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Article

Identification of Labors' Role Transition Processes: From Traditional to Electric Vehicles in Nepal

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Abstract

The maturity of technological innovation and declining battery costs have made us opt for purchasing the electrical vehicles. It has resulted into growing preference towards electric vehicle over traditional cars, thereby spurring more job vacancies in the electric vehicle industry. The study examined the labor's role in the transition process towards working with electric vehicle from traditional vehicle. An inductive narrative research approach was used to gather the necessary primary information from automobile technicians and engineers from authorized national electric vehicles distributors in Kathmandu. Globally, shifting towards the electric vehicles has stimulated a significant transformation in the automobile industry worldwide, which has encouraged labors of automobile to shift towards working with electric vehicle anticipating a better job opportunity in the changing automobile landscape and career sustainability. However, the experience of the role transition was not flawless. Challenges of role transition such as innovative technology and unavailability of quality training and hindrance in the shifting process caused the need for re-skilling for mitigating problems. As a result transition has presented a significant lift in the career of the participants which helped them fit in the new role. Finally, this case study serves as evidence to the transformative potential of education and institutional determination in transitioning labor's role from the traditional to electric vehicles. However, this study does not analyze the downside of transition process and status of job demand versus job loss in the changing automobile industry.

Keywords: role transition, automobile, electric vehicle

Introduction

Historically, the concept of electric vehicles is not new, as in the 19th century, the idea of electric vehicles was already tested to prevail over petrol and steam cars. Once again, this idea is becoming a global surge among manufacturers and consumers. Technological innovation has brought us to the stage of an intelligent device also called as 'computers on wheels' (Stone, 2012). The electrical vehicles are on continuous rise due to environmental concerns for controlling global warming, political concerns to reduce

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dependency on expensive foreign fossil fuel, economic concerns to revive the automotive industry, and social concerns over citizens' health priority. In addition, the maturity of technological innovation and declining battery costs have also made us think once again about purchasing the electrical vehicle (Talantsev, 2017).

Automobile Jobs Trend

Mönnig et. al., (2019) claimed that people will prefer electric vehicles over traditional cars, creating demand of more jobs in electric vehicle manufacturing industries, electric parts manufacturing industries and at service and maintenance area. Focal Initiative (2021) showed higher employment in the EVs sector while their parts manufacturing area faced losses as compared to ICE related jobs. The ministry of skill development and entrepreneurship has estimated 10 million direct jobs and 50 million indirect jobs in the EV industry by 2030 (CIEL, 2022). The Society of Motor Manufacturers and Traders (SMMT), UK also argued that the impact on the traditional vehicle industry cannot be ignored with increasing trend of electric vehicles, the rate at which EVs are being adopted is not proportionally matched by the corresponding increase in the number of EV technicians (Fleetnews, 2022). So, availability of more jobs can be expected in EV sector.

EV Related Jobs in Nepalese Context

Now, considering the trend of Nepalese consumers' behavior of purchasing electric vehicles, it is not different from the rest of the world because in the fiscal year 2021-2022, Nepal imported six times more electric vehicles than the previous year. (Lamsal, 2022). The number is going to increase year by year because government is promoting the electric vehicle to deliver as per pledges in the Paris Agreement, 2015, where the government plans 20% of four-wheeler public vehicles sold to be electric vehicles in 2025, reaching the progressive growth of market share up-to 60% in 2030 (Pande, 2020). While comparing the vehicle (cars, jeeps, and vans) import data from the Customs Department of Nepal, the import of electric vehicles were significantly higher in comparison to the traditional ICE vehicles. Year-on-year, electric vehicle imports grew by 189% when comparing the fiscal years 2022-2023 and 2023-2024. Similarly, in the previous fiscal year, the market share of electric vehicles was 64.06%, and of ICE vehicle was 35.64%. However, in the latter fiscal year, the market share of electric vehicles surged to 78.24%, making an increase of more than 14%; in contrast, there was a drop of around 15% in the import of ICE vehicles in the same year. These facts clearly indicate the sign of the growing demand of electric vehicle technicians in future.

Table 1: Import of EVs

Import Count	FY 2079/80 Quantity	FY 2080/81 Quantity	Y-O-Y Growth
ICE vehicles	2272	3254	43%
EV vehicles	4050	11700	189%

Source: Department of Customs, Nepal

Table 2: Market Share of EVs

Market Share	FY 2079/80 - Quantity	FY 2080/81 - Quantity
ICE vehicles	35.94%	21.76%
EV vehicles	64.06%	78.24%

Source: Department of Customs, Nepal

Based on the above facts, booming electric vehicle industries are bringing the massive wave of job opportunities in the labor market of electric vehicles manufacturing and service industries. As a result of the wave, author has studied to understand the role

Table 3: Vehicle Type and their Year-on-Year (Y-O-Y) Comparison Growth

Vehicle Import Data	FY 2079/80 Quantity	FY 2080/81 Quantity	Y-O-Y Growth
Other vehicles having capacity <=1000CC	395	533	35%
Other vehicle (Petrol engine) capacity >1000CC to <=1500CC	1676	2547	52%
Other vehicles (Petro engine) >1500CC to <=2000CC	52	70	35%
Other vehicle (Petrol engine) capacity >2000CC to <=2500CC	10	11	10%
Other vehicle (Diesel engine) capacity up to 1500CC	139	93	-33%
Electric car, jeep & van up to 50KW	3759	4571	22%
Electric car, jeep & van 51KW to <=100KW	272	6885	2431%
Electric car, jeep & van > 101KW to <=200KW	15	217	1347%
Electric Car, Jeep, Van with motors pick power 201KW to 300 KW	4	27	575%

Source: Department of Customs, Nepal

transition model of labors from traditional vehicle to electric vehicle sector in Nepal.

Literature Review

Regarding the role transition, Nicholson and West (1988) proposed the idea of two distinct adjustment processes, namely personal growth and role development in the process of work-role transitions. Individuals undergo modest routine and habit changes, big relationships and self-image changes, and everything in between as part of their personal development. Role development, on the other hand, is structuring the transitioning role to fit the requirements of that job, and framing can range from modest work schedule alterations to more dramatic role innovations like shifting the primary organizational work goals. Therefore, role development involves tailoring the role to fit oneself, whereas personal growth entails tailoring oneself to the function (Nicholson & West, 1988). This concept was then modernized by Blake in the year 2000 with his revised idea, occupational role transition as a process of extricating from one role and engaging into another role with or without new skill.

In 2021, the European Centre for the Development of Vocational Training (CEDEFOP) stated that technological innovation was bringing new products or services along with requirement of new skills within the labors. But again, there is another thought that technology is also making labor's skills out of date sooner (Stone, 2012). Electric vehicle technology is seen as one of the such examples of technological innovation which demanded new technical skill within the labors but at the same time outdating the existing skills. So, for the success in the era of working with electrical vehicle, personal development cannot be ignored. Thus, strong job-skill mappings will identify feasible job changes based on their existing skills as well as guiding them towards new skills to achieve their career objectives (Baldwin et. al., 2022) in order to be up-to-date with changing industry requirements. It can only be possible through re-skilling and up-skilling employees (Sawant et al., 2022). Frederiksen and Poulse (2016) also found similar thoughts from their research conducted on data taken from 1992 to 2007 among the private sector employees.

Similarly, a research conducted in China also found that skills upgrading met the increasing demands of skilled workers for the purpose of innovation and self-skilling for being up-to-date (Albatayneh, 2024; Alkhamaiesh & Cavanaugh, 2022; Li & Zhu, 2020). Further, Dawson and his team claimed differently about role transition that it should not be ignored that smooth labor transitions produce huge productivity and fairness gains for the whole labor market, but if labor transitions are sluggish or failed then it may result into huge costs for both the individual and the government (Dawson el. al., 2021). Employers found investment made in upskilling and re-skilling their staff is cheaper than hiring new workers and providing training to them for the same position (Chakma & Chaijinda, 2020). Thus, this process of transformation of labors towards EV has potential to demonstrate a prominent impact on the labor market of the automobile industry.

In contrast, a study conducted in Thailand explored the challenges associated with Electric Vehicles' workforces in SMEs of the automobile sector. The researchers found that the demand for occupational changes and skill development in the engineering industry might increase by 10%, while low labor skills severely decreased by up to 70%, which is a worrying indicator for workers in low skill positions in fossil fuel engine cars. So, they suggested a need for effective policies for establishing EV master plan in coordination with related stakeholders; otherwise, this adaptation of EVs could have a destructive effect on the workforce development of SMEs. In the worst case, the study highlighted some SMEs may need to shut down their business just because of insufficient workers to catch up with the demand of EVs workers in their industry (Osatis & Asavanirandorn, 2022).

Methodology

Selecting participants for the purpose of

research is the foundation of qualitative research. According to Neuman (2006), it is theoretically possible to learn people's perspectives on particular issue by choosing a small number or even by only one participant, but again, Creswell (2014) came with a different argument for the qualitative research which argued that about four to five case studies are enough for qualitative research. Thus, considering the views of Neuman and Creswell as well as the norms of research, author has interviewed four participants for the case study and took their stories to comprehend the role transition process adopted by Nepalese technicians from traditional automobile to electric vehicles. All of the participants are currently working at authorized EV dealers in Kathmandu Valley.

Qualitative inquiry was used to gather necessary primary information for the research since it is a kind of interview-based research that involves studying people's lives; here, the technicians and engineers of automobile sector were delimited as participants to understand their transition process from working with traditional vehicle to the electrical vehicles (Clandinin & Connelly, 2000). Since Nepal does not have any vehicle manufacturing plant, most of the jobs available are related to preventive care and maintenance so the engineers and technicians working in these sectors with experience in traditional vehicles are shifting to work with electric vehicles. They are selected from the Hundai, Skoda, and KN Motor within the Kathmandu Valley.

The author prepared open-ended questionnaire to explore the insight of their experiences, beliefs, and educational background during data collection process with additional follow-up questions to support their statements. Questionnaires had core set of questions for guiding the interview process and for assuring minimum required information from the participants. Prolonged engagement was applied to ensure research data's trustworthiness.

Findings

An inductive narrative analysis approach was used to categorize the participants' information on the shifting processes toward electric vehicles. For this, the author ensured sufficient data was collected from the individuals during the interview. As the information collected was non-numeric in the form of interview notes and audio recordings, three-step methods were used to extract the common understanding from the collected data. In the first step, the recording was listened to multiple times. Then, considering the reference notes of the interview, initial categorizations were developed, which were further improved by removing the overlapping categories and redundancies. Finally, the information collected was categorized based on respondents' educational background, professional experiences, and shifting process. Shifting process was again coded with motivations, challenges, and learning processes. Overall, a model was developed considering these underlying structures of experiences and processes.

The first participant was a Training Manager at Laxmi International (Hundai) Nepal, who had 16 years of experiences in working with fossil fuel engines and more than six years of experience in working with electric vehicle sector. His major duties are vehicle maintenance and services, conducting training programs and workshop management.

According to him, the global trend of demand and awareness towards electric vehicles alerted participant's company as well to meet with the demand of customers' choices. So, along with the traditional vehicles, company added electric vehicle stall in their product line. It caused them to learn working with the electric vehicles, otherwise company would degrade them. To meet with company's requirements and beliefs to sustain in the automobile industry for longer periods and constantly become valuable in the market motivated him to learn new skills and exceled in the working electric vehicles.

The participant added:

> *I feel lucky since company sent me for the training about electrical vehicle in Korea at the parent company, where I took classes from Korean experts and professionals which I found extremely informative and the perfect knowledge transferring moments.*

Altogether, he mentioned three such types of training in the last six years, , which covered the basic principles of electric vehicle, layout, periodic maintenance processes, and simple repairing procedures. Further, he emphasized as his dissatisfaction as the training sessions were only conducted for a limited time and knowledge shared could not cover all the topics. However, online training platforms and examinations with certification are featured in recent times. In the shifting process towards working with electric vehicles, his educational background and prior experiences of the automobile sector have supported him to learn quickly. As per him, basic concepts of automobile engineering such as vehicle suspension system, brake system, chassis, and electrification are similar in both types of vehicles. Along with that observing the maintenance processes of electric vehicles performed by seniors and following their instructions has also facilitated him to supplement in the transitioning process on the one hand, and on the other hand, self-study of instructional manuals became icing on the cake in his learning process.

The second participant was a technician who began his journey from informal education at the Underprivileged Children's Educational Programs (UCEP), Nepal, a technical school, with a rigorous six-month automobile training. He has seven years of working experience in the traditional automotive sector and two years of dedication in working with the electric vehicles (EVs) sector, making him an experienced technician in both traditional engine and EVs.

As he shared, nowadays, trend of car sales are reflecting people's interest more in

electric vehicles than in the traditional cars. So, in future, demand of jobs will be more in the EVs sector. After his consideration on the sales and self-realization, he concluded himself that technical knowledge of working with EVs will pay him for long-term and will be sustainable in the future. He said it is a journey of adaptation and learning.

In the transition process, despite three days training on electric vehicles in the Hyundai office, he found it was difficult for him in the beginning to cope with new technologies associated with EVs. According to him, "*Unlike traditional vehicles EVs lack conventional engines and instead they rely on motors, requiring extra effort to understanding of their unique components behaviors and systems*". After overcoming these initial obstacles through diligent study, suggestions and supervisions from the experienced seniors and supervisors, he is now satisfied with his role in EVs. Overall, he claimed the training and re-skilling have provided him invaluable skills essential for working with EVs. Later, he also discovered many aspects of traditional automotive skills are applicable and transformable to EVs. For instance, the skills of body electrification and mechanical components such as brake pads are similar in both types of vehicles. Understanding these similarities eased him on the transition to the realm of electric vehicles.

The third participant was a technician from Skoda motor having educational background up to the SLC level (Grade X), and four months of automobile training at UCEP. To validate his skills, he undertook exams at the National Skill Testing Board, CTVET. He completed skill test levels 1 and 2. Professionally, he has eight years of work experience in the traditional vehicle sector. However, his career took a new direction nine months ago when he transitioned to working with electric vehicles (EVs). This transition expanded his knowledge base, positioning himself as a versatile technician capable of navigating both traditional and electric vehicle systems.

In the interview, he claimed, *"The decision to shift towards EVs sector was developed as a consequence of a confluence of factors, primarily driven by practical and futuristic considerations"*. Initially, the realization of the growing trend of high costs associated with traditional fossil fuels sparked his interest in exploring alternative options. As he investigated deeper into the automotive landscape, it became apparent to him that EVs will represent the future of transportation, witnessing the increasing trend of EV adoption in the market. He recognized the immense potential for growth and opportunities within EVs sector which motivated him to shift towards this new realm.

Unlike traditional vehicles, where solutions may be more intuitive to the participant, the complexity of EV systems requires specialized knowledge. Diagrams and procedures to restore the problems are obtained from the VAS/scanner device,

making it the key device to resolving EV issues, yet deciphering output of device is another challenge for the participant without proper guidance. This hurdle became a significant obstacle in his journey towards proficiency in EV maintenance. However, relief came with the training from the Chinese technicians, who provided them with invaluable skills and knowledge needed to debug EVs. Their guidance not only deciphered the challenges but also filled confidence in his ability to effectively handle EV- related issues, ultimately easing his transition into this rapidly evolving field. According to the research participant, training equipped him with the necessary theoretical knowledge as well as highlighted the difference in approach compared to traditional vehicles. Besides, the participant claimed that traditional skills, indeed, play a crucial role in working with EVs, particularly in aspects unrelated to the engine. The skills acquired in traditional vehicle maintenance provide a solid framework for troubleshooting various mechanical and operational issues in EVs as well.

Lastly, the fourth participant began his journey with formal education of diploma in automobile engineering, followed by five months of on-the-job training at Sipradi. These training and formal education mainly focused on traditional fossil fuel vehicles. The participant has a rich hands-on experience on conventional vehicles, an impressive 8 to 9 years' experience in traditional vehicles.

With the increasing adoption of electric vehicles, he was sure that the pool of technicians that are proficient in working on EVs is relatively small, creating opportunities for those with the skills of EVs. He argued this sector has enough job opportunities. Recently, the company provided him three months of EV maintenance training which offered him opportunity to expand EVs knowledge and adapt new skills presented in the EVs technology. In the training, he became familiar with essential aspects such as EV concepts, scanner software procedure, and basic idea of issues solving methods in electric vehicles. Moreover, he figured out the acquired skills from working with traditional vehicles came to crucial in working with electrical vehicles because despite the distinct motor system and power source as the battery systems in EVs, he found many components and operational principles remain similar in both sorts of vehicle. His familiarity with traditional vehicle mechanics enabled him to leverage existing knowledge when troubleshooting and maintaining electric vehicles which helped him efficiently address the issues in EVs, minimizing downtime and enhancing overall service quality.

According to him, with the shift towards the electric vehicle sector, it has positive influence on his career prospects. His skills in both traditional and electric vehicles positioned himself as a versatile technician capable of addressing a broader range of automotive needs. It has unlocked potential for his promotions and career advancement opportunities in the company.

Discussion

Globally, shift towards the electric mobility is surging by stimulating a significant transformation in the automobile industry worldwide. In Nepal too, this change is demonstrated by rising sale volume of EVs (Central Bureau of Statistics [CBS], 2019) which is also highlighted by the participants in their narrations. The study found various factors such as motivation, challenges, learning processes and outcome of transition.

Motivations for the Transition

The transition to working with EVs among Nepalese technicians and engineers were primarily driven by two major factors: automobile market trend and individual foresight. Regarding the automobile market trend, participants unanimously recognized that the rapid acceptance of EVs globally and locally as a crucial indicator of shifting customers preferences is one of the motivation factors. Next, most participants realized that the prospect of better job opportunity in the long-term and career sustainability in the changing automobile landscape served as another compelling motivator for them (Mönnig et. al., 2019). This was also supported by Focal Initiative (2021), Fleetnews (2022) and CIEL (2022), showing sky-rocketed demand of workers in electric vehicles industries. Technicians also acknowledged that expertise in EVs could safeguard their importance and create opportunities for career advancement in future. One senior manager highlighted that their organization obligated them to acquire EVs skill, and similarly, another technician noticed role transition to EVs will secure his job for long-term in the company.

Challenges during Transition

Despite strong motivation among the study participants, the experience of the participant in the role transition process was not flawless either. The major challenges faced were knowledge gap and insufficient training.

Due to the absence of traditional engine, participants were struggling initially to understand the EVs system which demanded new technical skills, making their own skills useless (Stone, 2012) at the same time. The gaps of EVs' knowledge such as electric motors, battery system or working principle of EVs were clear challenges for them. Without adequate training, using and interpreting diagnostic tool was another headache for all the participants.

In order to update with the changing industry requirements, re-skilling and up-skilling employees (Sawant et al., 2022) were only solutions (Frederiksen & Poulse, 2016). Providing such skilling methods was also underscored by Li and Zhu (2020), Alkhamaiesh and Cavanaugh (2022) and Albatayneh (2024). Although all participants received some form of EVs training, the sessions were still limited in scope. For instance, one technician described the training mostly focusing on basic EV principles while neglecting advanced troubleshooting techniques. The absence of comprehensive hands-on training made them difficult to address different sort of problems they have recently faced.

Learning in Transition

Reskilling played a pivotal role in transferring the knowledge and skills of EVs to the technicians for the preparation of role transition as Nicholson and West (1988) and Blake (2000) underlined. International and local trainings were provided to reskill them. One manager benefited significantly from multiple training sessions at the parent office in Korea while most of them got training locally by the experts from the manufacturing company.

All participants agreed that prior knowledge of traditional automobile was useful in working with EVs. Except the knowledge of engine, the experiences such as suspension systems, brake systems, and chassis design share common principles in both ICE vehicles and EVs. This overlapping knowledge provided them a foundational framework in the transition process. Further, observing the tasks done, senior and supervisors came up with new learning method for the participants. Mentorship from them helped to bridge the knowledge gaps. Moreover, self-study of EVs manuals and online resources bridged the training gaps.

Outcome of Transition

Upon analysis of the information collection, role transition process has brought positive outcomes to all participants. Skill enhancement, career growth and increased job satisfaction are few of them. Participants have received EVs knowledge and repairing skills which enabled them for maintenance and servicing job. Additional EVs skills with their existing traditional vehicle knowledge made them versatile, unlocking the potential of career growth. In one case, a technician shared his company was for his promotion and he was confident to have better job opportunities within the company and outside. All participants expressed satisfaction with their roles in the EV sectors and felt a sense of continuing working with EVs in the competitive Nepalese automobile labor market.

Conclusion

The transition from working with traditional vehicles to electric vehicles represents a significant enhancement in the career of technicians which had made role transition to fit oneself in the required task. Such change was primarily boosted by the global market trends, increasing fuel prices, individual technicians' aspirations, and the realization of the long-term job probability in the EVs sector. However, challenges such as insufficient training and technical complexities were initial obstacles, which were, then, mitigated by the supporting supervisors, seniors and online self-studies.

The finding underscores the importance of continuous learning, trainings and institutional investment in EVs technicians' development. Institutions have missed prioritizing comprehensive and advanced training programs for upskilling and reskilling of their staffs in order to prepare expert technicians who can address all kinds of EVs problems.

Ultimately, the adaptability and resilience demonstrated by the respondents highlight their commitment to growth and learn innovative product. By accepting changes and overcoming related challenges, participants not only secured their professional futures but also contributed to the goal of promoting EVs transportation system in Nepal. This case study serves as evidence to the transformative potential of education and institutional determination in transitioning technician role from the traditional vehicles to the electric vehicles.

About the limitation of future study, it does not analyze the downsides of transition process and its possible affects (Dawson el. al., 2021) in the company or the government. Similarly, Osatis and Asavanirandorn (2022) are claiming that job demand will increase only by 10% in the engineering field of EVs but low labor skills will be dropped by up to 70% which needs further research considering Nepalese automobile industry.

Implications

The study has some important implications. As it is inevitable that the future of automobile is going to be EVs, so will it be crucial to prepare for the related requirements such as human resources and the technical expertise. This necessitates a proactive approach to provide EVs training to as many as possible for skill development and ensuring adequate professionals enough to meet the future demands of EV maintenance and repair workers.

The study also highlights a limitation in current training opportunities, as the training are primarily limited to the company premises to their staffs. This restricts individuals outside the company from accessing to the training opportunities, creating barriers to skill acquisition and hindering broader public participation. Thus, companies should be mandated to offer training opportunities to the public as well. This would help the needy ones build a skilled workforce despite limited resources. For that, policy intervention may require, to which the role of government bodies such as Council for Technical Education and Vocational Training (CTEVT) and Ministry of Education, Science and Technology (MoEST) will be crucial on this matter.

Moreover, the inadequate training scope is the dissatisfaction among the participants. Trainings are not designed to address the diverse range of EVs related issues. The syllabus of the trainings is limited to the trainers without monitored by any authorized agency. Therefore, today's necessity of comprehensive training is lacking, otherwise, it could have supported the effective integration of EVs maintenance and care technologies at societal level. As shared by the participants, automobile training at CTEVT is limited to ICE vehicle. Thus, considering recent market demand of EVs technicians, revision of syllabus is essential. It is also recommended for developing a standardized EV training syllabus aligned with global standards and making it obligatory for any training institutions which

is willing to provide EVs training. Finally, a standardized skill testing and certification mechanism system should be in place to ease employers to recruit technicians based on their skill-tested certificates.

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