviii. WHO. (2004). *World Report on Road Traffic Injury*. World Health Organization, Geneva,

xlix. World Health Organization. (2013). *Global status report on road safety 2013: supporting a decade of action: summary* (No. WHO. NMH. VIP 13.01). World Health Organization.

l. Yamane, Taro (1973). "*Statistics: an introductory analysis."* New York: Harper & Row