

Transportation of Laxmi Hyundai Cars

Supply chain and distribution of cars

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Abstract <p>Innovations and improvements in the transportation technology have increased companies' dissatisfaction with the traditional ways of transporting vehicles and goods. The supply chain and transportation process were analyzed for Laxmi Intercontinental Pvt. Ltd. to study how the company could improve the transportation of cars to dealers. Laxmi Intercontinental Pvt. Ltd. is the only authorized dealer of Hyundai vehicles in Nepal, and it has 11 dealers and 13 servicing centers. Laxmi Intercontinental Pvt. Ltd. mainly imports cars and sells cars to the dealers. The company deals with a massive supply chain and transportation operations.</p> <p>The objective of the study was to analyze the collected data from the company and explain how the transportation process could be improved by using modern available tools and technologies. All the data were collected by using self-observation, books, journals, literature reviews, articles, and interviews. The research started by analyzing the current supply chain and transportation process. Due to the lack of infrastructure and other modes of transportation, research was conducted to improve road transportation.</p> <p>As a result, poor techniques and traditional ways for dispatching the cars were identified. The traditional way of transporting cars was costly, fuel-consuming, risky, inefficient, and difficult to monitor.</p> <p>Large cars carrying trucks were proposed to be used for transporting the cars to the dealers, which is cost-effective, requires less manpower, is easy to monitor and safe as well as less fuel consuming and with lower CO2 emissions. The use of an Intelligent Transportation System (ITS) was also suggested to make the dispatch process more effective and to reduce the lead time for the dispatch process.</p>		
Keywords/tags: supply chain, information technology, transportation, Intelligent transportation system		
Miscellaneous		

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1 Introduction

In the year 1956, the first road was built in Nepal. Earlier than that, Nepal was mainly dependent on the traditional means of transportation. There were only short rail routes between Janakpur and Jayanagar, Raxaul and Amlekhgunj and a ropeway which connected Hetauda to the capital city of Nepal, Kathmandu. Roadway became the most preferred mode of transportation after the construction of the road started. Initially, the royal family and rich people slowly started to import the cars and later on, companies started to import and sell the cars commercially. Then, cars became a favorable means of transportation in Nepal. (Poudel 2015.)

The main purpose of this thesis was to analyze the current supply chain and transportation process in order to find out the best possible way to improve the dispatch process by utilizing the modern available equipment and techniques to deduct the logistics cost and smoothen the vehicles' dispatch process. The thesis starts with the research topic and general background about Laxmi Intercontinental Pvt. Ltd. activities, history and plan. It proceeds with an overview of the supply chain process and the process analysis of the company, transportation, dispatch process and presents the most relatable and applicable suggestions and conclusions.

The company's current working order for conducting a different set of activities was analyzed (i.e. purchasing, inventory management, supply chain process, transportation activities, customs, inventory management, transfer of ownership and logistics information system) from the vehicles transportation point of view. By analyzing the ongoing process of the company's problems in the transportation area, issues to be improved were detected. Based on the problem and development area, suitable improvement plans and suggestions were proposed to the company.

2 Laxmi Intercontinental Pvt. Ltd. (LI)

Laxmi Intercontinental Pvt. Ltd. (LI) has been the one and only official trader and distributor of Hyundai motors in Nepal since 2009. The company has 11 dealers in 12 major economic cities in Nepal. The company's head office is located at Thapathali, Kathmandu (the capital city of Nepal). After becoming an authorized dealer, the company started to import and sell different models of Hyundai cars which are manufactured and assembled by the Hyundai Motor Company, India and Hyundai Motor Company, Republic of Korea. Currently, the company sells hatchbacks, compact sedans, sedans, compact SUVs, SUVs and cross overs to stay ahead in a competitive market and provide all variants to the customer. In the year 2019, the company imported 11 different Hyundai models, namely the Verna, Santro, Venue, Grand i10, Creta, Xcent, Tucson, Elite i20, Santa Fe, and i20 Active, and the company recently started importing the electric cars Kona EV and Ioniq EV. Mainly the company imports passenger car but the company also import ambulance van and other vehicles in Nepal (Laxmi Hyundai 2020).

In the Nepalese automobile market, Hyundai is the most desirable vehicle and has been able to win thousands of hearts in Nepal. Customer has praised for its fuel efficiency, reliability, strength, durability, best resale value and after-sales service. In order to provide best after sales service experience to customer Laxmi Intercontinental Pvt. Ltd. has established a state of art showrooms and technologically superior after-sales facilities across the major cities in Nepal with Hyundai's global standard. Company doesn't focus only on selling cars to new customer but also focus on the retention of old or existing customers. So, to provide the best service among the rival companies in terms of ambiance, space, and quality. The company also offer the authentic spare parts and after-sales service which is followed by Hyundai's Global Auto Servicing along with high tech equipment which is necessary for different models of vehicles and well trained and certified technician and engineers (Laxmi Hyundai 2020).

The company aimed to provide the best possible service to make customer experience better. To ensure customer maximum satisfaction in every activities company

has started for the first time in Nepal and in South Asia, Hyundai Training Academy which offers training to the employees which includes customer relation management, marketing, after-sales service and technician, sales staff and training of product itself. Figure below illustrate all the LI dealer for Nepal. Hyundai logo with back small circle indicates the head office of LI Pvt. Ltd. (Laxmi Hyundai 2020).

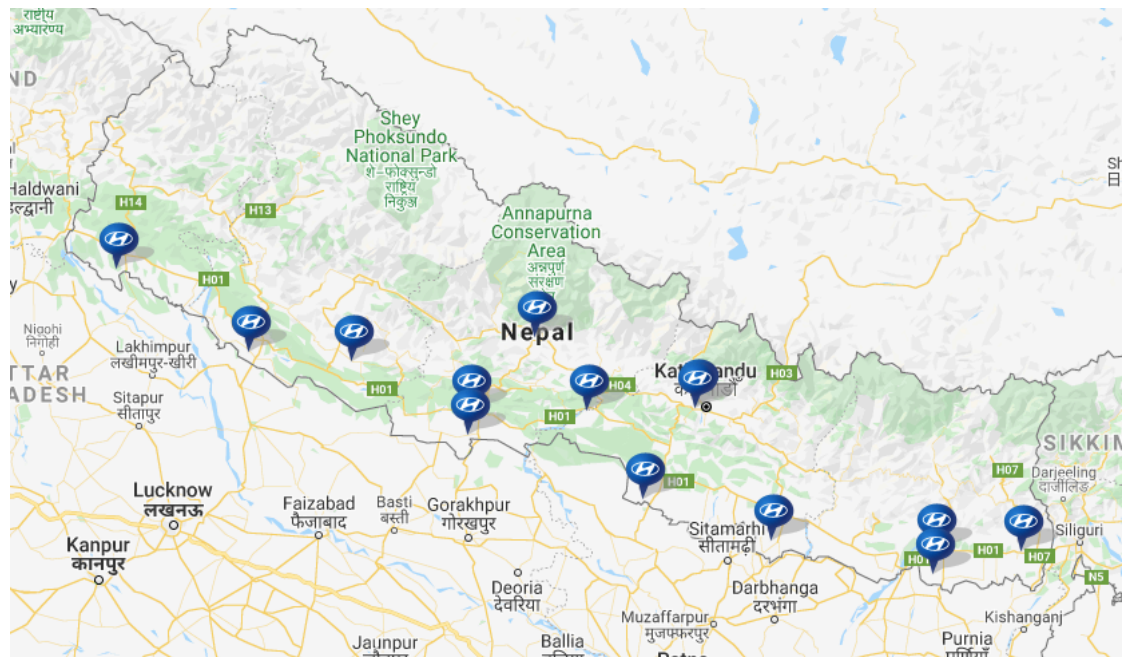


Figure 1. Hyundai car dealers and service centers in Nepal (Laxmi Hyundai 2020).

3 Research purpose and research question

Laxmi Intercontinental Pvt. Ltd. (LI) wanted to analyze the current process and find out the ongoing major problems in the transportation and dispatch process and find the place to improve performance to get better result and strategically meet the company's target. The research purpose was to prioritize the key activities and find the development area to focus and find out the applicable solution and improve the transportation and dispatch process. This thesis work has three research question:

- How the company can improve the transportation of cars in terms of cost?

- After analysis of the supply chain process how information technology can affect transportation?
- What actions are required to improve electric car transportation?

3.1 Qualitative and quantitative research

Qualitative and quantitative are the methods used to collect the data in the research. Depth and freedom of research, structure, flexibility and sequential order restriction are mainly due to the distinction of the research method. The quantitative method supports all these research restrictions but at the same time, qualitative method is opposite or against them. For example, narrative format observation is qualitative information but if the same observation is recorded in categorical form or a certain scale it becomes the quantitative information (Kumar 2011, 138).

Data were collected and analyzed in various way and procedures for it has been described in the following section.

3.1.1 Data collection

The primary data in this report were collected through observation and interviews with the supply chain professionals of the company from lower to a higher level. Secondary research was done from the literature review, article, journals, company's website and using the data from the logistics department, sales, and purchase department. Examining critically related data or research and relevant theoretical ideas that exist already is the literature review (Bryman and Bell, 2015, 14).

Observation is a systematic, selective and purposeful phenomenon to listen, interact, learn and understand with the ongoing process (Kumar 2011, 140). During my internship period, I worked for Laxmi Intercontinental Pvt. Ltd. as a logistics intern from which I got knowledge about general operation and logistics activities. (i.e. insurance claim, vehicles registration, transfer of ownership, custom to showroom

vehicles arrangement, pre-delivery checkup, etc.) from where I got knowledge about data collection.

3.1.2 Data Analyzed

The data analyzed depends upon the purpose of the research and the interpretive frame was used to evaluate the phenomenon or process (Kumar 2011. 350-351). The data collected through different sources were analyzed based on their importance, complexity, and result which may affect the operation and supply chain process.

4 Literature review of supply chain process

4.1 Supply chain

To explain the process and deepen the research theoretical study of the process was done. The supply chain was first introduced in 1980's, when companies were trying to figure new strategies to manufacture to reduce the manufacturing cost and increase the quality of the product or service. Then later Toyota introduced just-in-time, Kanban, Lean and six sigma which increased the profit and reduce the manufacturing cost. Later to increase the profit margin and efficient flow of operation companies focused on transportation. Logistics engineer/value chain then started to become professional in an academic center and others (Mangan *et al.* 2009, 4; Simchi-Levi, *et al.* 2008,7). Supply chain encloses all the operation and activities which are directly or indirectly related to transportation or flow of material and information from raw material phase (supplier) to end customers and end customers to the supplier. The flow of information and material takes place in both directions up and down (Handfield and Nichols, 2002, 8).

Supply chain exists everywhere, where company or associations which collaborate to sharing and moving money or finance-related assets, physical resources, administrative data and services in both downstream and upstream network. The supply chain

network starts from the suppliers or manufacturer and it ends at the end customer or final consumer. In between supplier and end customers, there are several activities can be done to add value to product or service from an end customer point of view (Hsuan, et al. 2015, 17-19; Waters 2009, 15).

4.2 Supply chain management

The term supply chain management (SCM) states the management of all the organization and activities that are associated with the supply chain network through the compelling business procedures, better relationships between the organizations, significant levels of sharing of data and information to generate competitive advantage in the supply chain network organization by the system of building performing value (Handfied & Nichols 2002, 8).

The supply chain is comprised of the associations carrying out important function or activities attached to the value chain of the product, SCM focuses on the better outcome of the chain. The competition between the associations and product has now shifted between the supply chains with the help of information technology which flow the information faster, accurate and on time. So, supply chains now compete to stay competitive and beneficial (Hsuan et al. 2015, 19-25).

Stream of material and sharing of data among association engaged in the supply chain should remain constant to remain beneficial. Association engaged in the supply chain should be managed separately in a network which puts the pressure for extra profound coordination and closer, increasingly open data sharing among the members in both the direction of the supply chain. The efficient flow of data and information ensure the increasing competitiveness among the members in the supply chain network and the pattern is towards the increasing incorporated tasks and taking out obstructions between associations. Forecasting of sales, transportation orders, production, inventory management, logistics follow up and other data which are related to the supply chain can be shared with its member in a network in real-time with the help of information technologies which have been continuously

developing from past decades. Collaboration and coordination between organization have resulted in shorter led time and less inventory (Hsuan et al. 2015, 19-25).

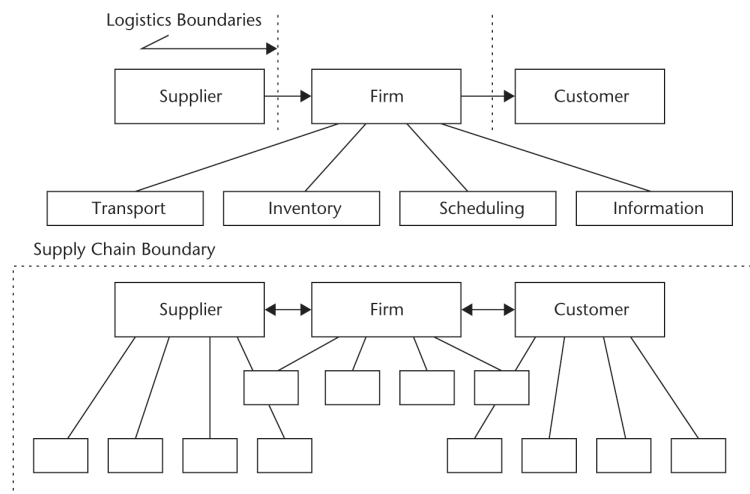


Figure 1.3. Logistics and the supply chain.

From: Juliana Hsuan, Tage Skjøtt-Larsen, Aseem Kinra and Herbert Kotzab: *Managing the Global Supply Chain*, 4th ed. © CBS Press 2015

Figure 2 Logistics and supply chain boundaries

(Hsuan *et al.* 2015, 22).

Supply chain management aims to conduct an operation to fulfill the demand of the product in the right quantity, right time and required condition. But, fulfilling the right quantity at right time is not practicable due to the Bullwhip effect. Inefficiency and unpredictable forecasting for demand or order information that effect the supply chain then bullwhip effect take place. Every supply chain division has its purchase order process and it is related to the continue order process and number of quantities. As purchase order data flow from one member to another in the supply chain, it shows the variation in actual order and order passed in the supply chain. Large variations can appear in the supply chain. Bullwhip effect might take place for various reasons: (Admin, 2012).

1. Disorganization – Ineffective control and operation.
2. Communication – Miscommunication between supply chain members.
3. Free return – Member knowingly order higher quantity to avoid a shortage, but later excessive supply occurs, and order will be postponed or dropped.

4. Order batching – an appropriate if organizations don't submit and request in appropriate way.
5. A Variation on price – Offers, sales, discounts, and promotions usually create variations in order patterns.
6. Order quantity – Previous order history are usually used to forecast; current order quantity might have huge variation than previous. The figure below illustrates the bullwhip effect and general idea of how it might occur.

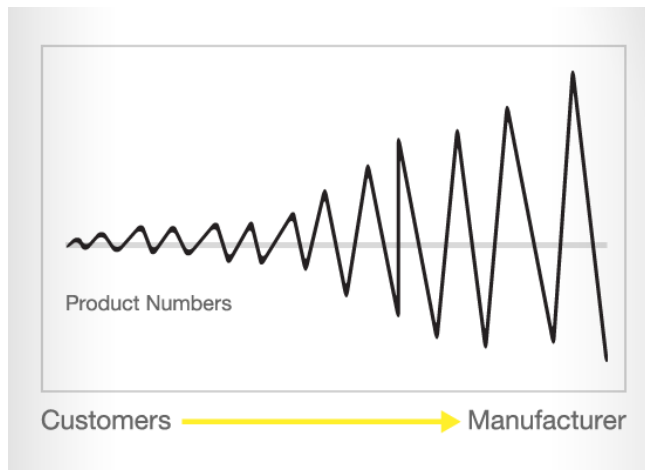


Figure 3 Bullwhip effect

(Admin 2012).

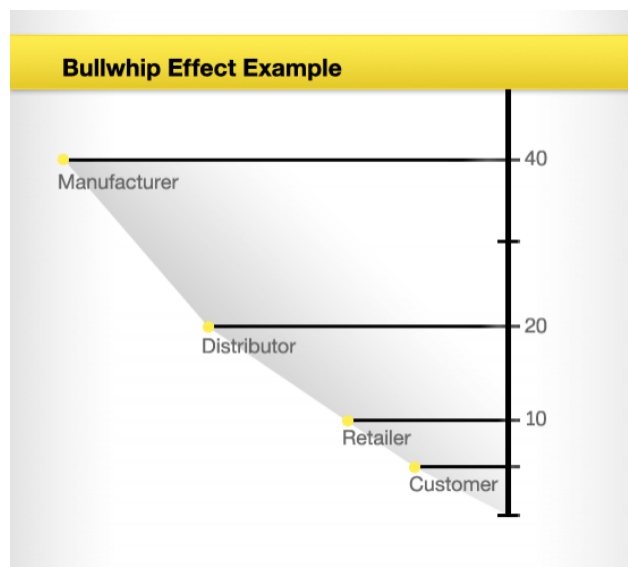


Figure 4 Example of Bullwhip effect

(Admin 2012).

4.3 Logistics

Logistics is a process of physical transportation of people, goods, and money from one place to another as per customer's order and relates to the theory or idea of the supply chain. Most often supply chain management and logistics conducts similar kind of activities but somehow supply chain management cover a wider range of operation rather than logistics and logistics itself is considered the part of supply chain management. Depending upon the authors or company's operation logistics have various definitions but mainly consider for managing the transportation of physical products, information, money but in small extension. Logistics includes activities like transportation, warehousing, inventory control, material handling, packaging and order processing (Mangan et al. 2009, 8-10, 58-60).

4.4 Supply chain engineering

In this global competitive market, companies are always trying to operate in minimum operating cost and production cost with very flexible and efficient way and companies are always thinking about the different current creation, modern production and operation management (POM) apparatuses and methods to relieve the difficulties to incorporate the supply chain activities. Information system, inventory strategies, stock management policies, radio frequency identification (RFID) devices, global insourcing, and outsourcing can investigate and solve the difficulties and issues regarding production and operation management (POM). All these processes can be analyzed through supply chain engineering procedures to advance the inventory network, amplifying the benefits and limiting the expenses by providing required service level (Dolgui et al. 2010, 1).

4.5 Process of supply chain

Depending upon the author's and organization's operation points of view supply chain process has different meanings. The supply chain has various perspectives on the basis of basic supply chain offered by corporate divisions, production and

logistics. The supply chain mostly comprises of producer, vendor, distributor, transport action and consumers. The supply chain process includes key activities like order fulfillment, procurement, demand management, distribution, production management, service management and return management (Larsen et al. 2007). In figure 7 below, the supply chain process and flow of information in the supply chain are illustrated.

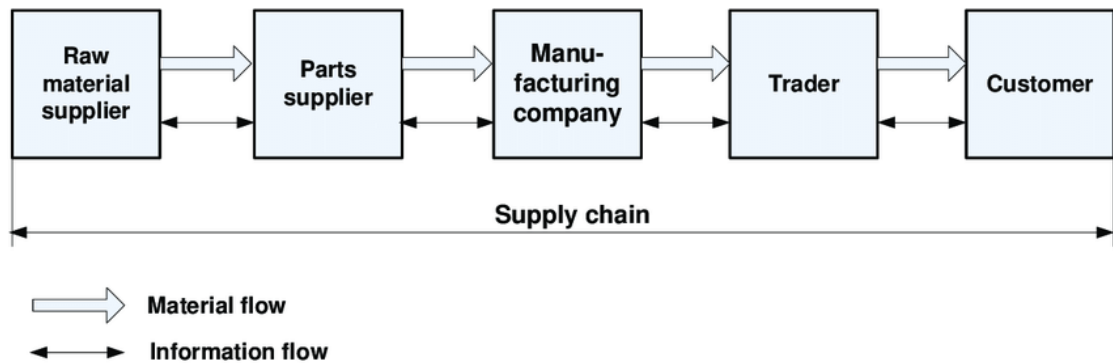


Figure 4 Supply chain process (Skapinyecz et al 2018).

4.6 Value chain in supply chain

In between supplier and end customers, several activities can be done to add value to product or service from an end customer point of view. The series or sequences of activities and operations (i.e. logistics activities, operations, marketing, sales, purchasing, after-sales services and research and development) that create or add value strategically of a product targeting the final customers. According to Michael Porter, the value system is a chain between the internal organization that form into a larger chain when linked together and tries to remove all the inconvenient works or activities and key activities at various stages are shifted to make the process flow smooth (Hsuan *et al.* 2015,17-19, 41-42).

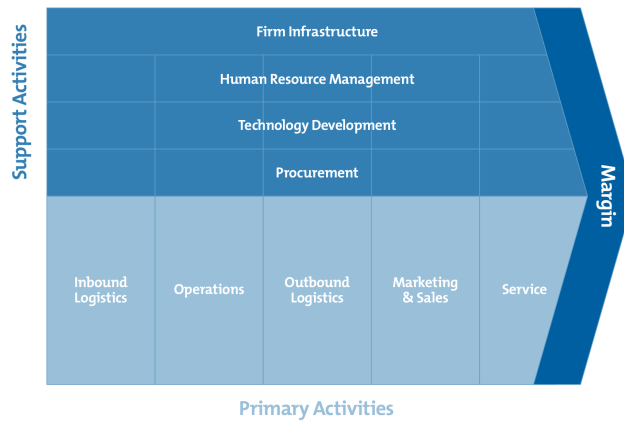


Figure 5 Porters value chain

(Hsuan et al. 2015, 17).

4.7 Information technology in supply chain and logistics.

The supply chain is physical flow or movement of goods, cargo, budgetary stream the motion of capital, managing the flow of the information, supporting and setting of the past streams. This intensive competitive contemporary worldwide market has a high requirement of the exact auspicious data on the required time or on time. The most common problems faced in the supply chain like understocking or overstocking can be solved with the help of the accessibility of exact on-time information about the customer demand and ongoing supply of real-time. Transparency and clear visibility of flow information can assist to detect the various ongoing problem and manage them or be prepared for it at various points across the supply chain (Mangan et al. 2009, 150–151).

The transparency, clear visibility, accuracy, and availability of the information to every party or network involved in the supply chain creates the competitive advantages in a value chain. Certain things are required for an efficient and effective flow of information like an understanding between the parties, equal collaboration and mutual understanding between the parties which is hardly implemented in the global supply chain. Cultural differences, technical challenges, financial conditions are the main problems in an effective and efficient flow of information in the supply chain and interorganizational supply chain (Mangan et al. 2009, 151-153).

The supply chain between two multinational organizations faces various problems including different working cultures. The value of time, openness and accessibility of data might not have the same importance in between the two different nations in the supply chain which is usually known as a cultural barrier in the supply chain.

All the parties in the network are not equally financially stable and good conditions and usually, information technology is rather expensive to implement and operate. So, it's not always suitable to use the integrated logistics information system in the supply chain with all the networks or parties.

In a global supply chain, multinational organization uses different information systems and official language to communicate with each other might not be the same so partner organizations should use at least agree to use the same or communicable information system. Technical things like units and currency should be agreed upon and accepted by both organizations to avoid technical problems (Mangan et al. 2009, 151-153).

In any organization, they do have a different department for different tasks and are responsible for their own assigned task which is aligned in the process to meet the goal of the company. More often these processes are difficult to manage and require knowledge and experience to organize. This mainly refers to the inter-organizational barrier.

In order to solve all the complex problems that might arise in the supply chain, the information system or technology should manage all the problems, make the process or information visible, transparent and give maximum benefits after its use (Mangan et al. 2009, 151-153).

4.8 Enterprise Resource Planning (ERP)

Enterprise resource planning (ERP) is software that empowers the business associations to utilize an arrangement of the incorporated applications to organize their

business. Business firms and companies have used ERP for observing and organizing operations of monetary, human and supplies in all the useful and departmental areas in the supply chain process. ERP software facilitates companies with the real-time tracking systems and transparency of all the operations, supports the supply chain to make better decisions and standards of its process (Chopra, & Meindl 2013, 65).

All the information and data generated from the process and performed operation are gathered and accumulated by ERP which can be utilized to review, study and documentation purposes. ERP helps to stop or reduce the paper documentation of the company. Modern ERP software is suitable to use with other different software or system and information technology software used in supply chain process to transfer or exchange the documents, information, and transactions without any technological barrier. Data transmitted from different supply chain software which are transmitted through different system and format requires external software to fix and convert the generated data (Hsuan et al. 2015, 107).

ERP software is primarily suitable and used for large scale companies and are designed as per the requirement of those companies. Still, ERP alone itself is not sufficient for controlling and organizing operations in the supply chain. Currently, most familiar ERP used in the market are Microsoft Dynamics, i2, PeopleSoft, Oracle, and SAP (Hsuan et al. 2015, 107).

5 Transportation

Transportation also can be defined as the physical movement of materials, money, people, animals, etc. from the place of origin to the destination and in terms of the supply chain from a place of origin to the final customer (Chopra & Meindl 2013).

Transportation forms are mainly distinguished based on modes use for transportation of materials, people, money, animals from one point to another and primary transportation forms are:

5.1 Pipeline transportation

A pipeline is a channel of pipe organized together to transport liquids, gases and similar materials like water, fuels, milk, beer, crude oil, chemicals, petrol, and diesel. A pipeline is the best modes to transport mainly liquid and gases because of the speed of transporting these products. Major benefits of a pipeline over other modes of transportation for transporting these products are less wastage, less energy consumption, rate of transport, can be operated and controlled by modern available technologies (Stock & Lambert 2001, P328).

5.2 Air transportation

Air transportation refers to modes of transportation mainly operated on air. Air transport is the most expensive form of transportation but also known as the fastest modes of transportation. Companies mainly prefer air transport to ensure the supply of just in time inventory replenishment. Air transport is mainly operated by airplanes and helicopters. Mainly high demand, perishable, pharmaceuticals and valuable goods are mainly transported by air transportation (Stock & Lambert 2001, P326).

5.3 Road transportation

Road transportation is the most flexible and important mode of transportation in supply chain operations. Road transportation relates to all the means of transportation operated on the road regardless of the country, cities, and routes used for transportation. Mainly bus, trucks, motorbikes, cycles and animals are used for transportation. Road transport is the most suitable transport for both long as well as short distances. Road transportation mode is the only way that logistics service provider or any other people can provide door-to-door service to their customers. Versatility in volume, heavyweight and availability of road in every country and cities are the main advantage of road transportation (Stock & Lambert 2001, P326).

5.4 Rail transportation

Rail transportation is the movement of series of wagon rails connected on railway gauge. Rail transportation is among the cheapest modes of transportation as compared to air transport and road transport. Rail transportation is less flexible but safer, cost-effective and efficient means of transportation. Rail transportation is operated in most of the countries in the world but due to the fact that it cannot provides door-to-door service, it lacks flexibility. Railway gauge size is different in the different nation (Stock & Lambert 2001, 327).

5.5 Water transportation

Water transportation is mainly used for transportation of bulky goods from one country to another or one continent to another around the world by using sea, lakes, rivers, and canals. Water transportation is the cheapest form of transportation in comparison to other forms of transportation. In western Europe, people mainly use water transportation because of clear connection, presence of water passages and cheapest means of transportation. Volume, cost, and weight of the goods are advantages of water transportation, but it is very slow compared to other modes of transportation (Stock & Lambert 2001, P327).

6 Transportation infrastructure in Nepal

Transportation infrastructure refers to the physical properties like ports, roads, airports, rails which are used to complete transportation network. Government ownership is required or should be operated to deregulate the monopoly in transportation infrastructure and market. The government is mainly responsible for the renovation, maintenance, and operation of those infrastructures. If any particular company or person own the infrastructure, then they should meet the basic requirement for the operation (Chopra & Meindl 2013, P392-393).

Nepal is a land lock country surrounded by China from the north and India from the other three sides. Nepal mainly uses the port of Kolkata (India) to import goods from other nation than India. Nepal uses five other dry port to import goods.

6.1 Road transportation in Nepal

Department of Road (DoR) under the Nepalese government Ministry of Physical infrastructure and transport is mainly responsible for controlling, planning and regulating road transportation and related works in Nepal. Road transportation is a major mode of transportation in Nepal. Nepalese road network mainly consists of the east to west highway (Mahendra highway, Mid hills highway) or the north to south highway (Tribhuvan highway, Karnali highway, Bhimdhatta highway) and feeder roads (FN) which are mainly to connect local roads network (LRN) to highways. This road network is also known as the strategic road network (SRN). The figure below shows the strategic road and its connection with local road networks (Bhandari 2015; Department of Road 2020).

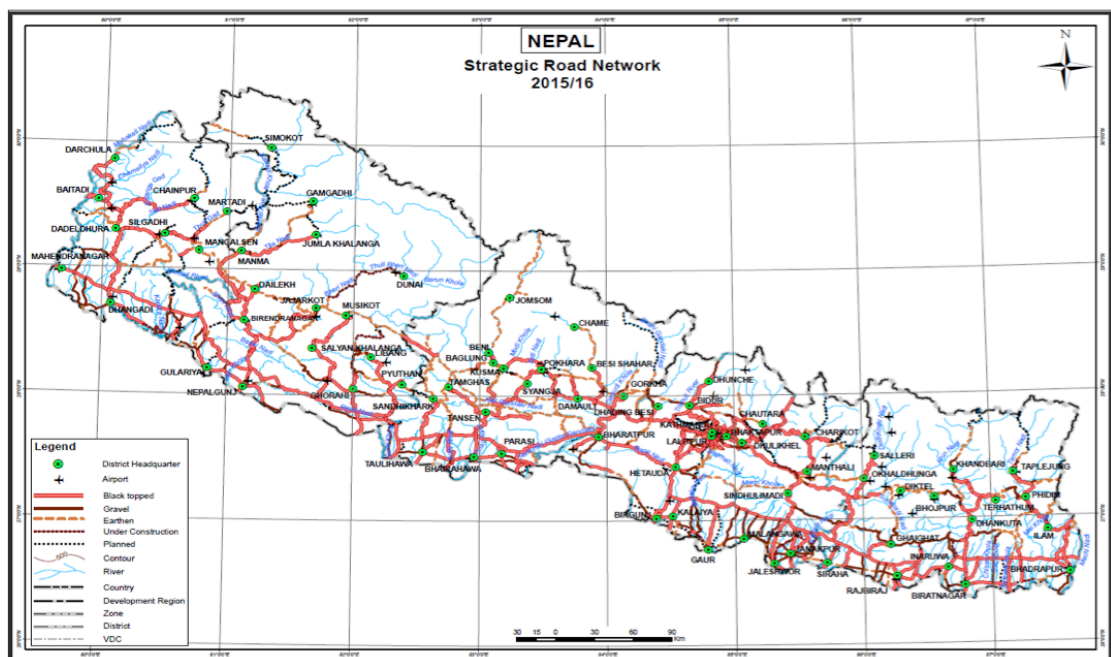


Figure 6 Strategic Road Networks, Red- Highway, Yellow-Feeder.

(Department of Road 2020).

Vehicle's payload limitation and Heavy Vehicles Management Policy (HVMP) is set by DoR and all the vehicles are regulated according to it. Trucks with 2-3 axel (6-10 wheel) are allowed to carry a maximum of 18 metric tons payload and medium-sized trucks are allowed to carry 7-10 tons payload. The figure below shows the maximum load capacity according to DoR and comparison with India (Department of road 2020).

Axle Load Limits	LCA Country (NEPAL)	Transit Country (INDIA)
Truck with 2 Axles (heavy truck)	16 MT	19 MT
Truck with 3 Axles (Multi-Axle Truck)	25 MT	28.5 MT

Figure 7 Maximum load capacity comparison in Nepal and India.

(Department of road 2020).

6.2 Air transportation in Nepal

Civil Aviation Authority of Nepal (CAAN) under Nepal government Ministry of Culture Tourism and Civil Aviation is mainly responsible for planning, controlling, operating flight, maintaining and constructing airports, flight safety and purchasing of equipment and aircraft corporations with the government of Nepal. Nepal currently has 53 airports along with only one international airport but only 32 airports are in operation. There are altogether 70 aircraft owned by government and private airline companies. Wide-body, Narrow body and small crafts and helicopters are mainly used for air transportation in Nepal. Air transportation is also mainly used for transporting people and cargo in major cities and rural areas with no road connection. The domestic airline has high value for the transportation of cargo and people especially in the remote areas (Rajkarnikar, 2010; Bhandari 2015; Civil Aviation Authority of Nepal 2019).

6.3 Rail transportation in Nepal

Railway in Nepal was first built in 1934 from Janakpur to Inaruwa and later it was further extended till Jayanagar, India. The total length of this railway is 42 km. Nepal has only two short railway routes from Raxaul (India) to Birgunj (Nepal) and another route from Jayanagar (India) to Janakpur (Nepal). According to the Railway service agreement between India and Nepal country's second railway came into action 2004. A short 5.4 km railway from Raxaul (India) to Dry port of Birgunj (Nepal) is mainly used to import and export goods. This railway connects Nepal with Seaports and big towns of India. Railway infrastructure is in working condition in Nepal providing service mainly to southern rural areas in Dhanusha Districts (Rajkarnikar 2010; Bhandari 2015).

6.4 Water Transportation in Nepal.

Nepal is not connected with the sea so, use Port of Kolkata (India) to import goods. People use small wooden and motorized boat to cross the lakes which are mainly operated and regulated by local people (Bhandari 2015).

6.5 Ropeways in Nepal.

Due to the complex geographical structure roadway and railway is not possible to connect every part of Nepal. The ropeway is suitable in those areas for transportation. Currently in Nepal, there are Goods ropeway, gravity goods ropeway, Cable car and wire bridges which are known as Tuin in Nepal (Bhandari 2015; Zimmerman 2010).

Nepal has more than 6000 rivers and there are only 3492 trail bridges. Wire bridges (Tuin) is more common in the rural area to cross the river. Ropeway in Nepal is mainly used for the transportation of people and goods. Some of the ropeways in Nepal are; Dhorsing - Matatirtha ropeway 31 km long, Hetauda - Teku ropeway 42.3

km long, Manakamana cable car 2.8 km long, Udaypur cement factory ropeway 5 km long, etc. (Bhandari 2015).

6.6 Fuel and charging station.

In Nepal only government-owned company Nepal oil corporation (NOC) is allowed to import, store and distribute all types of fuel. NOC imports fuel from Indian Oil Corporation (IOC) and set selling rates for fuel. NOC distribute oil to dealers and dealer to the consumers. According to the report from fiscal year, approximately 1.1 billion USD worth fuel was imported in Nepal. Altogether there are 1563 dealers all over Nepal scattered in all seven provinces and 60% of imported petroleum products are used alone in the Central region of the country (Nepal Oil Corporation 2020).

6.7 Transportation infrastructure challenges

Frequent floods and heavy rainfall are major for damage in the highway in Nepal. Glacier lake outburst floods (GLOFs) are a major natural calamity that has been continuously damaging the infrastructure. For example, in 1981 Arniko Highway and the friendship bridge was damaged because of GLOF outbursts in the Sun Koshi river (Bhandary et al. 2013, 1-20).

7 Process Analysis of LI

The company sells Hyundai cars and genuine parts which are imported from the Hyundai motor Ltd, India and Hyundai motor company, Republic of Korea. Mainly all the vehicles and parts are imported through roadway transportation via India border. The company uses two custom points for to import vehicles in Nepal. Birjung custom point and Bhairahawa custom point in Nepalese side and Sunauli custom point and Raxaul custom point for Indian side for export. Vehicles from Republic of Korea are received by third party at Port of Kolkata, India but customs and import works are done in Nepalese boarder. Third party receive vehicles and transport vehicles to the

Nepalese boarder. All Hyundai cars sold in Nepal is imported and distributed to the dealer through LI Pvt. Ltd. All the operations are conducted from Kathmandu (head office), but vehicles are dispatched directly from Birjung or Bhairahawa warehouse to the dealer's location after completing all the necessary paper works and other formalities. Customers can buy the cars, other products, parts, services from the local nearest LI dealer.

LI generally collects the order from its dealer twice in a month and forward purchase order to the supplier. In response to the LI purchase order, the supplier sends ordered cars to Sunauli or Raxaul warehouse, where a representative from LI receive all the cars according to purchase order and tally the purchase order with the received goods. Usually, until custom work isn't done Laxmi intercontinental agent manages all the paperwork as per requirement ordered by the sales department. A representative from the company tries to maintain the best optimal quantity to prepare batch to clear the custom. Local agents working for custom clearing work assist in every step to prepare appropriate documents for customs clearance. In Nepal, custom charge varies depending upon the engine capacity, fuel ingestion by the engine, and others. So, it's important to prepare an appropriate documentation to pay the minimum charge.

Local agent prepares the insurance of the car and makes an arrangement of proper transportation to their destination from the warehouse. Before the transfer of ownership and hand over any physical damage or any fault on cars are checked and if required insurance claim or rejection is done. Then after clearance of all payable charges and taxes vehicles and other goods are imported to the Birjung / Bhairahawa warehouse of Nepal. All the goods imported to LI are warehoused in Birjung / Bhairahawa and then distributed to different dealers according to the order. Although paperwork is done from head office, key logistics activities take place from Birjung warehouse i.e. arrangement of transportation of vehicles and goods, packing and unpacking, sorting, warehousing and distribution. Most of the vehicles are transported to dealers according to the order and remaining vehicles are transported to Kathmandu warehouse and transported to different cities from Kathmandu if necessary. The figure below shows the current vehicles supply process of the company.

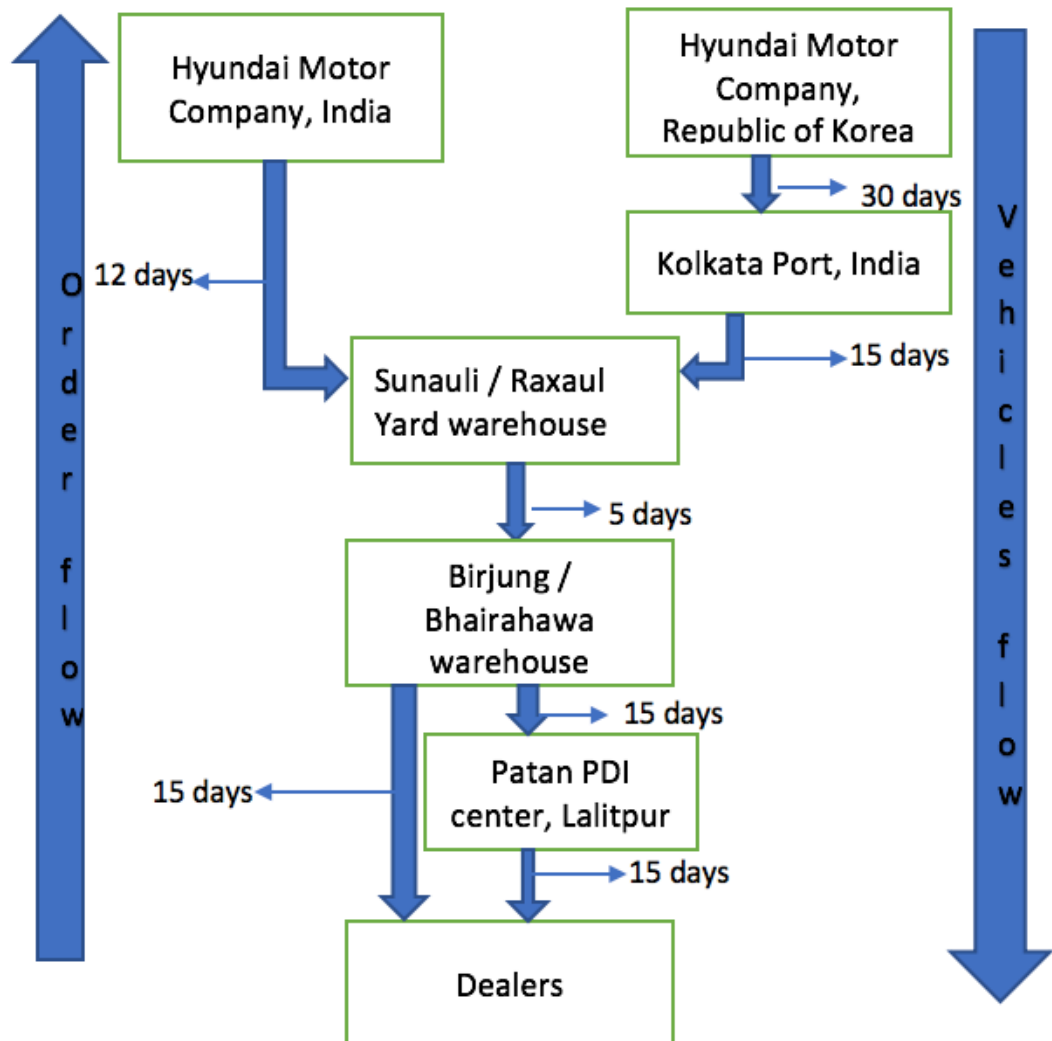


Figure 8 Vehicles supply process of company.

In this globally competitive market, the quantity of sales of the cars has been increased surprisingly and created great challenges for the supply chain managers but the way of working and techniques and tools are mostly the same as many years ago.

LI motors import all Hyundai vehicles from Hyundai Motor India Ltd, India and Hyundai Motor company, Republic of Korea and distribute the parts and other required material all over Nepal in different cities. As there are mainly two principal companies:

1. Hyundai Motors India Ltd, India
2. Hyundai Motor Company, Republic of Korea

7.1 Supply chain for Hyundai motor India Ltd, India

LI imports most of the vehicles and genuine parts from Hyundai motor India Ltd. so vital supply chain activities occur between two companies. The supply chain process starts with the purchase order of the vehicle's, genuine parts and other material which is mainly based on the pre-order from the dealer and forecasting from the sales department. LI receives the purchase order from dealers every two weeks and prepare the purchase order 60 days in advance of the actual delivery date from the supplier. Delivery time of the ordered car usually takes 90 days' time period. For example, to get the delivery placed on September 2019 the last date to order should be until the last week of July 2019. Production of ordered vehicles will take place in September and the final shipment will take place at the end of September or at the beginning of October 2019. The actual transit time for the shipment from the factory to India border takes 12 days. Then vehicles and other items are stored and warehoused in the Sunauli or Raxaul yard which is located on the Indian border.

Customs clearance is done based on requirements from the sales department. The dealer needs to send the purchase order one month in advance. Then within three business days, the logistics department confirm the order delivery date. Logistics department confirms the availability of vehicles and goods to head office and head office to dealers. Then, after the customs clearance in India boarder vehicles are transferred to the Nepalese custom department in either Birgunj custom point or Bhairahawa custom point. After the necessary paper works vehicles and other parts are warehoused in either Birgunj warehouse or Bhairahawa warehouse. After the completion of all the necessary formalities and payment vehicles are then vehicles are dispatched to dealers and parts to the service centers according to the purchase order received from the dealer. Actual lead time for delivery of vehicles to dealers is usually 30 days. Other orders to stock vehicles are transported to Patan Pre-delivery inspection center, Lagankhel, Lalitpur. Appendices 3 shows the transportation route from supplier to the main warehouse and appendix 6 shows the supply chain process of Hyundai Motors, India.

Generally, there are pre-determined products which are ordered and imported based on forecast like Lubricants, clutch plate, brake pads, gearbox, mudguard, tires. But other materials like glasses, frames, bigger parts are warehoused but in limited quantity and are imported mainly based on of purchase order. LI receives the purchase order for spare parts every two weeks and after receiving all order LI forward purchase order to the supplier and in the response of purchase order supplier send the listed number of products. They are transported to Raxaul warehouse and necessary paperwork is done there for customs clearance. Third-party or the agent does all the customs clearance work. After all, paper works before the custom tax amount is paid and parts and other materials are imported and after checking the quantity, physical damage, quality, and missing materials all the goods are warehoused in Birjung warehouse, Nepal and report are forwarded to head office.

If any cars are missing, damaged parts, irrelevant products are found then report sent to head office, supplier and insurance company. Mostly damaged and missing goods are compensated by the insurance company or transport company unless irrelevant goods sent from the supplier. Vehicles and parts are transported to the dealers and service center by LI by driving and renting different transport companies depending upon the nature and cost of the transportation. Mostly cars, spare parts, and other materials are transported by road transportation from the Birjung warehouse but in case of emergency depending upon quantity and volume of goods are also transported by air transportation from supplier to head office and head office to the dealer.

The company's main warehouse is located at Kathmandu, the capital city of Nepal and geographically at the center from all the dealer and service center. All the automobiles and parts are warehoused in this warehouse. Major financial transitions and dispatch of vehicles and other material and big decisions are taken from head office. Below you can see the basic example of the process from order to delivery.

Order: Advance 60 days (90 days delivery time. E.g. To get delivery in September)

Last order: Last week of July 2019

Assembly: September 2019

Transport: September /October 2019

Transit duration: 12 days to reach border

Warehouse 1: Sunauli / Raxaul

Custom clearance: According to sales requirement (5 days)

Custom department: Birjung / Bhairahawa

Warehouse and distribution: vehicles dispatch (15 days)

Receiving: Patan predelivery inspection center, Lalitpur.

7.2 Supply chain process for Hyundai motor company, Republic of Korea.

LI imports most of the vehicles and genuine parts from Hyundai Motor India Ltd but in some especial case vehicles and genuine parts of vehicles are imported from the Republic of Korea. Supply chain process starts with the purchase order of the vehicle's, genuine parts and other material according to the sales department. LI prepares the purchase order 30 days in advance of the actual delivery date. Delivery time of the ordered car usually takes 90 days to 120 days' time period. For example, in order to get the delivery placed on September 2019 the last date to order should be until the first week of July 2019. Production of ordered vehicles will take place in August and the final shipment will take place at the end of September or at the beginning of October 2019. It takes 30 days to reach vehicles and other goods to reach from Korea to Kolkata port, India. All vehicles and goods are received, and ownership is transferred to the company. Cars are transported by roadways depending upon the nature of the goods and its urgency parts and other goods are transported by

roadway or airway. Mostly road transportation is used because of its volume flexibility and cost efficiency. Any visible damage and missing of goods are checked and fault or missing report is prepared based on goods received. Cars are received at Port of Kolkata and inspected then vehicles are further transported to Sunauli or Raxaul custom point in Indian boarder and transit time is usually 15 days. Then vehicles and other items are stored and warehoused in the Sunauli or Raxaul yard.

Customs clearance of vehicles is done as per demand from the sales department. Local custom clearing agent work for custom clearance of the vehicles and parts. Then vehicles are transferred to the Nepalese custom department either Birgunj custom point or Bhairahawa custom point. Then vehicles and other goods are warehoused either in Birgunj warehouse or Bhairahawa warehouse. Then after completing required formalities, paperwork, payment vehicles are dispatched to dealers and parts to the service center. Other orders to stock vehicles and other goods are forwarded to Patan Pre-delivery inspection center, Lagankhel, Lalitpur. Appendix 4 shows the transportation route from the supplier to the main warehouse and appendix 6 shows the supply chain process of Hyundai Motors, Republic of Korea.

Any damage and missing goods are compensated by the transport or insurance company and incase of irrelevant goods fault report are sent to supplier and compensation is claimed. Warehoused vehicles and parts are further transported to different dealer and service centers according to purchase orders from the main warehouse of the company. Below you can find the simple example of the process.

Order: Advance 30 days (Delivery takes 90 days, e.g. to order in August)

Last order: First week of July 2019

Assembly: August 2019

Transport: Korea – India (30 days)

Transport: India – Nepal border 15 days

Custom clearance: According to sales requirement (5 days)

Custom department: Birjung / Bhairahawa

Warehouse and distribution: vehicles dispatch (15 days)

Receiving point: Patan predelivery inspection center, Lalitpur

7.3 Documents requirement for the vehicles dispatch.

There is a certain requirement for dealer and sales department to be fulfilled before the delivery of any vehicles and goods.

7.3.1 Dealer sales:

- Tax invoice copy
- Official delivery order letter signed by sales official and authorized person of dealer (manager).
- Goods received a letter after the delivery of goods.

7.3.2 Kathmandu sales department:

- Predelivery inspection and transfer of stocks by the department of logistics.
- Transfer of ownership to respective dealers as per order.
- Accepting for the dealer's logistics division.

7.4 Purchasing

By definition, according to Van Weele purchasing refers to acquiring different raw material, goods, and services from an external organization by using the assets so that organizations can keep on performing the regular business activities. In general, purchasing is the task to the management of outer resources of the organization to

ensure enough supply of goods, service, and knowledge and support the activities performed by an organization which is required in order to operate the organization. In this globally competitive market to stay on the market organization must focus on their purchasing strategies to reduce the purchasing cost, deduct the inventory cost and capital, making the core quality better, trying to reduce the lead time. Win-win situation for both supplier and buyer help to improve the buyer supplier relation and benefits both the parties in long term business (Weele 2010, 3).

The company purchases cars from two suppliers and distributes all over Nepal to different cities to dealer and service centers so, purchasing is the key activity that the company performs and makes a profit from it. Most of the part of the revenue of the company is invested in purchasing. In general, the company mainly purchases cars, parts, goods and sells to dealer and customers. Besides this the company purchases service and knowledge to smoothen the operation and make the operation faster. Starting from the transition period of buying from supplier to delivering it to the dealer to the showroom.

The company needs to purchase different services and knowledge like human resource (for transporting vehicles one place to another, logistics, driver, warehousing, packing, maintenance, cleaning), transportation (distribution of vehicles and delivery of goods), finance (payment and other activities) and facility service (office maintenance, office cleaning and other tasks). The company has its purchasing department to strategically purchase all the goods and services to avoid the excessive inventory or run out of inventory, on-time payment to utilize the working capital and ensure just in time delivery of the product.

For the company's core purchase sales department follows a standard process prepared by the procurement department and the purchasing process is conducted according to it. When LI receives a purchase order from the dealers, they check the inventory on the head office, Birjung or Bhairahawa warehouse and then Raxaul or Sunauli warehouse respectively. If the stock is out of order or limited in quantity or needs to be restocked then the company releases the purchase order to fulfill the demand and ensure on-time delivery.

7.5 Custom and Duties

The company mainly use two custom point to import vehicles from the supplier. Nepal is a land lock country so vehicles that are imported from Korea are first imported to Kolkata port in India and then warehoused in Indian border. Similarly, vehicles received from Hyundai Motors India are also warehoused in Indian border before custom. Vehicles are stored in Raxaul or Sunauli border in India to better utilize the working capital and custom clearance work is done only when the sales department release a clearance memo. After issuing the clearance memo, import process begins which includes official documentation for export from the Indian custom department and import documents from the Nepalese customs department. Local custom clearing agent (expertise) prepares and takes care of legislation and documentation necessary for the import process. For exporting the vehicles generally, Indian customs department requires invoice of the vehicles, letter of credit, all necessary bills paid certificate, insurance of vehicles along with customs clearance application and for import process Nepalese custom requires invoice of vehicles, insurance of vehicles, letter of credit along with customs clearance application. After all authorization from the custom department from both nations vehicles is exported from India and imported to Nepal. The figure below shows the process flow for importing Vehicles.

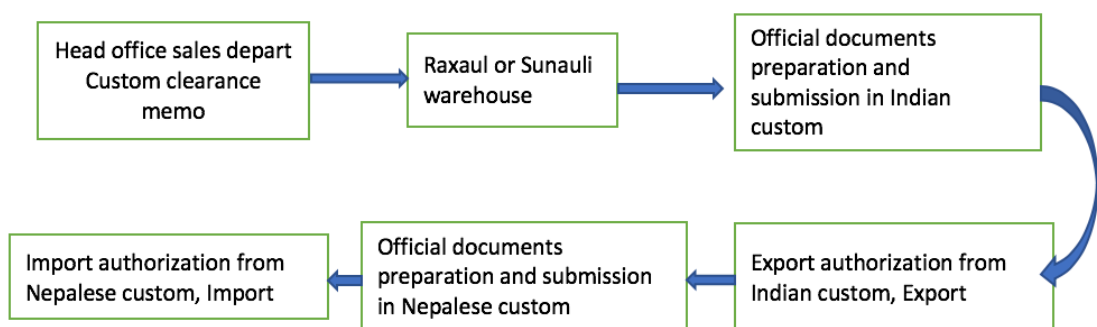


Figure 9 Import process for vehicles.

7.6 Dispatch Process

The company performs dispatch of vehicles mainly from Birjung / Bhairahawa warehouse or the main warehouse in the head office. LI has certain dispatch steps to be followed i.e. Documentation, Preparation, Dispatch, Dispatch report. This process is followed to ensure efficient and effective dispatch operation and to complete all the documents required.

7.6.1 Documentation

Documentation is the first phase of the dispatch process where the logistics engineer gets the Car or goods dispatch order from dealer or service centers with the official signature from the sales department and authorized person from the branch. Logistics engineer confirms the payment received from the dealers with the account department. Then confirms the stock, quantity and issue the dispatch order to warehouse after confirmation of payment. In case of insufficient stock report is sent immediately to a dealer or service center and the purchase order is prepared for supplier.

7.6.2 Preparation

At this phase, the warehouse manager receives the dispatch order along with the payment confirmation invoice from the logistics engineer. Depending upon the number of vehicles to be dispatched, delivery date, goods volume, goods quantity, etc. preparation is done for transport (drivers and cargo trucks for parts). If the quantity of goods is very low and the volume is less, then goods are delivered by the transport company. Cars in transit or goods in transit insurance is done with expected departure and delivery dates. Other vehicles and goods to be dispatched are prepared and loaded on the trucks and arrangements are confirmed by a logistics engineer.

7.6.3 Dispatch

After the preparation confirmation is sent dispatch of vehicles and vehicles are dispatched to their destination. Logistics officer monitors all the dispatch operation

including loading, unloading, and packing. The warehouse manager is responsible for the right item to the right place according to the dispatch order. Accident, visible damage, missing of goods during transit are immediately reported to logistics officer and insurance company by a driver or responsible person for transit. Cars are dispatched twice a month except during high festival demand dispatch should be done thrice a month maximum. Not all dealers have equal demand so, in case of very low demand cars are dispatched once a month.

7.6.4 Dispatch report

Dispatch report is sent by the dealer or service center to logistics engineer. Damage, wrong goods, missing goods are reported to logistics engineers and insurance companies. In case of accident or theft police report is filled and goods are kept unopened or untouched until a representative from insurance company arrives at the location. Damaged vehicles are maintained at the local service center but in case of heavy damage of vehicles or delivery of wrong goods, they are returned to main warehouse.

7.7 Inventory optimization of LI motors.

To maintain the smooth supply chain and overcome the demand variation company stock car and other goods in stocks. When a correct number of cars is stocked, so it can fulfill and play a key role during the supply and demand variation. The company might face various problems because of which safety stock is more important such as fluctuation in demand, seasonal demand, strike on the border, boarder shield during the election in both the nation, human error, accident or damage during transit and wrong delivery. These types of situations can cause a shortage or delay in the delivery of cars and other goods. So, to overcome these problems and gain a competitive advantage and add value to its customer company stock a certain number of cars and other goods depending upon the forecasting and safety stock of the company.

The company mainly follow their inventory strategy to reduce the lead time and overcome the problem mentioned above. Inventory strategies followed by the

company are seasonal inventory, replenishment inventory and standard inventory. The inventories number of cars is increased to counterbalance the forecasted demand fluctuation only for a certain period time in seasonal inventory. In Nepal, there is a huge demand of cars in September, October and January which is also known as festival demand or seasonal demand. Company replenishes the inventory of the car according to the model and function to hold enough stock for all the offered model which is known as replenishing inventory. Standard inventory is the average number or car held in stock to balance demand and supply variation.

Generally ordering a larger number of cars provides company opportunities to decrease the total cost and other short-term discounts from the supplier but at same time it also increases the inventory cost. So, company order batch size is always based on the holding capacity and reordering strategy. In the automobile business, it is more important to have accurate forecasting and inventory management strategy to hold the optimum level of stock to balance demand and supply variation and ensure the profit of the company. Purchasing unit of company overview the unit of car inventory and make new ordering decisions. Purchasing unit in the company analyze the report of a stock car in its warehouse in a different location and its branches and then ordered only if required depending upon the batch size and holding capacity.

7.8 Logistics Information Technology (LIT)

The company use information technology for the smooth and efficient flow of information, updating inventory, documentation, warehouse management and sharing of information. The company monitor all its operation from head office with the help of ERP system. The company sends the purchase order, dispatch order, payment confirmation, monitor supply chain with the help of an ERP system. For example, a company receives the purchase order from the dealers then sales department check the inventory and confirm the purchase order, release the custom clearance order, after receiving payment confirmation dispatch order is released.

Trained and qualified employees are capable of using the latest information technology. The information system has made the supply chain process more effective and faster.

7.9 Transportation of cars

The roadway is the only transportation option currently for the transportation of the car in Nepal and Ministry of physical planning, works, and transport management, Department of transport management regulate the transport operation and all the transport operator should operate its operation according to the vehicles and transport management rules 2054 B.S. (1998/1999) and vehicle and transport management act 2049 B.S.(1992/1993) (Department of Transport Management 2020).

LI transport the car to the dealers from the distribution center and head office (main warehouse). LI has a well-arranged distribution network in all seven provinces and 13 major cities where dealers are situated.

All the imported cars in Birjung or Bhairahawa warehouse are distributed to the dealers or main warehouse in head office by driving them individually either by Hyundai driver or operation is carried out by a local transport service provider company. Mainly drivers are rented from the transportation company in case of a high supply requirement. LI is responsible for the insurance and other expenses of the driver in the transit. Spare parts and other goods are transported by renting medium size cargo truck depending upon the volume and necessity of the goods. In some cases, airways are also used to transport parts and small volume goods. In the case of small volume and valuable goods, courier companies such as DHL, TNT, and other local courier companies are used.

Road condition, natural calamities, bridges, load-carrying capacity, total tons to carry on the road, sharp turning and variation in the quantity of the cars to be transported are the primary challenges that occur during transportation. Appendix 2 shows the distance from warehouses to the dealers.

Generally, transportation charges are agreed by two parties but while transporting the car or renting the transportation service, LI or other local transportation company should consider the following things for the cost calculation which is decided by the department of transport are as follows:

- a) Taxes (Transport, road permit, pollution, renewal, municipality).
 - b) Driver and vehicles insurance.
 - c) Total depreciation.
 - d) Driver and helper salary.
 - e) Administration cost.
 - f) Maintenance costs.
 - g) Variable costs (fuel, lubricant, tire)
 - h) Profit maximum 15%
 - i) Battery cost
 - j) Parking cost
- (Poudel 2015).

8 Electric vehicles.

Currently, Hyundai Nepal imports two electric vehicles model Hyundai Ioniq and Kona. The company started to import the electric vehicles from the year 2019 but just within a short period time the company sold 214 electric cars in the year 2019. The company currently has 20 AC charging stations in overall provinces in Nepal including places like showroom, service center and public places.

The company currently imports full battery electric vehicles only. Until now the company has not imported Hybrid electric vehicles (HEV) or Fuel cell electric vehicles (FCEV). The company currently offer only AC charging service to their customer and no plan to install DC charger from the company. There is no set plan for battery disposal or recycling.

Hyundai has given the great focus on electric vehicles and planning to launch 44 electric vehicles in the international market by the year 2025. Recently the Government of Nepal has decreased tax to encourage the buyer to choose electric vehicles instead of petroleum operated vehicles. There are over 45000 electric tills now including two-wheeler, three-wheeler, and four-wheeler (Laxmi Hyundai 2020; Department of transport management 2020).

Government has declared to decrease tax rate on electric vehicles to encourage customer to buy electric vehicles and increase the electric vehicles new sales up to 20% by the year 2020 which is currently 10% of sales. Customer need to pay 261% tax above the purchase price for the diesel and petrol vehicles whereas electric vehicles have to pay 10% tax above purchase price. Diesel and petrol vehicles have to pay 200 USD to 500 USD annual road tax depending upon the horsepower of car whereas electric cars do not have to pay road tax. (Department of transport management 2020; Awale 2019)

9 Result and findings

From the process analysis of LI supply chain and its operation the following problems were identified in the transportation and company's information system which can affect the operation and profit of the company are:

9.1 Poor way of distributions of cars.

Cars are dispatched by driving them individually regardless of the quantity and number of kilometers to be traveled. The company itself cannot appoint high number of drivers and arranging the driver from transport company to drive each car to the dealers increase the lead time as there are only a limited number of driver available during high seasonal demand. Difficult to monitor the vehicles as number of cars are high and risk of accident, theft, and damage is also high. High

transportation cost as the company needs to pay driver's salary, fuel, driver's insurance, car insurance, drivers' expenses (meal, hotel, transportation and other) etc.

9.2 Information technology on transportation.

Drivers use the company's distribution network to deliver the cars to dealers. Short and safe routes to reach dealer has been selected as distribution route however sudden road strike, accident, landslide, road maintenance, traffic, etc. during transit are very common in Nepal. These types of activities increase fuel consumption due to stop-and-go. When cars get stuck on the road then the cost of transportation and lead time both increases.

9.3 Electric car vehicles charging station.

Currently, there is not enough government-owned infrastructure for electric vehicles in Nepal however companies have installed limited charging stations and service centers in all provinces to serve their customers and to be competitive in the market. Limited charging stations is the main problem with driving electric vehicles in Nepal. Company needs to plan very wisely before every trip. Electric vehicles cause problem to dispatch due to lack of fast charging stations and short driving capacity. Those fast-charging stations are open only for a limited time and do not offer 24-hour service.

10 Most effective and applicable suggestions.

After analyzing the current situation and identifying the problem related to the transportation of cars and electric vehicles most applicable and effective technologies and information system are proposed below:

10.1 Using truck to transport cars.

Nepal is a land lock country with a fast-flowing river and only a few kilometers rail-ways only in certain areas, air transportation is very expensive and not suitable for transportation of cars but can be the best option to transport parts or other materi-als in case of emergency. So, the roadway is the only favorable option at the mo-ment. It's common to carry or transport one or more cars on the truck and deliver to its destination in the global automobile market. Whereas, this technology is not com-mon or has not been practice earlier before. Still, cars are driven individually to the dealer in the distribution process regardless of the number of cars and distance to be traveled. Despite of numerous new available technology the company as well other competitors are still practicing the traditional way to deliver cars. New methods and technology for transportation vehicles have not been implemented yet.

Auto carrier trucks are generally are of two types closed or open. The open auto car-rier truck can carry more vehicles at a time than closed auto carriers' truck. A closed carrier truck can carry 1-5 car at a time depending upon the size of the truck. Accord-ing to the national survey for truck industry there is a lack of professional transport-ers in Nepal. So, outsourcing the transportation service can be the cause of longer lead time. In Nepal its beneficial to buy trucks when they need to deal with high transportation demand or low transportation demand (Poudel 2015).

In the present-day government is more stable and development work has been un-dergoing rapidly, conditions of the road are better than earlier before, the current situation is more favorable for the large auto carrier trucks and trailers for distribu-tion of cars in most of the part of the nation. Most of the dealers are located in the low belt of the country where land is flat and transportation by auto carrier trucks is easy to operate. Steep uphill and steep downhill do not allow the big carrier to reach all the destination but car carrying semi sized carrier truck can be the better solution for distribution of cars which can reach in every destination. Auto carrying trucks will allow carrying the maximum number of cars safely to their respective destination. Space management techniques can help to utilize the space of trucks to fit the

maximum number of cars by positioning from different angles. A customized car carrying truck will have the following benefits over traditional distribution method.

1. A truck can carry more cars at a single time so, it is easy to monitor one vehicle rather than monitoring all the cars at once.
2. There will be less chance of an accident as trucks have a limited speed limits and favorable for all-weather so the dispatch process will be safer.
3. Fewer expenses as compared to the traditional method. Fuel cost, drivers' wages, drivers' insurances, drivers' expenses during transit, etc. will be decreased.
4. The dispatch process will be faster, and operation will be easy to organize as a company will require fewer driver and arrangements.
5. Less noise and air pollution as compared to transporting every car driving individually.
6. Less traffic on the road and cars will reach the destination safely.



Figure 10 Modified car carrying truck.

(<https://www.movingfeedback.com/best-car-shipping-companies/>)



Figure 11 Example of modified car carrying truck.

(<https://www.wikiwand.com/en/Truck>)

10.2 Increasing purchase order number.

The company receives a purchase order from dealers every two weeks which causes bottleneck during high demand while preparing appropriate batch size for custom clearance and transportation due to time taken to clear the customs and lack of required number of drivers. This problem can be mitigated, or the company can be prepared to encounter the situation when the company receives a purchase order from dealers once a week instead of once in two weeks.

As a short-term solution company can request a purchase order from dealers once a week which will provide flexibility to prepare the dispatch process of cars. Although the company receives a purchase order every week but also the company can still dispatch car every two weeks or once a month depending upon the batch size of the car. The company can prepare appropriate batch size in to clear the customs and import cars and arrange drivers to transport cars to the dealers. Dealers with high demand can be dispatched twice a month which will improve the supply chain process.

10.3 Executing intelligent transportation system.

Intelligent transportation system (ITS) is the combination of traffic engineering concepts, information technology, hardware and software that can use to upgrade the productivity and security for the transportation system (Chowdhury & Sadek 2003). ITS is a navigation system that allows drivers to select the most appropriate route. Cars drove through the congested path often ingest more fuel than the car driven through the uncongested path (Barth et al. 2007. P 684-689). ITS is a tool that is designed to navigate the path to reduce the fuel Ingestion and find a way to mitigate the congestion (Kuriyama et al. 2007, P 910-915).

Transparency and visibility in the entire supply chain process can be made better by investing on the correct information system or technology. Easy sharing of information and accessibility of information through all the networks involved in the business then decisions making, and operation becomes more productive and systematic (Chopra, & Meindl 2013, 63, 500).

An intelligent transportation system (ITS) can help the driver to save fuel ingestion and emissions. A driver can get lost on the way, take long routes, accelerate inefficiently, get stuck in traffic or stuck in natural calamities or road maintenance. In such cases, intelligent transportation system can help the driver to find the direct and short route to the destination, alert high speed, alert driver about the traffic and road condition because of which driver can choose the alternative way or schedule rest time according to the condition. For example, below we can see the example of how ITS works in saving fuel and emissions. Figure 8, shows the simulation model where accident occurs in highway and drivers select the second highway and the

result is shown in figure 9 (Alsabaan et al. 2012, 9-13).

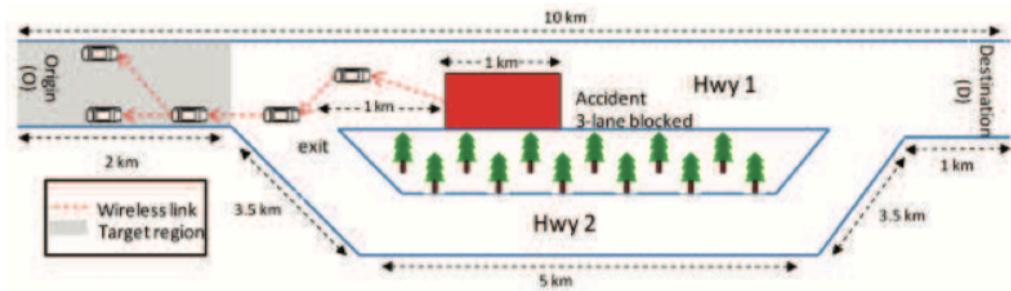


Figure 12 Simulation model of car driven in highway.

(Alsabaan et al. 2012).

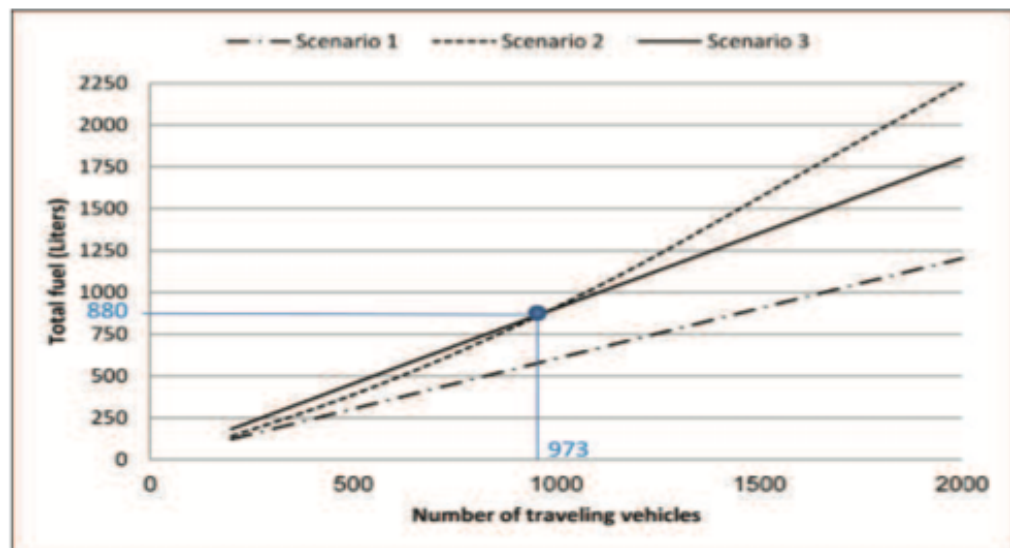


Figure 13 Total fuel ingestion by travelling car from in different scenario.

(Alsabaan et al. 2012).

In figure 10 above scenario 1 indicates to fuel consumed by cars traveled on the highway without the accident. Scenario 2 indicates the fuel consumed by cars after the accident and scenario 3 indicates the cars which traveled on the second highway (Alsabaan et al. 2012, 9-13).

It is very obvious that scenario 1 is very suitable and the ingestion of fuel is low but after the accident cars consumed more fuel due to the stop-and-go scenario. In such cases scenario, 3 is more economical and effective to save fuel and time. If ITS sends

information about the accident, then the driver can choose the suitable path targeting reduction of fuel consumption and on-time delivery (Alsabaan et al. 2012, 9-13).

Executing ITS company can reduce fuel consumption, reduce CO₂ emission and make the dispatch process more efficient and effective. Vehicular networks are one of the ITS application which informs the driver about the scenario and travel impact in advance. Accident and landslides are frequent in Nepalese highway which not only makes the lead time longer but increase the cost of transportation as fuel consumption increase and allowance to the driver increase due to overtime. ITS can help driver to deal with various sudden traffic conditions on roads or highway such as traffic, road maintenance, and accidents. The company can save the cost of transportation by implementing ITS.

In case of sudden accident, traffic, road problem on road ITS will inform the driver and show other suitable routes so that the driver can change the route or plan the rest time, meal time so that drivers can better utilize the time and reduce the fuel consumption and CO₂ emission.

10.4 Electric vehicles

Longer charging time and short driving capacity are the major problem with the electric vehicles to transport. To provide service and add value to the customer and company can do the following things.

10.4.1 Increasing number of charging station.

The company should install a new charging station focusing on the strategic road network of Nepal. The company should add the number of charging stations focusing on the highways targeting the drivers who drive long trips frequently. The current charging stations are open only for a limited period of time (8-18) so, the company can make the dispatch process better by providing 24-hour charging facility. Mainly electric vehicles buyers are from the major cities like Kathmandu and Pokhara so, adding more fast-charging stations in highways which connect to these cities will improve

the transportation process as short term solution but adding fast-charging stations in the major highways and focusing on dealer's location and distance. Currently, imported electric cars have maximum driving capacity of 415 kilometers. So, depending upon the distance in appendix 2 below charging station can be set in between two locations. Using a car carrying truck to deliver the car can be a better solution but dispatch process can be made more effective by using ITS to dispatch the car as mentions above.

10.4.2 Especial parking spot for electric car.

The government is focusing on encouraging the new buyer to buy electric vehicles and supporting the auto sellers. Currently, it takes a maximum of 75 minutes for fast-charging stations to fully recharge the car so, during this period drivers can plan the mealtime or rest time. The company can reduce the duration of delivery by establishing the fast-charging stations in hotels or parking spots close to the highway. The company in coordination with provinces, and the government can request to build electricity connections and fast charging stations on current and under-construction parking spots in public places like city parking, hospitals, hotels, etc.

10.4.3 Importing hybrid electric vehicles.

The company can start importing hybrid electric vehicles along with fully electric vehicles till country build the required infrastructure for electric vehicles on one hand and on another hand, the company won't lose valuable customers who are afraid to switch to full electric car from gasoline car. Hybrid vehicles are easy to transport as it can be operated by battery and fossil fuel. Hybrid electric vehicles are environmentally friendly and economical. Hybrid electric vehicles are safe, and the company should not have to compromise in the service.

11 Conclusion

The objective behind this thesis work was to analyze the current supply chain for transportation process and to find the possible area to improve and recommend the practical suggestions to improve the process and make the process more effective and smooth. Methods of transportation couldn't be compared to other transportation modes as road transportation is the only option country has due to lack of infrastructure in the country for railway and other means of transportation.

Road transportation is the only option for the distribution of cars but certain things are making road transportation challenging. All the problems in transportation cannot be solved however problems can be reduced by introducing a new way to dispatch cars. Pre-order information can not only shorten the lead time but also make the supply chain process smooth and support the company to tackle the demand variation. Receiving purchase order twice a month will make the company easy to form batch size for transportation and customs clearance as larger batch have created a bottle neck, delay operation and longer-lead time.

Customer expectations constantly keeps on growing and hard to meet but the implementation of suggestions will make the transportation operation smooth and effective. The lead time for transportation can be reduced by executing the above-mentioned suggestions. Electric and autonomous vehicles are the future of transportation so, the company should mainly focus on installing the infrastructure in order to support the smooth operation. The company alone cannot develop all the infrastructure unless the government build and support the private investor.

In my opinion, the objective behind the thesis was reached although thesis suggestions are basic and practical. There are still many technology which can be used to solve the problems or improve the dispatch process. The above suggestion can reduce the labor force, increase productivity and reduce the lead time for the dispatch process.

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Appendices

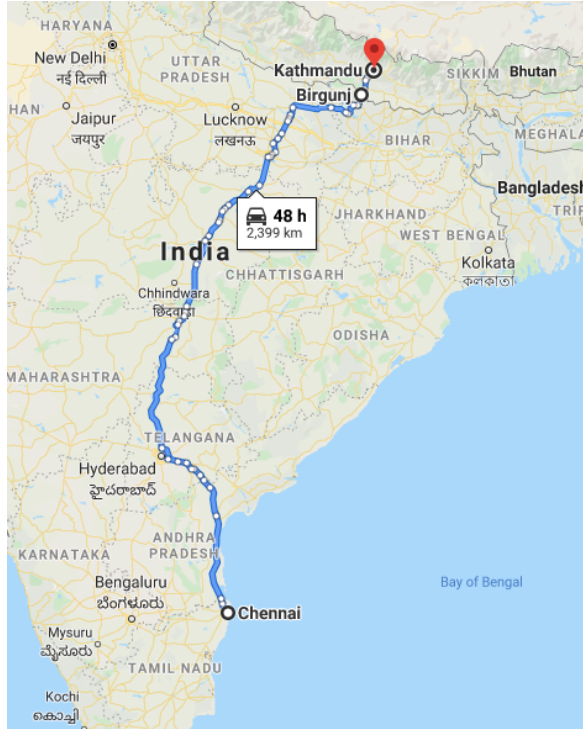
Appendix 1. Total car sold on last two years and model names.

Model	Sold year		Grand Total
	2018	2019	
Creta	1097	1068	2165
ELANTRA	1		1
Eon	301	32	333
GENESIS	1		1
Grand I10	1021	699	1720
H1 Ambulance		1	1
H1 Cargo Van		2	2
I 20	130	203	333
i10 MAGNA 1.1	2	1	3
I20 Active	934	575	1509
IONIQ EV		12	12
Kona EV		202	202
Santa Fe	4	5	9
Santro		534	534
Tucson	21	58	79
Venue		438	438
Verna	42	15	57
Xcent	70	51	121
Grand Total	3624	3896	7520

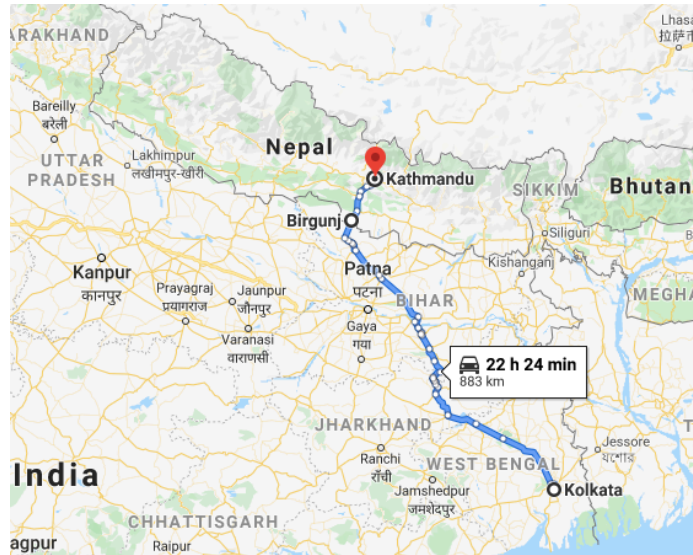
Appendix 2. Distance from dealers to companies' warehouses.

	Dealers	Distance from dealers to warehouse		
		Birgunj	Bhairahawa	Kathmandu
1	Pinnacle trading concern, Chitwan	125 KM	120 KM	150 KM
2	Pratisthan motors , Birtamode	373 KM	572 KM	440 KM
3	Dinesh 4 wheels, Dhangadhi	644 KM	408 KM	662 KM
4	Siddhi vinayak moto, Butwal	250 KM	28 KM	267 KM
5	Pathivara Auto link, Sunsari	286 KM	485 KM	353 KM
6	Royal Auto world, Biratnagar	310 KM	509 KM	377 KM
7	Him Auto distributors, Nepalgunj	498 KM	262 KM	516 KM
8	L.I. Motor, Pokhara	254 KM	180 KM	200 KM
9	New Rider Auto, Dang	430 KM	194 KM	450 KM
10	Orchids Moto Corp, Birgunj	0 KM	246 KM	136 KM
11	Jagat Motors, Bhairahawa	246 KM	0 KM	270 KM
12	Hyundai Kathmandu, Thapathali	136 KM	270 KM	0 KM
13	Hyundai Kathmandu, Naxal	136 KM	270 KM	0 KM

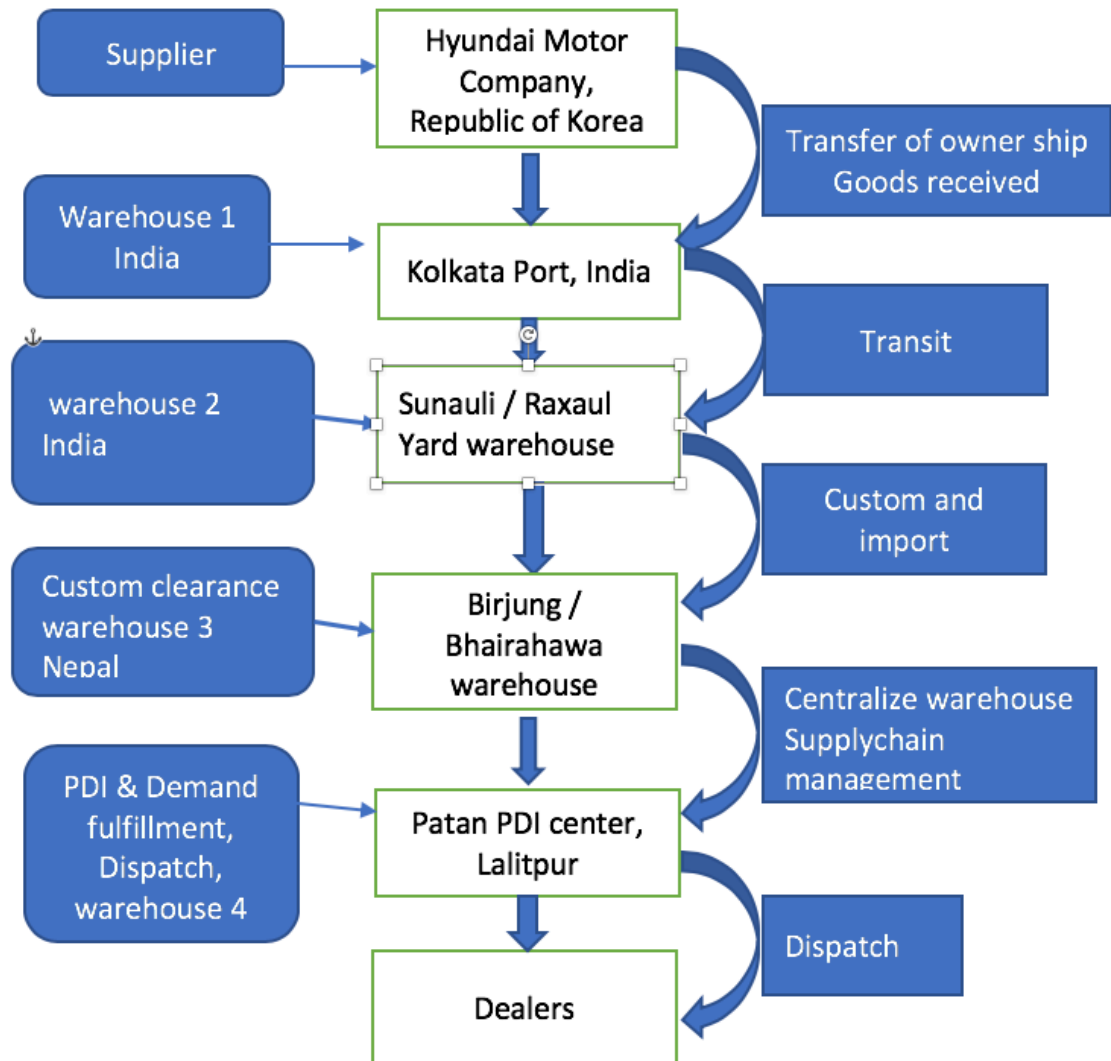
Appendix 3. Transportation route from supplier (India) to main warehouse.



Appendix 4. Transportation route from supplier (Korea) to main warehouse.



Appendix 5. Supply chain process of Hyundai Motors, Republic of Korea.



Appendix 6. Supply chain process of Hyundai Motors, India.

