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Life Cycle Assesment of Distribution

Anesa Muminović, Blaž Šamec & Andrej Lisec

Abstract Through the years, companies have been faced with a problem of demanded goods from the customers. Some demanded goods were undoubtedly at abroad location or the goods would not be available for the customer in the moment they wanted it. As a consequence, and in the meaning of keeping up with the competition, factories and manufacturers had to make it possible that their products are at any time and at any place available for the customers to buy. Distribution is the system that takes the task upon itself to carry the products from factories and manufacturers and break the barrier between global time and distance in hope of keeping up with customers interests. Distribution is the key for providing a connection between distant markets and demanding customers.

Keywords: • customers • distribution • demand • system • life cycle assesment •

Correspondence Address: Anesa Muminović, University of Rijeka, Faculty of Maritime studies Rijeka, Studentska ulica 2, 51000 Rijeka, Croatia, e-mail: muminovic.anesa@gmail.com. Blaž Šamec, PhD, Assistant, University of Maribor, Faculty of Logistics, Mariborska cesta 7, 3000 Celje, Slovenia, e-mail: blaz.samec@um.si. Andrej Lisec, PhD, Associate Professor, University of Maribor, Faculty of Logistics, Mariborska cesta 7, 3000 Celje, Slovenia, e-mail: andrej.lisec@um.si.

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1 Introduction

Distribution presents the stage of production of a product, from the time this product was made, up to the time of delivery of the product to the final consumer or buyer. Distribution covers all product activities to deliver the product in the safest, best, and most accessible way available to customers.

The purpose of the distribution is to increase the value of goods through distribution activities, i.e. the selling price of the delivered goods to customers is higher than the total costs incurred in production and distribution activities.

This study will get you briefly through history of distribution, it's definition from various points of view and get you know with main participants in distribution. Later, study will present the main distribution tasks, explain different distribution channels and physical distribution. Following that, study will explain term of Life Cycle Assessment and it's main tasks, and connection between distribution and Life Cycle Assessment (LCA). Last part consists of conclusion and references I used to help with writing this study.

2 Distribution

2.1 History

In history, local factories supplied local markets either directly or through local merchants. At the begin of mass production, companies had to make an innovative solution on how to full fill the needs of customers and how to put their product (or services) on a competitive market. The solution was "inventing" wholesalers.

A traditional supply chain consisted of a manufacturer that produced the goods, a wholesaler that bought in bulk from the manufacturer, and retailers who bought small quantities from the wholesaler and offered the products to their customers. The savings from mass production were so great that wholesalers could often sell to retailers at double the price they paid to manufacturers and the retailers in turn doubled the price again.

As we know, globalization and trade, in the surrounding world, change on a daily basis. Companies are on daily basis dealing with more and more demanding and strict customers and with new technologies. Companies are confronted to use sophisticated technology, marketing strategies and innovative approaches to keep up with the competition otherwise they would get left behind.

2.2 Definition

According to the International Chamber of Commerce, proposed in 1957, the distribution is: "the stage that follows the production of goods from the moment when they are commercialized to their delivery to consumers. It includes early activities and operations, which ensure that the goods are made available to customers, whether they are processors or consumers, facilitating the choice, purchase and use of goods." (Segetlija, 2006)

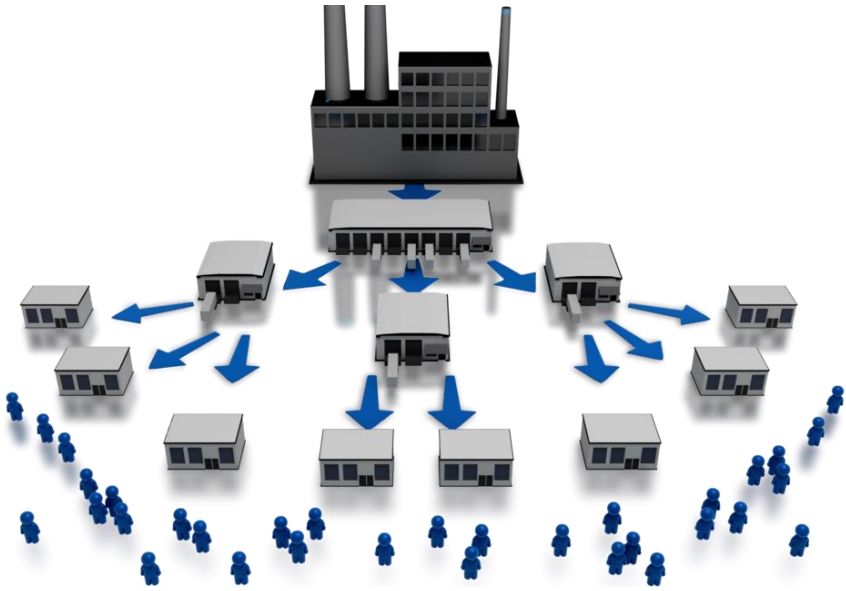

Figure 1: Scheme of distribution.
(Source: http://www.rg-group.com/blogs/distributor-service-model-evolution-revolution/)

For customers matter, about a product or service, distribution is the most important supply chain phase because it represents a link to customers, through which they perceive and evaluate functioning of the supply chain as a whole (Figure 1). Except of providing goods to customers, distribution also covers the flows of returned goods, as well as the flows of waste material.

The distribution is a system composed of a series of different, but intertwined elements such as order, delivery, storage, inventory management, manipulation, transportation, information system that has its own structure within which different activities take place, processes and actions that allow the availability of goods or services to customers, whether it is further processing or end-use.

National Council of Physical Distribution Management defines the concept of distribution as an efficient moving of finished products from the production line to the consumer, and in some cases includes moving the raw material from the supply point to the start of production. In accordance with, the distribution includes many activities, such as: case-related operations distribution, packing, signing, weighing, counting, sorting, storing, controlling inventory, choice of warehouse locations, terminals, market research, order processing, consumer service activities.

If we try to define distribution from science point of view, it is defined as a set of knowledge and activities that functionally and effectively connect all the partial processes of comprehending (understanding) spatial and temporal transformations of materials, goods, (semi) products, raw materials, live animals, capital, knowledge and information.

2.3 Participants in the distribution

Manufacturers can only produce the goods, but it is the intermediary who supplies these goods to the people who need it. To reach end customers, businesses need a well knitted network.

The network includes manufacturers, retailers, wholesalers, agents and brokers, commonly known as channel participants. These participants play a vital role in success and failure of any business. They connect the gap between suppliers and end consumers (Agarwal R. (a)). In the "New Age", Internet also became one intermediary between manufacturers and consumers (Amazon, eBay, Bolha, Njuskalo etc.).

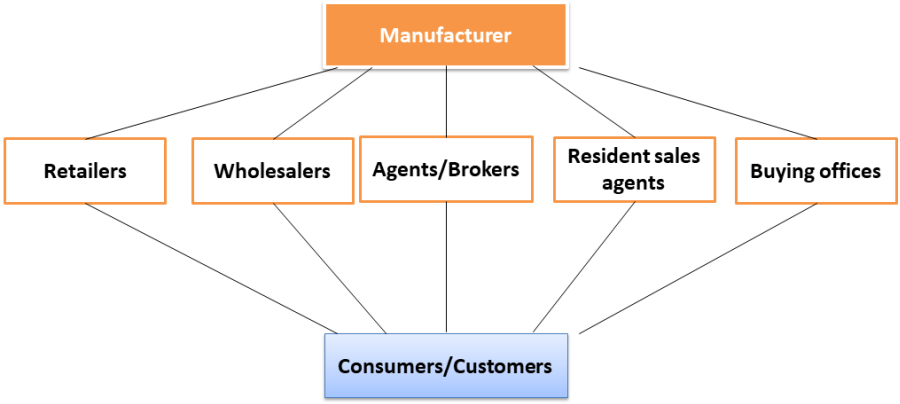

Figure 2: Basic scheme of participants in distribution.

Participants in distribution are (Figure 2):

Retailers are the gate keepers to the market for all other members of the sales distribution process. The retailer is the person who ultimately sells the goods to its end consumers.

Wholesalers are intermediaries who buy products from manufacturers and resell them to the retailers. They take the same types of financial risks as retailers, since they purchase the products, keep them in inventory until they are resold to retailers, and may arrange for shipment to those retailers. Wholesalers can gather product from around a country or region, or can buy foreign product lines by becoming importers.

Agents (occasionally called *brokers*) are also intermediaries who work between suppliers and retailers, but their agreements are different, in that they do not take ownership of the products they sell. They are independent sales representatives who typically work on commission based on sales volume, and they can sell to wholesalers as well as retailers.

Resident sales agents reside in the country to which they sell products, but the products come from a variety of foreign manufacturers. The resident sales agents represent those manufacturers, who pay the agent on commission.

Buying offices are also considered a type of commission agent or broker, since they make their money pairing up retailers with product lines from various manufacturers.

3 Main distribution tasks

The main distribution tasks generally consist of the following:

- shortening the time and time needed to get the goods (or services) from the place of production to places of consumption,
- increase the competitiveness of goods,
- programming production according to consumer requirements (needs),
- placement of new products (or services) on the market,
- creating and changing habits of consumers.

4 Distribution channels and physical distribution

The distribution system structure is structured from a distribution channel and physical distribution.

Physical distribution represents *physical flows or processes* of delivery, storage, handling and storage of goods. Distribution channels are the *routes* through which the goods are going, in other words, flowing from manufacturer to customer (consumer).

Distribution channels (marketing channel distribution) are functional paths, forms and methods of delivering goods from the manufacturer to the consumer. Distribution channels can be direct (no intermediaries) and indirect (with an intermediary). Distributors of distribution channels are economic entities who perform the functions of the goods and services market (classic shippers, logistic operators, carriers, warehouse keepers, distributors, insurers, financial institutions, etc.).

Figure 3 shows us difference between distribution channels and physical distribution.

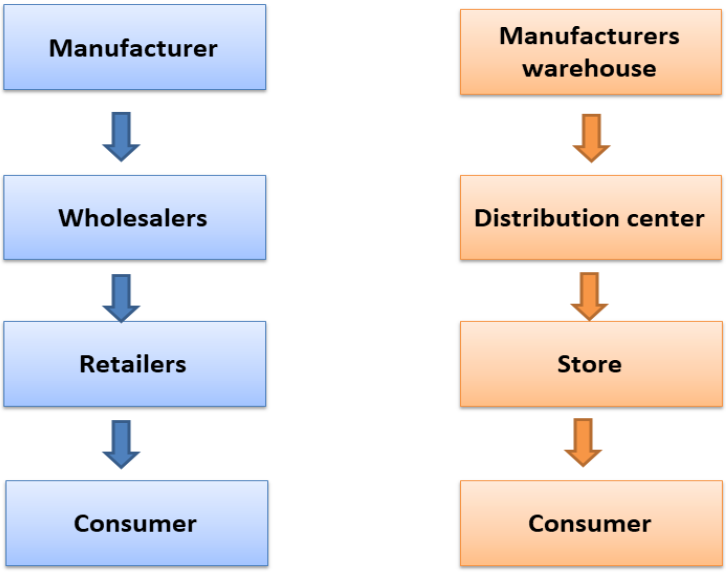

Figure 3: Display of distribution channel and physical distribution.

4.1 Distribution channels

Distribution channels are well organized arrangements that perform all the necessary tasks to assist exchange transactions. The basic function of a distribution channel is to provide a link between production and consumption and to create time, place and possession utilities which constitute the added value of distribution. (Agarwal R. (b))

While a distribution channel can sometimes seem endless, there are three main types of channels, all of which include a combination of a producer, wholesaler, retailer and end consumer. (Investopedia)

The first channel is a direct-to-consumer model where the producer sells its product directly to the end consumer. Amazon using its own platform to sell Kindles to its customers, is an example of a direct model. This is the shortest distribution channel possible.

The second channel is one where the producer sells directly to a retailer who sells the producer's product to the end consumer. This means the second channel

contains only one intermediary. Dell, for example, is large to sell its products directly to reputable retailers such as Best Buy.

The third and final channel is the longest because it includes all four: producer, wholesaler, retailer and consumer. The wine and adult beverage industry is a perfect example of this long distribution channel. In this industry, thanks to laws born out of prohibition, a winery cannot sell directly to a retailer. It operates in the three-tier system, meaning law requires the winery to first sell its product to a wholesaler who then sells to a retailer. The retailer sells the product to the end consumer.

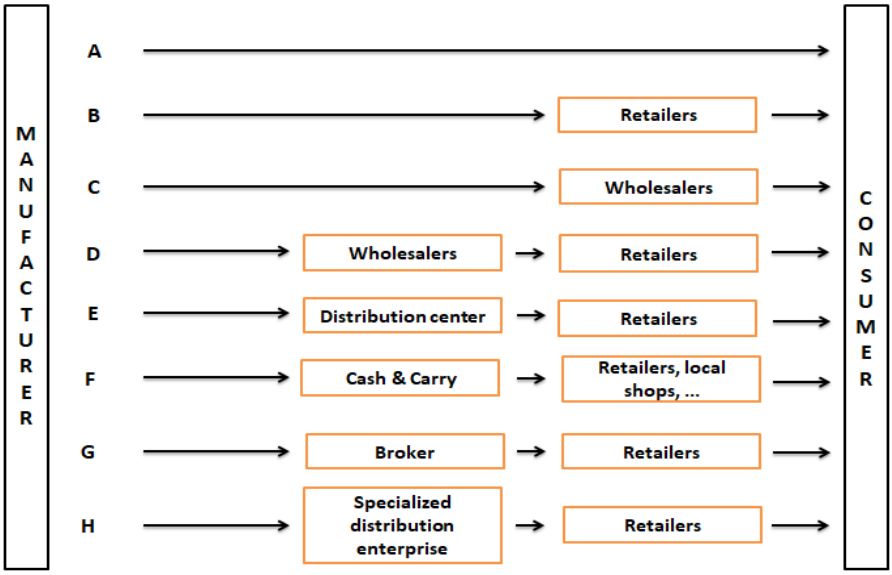

Figure 4: Alternative distribution channels for end-consumer goods.

Alternative distribution channels for end-consumer goods as shown on Figure 4: Channel "**A**" has the characteristic of a direct distribution channel. The manufacturer can sell the goods directly to the consumer via the factory retail network, catalog, newspaper, ads. Recently, through television and internet. Delivery of goods is done via mail, carrier or delivery service of the manufacturer.

Channel "**B**" has the characteristics of a short, indirect channel in which, apart from the manufacturer, there is an intermediary and a retail company.

Channel "**C**" also has the characteristics of a short marketing channel distribution. That's it mostly used by large consumers, such as hospitals, hotels, schools, etc.

In Channel "**D**", goods are delivered to consumers via wholesale and retail businesses of retail trade companies, whereby wholesale companies generally use theirs' own warehouses and a fleet. This channel is most widely distributed in consumer goods.

The "**E**" channel is most often used in the supply of regional markets for consumer goods.

Channel "**F**" is characterized by the sale of goods for cash. Wholesale grocery store uses this model to sell goods to craftsmen and small business owners under the cash and carry system. The goods are paid in cash when picking up.

Channel "**G**" is characterized by a broker as an intermediary in the distribution channel. The broker is an *independent trader* who without any persistent contractual relationship, based on specific orders, mediates between the buyer and the seller concluding a sales contract. This is an expert who knows the goods and market conditions very well. In addition to intermediary roles, brokers they can still run jobs on the market, sorting, packaging, promoting, and selling, all the way to providing the necessary documents necessary for the sale of the goods. Broker mediates between manufacturers and retailers, where they can use their own warehouses and fleet, but can also use the services of specialized distribution companies, which is not characteristic of the wholesale companies.

The "**H**" channel has been increasingly used in developed industrial countries lately. It is characterized by specialized distribution companies, as intermediaries in distribution of goods.

4.2 Physical distribution

Physical distribution covers all operations related to shipping, storage, shipment and delivery of goods, which take place in the warehouses of finished products from the manufacturer, logistics and distribution centers (LDCs), transport and retail (Figure 5).

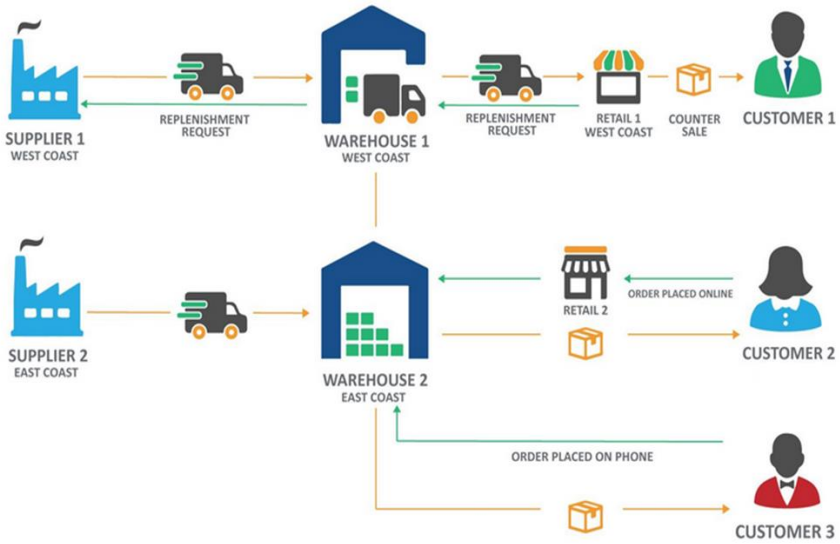

Figure 5: Distribution flow.
(Source: https://www.aboutitgroup.co.za/distribution-management-2/)

In a broader sense, physical distribution includes the movement of raw materials and raw material from the source to the beginning production phase. Physical distribution, therefore, involves planning, applying and controlling physical streams of raw materials and final products from the point of origin to the place of use in order to profit, also met customers' needs.

The illustration shows us how the goods are moving from the source (factory, manufacturer, supplier) through a distribution channel to the final user (customer, consumer) and in the opposite direction, the movement of payment to the original source. This illustration might as well show us, in the most basic way, the movement of goods, without flow of returned goods and the flow of waste material.

5 Life cycle assesment of distribution

5.1 Definition of Life Cycle Assesment

Society of Environmental Toxicology and Chemistry define Life Cycle Asessment (LCA) as an objective process to evaluate the environmental burdens associated with a product, process, or activity by identifying energy and materials used and wastes released to the environment, and to evaluate and implement opportunities to affect environmental improvements. The LCA methodology is standardized in ISO 14040 and 14044 (Figure 6).

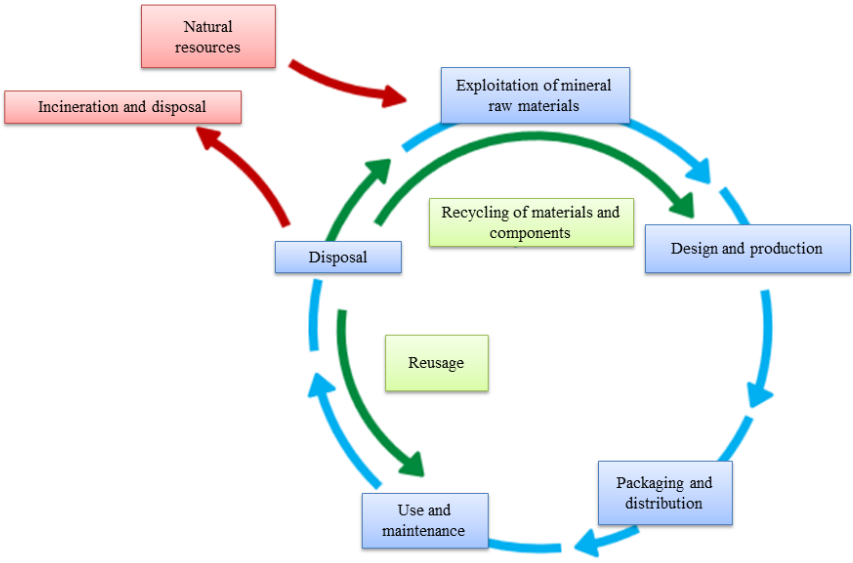

Figure 6: Illustration of life cycle assesment.

According to Ingaldi (2016) Analysis based on environmental life cycle of the product, has become one of the most important methods of assessing the effects of products on the environment. His complex method of analysis we try to gain insight into the entire product life cycle, which includes:

- extraction of raw materials,
- the acquisition of energy resources,
- production and distribution of energy required,
- production of semi-finished products and by-products,
- transportation and distribution,
- effects during use and
- alternatives handling of the product after use.

LCA provides information to manufacturers, suppliers, customers, and other stakeholders, it can be used for general information purposes, but also for specific production and consumption-oriented improvements e.g. process optimization, product comparison, product policies and ecolabelling.

5.2 Main phases of LCA

No matter of the LCA study range, it is carried out in four phases outlined in the Standard: Environmental Management - Life Cycle Assessment - Requirements and guidelines of ISO 14044 (Figure 7) (ISO 14040:2009; ISO 14044:2009).

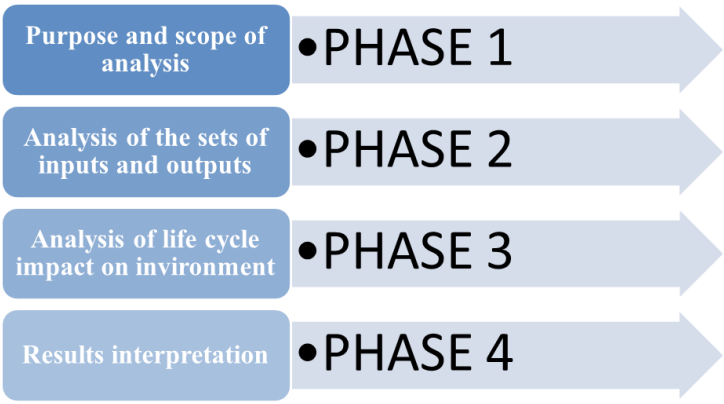

Figure 7: Main phases of LCA (based on SO 14040:2009 & ISO 14044:2009).

Phase 1: to determine the purpose and scope of the analysis,

Phase 2: analysis of the sets of inputs and outputs (analysis of the technological process, material and energy required for the process and emissions and waste, as well as the identification of potential sources of their formation, take into account issues of intangible assets, such as noise and odor.

Phase 3: life cycle impact assessment on the environment (transformation of the data collected in the impact category indicators or categories of damage),

Phase 4: results interpretation (application and verification of results)

Life cycle assessment can be useful to different actors:

- to raise awareness of decision makers on more sustainable phases of the life cycle,
- to support stakeholders seeking approaches that will provide a holistic assessment of the impact of the life cycle on the environment and society,
- offer guidelines to companies and people trying to reduce environmental degradation and use of natural resources in their production practices and to increase environmental, economic and social benefits for society and local communities.

5.3 Life cycle assesment of distribution

The LCA method is becoming an important contribution for long-lasting and stable sustainable development, as it combines economic and ecological effects in the overall understanding of the entire production, user and waste systems.

Manufacturers that uses the basics of the LCA method must take into account not only the choice of input materials, but also whether the material will be at some stage of the product life due to a negative impact on the environment, but also whether the production of this material results in a negative ecological effect.

Except of flows of goods to customers, distribution also covers the flows of returned goods, as well as the flows of waste material and is called reverse distribution.

Reverse distribution is a process of constant return of product or packaging in order to avoid additional environmental pollution or achieve another goal such as savings. Reverse distribution is a part of distribution channels and physical distribution.

The segment of "health" and "ecologically" oriented customers presents in the last ten to fifteen years the segments that have attracted the attention of a large number of manufacturers. Everything related to healthy life and environmental protection was the basis of the change in this new type of distribution flow.

The Life Cycle Assessment approach applied to distribution will provide a detailed account of the impacts of each aspect of the process. Such an analysis is particularly useful in the determination of a set of indicators that can be used to monitor changes in the environmental load of an evolving territorial distribution system and while producing products or services.

The results of LCA analysis could provide useful information in particular environmental areas, therefore such analysis can provide specific information which can be combined with the available information on the state of the environment to elaborate integrated programmes to improve quality, in particular regarding:

- Production of waste,
- Land use impacts,
- Resource use management,
- Air quality and noise related impacts and
- Landscape management and conservation.

6 Conclusion

The Life Cycle Assessment analysis approach is based on the analysis of all the resources consumed and material (wastes) generated in a particular process or product, considering its entire life cycle. The results of the analysis are a series of environmental indicators that consider both the local as well as global environmental impacts of the studied process. (Principi 3003)

When applied to distribution, LCA leads to determinating the impacts of the material, energy and information flows that that are related to all aspects of the local production, local transport system, inventory, warehouse systems and administration. These impacts may be dominated by production related emissions in some cases, while in others, significant emissions may be related to warehousing and administration activities.

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