MASTER

Improving distribution of consumer packaged goods to nanostores in emerging megacities

Plasman, S.J.M.

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Improving distribution of consumer packaged goods to nanostores in emerging megacities

By Sidney Plasman

BSc Industrial Engineering & Management Sciences (2010)
Student identity number 0617849

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Supervisors:

dr. K.H. van Donselaar (TU/e, Operations, Planning, Accounting, and Control)
prof.dr.ir. J.C. Fransoo (TU/e, Operations, Planning, Accounting, and Control)
S. B. (Company XYZ)
L. D. (Company XYZ)
TUE. School of Industrial Engineering.

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Abstract

Millions of nanostores, where hundreds of millions of emerging market consumers shop, are still small, unorganized, and located in increasingly congested megacities. This poses a challenge to profitably distribute consumer packaged goods to these stores. Hence the main question of this master thesis project is how to profitably increase coverage of nanostores in emerging megacities. The distribution model of a large consumer packaged goods manufacturer in India has been studied by means of empirical model-based quantitative research. The quantitative model is broadly applicable to distribution models for nanostores in emerging markets. Actionable recommendations have been proposed to increase coverage of nanostores in emerging markets.
Management summary

This master thesis project is about improving distribution to nanostores in megacities in emerging markets. Companies such as consumer packaged goods manufacturers want to reach the world’s consumers, of which an increasing number lives in these megacities. Many of them shop in small traditional stores, called nanostores. Hence one of the ways to reach these consumers is to increase the number of nanostores covered directly. That however is a challenge in terms of costs and complexity.

Nanostores are small, traditional stores that typically serve a few hundred people in the neighbourhood, and match the emerging consumers’ needs. Although the share of modern retail rises over traditional retail, it is expected that nanostores in emerging megacities will not disappear in the near future. Their competitive advantages such as location compensate for higher prices. Due to their small size, drop sizes may be as low as several euros, which makes distribution relatively costly.

The stores are typically located in emerging megacities, which make distribution more complex. The environment comprises congestion and pollution issues as well as unstable political situations, and different local regulations and cultures. Although emerging markets have grown enormously, much growth has still to come, along with urbanization. There will arise a huge number of new megacities in emerging markets, with many new consumers escaping poverty.

Although this thesis provides some results that are generally applicable to consumer packaged goods manufacturers and emerging markets, it is mainly inspired and inputted by one large consumer packaged goods manufacturer (Company XYZ) in India. India has been chosen as a country because it has the most traditional retail climate (i.e. nanostores), is the second largest country in the world, has some of the densest cities, and will contribute the second largest share of new megacities in the future.

XYZ’s current distribution process is completely executed by an exclusive distributor. Contrary to developed market terminology, this is a direct distribution model, because XYZ has extensive control and visibility over the process. It consists of three visits. First, a sales representative visits the store to sell XYZ products. The next day, a delivery boy delivers the products. On the third day, a merchandiser visits the store to ensure the visibility of XYZ products in the store. The distributor also supplies wholesalers, where shopkeepers of nanostores can buy XYZ products when they are out of stock or not covered directly at all. Wholesalers are named the indirect channel.

In India, XYZ wants to attain a certain market penetration. In order to achieve this, at least an additional [number] nanostores need to be covered, when only urban areas are considered. This number is most likely to grow along with the economy, while the number of covered stores has stagnated due to concerns about the profitability of coverage. Moreover, there is a research gap on distribution models to nanostores in emerging megacities.

Therefore, the main research question driving this project is: ‘How can a consumer packaged goods manufacturer increase the number of urban nanostores covered, in a profitable way?’

The three main recommendations of this thesis are now discussed one by one, along with their supporting conclusions. The first two recommendations comprise using the current distribution model more efficiently and effectively, in order to reach more stores. The third recommendation concerns a new low-cost model in order to increase coverage to the smallest nanostores.
**Recommendation 1:** Determine a sales threshold corresponding with a lower bound profit margin, implying the allowed increase in number of stores covered

**Conclusion 1.1:** Average sales to stores can be decreased by adding lower-throughput stores, which lowers profit margin but increases total profit due to increased volume

By deciding on a threshold of the average sales per store per month, the number of stores covered can be increased by adding smaller stores. The threshold gives certainty, as currently the number of stores covered is kept constant due to concerns about its distribution cost. Adding smaller stores will decrease profit margin, but increase total profit due to an increase in volume: number of stores covered. The Excel implementation of the quantitative model proposed in this thesis can easily be used to determine a sales threshold given a required lower bound of profit margin. The current average sales of the considered nanostores more than double the sales threshold for a profit margin of **%. Hence, there is ample room to decrease the average sales per store by covering more (smaller) stores.

**Conclusion 1.2:** The sales threshold is subject to changing distribution cost, and most sensitive to the sales representatives’ efficiency and the store’s sales frequency

Given India’s rapid economic growth and the corresponding increase in wages and purchasing power, both store sales and distribution cost rise rapidly. Therefore it is important to recalculate the needed sales threshold to profitably supply stores, on a yearly basis. One could again use the Excel model to compute the corresponding thresholds, for different input parameters. The model also takes into account certain design choices, of which the most important factors influencing profitability are a sales representative’s number of visits per day and the monthly sales frequency per store. An increase in visits linearly increases profit. When the number of visits is kept constant, an increase in the monthly sales frequency of stores decreases the number of different stores that can be visited with the same ratio.

**Recommendation 2:** Increase the sales representatives’ adherence to the distribution model and improve the distribution model systematically

**Conclusion 2.1:** Substantial variation in sales representatives’ number of visits per day provides opportunities for increased efficiency by discussion and stricter execution

Currently, the average number of bills per sales representative per day varies between ** and **, while the design prescribes **. Since the number of bills per day does not correlate with the size of these bills, this leads to a substantial variation among the profit that sales representatives bring in. Therefore priority should be with making as many visits per day as possible without compromising severely on the relationship with the shopkeeper. The reason for this effect is that the size of the bill is determined based on the nanostores’ inventory, rather than the effort of the sales representative. Solutions have been provided, such as monthly discussion meetings and a stricter execution of the distribution model.

**Conclusion 2.2:** Sales representatives that make more visits, visit the same stores more often, which provides an opportunity to increase effectiveness by changing incentives

Sales representatives on average make one third more visits in the last week of the month versus the first week, in order to achieve their monthly sales targets. The problem is that these visits are made to already covered stores instead of additional stores. The additional visits are unstructured and comprise third, fourth or even more visits to a store, while the design prescribes two. This results in more relatively small bills. Increasing sales frequency only makes sense financially when either the number of visits per day per sales representative or the sales per store increase with the same ratio. If the latter is thought to be possible for specific stores,
the store should be upgraded to a different model with a higher designed sales frequency. If not, the current additional visits should be used to cover more new stores. A way to achieve this is making the number of stores covered part of the sales representatives’ target.

**Conclusion 2.3:** The distribution model could be improved by benchmarking across countries, and by more systematic data collection of pilots and current execution

It has been shown that there is much variation in the execution of the distribution model, and local circumstances differ substantially. Therefore, benchmarking distribution model variables, such as the actual average number of sales visits per day and distribution cost, among different countries, would most likely provide useful insights to increase efficiency. Furthermore, it turned out that conducted pilots for changes in the distribution model could have been used more effectively with relatively little extra effort. They have been very useful to conduct analyses, but more data would have made stricter conclusions possible.

**Recommendation 3:** Pilot a low-cost model for the smallest nanostores in order to lower the sales threshold and expand the number of stores covered even further

**Conclusion 3.1:** Simple distribution model adaptations reduce sales threshold for profitable coverage by almost \( \% \)

The sales per store threshold for viable coverage decreases when distribution costs are decreased. Three adaptations are considered: removing the merchandiser from the distribution model, reducing sales frequency from two times per month to once per month, and designing sales representatives to conduct \( \) instead of \( \) sales visits per day. Making these changes would reduce the sales threshold for profitable coverage by \( \% \). This makes it possible to increase coverage to even smaller stores that are currently considered unprofitable to supply. It is argued why the considered adaptations are thought to be reasonable.

**Conclusion 3.2:** For the smallest nanostores, direct coverage is important, but multiple visits add little value

Typically, for XYZ, direct coverage in addition to indirect coverage increases the total XYZ sales of a store by a factor \( \)\( \). Among other things, this makes it important to make a direct visit to a store. The sales increase mainly result from broadening the stores’ (XYZ) assortment, which is a one-time effect. After that, the main goal of a direct sales visit is not to ‘sell’, but rather to replenish. Since a shopkeeper will most likely restock the remaining XYZ products at the wholesaler, with only limited decrease in total sales, almost twice as many stores can be covered for the same cost.
Preface

Eindhoven, July 11th 2013

This report is the result of my master thesis project that I conducted in partial fulfillment for the degree of Master in Operations Management and Logistics at Eindhoven University of Technology in the Netherlands. I am grateful that I have been able to engage in this study and for the opportunities that it has given me, both within and outside the curriculum. Below, I would like to thank several people that contributed to the result of this thesis as well as my personal development during the process.

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Sidney Plasman
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1. Introduction

1.1. Overview

This master thesis project is about improving distribution to nanostores in megacities in emerging markets. Companies such as consumer packaged goods manufacturers want to reach the world’s consumers, of which an increasing number lives in these megacities. Many of them shop in small traditional stores, called nanostores. While distribution to nanostores in emerging markets is an important challenge, still little knowledge has been produced on the topic.

This thesis contributes to reducing this research gap and provides recommendations on how a consumer packaged goods manufacturer can profitably increase the number of nanostores covered. The remainder of this subsection provides a coherent frame to keep in mind when reading this thesis. Section 1.2 discusses the research approach.

Literature review and current situation

Section 2 provides a literature overview that includes the characteristics of nanostores, the complex emerging megacity environment, and corresponding distribution models. Nanostores typically serve a few hundred people in the neighbourhood, and match the emerging consumers’ needs. They sell all relevant basic products in small package sizes, provide relationship-based credit, and give a feeling of emotional proximity with the shopkeeper. They might even offer home delivery, and are always close by due to the great number of stores. From a distribution point of view, a challenge arises from the fact that nanostores are unorganized, have no IT infrastructure, and are cash and storage constrained. Therefore, drop sizes are as low as several euros. Although the share of modern retail rises over traditional retail, it is expected that nanostores will not disappear for at least the next two or three decades. Their competitive advantages such as location compensate for higher prices.

The environment of nanostores is typically an emerging megacity. Emerging markets, such as China and India, have grown rapidly in terms of their GDP. However, their GDP per capita is still low hence much growth has still to come. Since growth goes hand in hand with urbanization, there will arise a huge number of new megacities in emerging markets. These cities will have millions of inhabitants, while many people in developed countries have never heard of them. Growth in recent years has already led to many issues, such as congestion and pollution, and income disparities typically grew. Add unstable political situations, and different local regulations and cultures to this enumeration to classify it as a complex environment. Although this thesis provides some results that are generally applicable to emerging markets, it is mainly inspired and inputted by India. This is because India has the most traditional retail climate (i.e. nanostores), is the second largest country in the world, has some of the densest cities, and will contribute the second largest share of new megacities in the future.

Finally, the literature review discusses current distribution models for nanostores in emerging megacities, and its typical process. Differences between direct and indirect models are discussed, which relate to the extent of control and visibility that the manufacturer has over the distribution model. Direct models may be a proprietary distribution network, or contracting exclusive distributors to supply nanostores. Indirect models may be supplying to wholesalers, where shopkeepers of nanostores can buy their products.
Section 3 gives an extensive overview of the current distribution model of a large consumer packaged goods manufacturer (Company XYZ) in India. XYZ has contracted distributors to supply nanostores. This is a direct distribution model, because the distributor works exclusively for XYZ, a XYZ team works on the distributor site, and XYZ has a great deal of control and visibility over the distribution model.

The distribution process of supplying a single nanostore once consists of three visits, all executed by the exclusive distributor. First, a sales representative visits the store to sell XYZ products. The day after, a delivery boy actually delivers the products, and on the third day a merchandiser visits the store. The merchandiser has to make sure that XYZ products are visible in the store, preferably better than competitor’s products. The distributor also supplies wholesalers, where shopkeepers of nanostores can buy XYZ products when they are out of stock or not directly supplied by the distributor. Wholesalers are somewhat larger nanostores with a backroom, which only sell full case packs. In India, wholesalers do not have an active sales force themselves.

**Analyses and results**

After the literature review and understanding of XYZ’s current distribution model, section 4 gives the results of analyses on empirical XYZ sales data. These analyses concern sales data of the current distribution situation in one Indian megacity, and sales data of pilots throughout India. The pilots were executed to test changes to the distribution model in order to visit more stores with the same cost. The results of the pilots are discussed, which show variation in local execution of the design changes. The ‘normal’ sales data of one Indian megacity gives a more thorough understanding of the variation in the execution of the current distribution model. This set is based on bills of sales representatives on the store visit level. Results of analyses on the variation imply various efficiency and effectiveness improvements of the current distribution model, which can be used in order to visit more stores with the same cost.

Section 5 proposes a new quantitative model and discusses results of its evaluation. The model is an abstraction of direct distribution models for nanostores in emerging markets, and is generally applicable in that field. Its results have led to: a quantified understanding of the drivers of both cost and sales for profitable nanostore coverage, sensitivity and thresholds of these drivers, and insights in trade-offs between the distribution model’s design choices.

**Conclusions and recommendations**

Finally, three recommendations (section 6) are proposed in order to increase the number of nanostores covered. The first recommendation is to determine a lower bound threshold of the average sales per store that one chooses to supply. The proposed model provides these thresholds based on given design choices. By deciding on such a threshold, one can increase the number of stores covered by adding smaller stores. Although this will decrease profit margin, it will increase total profit because the volume, the number of covered stores, increases. The second recommendation is to increase the sales representatives’ efficiency and adherence to the distribution model. Current variation in the distribution model’s execution provides several opportunities, and specific proposals are given to take advantage of this. By doing so, more stores can be covered with the same cost. The third recommendation is to pilot a specific new low-cost model, which decreases the sales threshold in order to supply even smaller stores profitably.
Note that due to confidentiality of XYZ data, some numbers have either been made unreadable or moved to a confidential appendix, which is not included in the public version. In the latter case, these numbers can be recognised by superscript letters in the main text. Furthermore, for some figures axis labels have been removed.

1.2. Research approach

1.2.1. Research questions

Consumer packaged goods manufacturers want to reach consumers in emerging markets, since that is increasingly the place where they live. These consumers shop in nanostores, hence one of the ways to reach them is increasing the number of nanostores covered directly. It will turn out that XYZ currently sees upward potential in order to cover all the stores they want to cover in order to attain a certain market penetration (section 3). Moreover, there is a research gap on distribution models to nanostores in emerging megacities.

The main research question therefore driving this project is *'How can a consumer packaged goods manufacturer increase the number of urban nanostores covered, in a profitable way?'*

Two sub questions have been identified:

1. Which distribution model factors drive profitability of covering nanostores?
2. Which changes to the current distribution model increase the potential of the number of nanostores covered?

1.2.2. Approach

The project can be roughly divided in three parts: a problem definition phase, an analysis phase and the drawing of the final conclusions and recommendations. These are three stages of the regulative cycle (Figure 1). The remaining stages are the intervention and evaluation phase, which are out of scope for the duration of this project.

![Figure 1: The regulative cycle (Van Strien, 1997)](image)

**Problem definition**

First, both academic and non-academic literature were explored with search terms as emerging markets, distribution model, distribution channel, megacities, India, traditional retail, fast moving consumer goods, bottom of the pyramid, and some more specific terms like mobile payments and credit.
Then, many parts of data were requested from the XYZ organization in India, such as information concerning the current distribution model and aggregated data on customer groups. Indian XYZ employees have been interviewed, and the local market in one Indian megacity has been visited by means of joining the distribution process and visiting stores with sales representatives and delivery boys.

This phase led to a definition of the current problem, i.e. an overview of the current coverage and what its growth limitations are. Furthermore, a conceptual framework has been developed to structure the qualitative findings of cost and sales drivers for distributing to nanostores.

**Analysis and diagnosis**

The analysis phase consisted of two main parts: empirical data analysis, and model building and evaluation.

For the empirical data analyses, the most important data used was sales data for several pilots for changes in the distribution model, and the most recent ‘normal’ sales data for one Indian megacity. After obvious efforts on data cleansing, combining and processing, an iterative process has taken place to generate, test, and restate hypotheses in order to structure analyses. Testing hypotheses has been done both quantitatively and by interviews with experts in the Indian XYZ organization.

The pilot sales data were analysed to find out which effect changes in the distribution model had, as input for the model that will be discussed in the next paragraph. However, these data also showed substantial variation in several variables that were supposed to be fixed. These variations were further explored by means of analysis of the ‘normal’ sales data that is more detailed and less confounded because of the changes that were initiated in the pilots.

Building and evaluating the quantitative model has been conducted in parallel with the empirical analyses. The model has been constantly improved to make it fit with the empirical data while keeping a high level of abstraction in order to draw generally applicable conclusions. Therefore, in the classification of Bertrand & Fransoo (2002), the considered model is empirical and descriptive. After building the model, it has been implemented in Excel to conduct several analyses.

The findings resulting from these analyses give general insights as well as strengthen or add to empirical results. First, a cost to serve analysis has been done, because cost was perceived to be the main driver that limits growth of coverage. Second, the iterative part mainly consisted of adding, adjusting and removing (the effect of) design choices on cost and sales. Third and finally, trade-offs and interactions between design choices have been considered.

**Plan of action**

Lastly, but being a main part of the project, conclusions have been drawn from findings, and actionable recommendations have been created. Given the broad scope of the project, drawing conclusions and recommendations has not been a trivial exercise. Testing and restating them both with XYZ Brussels, XYZ India, and the university supervisors have made the results more valuable. Finally, the presentation and implementation of the model will be made usable and clear to leave an impact within XYZ.
2. Literature: distribution to nanostores in emerging megacities

Now the introduction has given an overview of this thesis, the literature review is a deeper dive in the subject's context. First, characteristics of emerging markets and megacities will be discussed (section 2.1), in order to understand the environment of nanostores. Then, the specific characteristics of nanostores themselves are examined as well as their competitive advantages as compared to modern retail formats. Finally, the process for supplying nanostores in emerging megacities is considered (section 2.3), which will be used as a basis for XYZ’s distribution model in section 3.

2.1. Emerging markets and megacities

This subsection's aim is to provide context on the environment of nanostores, which will be elaborated on in the next subsection. First it will be shown that megacities in emerging markets will grow fast, both in their number and in their size, comprising an increasingly larger share of the world’s consumers. Second, providing certain trends and characteristics of megacities and emerging markets will outline the circumstances.

According to a McKinsey Global Institute (MGI) report, if you rank all cities by GDP, the top 600 already produce more than half of global GDP and comprise 1.5 billion people (Dobbs et al., 2011). In 2025, there will be 136 new cities in this list, which will all be in emerging markets. These cities might be so-called middleweights today, i.e. cities that have between 150,000 and 10 million inhabitants, which have big differences between their functions and growth. Megacities are generally defined as cities with more than 5 or 10 million inhabitants.

The biggest GDP growth is expected in Asia, and India will contribute the second largest share of new megacities, after China. It is projected that in 2030 in India, there will live 590 million people in cities. Of these cities, 68 will have a population of more than 1 million, compared to 35 in Europe today (Cadena et al., 2011). Today, it concerns 53 cities where 12% or 147 million Indian people live (India Census 2011). Figure 2 (right) shows the most important Indian (mega)cities geographically.

![Figure 2: India’s population density (India census, 2011), clusters around 14 largest Indian cities in 2030 with their projected population size (Dobbs et al., 2011)](image)

**Growth, urbanization and density**

As just illustrated, one characteristic of emerging markets is the rapid pace of urbanization. India has however still a relatively low urbanization percentage of 31%, i.e. 389 million people (The World Bank, 2013). In China, already 679 million people or 51% live in cities.
Despite it’s relatively low urbanization percentage, India has some of the largest and also some of the densest cities. Figures for the average population density for the whole metropolitan area of Mumbai range from 22,000 to 30,000, which is two to three times the 10,000 of Manhattan in New York City. Figure 2 (left) depicts the population density of India across states. Unfortunately there is no density map available for within Indian cities, since most information stops at the state level.

High population density leads to the main two issues of megacities: congestion and pollution. Some parts of the cities might not even be accessible by trucks or cars due to the width or steepness of the roads. As an example in Mumbai, the average speed in some areas of the city might drop to 6 km/h (Baindur & Macario, 2013).

**Growing middle class and high income disparity**

One severe negative side of urbanization is people living in slums. In for example Mumbai, around 60% of its inhabitants live in slums. According to an Indian national health survey of 2006 however, people residing in the slums are not always poor. Poor people don’t always live in the slums either (Gupta, Arnold & Lhungdim, 2006). In any case it is clear that within cities, huge income disparity and geographic differences exist. High income disparity leads to social issues such as an increased crime rate, and people living within close distance of each other might have completely different incomes and characteristics. This is of course very dependent on the specific characteristics of a city.

![India's predicted income distribution](Figure 3)

On the other hand, the middle class in India is growing rapidly, which is also a typical characteristic of emerging markets. India has recently entered the top-10 countries listed by GDP, but its GDP per capita is still low, hence much growth has still to come. According to a recent OECD working paper, China and India have reached a tipping point where large numbers of people will enter the middle class and drive consumption (Kharas, 2010). When defining middle class as people with daily PPP incomes between USD 10 and 100, the middle class will grow from 5-10 per cent today to 90 per cent in 30 years (Figure 3). Note that this projected rise in income also means that millions of people are lifted out of poverty.

**Politics, regulation and organization differs per state or even city**

Another important characteristic of emerging markets is that politics might be unstable or regulations dynamic. On the national level in India, there are nowadays many parties that have to work together, which implies that it is not very certain in which way regulations will develop. Foreign direct investment (FDI) regulations were
first strengthened, and politicians said to protect the traditional retail stores. Currently however, FDI regulations are loosened, putting the retail market more open for foreign grocery chains.

It is not expected that loosening FDI regulations will swipe away the traditional stores. Popli & Singh (2012) argue that consumers prefer to buy products from both organized and unorganized retailers; hence both traditional and modern retailers need to focus on their specific value added services. For modern retailers, the most important would be low prices. In section 2.2 will be elaborated on key properties and advantages of traditional retail.

In India, different states also have different rules and regulations. Therefore, for example, the availability of retail channels differs between states (Griffith, Chandra & Fealey, 2005). Naturally, every city has its own characteristics. In Mumbai, the transport market is very fragmented and consists of many highly competitive small players (Sriraman et al., 2007). According to Sriraman et al., in Mumbai there are two main parties between the user and the transport operator, which are (1) transport contractors or booking agents who collect, forward and distribute goods, and (2) brokers or transport suppliers who ensure the supply of trucks to the transport contractor.

Urban transport policies are also very much locally organized, e.g. choices for only allowing trucks in parts of the city during night hours, delimited and paid loading and unloading places, and new goods distribution centres. Of course also the development of ring roads, and distribution centres inside or outside the cities is policy and city dependent. Sriraman et al. (2007) note that the major cost components of transport operators are loading and unloading charges and wayside expenses, next to fuel. Furthermore, as an example, in Mumbai a permit is needed for goods transport vehicles and octroi charges up to 4.75% apply to articles brought into a district for consumption (Baindur, 2011).

**Being acquainted with local culture is essential**

Several scholars stress the importance of a deep understanding of the habits and needs of local people (Johnson, 2011; Boulaksil, 2012; Jin et al., 2010). This applies to both poor and middle- or higher-class people (Levy & Weitz, 2012). Local environments differ greatly from place to place, even from city to city (Jin et al., 2010). India is typically named as an example, since with 22 official languages it is a myriad of cultures and a conglomeration of markets (Levy & Weitz, 2012). Radjou & Prabhu (2012) name two ways to acquire and leverage local knowledge: partnering with NGOs and government, and appointing local managers.

Another important point that specifically implies to India is the importance of personal relationships. Economic exchanges are strongly driven by relational norms (Baindur, 2011). Hence, for a consumer packed goods manufacturer it is very important to actually meet shopkeepers, foster the relationships and for example conduct after-sales activities.

In India, the role of the shopkeeper is also typical. Sales are merely demand-driven: the shopkeeper serves the questions of the customers. The shopkeeper has also got limited authority, except in the pharmaceutical channel, where he might be seen as a replacement for an expensive doctor. Therefore, from a consumer packed goods manufacturers point of view, it is essential that the product is in the shelves and visible.
2.2. **Traditional retail: the nanostore**

Now the environment of nanostores has been discussed, this second subsection elaborates on the nanostore itself. A comparison is made between traditional retail, which is the nanostore, and modern retail formats. It will be seen that modern retail rises, but is not expected to drive traditional retail out of business. To both complete that argument and provide a more detailed image of nanostores, the competitive advantages and specific characteristics of nanostores are discussed.

2.2.1. **Modern versus traditional retail**

This project focuses on nanostores, which, as traditional retail, can be opposed to modern retail. Table 1 gives a short overview of main differences between traditional and modern retail. Nanostores are small neighbourhood stores that typically serve a few hundred residents of the neighbourhood (Boulaksil, 2012; Zhao et al., 2012). Consequently, there are many small stores, especially in megacities like Beijing (Zhao et al., 2012).

In India alone, at least 9 million nanostores exist, and their characteristics and issues are very distinctive. Their small sizes make distribution to nanostores a challenge. Distribution drop sizes are small, typically limited cash is available, and there is very limited (shelf) space – especially in urban areas - that needs to be secured, from a consumer packed goods manufacturer’s point of view. The rest of this subsection elaborates on characteristics and competitive advantages of traditional retail.

<table>
<thead>
<tr>
<th>Functions</th>
<th>Modern channel</th>
<th>Traditional channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistics support</td>
<td>Professionals, dispersed, DCs, cross-docks, 3PL</td>
<td>Single shopkeeper</td>
</tr>
<tr>
<td>Financial flow</td>
<td>Formal credit, bank transfers</td>
<td>Cash, informal credit</td>
</tr>
<tr>
<td>Line items</td>
<td>Full case packs to store, pallets to retailer DC</td>
<td>Consumer units, mixed case packs</td>
</tr>
<tr>
<td>Number of SKUs</td>
<td>Thousands to tens of thousands</td>
<td>Hundreds</td>
</tr>
<tr>
<td>Category depth</td>
<td>Half dozen to dozens</td>
<td>Single or double</td>
</tr>
<tr>
<td>Consumers per store</td>
<td>Tens of thousands</td>
<td>A few hundred</td>
</tr>
<tr>
<td>Technology</td>
<td>ERP, POS scanning, EDI</td>
<td>Personal mobile phone</td>
</tr>
</tbody>
</table>

Table 1 Comparison of modern and traditional channel (Blanco & Fransoo, 2012)

**Figure 4** Share of grocery retailing in modern formats over time (Source: Euromonitor International, in Tandon et al., 2011), and current share of modern retail for countries (Diaz, Magni & Poh, 2012)
In recent years, modern retail has grown in emerging markets in general and India in specific, among others by joint ventures of the large international chain groceries like Walmart and Carrefour. This does not mean however that traditional retail will soon disappear. According to Fransoo & Blanco (2012), nanostores keep on exist at least for the next two or three decades. Figure 4 shows the rise in modern retail per geographic area, and the current share of modern retail for several countries. Note that China is already predominantly modern, where India is predominantly traditional.

2.2.2. Characteristics and competitiveness of nanostores

Convenience

Customers have limited access to transport. Specifically in India, nanostores typically provide home delivery. In general, because nanostores are abundant, they are closer than modern retail stores that are less in number and even might have to limit themselves to the outskirts of the cities to keep real estate cost low. An exception is the organized convenience stores, which has not yet gained weight in India.

Given the lack of scale advantages, prices at small retail stores are somewhat higher than their larger counterparts (Boulaksil, 2012; D'Andrea et al., 2006a). However, since the accessing cost is low due to the short distance, customers perceive the total purchasing cost as lower, which is what they care about more (D'Andrea et al., 2006b). Typically, ticket sizes are very small because people buy small daily purchases. Hence people visit the store on a daily or even more frequent basis, which is made possible given the very extended business hours. Related to the low ticket sizes are small quantities of products that are not available at larger retailers or customers are ashamed to ask for (D'Andrea et al., 2006a).

Consumer research of Zhao et al. (2012) with mainly students and their families as respondents, pointed at neighbourhood access as a major reason to go to a small store or a supermarket. It must be noticed that probably middle-class consumers are considered here. They mainly use the supermarket for routinely shopping, and the small stores for emergency shopping. This behaviour is affected by mobility differences: some prefer to go to a shop nearby instead of driving in the traffic; some go to a hypermarket weekly (Jin et al., 2010). Lower-income people might even not have the opportunity to go to a supermarket at all.

Therefore, hypermarket ease of access is way more important in developing than in developed countries. Herring et al. (2012) state that even with increased car ownership in China, around 40% of shopping trips to hypermarkets are on foot, 30% by bus and 20% by bike. Also in hypermarkets, Chinese consumers want to shop near daily. This does not only have to do with shopping for fresh food, but also with space constraints. An average kitchen is only 5 square meters large, which limits storage capacity.

Right assortment

The product mix consists mainly of basic products like milk, bread, biscuits, cigarettes, soft drinks, and cooking oil, which is ‘right’ for the customer (D'Andrea et al., 2006a). Typically only limited varieties are available, e.g. for FMCG just the most popular brands, which is fine since the customers visit the stores for specific needs (Zhao et al., 2012). A limited selection of cleaning products, personal care items and luxury food items might also be available (D'Andrea et al., 2006a).
Emerging consumers value the right assortment, which is the assortment that is carefully tailored to the needs for performance, brands, economy and feelings of validation (D’Andrea et al., 2006b). This implies that for some product categories like fresh fruits, vegetables, meats, breads, and milk, emerging consumers might not prefer large chain supermarkets at all. Emerging consumers have a strong association of fresh categories with street and open air formats, where quality is perceived to be higher, prices are substantially lower, and products may be sampled, and the customers can actively manage the price/quality trade-off by choosing the time of day at which they buy.

This is an important statement for modern retailers that might have focused only on higher quality and safer food (Tandon et al., 2011). Successful Chinese hypermarkets now try to accommodate old habits via new channels. They have high-quality wet markets, sell living fish, and many even kill chickens on-site (Herring et al., 2012). In this way, many Chinese consumers that are able to visit hypermarkets still visit the stores five times a week, shopping every day for fresh food.

Another preference of emerging consumers is that of small package sizes, due to affordability. Therefore, one should reason from what the customer is able to pay. Affordability for the poor people can mainly be accomplished by offering very small packaging (Johnson, 2011). Poor customers have a substantial purchasing power (D’Andrea et al., 2006a), but very limited cash. Unilever now makes one third of its turnover in Indonesia with products that have a selling price of less than 0.20 USD (The Economist, 2012). For the Indian branch of Unilever, Prahalad & Hammond stated in 2002 that their sugar and real fruit candy for 1 penny is stated to have a potential of 200 million sales in 5 years.

Replenishment orders of shopkeepers are purely based on intuition, which is a combination of thoughts on sales of previous weeks and the amount of cash available. In Morocco, no action is taken when certain products are out-of-stock since the perceived order costs are too high and customers will most likely choose a substitute (Boulaksil, 2012). Zhao et al. (2012) adds that no inventory policies are used and information collection is passive. Due to cash constraints, order sizes are small and the order frequency is high.

**Informal credit**

Interestingly, small retailers offer credit facilities to their customers (Amine and Lazzaoui, 2011), while at the same time caring almost exclusively about cash flow (D’Andrea et al., 2006a). The main type of credit, ‘informal credit’ is applied when the customer does not have enough cash on hand and a delayed payment is accepted. In Morocco, only 45% of the payments are paid with cash and credit is extended on average by one month. Some credit can take the form of a ‘virtual wallet’, when, for example, not the right amount of change is available.

According to D’Andrea et al. (2011), credit facilities are merely an extension of the personal relation than a reason to buy at small stores. Consumers find it convenient for its flexibility, but cash is also a way to keep expenses under control. In any case the social cost of bad debt is very high (D’Andrea et al., 2006a). Boulaksil (2012) adds that a very small percentage is never paid back.

From a manufacturers perspective, a significant part of inefficient distribution arises due to limited cash at the moment of delivery (Boulaksil, 2012; Zhao et al., 2012). The fact that the distribution network is very inefficient is one of the reasons that the
poorest people pay the highest price for their products, and adds to congestion and pollution. It is remarkable that manufacturers do not offer credit facilities, while the small retailers do so for their customers, and typically have long-term relations with manufacturers and supplier-changing frequencies are extremely low (Zhao et al., 2012).

**Emotional proximity**

At small retailers, storeowners know the majority of their consumers by name, which feels comfortable and increases emotional proximity (D’Andrea et al., 2006a). Large chain formats lack emotional proximity and the feeling of community that comes as a result of personal relationships with shopkeepers. This is a key element in emerging consumer behaviour (D’Andrea et al., 2006b). Emotional proximity also resolves issues like too little cash on hand, product exchange, and is the main driver of trust in the right prices and weighing. Large chain stores on the other hand are perceived to treat low-income consumers snobbish, cold, and out of touch with the real needs of low-income families (D’Andrea et al., 2011).

2.3. **Distribution models for nanostores**

Having discussed nanostores and emerging megacities, distribution models are the remaining part of this thesis’ subject. In this subsection, an overview of different distribution models for nanostores is given, based on their common process. It is discussed why certain distribution models are chosen in certain circumstances, and finally some innovative initiatives regarding distribution models are examined.

2.3.1. **Overview of distribution models**

A distribution model has been defined in various ways. Scholars agree however on the fact that it is an integrated system that comprises the steps of moving products from the supplier to the customer (Blanco & Garza, 2012). Blanco & Garza state that the process of designing and selecting distribution models is particularly challenging in emerging markets, due to the significant differences with the available knowledge on developed markets.

**Process and models**

A distribution model consists of five processes: demand generation, order processing, physical distribution, payment collection and after-sales service (Figure 5).

![Figure 5: Process view of distributing to nanostores](image)

One can distinguish several distribution models (Fransoo & Blanco, 2012), which on an aggregated level are:

- On-board sales: one physical visit including both sales and delivery;
- Pre-sales + direct store delivery: two separate visits;
- Pre-sales + distributor: physical distribution conducted by separate company;
- Distributor: outsource whole process to distributor;
- Wholesaler: sell products to wholesaler that sells through.
Making certain decisions for each stage leads to more specific distinctions in distribution models, such as:

- Demand generation: passive, by sales visit, by phone call;
- Order processing: digital, non-digital;
- Physical distribution: own network, (non-)exclusive distributor;
- Payment collection: cash, cheque or mobile; credit provision;
- After-sale service: no after-sales, visit by merchandiser.

**Wholesaler**

From a shopkeepers’ perspective, there are typically two ways to buy inventory: at the wholesaler or directly from the manufacturer. Wholesalers take the form of a shop themselves and small retailers just buy there. This is an advantage for manufacturers that have difficulties to reach the many small retailers, typically for products with various competing brands and low turnover rate for each particular brand (Zhao et al., 2012). The wholesalers might however be perceived to be unreliable and focused on short-term profit (Boulaksil, 2012), and storeowners have no idea about the supply chain behind these products (Zhao et al., 2012).

**Distributor**

According to Blanco & Fransoo (2012), developing delivery capabilities to keep the distribution process completely in-house, allow for a closer proximity with the channel, but require complex operations to balance inventory, SKU assortment and cash flow management. Their view on trade-offs between direct and indirect distribution channels is summarized in Table 2.

<table>
<thead>
<tr>
<th>On-board sales</th>
<th>Pre-sales + direct store delivery</th>
<th>Pre-sales + distributor</th>
<th>Distributor</th>
<th>Wholesaler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single point of contact with nanostore</td>
<td>Control in demand generation</td>
<td>Active relationship with nanostore</td>
<td>Low complexity</td>
<td>Lowest cost</td>
</tr>
<tr>
<td>Full control of all functions and flows</td>
<td>Control of monetary flows</td>
<td>Reduced distribution and operational costs</td>
<td>Low cost</td>
<td>Lowest complexity</td>
</tr>
<tr>
<td>Urban logistics capabilities</td>
<td>Proximity with shopkeepers</td>
<td>Operational influence to distributor</td>
<td>Operational influence on monetary flows</td>
<td>No visibility to nanostore</td>
</tr>
<tr>
<td>High logistics cost</td>
<td>Urban logistics capabilities</td>
<td>Opaque view of nanostore</td>
<td>Loss of urban operational capabilities</td>
<td></td>
</tr>
<tr>
<td>Increased inventory</td>
<td>Logistics complexity</td>
<td>Reduced influence on nanostore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited assortment in vehicle</td>
<td>Cash management</td>
<td>Loss of urban operational capabilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium/high logistics cost</td>
<td>Medium/high logistics cost</td>
<td>No visibility to nanostore</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2** Trade-offs between different distribution models (Blanco & Fransoo, 2012)

**Choosing a distribution model**

Blanco & Garza (2012) aimed to reveal the key factors that determine the chosen distribution channel in a sample of 35 company-channel combinations. Based on a literature review, five factors were selected to test (Table 3). They found that all but the frequency of purchase where statistically significant and good predictors (83%).
Blanco & Garza suggest the following conclusions, based on empirical correlations:

- When market share and geographic concentration is low, suppliers choose for wholesalers to achieve coverage and reduce unit cost;
- When drop-sizes and merchandising needs are high, suppliers choose for onboard sales to build on customer intimacy;
- Combinations of these distribution channels arise due to consideration of costs and channel proximity.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market share</td>
<td>Percentage of the total available market or market segment that is being serviced by a company</td>
</tr>
<tr>
<td>Drop size</td>
<td>Average quantity of products that is delivered to a customer group during a specific period of time (i.e. 1500 SKUs, 5 tons, etc.)</td>
</tr>
<tr>
<td>Product complexity</td>
<td>Level of effort in terms of merchandising required from the manufacturer to sell their products: high (every week), medium (once a month), or low (no merchandising)</td>
</tr>
<tr>
<td>Purchasing frequency</td>
<td>Average frequency of shopkeeper’s orders to the manufacturer (e.g. weekly or bi-weekly orders)</td>
</tr>
<tr>
<td>Geographic concentration</td>
<td>Customers per unit of measurement (e.g. 500 customers or 10 stores per squared mile)</td>
</tr>
</tbody>
</table>

Table 3 Distribution channel driving factors (Blanco & Garza, 2012)

2.3.2. Distribution model initiatives

Compared with large retailers, small retailers have only 10% of the sales per square metre of a large-scale supermarket, but excel in inventory turnover: their gross margin return on inventory doubles or even triples those of large chain retailers. When delivering nanostores, there has to be dealt with fragmented logistics operations: more locations, smaller shipment sizes and more empty miles. While doing this, congestion is a huge problem. In-city distribution is one of the main effects that will limit economic growth, according to Cadena et al. (2011). A disproportionate flow of products might go to infrastructure-friendly areas.

In megacities in emerging markets, parts of the actual physical distribution might be complex and sometimes very pragmatic. Distribution typically consists of three or four tiers, of which the last mile is in great extent conducted by foot, with or without handcarts.

Rural initiatives

Many best practices that can be found in literature are distribution mechanisms to rural areas. The common denominator is typically that it is combined with socio-economic development and drives on small female entrepreneurs, who sell or distribute goods from their homes. For example Unilever’s Shakti project, where female entrepreneurs also educate their friends in health and hygiene, and Coca Cola’s manual distribution centre (MDC) project.

Coca Cola’s MDC is described extensively in a report by the Harvard Kennedy School (Nelson et al., 2009). MDCs are central warehouses for approximately 150 outlets that cannot be effectively or efficiently reached via classic distribution models. The MDCs are independently owned, characterized by manual distribution (e.g. via pushcarts) and a high inventory turnover due to its low volume, limited cash, but high demand frequency.
Unilever’s Shakti project, which improves supply to small Indian villages, is examined in an interesting corporate social responsibility paper by Porter & Kramer (2011). Unilever now employs more than 45,000 entrepreneurs distributing to more than 100,000 villages, where traditional transport is difficult or impossible. Simultaneously, Unilever provides microcredit and training. Like MDC, Shakti obviously increases the manufacturers revenues, but is also beneficial for the communities. In this case, communicable diseases were reduced by increased access to hygiene products. Project Shakti now accounts for 5% of Unilever’s total revenues in India, and has extended the availability of products and Unilever’s brand recognition in rural areas.

Urban initiatives

Another interesting point for research is city logistics in emerging markets. The major idea of city logistics is urban consolidation centres, but other possibilities are for example cooperative freight transport systems, and the use of public transport for urban freight distribution (Ma & Li, 2012). Currently, most city logistics research and implementation takes place in developed markets, specifically Western Europe. Fransoo & Blanco (2012) suggest it won’t be possible for emerging cities to skip a part of development we have seen in developed cities and move instantly to smarter structures like city logistics.

There is however a great dependence on policy makers, and in Western Europe almost all city logistics initiatives have been funded by the public sector (Ma & Li, 2012). Ma & Li conducted a case study on the possibilities of city logistics for the Chinese megacity Ningbo. They argue that the right circumstances are emerging, since people blame transportation for poor living conditions and governments are implementing regulatory restrictions for transportation. However, due to the highly fragmented logistics market, and lack of capabilities due to the age of the logistics sector, it may be problematic to organize city logistics operations.

The European Union funded TURBLOG_WW project conducted several case studies on urban logistics’ best practices worldwide to learn if they are re-applicable in other parts of the world. The most well known best practice is that of the dabbawallas in Mumbai, India (Baindur, 2011). Dabbawallas distribute 200,000 lunch meals to workers on a daily basis. The meals are home-cooked, e.g. by the wife of the worker. The dabbawallas claim to have an error rate of one in 16 million, six sigma compliant. They focus solely on this specific distribution, and do so by making use of public transport and bikes.

From a network point of view, the difference between dabbawallas and a typical retail distribution is that for dabbawallas, the origins are dispersed and the destinations dense, as the opposite hold for retail distribution. If you look at transferability, the Mumbai is very specific in that it has a linear topography, and the infrastructure is flexible and inexpensive. In the Mumbai Suburban Railways, three of the nine to twelve car rakes are dedicated to goods transport. Furthermore if you consider the specific distribution model, cultural aspects play an important role because, for example, home-cooked food provides bondage in families that work long days out in the cities.

Other case studies of the TURBLOG_WW project include successful off-hour deliveries in New York City (Holguin-Veras, 2010), consolidation of local distribution centres in China (Public Planning & Policy Studies, 2011), and a study to Shinjuku (Yashiro, 2011). Shinjuku is a system in Tokyo where physical distribution flows are combined to office buildings, and within the office buildings separately distributed. This works because of the extreme density in delivery locations.
3. **Current situation: XYZ’s distribution model to nanostores**

In the previous section, a classification of distribution models and its overall process have been given. In section 3.4, XYZ’s current distribution model to nanostores will be examined. The first three subsections give more background on the model: the universe of nanostores and XYZ’s coverage (section 3.1), the rationale behind the distribution model with explanations on distributors and wholesalers (section 3.2), and a conceptual framework to structure the drivers for cost and sales in the distribution model (section 3.3). The conceptual framework provides an overview for the considered design changes and deviations in the empirical data analyses in section 4, and has been a basis for the quantitative model that will be proposed in section 5.

3.1. **Current coverage**

3.1.1. **Definition of coverage**

Since the aim of this project is to increase coverage, it is important to define coverage first. While you can think of coverage in many different ways, XYZ defines coverage as the number of stores directly reached by one of its exclusive distributors. Strictly, it should hold that:

1. The store is visited at least once a month,
2. The share of XYZ products over the total products that a sales representative carries when visiting the store is at least \( \% \).

The second requirement is applicable to low-cost models for rural areas, where small sub distributors do not work on an exclusive basis.

The base situation is typically that a nanostore is covered via a wholesaler, which is supplied directly by XYZ. It might be decided to cover a nanostore directly when both of the following statements hold:

1. There are already some XYZ SKUs in that store,
2. The potential direct XYZ sales to that store exceed INR \( \text{INR} \) per month.

The first statement is related to a core XYZ assumption, which is that sales are demand driven. In essence, XYZ is a marketing organization, and it reasons that stores will start selling products (bought via wholesalers) when shoppers ask for it. This seems a reasonable assumption in India, because a) retailers are relatively passive in promoting products to customers, and b) even in slums people tend to be able to watch television – which shows XYZ ads.

The second statement is related to current thought about distribution cost. When a storeowner buys more than INR \( \text{INR} \) per month, spread out over two store visits, it is said to be profitable to distribute the products. In this reasoning, it is included that a town in general might not have the required sales today, but it might have in the future. Obviously, there might be other factors that would influence profitability, which will be discussed in the conceptual framework (section 3.3).

From experience it turns out that total XYZ sales in a store increase \( \text{times} \) times when covered directly, instead of the shopkeeper buying its supplies at a wholesaler. This is attributed to a) making more volume per product, and b) selling more XYZ product categories. Although it lacks evidence, more volume per product may be due to fewer out-of-stocks and the risk that the shopkeeper buys other brands at the wholesaler.
3.1.2. Current coverage

Around 2010, XYZ India decided on the high level goal to cover million stores in India, in 2015. Currently, million stores are covered. Simplified, XYZ wants to reach the world’s consumers, and currently an estimated million of India’s 1,241 million people use one or more XYZ products. These products are bought in one of an estimated million stores where XYZ products are sold. This figure is the number of stores that are covered directly or indirectly via wholesalers, hence the approximation.

It turns out from interviews that common thought in the Indian XYZ organization is that all larger, profitable stores are covered, and smaller stores are too costly to cover due to their low throughput. In other words: sales per store are too low compared to delivery cost. This is said not to be a supply chain problem, and also finding the uncovered stores is not a problem.

3.1.3. Store universe

Mid 2011, XYZ India requested a study on the store universe in India and the amount of stores needed to cover in order to attain a certain market penetration. Figure 28 (Appendix) depicts an analysis based on some of the study’s results, showing that covering million urban stores and million rural stores would achieve % of Indian All Commodity Volume (ACV). These stores have at least INR sales per month in categories that XYZ competes in. Indian ACV represents the total sales volume of India. When XYZ achieves % ACV, it reaches that amount of stores that sell % of India’s total sales volume.

Since XYZ’s acknowledges INR direct sales per store per month as viable to cover, this number is taken to couple to the INR category sales. Only taking market share ( % in channel 2, % in channel 3) would not be completely right, since what matters is the market share in a covered store. Combining market share however with the fact that a shopkeeper typically buys % of his stock via wholesalers, and % directly, makes INR a reasonable assumption.

It is not known exactly how much stores in urban and rural areas are currently covered. However, taking numbers of mid 2011, and adding the growth since then in the same proportion, results in the right part of Figure 28. Currently, approximately out of million viable urban stores are uncovered. Note that next to the coverage, the number of uncovered stores most likely grew as well, due to high economic growth.

Figure 28 also shows that there is a huge number of rural stores uncovered, which have great potential. However, the threshold for low and high throughput stores is the same for urban and rural. Since distribution costs are relatively higher in rural areas due to a lack of infrastructure and higher dispersion of stores, the potential might more difficult to take advantage of in a profitable way. Therefore, rural stores might call for different distribution models than urban stores. The scope of this project only allows for one of them. The reasoning for a focus on urban is twofold: First, while India is still relatively un-urbanized, the purchasing power of the urban areas doubles that of the rural part and the country urbanizes rapidly. Second, best practices in the literature mainly address the rural areas; hence there is a greater gap for research on urban stores.
3.2. **Rationale behind current model**

### 3.2.1. Wholesalers

Typically, a shopkeeper buys inventory in two ways: via the wholesaler, or when distributed to directly. Commonly in the smaller channels, a retailer buys %%direct. In the larger channels, this number goes to 100%. Although XYZ prices to wholesalers are lower, they are very important for two reasons:

1. Stores that are not covered directly by XYZ, are 'covered' via wholesalers; buy their XYZ stock at wholesalers,
2. When stores are out of stock, either because they bought only a few days of inventory due to limited cash, or due to variation in shopper demand, they can replenish at a wholesaler.

A phenomenon in other countries than India is that there is an active competition from the wholesaler with the direct distribution to a store. There are two reasons why in India this is not a problem:

1. India has a Maximum Retail Price (MRP)-regime, which implies that it is obliged to print a binding maximum retail price on all products. Therefore, the wholesaler has little room to change his price. It gets a fixed discount on the suggested price to the retailer, and the suggested price is followed because the retailer otherwise cannot make any margin.

   *Obviously the wholesaler can shrink his own margin, which happens, but this has far less impact than in other countries where the final price is not fixed. Since modern cash & carry formats have greater negotiating power and therefore more flexibility in their selling price, this is an emerging problem.*

2. Probably culture-wise, or connected with the previous point, Indian wholesalers do not actively go into the market selling their stock. One can say this is a passive model, while other countries know an active model where wholesalers even have their own sales force.

### 3.2.2. Distributors

Exclusive distributors execute XYZ's complete distribution model, although XYZ has a great deal of control. A team of %%XYZ account managers are located on the distributor site, XYZ trains the sales representatives, and XYZ decides on the funds the distributor receives to be able to cover a specific number of stores in specific channels.

Several payments occur between XYZ and the distributor, which eventually lead to a net sales margin for the distributor that is consciously controlled. First, a distributor buys XYZ products to sell. It typically takes %%days of inventory, pays after %%days (hence does need little working capital), and receives a fixed gross margin of on the bill. Then, related to performance, the distributor receives another as variable performance incentive.

### 3.2.3. Other initiatives

In order to be able to cover stores with a low throughput, current efforts go in two directions. The first direction is cost reduction of the current distribution model. In regular intervals, a critical look is taken on all costs related to distribution, and pilot projects are initiated on costs that might be reduced.
The second direction is the development of new low-cost models. The two projects with the most impact are 

- concerns individual ‘sub distributors’ who sell in their villages and travel to the depot once per week to collect stock after they have sold it.
- is a way to reach more stores in urban areas, by means of making a very small depot at some distance of the original depot but close to sales routes, which reduces travel time and transportation cost for sales representatives and delivery boys. For the latter no van is needed anymore.

### 3.3. Conceptual framework

In order to structure the qualitative findings about the cost drivers of sales and as a step towards the quantitative model, a conceptual framework was created (Figure 6).

![Conceptual framework of the cost drivers of sales](image)

The framework segments the generated sales per sales representative per month in three branches: the inventory needs of a retailer, its actual order, and the total number of stores a sales representative visits on a monthly basis.

In essence, total XYZ sales for a store depend on two things: 1) shopper demand, and 2) the relationship of the shopkeeper with XYZ. Within shopper demand, a distinction can be made between aggregated demand, which is driven by advertisement and good experiences with XYZ products, and in-store demand, that is driven by visibility and availability of XYZ products. Imagining the context of a nanostore, availability also has a significant impact on the visibility of products.

Another important point is that there is a significant difference between needs and orders, which makes the relationship of direct sales and wholesale sales interesting. Shopkeepers have limited cash available, and when they are supplied less frequent than they would need to cover their monthly demand, they rely on wholesalers to buy...
their additional stock, and refill in case of out-of-stock situations. Shopkeepers go to wholesalers anyway, because not all manufacturers distribute to the store directly. However, it is not reasonable to assume that for every XYZ out-of-stock, the shopkeeper makes a visit to a wholesaler. Hence, increased relationship with the shopkeeper and increased sales via the direct channel could decrease out-of-stocks.

3.4. Distribution model

3.4.1. Customers or channels

XYZ defines channels as groups of customers, which are stores. These channels are grouped based on a combination of geography (big cities or rural villages) and store size in terms of throughput, which ranges from a couple of euros per month up to more than a thousand euros. The first and most useful segmentation can be made as follows:

- Modern retail: hypermarkets, supermarkets and cash & carry.
- High frequency stores (HFS): Ranging from 1 (the largest) via 2A, 2B and 2C through 3 (the smallest).
- Mini markets: somewhat larger stores and the only ones where you can actually walk into the store.
- Wholesale: unorganized wholesalers, which are typically a larger HFS with a backroom and sells only in case packs.

The HFS 2B, 2C, and 3 channel are the actual nanostores that are considered in this project. These stores will be referred to as the 2BC3 channel.

Within, for example, the HFS 2B channel, other segmentations can be made, such as traditional stores, drug stores, and beauty stores. The most important segmentation however, is given above. The three photos of Figure 7 illustrate the wholesale channel, and the largest and smallest HFS channels.

Figure 7 From left to right: Wholesale channel, largest HFS, smallest HFS

Figure 8 gives an overview of sales and the number of covered stores, for each channel in February 2013. The smallest 2BC3 channel, the nanostores, has by far the highest number of stores (????%), but only ???% of sales. On the contrary, the wholesale channel makes up ??% of sales with a limited amount of stores.

That makes the 2BC3 channel also relatively the most expensive to serve. The most important drivers are administration overhead, sales, and delivery. The cost to serve for the 2BC3 channel will be explained in more detail in section 5.4.1. Table 4 gives a relative comparison of the cost to serve for each channel; Table 10 (Appendix) gives the actual cost to serves as a percentage of sales.
Despite their differences in size, one can speak of a base distribution model that is similar for all channels, except the modern channel that is out of scope, and differences in the specific execution such as sales frequency (Table 5). From a process point of view, the distribution model is given in Figure 9 (compare Figure 5). After the figure, additional information is given per process step where needed.

### Demand generation

Sales representatives carry a list of stores that they need to visit per day, and are segmented based on channel. However, since stores of different channels are obviously geographically mixed, no further distinction is made within the 2BC3 channel in terms of sales representative.

Each store has a target that is based on previous sales. Sales representatives also carry a monthly changing sales book in which that month’s promotions are denoted. Sales representatives typically do not use vehicles to visit the stores. Table 5 lists the differences in process execution for the different channels. For the mini market and HFS 1 channel, two sales representatives visit the store some days after each other, with their own product portfolio.
Order processing

In India, 98% of sales representatives carry a handheld device, which have currently been changed to cheaper Samsung Galaxy phones with an app. This is where the order is processed with and sales (billing) data comes from. Therefore, sales data is only available up and until the sales of the sales representative; there is no data on sales of wholesalers to stores.

Physical distribution

Distribution happens with a small van, driver and delivery boy. Currently, two delivery boys join one truck to combine two sales routes in one day. Inventory is held at distributor branches. These branches are replenished internally via one main distributor branch that is replenished by XYZ. In India, XYZ works with exclusive distributors, which is approximately one for every state. The distributors operate branches, that each cover approximately a km or minutes radius. There might be sub distributors

Figure 10 depicts the simplified physical flow of XYZ finished products. In fact, distributors might also supply modern retail, a distributor is a branch itself (the main branch), and modern retail may also supply nanostores. An additional model is the sub distributor (section 3.2.3), which covers areas outside the branches’ reach.

Payment collection

While carrying large amounts of money could be an issue, in this process it is not a serious issue. For small stores, which pay in cash, the total cash amount is relatively small. For larger stores, the payments are typically done with cheques. When a store owner cannot pay, the delivery is completely returned. To all but the smallest channel, credit is extended until the next delivery. Table 6 lists the number of credit days per channel.

After-sale service

After both sales and delivery, a merchandiser will separately visit the store to ensure visibility of products.
4. Empirical data analysis

This section documents the most important results of analyses using empirical XYZ sales data, sales resulting from execution of the designed distribution model that has been discussed in the previous section. Empirical data was used to both thoroughly analyse the current execution of the distribution model, and to distil effects of design changes or deviations on costs and sales. An overview of these design choices and their effects is provided by the conceptual framework as given in section 3.3. The analyses’ results are segmented in two, based on their underlying data sets: the pilot data for changes in the distribution model, tested in different distributor branches across India over several months (section 4.1), and a month of detailed sales data for the distributor of one Indian megacity (section 4.2).

4.1. Sales data of pilots for distribution model changes (Appendix)

4.2. Sales data of current situation in one Indian megacity

In this section, results of analyses on the sales data for a recent month (February 2013) are denoted, for the 2BC3 channel in one Indian megacity. The first subsection gives an overview of the data after which results are aggregated per distribution model design choice: sales visits per day, store sales frequency per month, and providing credit. The merchandiser design choice is omitted since there is no relevant data available to analyse.

4.2.1. Overview of data

Figure 11 depicts a boxplot for the distribution of sales per channel, in order to get an idea of the size of these stores. It shows quite some variation in the size of these stores, especially for channel 2.

Sales data has been processed and combined with other sources in order to get, per bill (identifiers for): date, store, sales representative, amount of sales per bill, number of lines per bill (i.e. assortment), and channel. Furthermore, the number of visits per store per month and the number of visits per sales representative per day have been coupled to these bills.

The data includes roughly 3,000,000 bills with 15,000,000 lines valuing 549,000,000, from 30,000 stores visited by 15,000 sales representatives over 50 branches. In order to make the fairest conclusions, sales representatives that visited other stores than channel 2BC3 have been removed. Note that sales representatives could not be separated between channel 2BC and channel 3, since all sales representatives visit a mix of stores in these channels.

Figure 11 Boxplot (range from 10th to 90th percentile, incl. mean) for monthly sales per store per channel
4.2.2. Sales visits per day

Number of bills per day per sales representatives designed to be $\text{[blank]}$, varies from $\text{[blank]}$

It is interesting that despite a design of visiting $\text{[blank]}$ stores per day per sales representative, there is a substantial variation in the amount of bills per day per sales representative.

It turns out that for sales representatives that contribute more bills per day:

1. Total sales per month are higher;
2. A higher number of stores is covered;
3. Its covered stores are not smaller (in terms of monthly sales per store);
4. The same number of SKUs is sold per visit.

Figure 12 depicts the first three statements, the fourth being discussed in the next subsection.

![Figure 12](image)

Figure 12 Scatter plots for each point representing one sales representative. Correlations, respectively: $\rho = .52$, $\rho = .58$, and $\rho = .36$

Reasons for this variation in efficiency could be twofold: uncontrollable factors like store density, and controllable factors like the choices sales representatives make in and between stores, such as visiting many stores versus spending more time in one store, working harder, and visiting specific stores more often. Note that the reasons do not include store size, since the average sales per store per month do not decrease for a higher number of visits per day.

Number of sales visits per day does not relate with size of bill, both in lines and sales

It is interesting that there is no correlation between the number of bills per day and both the sales per bill and lines per bill. This corresponds with the author’s personal observations during market visits that the size of a bill is merely a result of the inventory position, rather than efforts of the sales representative. When taking number of bills per day as a proxy for the time in store, spending more time per store has no positive effect on the lines per bill (i.e. number of SKUs) or total bill amount.

![Figure 13](image)

Figure 13 Average sales per bill ($\rho = 0.01$), and lines per bill ($\rho = -0.03$) per number of bills per day
Combining this finding with the previous one, it might be the case that sales representatives make different choices in the number of visits they make per day and the time they spend in stores, but based on the considered data, increasing the number of visits is more preferable than increasing the time in the stores.

4.2.3. Sales frequency

Sales visits increase during month, leads to more visits to same stores than designed

During the month, the total number of bills increased by **%** when one compares the last week with the first week, while the number of sales representatives remained equal. It can be reasonably deduced that this is a result of a monthly sales target. Furthermore, when sales representatives make more visits per day, they tend to visit the same stores more often and up to **times per month** (Figure 14), while the designed sales frequency remains **. Note that the latter also happened in the sales visits increase pilot (section 4.1).

![Figure 14](image)

**Figure 14** Increase of total daily bills during month, and effect of average number of sales visits per sales representative on average sales frequency to stores per sales representative

Not-designed higher sales frequency leads to more small bills

During the month, the percentage of small bills increases, both in terms of weeks as in terms of the x’th visit to the store (Figure 15). Combining this finding with the previous one, there is a reasonable indication that because of the sales representative’s incentive, he or she conducts more and more visits during the month. These visits go to already covered stores, where the size of the bill becomes increasingly unsure. The latter statement is based on the fact that by going to the same store more often, but not by design, the shopkeeper did not expect the sales representative, and might have just bought inventory at the wholesaler.

![Figure 15](image)

**Figure 15** The percentage of small bills during the month, per visit, and over all bills.

The problem with very small bills, are their relatively too high distribution cost. Small bills have two main reasons: subsequent deliveries, and just a too small order because the store is too small or it needs little inventory at that moment. One of the targets for distributors is the percentage of bills that is above INR **. However, since 67% of

![Image](image)
the bills under INR are between INR and, the problem may not be to attain a bill over INR but to get rid of the really small bills under INR.

Not-designed higher sales frequency leaves opportunity to use capacity more efficiently

In the abovementioned line of reasoning, there seems to be an opportunity to use the sales representative’s capacity more efficiently. The opportunity rises from the fact that all third, fourth and even fifth or more visits could be used to increase coverage. The average bill size for the third or higher visit is substantially smaller than the first visit (Figure 16). If that bill size could be achieved in one bill for one new store, coverage could be increased by % ( stores), and % ( stores), respectively for channel 2BC and 3.

When this bill size could not be achieved, there are still other reasons to increase the number of stores covered instead of the sales frequency to current stores. These include: sales in newly covered stores increase over time with a factor over the situation where the shopkeeper only bought inventory at the wholesaler (section 3.1.1), and covering a growing store that is not yet profitable to visit but has limited shelf space that needs to be secured today.

![Figure 16](image)

**Figure 16** Average sales per store by sales frequency, for each visit. Left: channel 2BC, right: channel 3

4.2.4. Credit

Figure 15 also shows the negative bills, which account for % of all bills. That is one bill, for every sales representative, every day. Observations and literature show that the cash position of shopkeepers is a great problem and typically leads to distribution inefficiencies.

If negative bills are returned orders, a lower bound of the opportunity cost is exactly the gross margin (sales price minus production cost) of the unsold products. A sales visit has been made; products have been picked and delivered, and then the products are returned.
5. Model

An introduction to the proposed quantitative model is given in section 5.1. The model, which is an abstraction of the distribution model to nanostores, is denoted in detail in section 5.2 and is a contribution to research as such. Furthermore, analyses (section 5.4) have grounded empirical results that are given in the previous section. Moreover they have led to general insights about the impact of distribution model design changes on profitability, sensitivity of these design choices, and trade-offs between them. The used variables for these analyses are noted in section 5.3.

5.1. Introduction

5.1.1. Scope and function

The proposed model is a quantitative representation of a direct distribution model to nanostores, including the effect of certain design choices on distribution costs and sales to stores. The latter has been discussed in the conceptual framework in section 3.3. The model is mainly built for and used with data of XYZ’s distribution model that has been described in section 3.4. However, with limited and obvious changes in parameters, the model can also be used to quantify all distribution models to nanostores as discussed in section 2.3, as long as they are served directly. Directly means that stores are visited, as opposed to an indirect model where stores only buy their stock at wholesalers. The model can be executed either by an exclusive distributor or via a manufacturer’s proprietary distribution network.

More specifically, the quantitative model encompasses a general nanostore distribution model with its complete cost to serve as well as sales. Parameters for the impact of design choices on cost and sales are included to analyse its effect on profitability. The considered design choices are the number of stores that can be visited for sales and delivery routes, the sales frequency per store per month, credit provision, and a merchandiser visit.

The main use of the model is:

- Computing thresholds of store and environment conditions for viable coverage;
- Quantifying distribution model requirements for viable coverage;
- Quantifying the effect of changes in the distribution model on viable coverage.

Because the model has been implemented in Excel, with a clear user interface, employees with responsibility for the distribution model can use it for several reasons, e.g.: to recalculate sales thresholds on a yearly basis, to decide on pilots to change parts of the distribution model, and to benchmark costs and distribution model execution over countries.

5.1.2. Terminology

Distributors sell and deliver XYZ products to stores (section 3.2.2). These distributors are quite consolidated. Approximately one distributor per state subcontracts delivery trucks and drivers, but employs sales representatives, warehouse helpers, delivery boys and administrative staff. Therefore note that ‘direct distribution’ actually happens via a distributor in XYZ’s case, which can be confusing when compared to Western distribution models and terminology.
Wholesalers are typically somewhat larger nanostores, with a backroom, where nanostores can buy their stock as well. The same distributors that distribute to the nanostores also distribute to these wholesalers, but the distribution model to wholesalers is out of scope.

Merchandisers visit nanostores the day after the delivery to take care of the visibility of products.

5.1.3. Omitted and assumptions

Omitted from the model

The following variables are omitted from the model: the number of SKUs sold per visit, a sales representative's proficiency, marketing, pricing, service levels, and store and area characteristics. They are now shortly discussed one by one.

It turned out empirically that the number of visits per day, or time in store, did not influence the number of SKUs sold (section 4.2.2). Therefore, the number of SKUs is not included in the model. This is reasonable since the number of SKUs sold increases when a store is just started to be covered directly, but afterwards its assortment remains constant.

It has also been seen in empirical data that variation in a sales representative's proficiency (section 4.2.2) does not depend on its pay, which is equal for the considered stores. Next to his choices in the execution of the distribution model, such as the number of visits per day and store sales frequency, proficiency rather depends on variables such as his experience, people and sales skills, and commitment, for which quantitative data is hard to obtain.

Marketing and pricing, and their impact on sales, have been omitted because they are in a completely different field of study. Within XYZ, many people work full-time on these issues. Hence, additional marketing to increase sales, and change of prices to increase competitiveness against competitive products or wholesalers, are out of scope.

The relation between out of stocks, i.e. service level, and subsequent deliveries is not taken into account because it is not clear whether this is either a substantial problem for XYZ or relevant for other manufacturers.

Characteristics of individual stores, such as store size (e.g. surface or total throughput), or the areas they are in, such as store density, and distance to branch, are not taken into account due to an absence of data, but remain relevant.

Furthermore, note that several variables are not included in the model directly, but still calculations can be done for the impact of changes in these variables. They include:

- Branch overhead efficiency: analyse decrease in overhead cost;
- Distributor incentive: analyse projected results of changed incentive, such as an increase in the number of visits per day, or a decrease in overhead cost;
- Sales representative's variable pay: analyse its effects such as increased adherence to distribution model or more visits per day;
- Phone sales: analyse increase in 'visits' per day due to phone sales.
Assumptions

The assumptions for this model are:

- No differentiation in gross margin on the product level;
- Fixed cost allocation is based on sales;
- The effect of credit is irrespective of the credit term;
- No active competition between direct and wholesale channel, which is reasonable in India, where wholesalers are relatively passive and due to the maximum retail price regime, have little room to lower their prices;
- Linear relationships for the effect on sales for sales frequency increase, sales frequency decrease, credit provision, and merchandiser visit;
- The distributor’s net margin is fixed;
- Regarding the shift of wholesale sales to direct sales, a merchandiser visit results in additional sales, credit provision and changes in sales frequency shift sales (partly) from the wholesale channel.

5.2. Quantitative

5.2.1. Objective

The objective function of the model is the total margin per sales representative per month ($\pi_d$). This has been chosen as the objective, since sales representatives are the scalable part of the distribution model, and this level of aggregation gives the most truthful reflection of reality. When making calculations on the level of a single store, some effects are lost. An example is the impact of being able to visit less stores in total when increasing the sales frequency.

The total margin per sales representative per month ($\pi_d$) is the total margin that results from the XYZ sales to nanostores he or she generates ($S$), minus all direct and allocated cost ($C$). $S$ and $C$ are elaborated on in section 5.2.2 and 5.2.3, respectively.

$$\pi_d = S - C$$

Sales might be influenced based on certain design choices. Some or all of these increased or decreased sales, may be a result of a shift from the wholesale channel, i.e. when a sales representative visits a store more frequently, the shopkeeper needs to restock at a wholesaler less often. Margin that results from this shift ($\pi_w$) does not add the same value on a higher aggregated level and is therefore corrected for to attain the total relevant margin ($\pi$).

$$\pi = \pi_d - \pi_w$$

Margin $\pi_w$ for shifted wholesale sales ($\Delta_w$; more details in next section) is based on the gross margin of products ($1 - c_p$) and reduction of sales prices via the wholesale channel ($r$). This modelling choice is made based on the reasoning that given a sales and delivery visit to both the nanostore and the wholesaler, a shift in one product that is now sold to the nanostore instead of to the wholesaler, only adds value in the difference in sales price, which is $r$. Production cost $c_p$ are deducted because they are initially falsely added to $\pi_d$.

$$\pi_w = (1 - c_p - r)\Delta_w$$
5.2.2. Sales

Starting point of the model is a base level scenario, with average XYZ sales per store per month for a sales representative \((d_0)\), a store’s monthly sales frequency \((f_0)\), and the number of visits per day a sales representative conducts \((p_{s0})\).

In the base scenario, a sales representative can make \(w_s\) working days per month times \(p_{s0}\) visits per day is \(w_s p_{s0}\) visits per month in total. Dividing \(w_s p_{s0}\) by the number of visits per store per month \(f_0\) gives the number of stores per month a sales representative can visit, all still in the base scenario.

Multiplying this number of stores \(\frac{w_s p_{s0}}{f_0}\) by sales per store \(d_0\) gives the base level sales per sales representative per month.

Design choices, such as increased sales frequency, increase or decrease the base level sales per sales representative per month to a certain level of projected sales per sales representative per month \((S)\). The increase in sales is denoted by \(\Delta d\).

\[
S = \frac{w_s p_{s0}}{f_0} d_0 + \Delta d
\]

Sales increase \((\Delta d)\) is a function of the number of visits per day per sales representative \((p_s)\), sales frequency \((f)\), credit \((c)\), and merchandiser visit \((m)\).

\[
\Delta d(p_s, f, c, m) = \left(\frac{w_s p_s}{f} - \frac{w_s p_{s0}}{f_0}\right) d_0 + \frac{w_s p_s}{f} d_0 (\beta_f |f - f_0|^+ - \beta_{fa} f_0 - f|^+ + \beta_c c - \beta_m (1 - m))
\]

The first part of the equation represents the sales increase or decrease due to an increased or decreased number of visited stores per sales representative per month. The second part of the equation represents the sales increase or decrease for each store, based on the choices made for distributing to the store.

The first ‘more stores’ part is dependent on \(f\) and \(p_s\). On \(f\), because when a sales representative visits stores more frequently when his or her capacity remains constant, he or she can visit fewer stores in total. On \(p_s\), because when his or her capacity in terms of number of visits per day increases, he or she can visit more stores in total.

The second ‘more sales per store’ part is dependent on \(m, f,\) and \(c\); a merchandiser is there to increase visibility of XYZ products that should increase sales (hence removing the merchandiser decreases sales), and allowing credit or going more frequent to stores reduces out of stocks and wholesaler restocking. In general, linear relationships have been assumed, most importantly because there would be no relevant arguments to adapt more profound relationships.

Note that sales do not necessarily depend on sales frequency linearly, but sales are linearly affected by decreasing sales frequency and by increasing sales frequency. This modelling choice makes it possible to conduct two distinct analyses. One is for a sales frequency design change, the other for individual deviations by sales representatives on the current design. The first effect could be up to both a decrease and an increase of \(1/f_0\) percent of sales per extra or less visit, i.e. the size of one current bill per store. The
second effect was found in the empirical data (section 4.2.3) and is different for increase and decrease. Here, a sales frequency of $\frac{f_0}{f}$ instead of $\frac{f}{f_0}$ resulted in a sales decrease of 50% ($= \frac{1}{f_0}$), but a sales frequency of $\frac{f_0}{f}$ or $\frac{f}{f_0}$ instead of $\frac{f}{f_0}$ resulted in much smaller percentages of sales increase: around 10 to 20%, among other things due to the unstructured nature of these visits.

Theoretically in this model, sales would increase forever while increasing sales frequency. This obviously does not hold in practice. In order to keep the model simple and because it does not enhance the model’s use nor its intelligence, no maximum sales amount has been implemented. This would need more data and more assumptions, while for relevant parameter values the cost of extra visits quickly outweigh the extra sales. For large values of the sales increase parameter, it should be kept in mind that sales increase is considered within relevant bounds.

As denoted for the profit variables, part of the increased sales $\Delta d$ might in fact be shifted from the wholesale channel, i.e. it reduces a part of the sales via the wholesale channel. $\Delta w$ is the absolute part of $\Delta d$ that is shifted from the wholesale channel, hence similar to the expression for $\Delta d$. One difference is $\beta_w$, which determines which percentage of the sales increase shifts from the wholesale channel.

$$\Delta_w(f, c) = \beta_w \frac{w_p s}{f} d_0 (\beta_{f_1} [f - f_0]^+ - \beta_{f_d} [f_0 - f]^+ + \beta_c c)$$

5.2.3. Cost

Costs are segmented in production cost ($C_p$), variable cost ($C_v$), and allocated fixed cost ($C_f$).

$$C = C_p + C_v + C_f$$

Production cost is a percentage of XYZ sales to stores.

$$C_p = c_p S$$

Variable cost is further segmented in sales cost ($C_s$), credit cost ($C_c$), distribution cost ($C_d$), merchandiser cost ($C_m$), overhead cost ($C_o$) and the distributor net margin ($C_n$).

$$C_v = C_s + C_c + C_d + C_m + C_o + C_n$$

Sales cost is the sum of a sales representative’s wages ($c_{sw}$) and directly allocated overhead ($c_{so}$, e.g. sales team leaders).

$$C_s = (c_{sw} + c_{so})$$

Credit costs are the costs of capital per month ($c_c$) multiplied by the amount of credit that is provided, i.e. sales, $S$. Since credit is collected at the next visit, the costs are divided by the sales frequency ($f$).

$$C_c(c, f) = c_c \frac{c}{f} S$$
Distribution cost consists of the salary of the delivery boys and the truck rent, and overhead. These cost are allocated to the number of stores per sales representative per month (a delivery tour might be able to include more stores than a sales tour). Next to that it includes the cost for return bills, which is the gross margin of returned products \((1 - c_p)\) for all return bills \((bS)\), incorporating the return bills’ reduction due to credit \((1 - c_{\beta b})\).

\[
C_d(f, p_d) = (c_{dw} + c_{do}) \frac{p_d}{p_s} + bS(1 - c_p)(1 - c_{\beta b})
\]

Merchandiser cost is the wages of a merchandiser \((c_m)\) if designed to be included in the distribution model \((m)\).

\[
C_m(m) = mc_m
\]

Other overhead costs are cost \((c_o)\), such as administration expenses, which do not apply directly to sales or distribution, but are variable for one sales representative. This is the case since distributors work with branches, where only a limited amount of sales representatives work. Hence costs for these branches can be fairly easy allocated to one sales representative.

\[
C_o = c_o
\]

The distributor net margin is a percentage of sales. In reality, the margin percentage \((c_n)\) varies, but only very little (between [80] and [80]%). Hence for simplicity and due the small nature of the margin in general, it has been assumed that the margin is fixed.

\[
C_n = c_nS
\]

Finally, fixed cost is a percentage of sales \((c_f)\). It includes among other things marketing and branch replenishment expenses, i.e. overhead cost that can not be allocated to one sales representative. That makes \(C_f\) different from \(C_o\). Fixed cost are based on the sales in the base level scenario, to make them really fixed and not make them dependent on any design choices.

\[
C_f = c_f \frac{w_sp_{x0}}{f_o} d_o
\]

### 5.2.4. Notation

Table 7, Table 8, and Table 9, respectively, give an overview of the variables and parameters for the objective function, decision variables and input parameters. Note that DSE is an acronym for Direct Sales Employee, XYZ’s term for sales representatives.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Margin</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\pi)</td>
<td>Total relevant margin</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>(\pi_d)</td>
<td>Total margin via direct channel</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>(\pi_w)</td>
<td>Margin reduction due to wholesale channel shift</td>
<td>INR per DSE per month</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sales</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(S)</td>
<td>Projected XYZ store sales via direct channel</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>(\Delta_d)</td>
<td>Projected sales increase via direct channel</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>(\Delta_w)</td>
<td>Projected sales shift from wholesale channel</td>
<td>INR per DSE per month</td>
</tr>
</tbody>
</table>
### Cost

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C$</td>
<td>Total cost for direct distribution model</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>$C_p$</td>
<td>Production cost</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>$C_f$</td>
<td>Fixed cost allocated to sales</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>$C_v$</td>
<td>Total variable cost</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>$C_s$</td>
<td>Variable sales cost</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>$C_c$</td>
<td>Variable credit cost</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>$C_d$</td>
<td>Variable delivery cost</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>$C_m$</td>
<td>Variable merchandising cost</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>$C_o$</td>
<td>Variable overhead cost allocated to DSE</td>
<td>INR per DSE per month</td>
</tr>
<tr>
<td>$C_n$</td>
<td>Net margin distributor</td>
<td>INR per DSE per month</td>
</tr>
</tbody>
</table>

**Table 7 Variables related to the objective function**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f$</td>
<td>Sales frequency</td>
<td>visits per month</td>
</tr>
<tr>
<td>$m$</td>
<td>Merchandiser visit</td>
<td>visit (1) or no visit (0)</td>
</tr>
<tr>
<td>$c$</td>
<td>Credit provision</td>
<td>provision (1) or not (0)</td>
</tr>
<tr>
<td>$p_s$</td>
<td>Sales representative (DSE) productivity</td>
<td>stores per day</td>
</tr>
<tr>
<td>$p_d$</td>
<td>Delivery boy productivity</td>
<td>stores per day</td>
</tr>
<tr>
<td>$p_m$</td>
<td>Merchandiser productivity</td>
<td>stores per day</td>
</tr>
</tbody>
</table>

**Table 8 Decision variables**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$d_o$</td>
<td>XYZ sales in base level scenario</td>
<td>INR per store per month</td>
</tr>
<tr>
<td>$f_0$</td>
<td>Store sales frequency in base level scenario</td>
<td>visits per month per store</td>
</tr>
<tr>
<td>$p_{s0}$</td>
<td>DSE sales visits per day in base level scenario</td>
<td>visits per day per DSE</td>
</tr>
<tr>
<td>$w_s$</td>
<td>Number of working days for sales representative (DSE)</td>
<td>days per month</td>
</tr>
<tr>
<td>$w_d$</td>
<td>Number of working days for delivery boy</td>
<td>days per month</td>
</tr>
<tr>
<td>$w_m$</td>
<td>Number of working days for merchandiser</td>
<td>days per month</td>
</tr>
<tr>
<td>$r$</td>
<td>Reduction and discount of XYZ sales to wholesaler</td>
<td>% of sales</td>
</tr>
<tr>
<td>$b$</td>
<td>Relative amount of deliveries that is returned</td>
<td>% of sales</td>
</tr>
</tbody>
</table>

**Base level and distribution model parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_m$</td>
<td>Coefficient for removing merchandiser $m$</td>
<td>% sales decrease</td>
</tr>
<tr>
<td>$\beta_{fi}$</td>
<td>Coefficient for increasing sales frequency $[f - f_0]^+$</td>
<td>% sales increase per visit</td>
</tr>
<tr>
<td>$\beta_{fd}$</td>
<td>Coefficient for decreasing sales frequency $[f_0 - f]^+$</td>
<td>% sales decrease per visit</td>
</tr>
<tr>
<td>$\beta_c$</td>
<td>Coefficient for sales increase due to credit $c$</td>
<td>% sales increase</td>
</tr>
<tr>
<td>$\beta_b$</td>
<td>Coefficient for reducing return bills $b$ due to credit $c$</td>
<td>% reduction of return bills</td>
</tr>
<tr>
<td>$\beta_w$</td>
<td>Part of sales increase for $f$ and $c$ that shifts from wholesaler</td>
<td>% of the sales increase</td>
</tr>
</tbody>
</table>

**Coefficients for effect design choices on sales**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$c_c$</td>
<td>Distributor cost of capital for providing credit</td>
<td>INR per INR per month</td>
</tr>
<tr>
<td>$c_{sw}$</td>
<td>Sales representative (DSE) wages</td>
<td>INR per month per DSE</td>
</tr>
<tr>
<td>$c_{so}$</td>
<td>Overhead allocated to sales, e.g. sales team leader</td>
<td>INR per month per DSE</td>
</tr>
<tr>
<td>$c_{dw}$</td>
<td>Delivery boy wages and truck rent for $p_d$ visits/day</td>
<td>INR per month</td>
</tr>
<tr>
<td>$c_{do}$</td>
<td>Overhead allocated to distribution for $p_d$ visits/day</td>
<td>INR per month</td>
</tr>
<tr>
<td>$c_m$</td>
<td>Merchandiser cost for $p_m$ visits per day</td>
<td>INR per month</td>
</tr>
<tr>
<td>$c_o$</td>
<td>Cost of other overhead, allocated to DSE</td>
<td>INR per month per DSE</td>
</tr>
<tr>
<td>$c_n$</td>
<td>Distributor net margin</td>
<td>% of sales</td>
</tr>
<tr>
<td>$c_f$</td>
<td>Fixed cost</td>
<td>INR per INR of sales</td>
</tr>
<tr>
<td>$c_p$</td>
<td>Production cost</td>
<td>% of sales</td>
</tr>
</tbody>
</table>

**Table 9 Input parameters**

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5.3. Parameter values

5.3.1. Base level and distribution model parameters

The base situation is the current distribution model for the 2BC3 or nanostores (section 3.4), which implies a sales frequency $f_0$ and number of sales visits per day $p_{sd}$. The number of working days per month are $w_s = w_d = w_m = 24$. Reduction of sales to wholesalers $r$ is several percent, consisting of lower prices and bulk discount.

The number of returned deliveries $b$ and sales per store per month $d_0$ have been based on empirical data, as discussed in section 4.2.4. For the number of returned bills, several percent is used since this was the case in the considered data.

Since average monthly sales per sales representative differs greatly from route to route, various values for base level sales $d_0$ have been used, e.g. to find the sensitivity of parameters to sales and draw conclusions on minimum sales levels to cover stores in a viable way.

The sales per store per month over the considered nanostores (channel 2BC3) in the empirical data set are in a range up to several thousand rupees.

5.3.2. Coefficients for effect design choices on sales

Estimations for coefficients that affect sales via design choices are given in section 5.4.3, alongside with a sensitivity analysis on their effects.

5.3.3. Cost parameters

The values for cost parameters (Table 11, Appendix) have been based on data of distribution plans, which XYZ creates together with the distributor, upfront and yearly, to make clear which number of stores should be visited for a certain amount of cost, in order for the distributor to attain a net margin of $c_n\%$.

Sales overhead per sales representative consists of a sales team leader (ratio), a one-day monthly meeting, and one PDA. Distribution overhead per delivery route consists of a logistics planner (ratio) and warehouse helper (ratio). Other overhead per sales representative comprises a systems FTE (ratio), cashier (ratio), sales manager (ratio), executive (ratio), invoice expense, computer and printer depreciation, and staff welfare.

Fixed cost is the sum of marketing, branch replenishment, warehouse rent, and some travel and awards, divided by the total amount of sales. Marketing comprises the greatest part of fixed cost.

Note that production cost comprises a substantial part of the total cost, hence real or erroneous small deviations in this number have a significant impact on profitability.
5.4. Results

5.4.1. Base level distribution cost structure

Based on the current cost parameters and design of the distribution model in the discussed quantitative model, profitably (margin greater than 0) covering stores starts from average sales per store per month of several euros.

Figure 29 (Appendix) shows how margin results from the XYZ sales per month per sales representative and its cost. It also shows the main cost drivers of the distribution part that this project focuses on. Sales cost make up approximately □□%, delivery □□%, and merchandising, administration and overhead □□%.

5.4.2. Influence of parameters on profitable coverage

Sales: threshold for required margin

Store sales obviously have a great influence on the ability to cover stores profitably. Costs to serve for a store at a moment in time are rather fixed, after which every additional product adds its gross margin (sales price less production cost) to profitability.

When increasing the number of stores covered by adding relatively smaller stores, the average profit margin will decrease, because the average sales per store drops while the distribution cost structure remains the same. This reduction in profit margin would not be undesirable, because the total absolute profit increases due to an increased volume (number of stores covered). The question is what the threshold of average store sales should be in order to cover them profitably enough.

Figure 17 answers this question and provides, for any required margin (percentage or absolute), the lowest average store sales ($d_o$) that are permitted to achieve at least this margin ($\pi$).

Figure 17 The average sales per store per month influencing margin (left: INR, right: %)

Wages and distribution cost: rising cost influences threshold

Figure 18 gives, by varying total variable cost ($C_v$), an upper bound for the effect of increased wages, and risen cost due to inflation, on the total margin per sales representative per month. Currently, □□% cost inflation is used as the number for next year’s plans. Figure 18 shows that it is important to yearly recalculate the lower bound of average sales needed to serve stores profitably. Note that the same macro factors that affect cost will most likely increase store throughput as well.
5.4.3. Influence of design choices and its coefficients on profitable coverage

For each design choice, it has been chosen to depict the effect of the coefficient for that design choice on the percentage point increase in margin. That choice has been made to show the fairest effects, since absolute margin differs for different sales levels and a relative percentage increase would magnify results for small base level margins.

Merchandiser: profitability especially sensitive for low average sales

Figure 19 shows that especially for the smallest stores it makes sense to remove the merchandiser ($m$). For stores with average sales of INR per month, removing the merchandiser can lead to a decrease in sales ($\beta_m$) of 11% and keeping the relative margin constant.

Relative amount of wholesale shift: great influence on perceived profitability

Little is yet known about the percentage of increase in sales that will decrease sales via wholesalers ($\beta_w$), apart from the fact that it will neither be 0% nor 100% (section 3.3). In the first place, increased direct sales may decrease sales via the wholesaler, because less resupply is needed. The shopkeeper might not have been able to buy all products via the direct channel due to cash constraints, and bought the rest of his needed inventory at the wholesaler. However, sales via the direct and wholesale channel are not a closed system and have various interactions. One example is that increased direct sales decrease out-of-stocks and increase visibility of products, which increase total sales, and also wholesale sales.

The most relevant point to be made is that the relative amount of wholesale shift has a great influence on the perceived profitability of design choices. Therefore, results for sales frequency and credit are depicted for the extreme values $\beta_w = 0$ and $\beta_w = 1$, i.e.
respectively: increase in direct sales is completely additional, and the complete increase in direct sales is decreased from the wholesale sales.

**Sales frequency increase: breaks even only when sales to store or sales representative’s visits per day increase with same ratio**

For sales frequency \( f \), an important distinction to be made is that between a change in sales frequency design, and a variation in sales frequency from that design (section 4.2.2).

From empirical data, where the latter happened, we know that for channel 2 stores the increase per visit (\( \beta_{f_1} \)) was \( \ldots \)% and for channel 3 stores, \( \ldots \)%. Most likely, there is little rationale behind these numbers, because of the lack of structure behind these visits.

Since there is a substantial correlation between the number of visits per day a sales representative makes \((p_v)\), and the sales frequency of the stores he visits \( (f)\), these two are taken together in Figure 20. Average monthly sales per store\(^{th} \) are kept constant.

![Figure 20](image)

**Figure 20** Change in margin depending on sales increase due to increasing the sales frequency from \( \ldots \) to \( \ldots \) for different number of visits per sales representative per day. Right \( \beta_w = 1 \), left \( \beta_w = 0 \).

The figure shows that a non-designed increase of sales frequency only starts to break-even when the number of visits per day a sales representative makes is increased in the same ratio as the sales frequency. If the number of visits per day increases relatively less than the sales frequency increases, the effect is a decrease in profitability.

When considering a design change in sales frequency, the projected sales increase is much higher. An extra visit could add up to \( 1/f_0 \) of sales, i.e. the current sales per bill. However, with a constant number of sales visits per day, that is also the lower bound to break even. Again, the sales should increase with the same ratio as the sales frequency. That makes also a design change in sales frequency not attractive. Note that again whether the sales shifts from the wholesale or consist of additional demand has a great influence.

**Sales frequency decrease: interesting when decreased sales to store shift to wholesale channel**

Empirical data showed that for a decrease in sales frequency \( (f) \) from \( \ldots \) to \( \ldots \), sales decreased \( (\beta_{f_1}) \) by approximately \( \ldots \)%\. This is a reasonable number and assumption, since it equals \( 1/f_0 \), the sales of one bill.

When the sales frequency and sales are halved, but as a consequence double the number of stores can be visited, the result would be flat. Figure 21 shows the
sensitivity of the margin for changes in $\beta_{fd}$ when sales frequency is decreased from $\beta_{w} = 0$ to $\beta_{w} = 1$.

![Graph showing change in margin](image)

**Figure 21** Change in margin depending on sales decrease due to decreasing sales frequency from 2 to 1 for different average sales per store per month (left $\beta_{w} = 0$, right $\beta_{w} = 1$)

Note the huge profitability increase when the decrease in sales due to a less visit shifts to the wholesale channel, which results from a practical halve in cost with the same sales (over the direct and wholesale channel combined).

**Credit and return bills: little financial return**

Figure 22 shows the effect of providing credit for different levels of resolving return bills ($\beta_{p}$) and increasing sales ($\beta_{s}$), on margin. Average monthly sales per store$^{6}$ are kept constant, and $\beta_{w} = 0$. The values for the coefficient of increased sales have been based on the similarities with sales frequency. It is shown that resolving return bills alone adds very little value if combined with credit. The reason for this effect is that credit costs over all sales are close to the gross margin over only the return bills$^{6}$. Gross margin is taken for the costs of return bills since for a return bill, all distribution cost are made but the product is not sold. In practice the costs might be slightly higher due to handling of the return bills.

![Graph showing change in margin](image)

**Figure 22** Change in margin depending on the percentage of return bills resolved due to credit provision, for different levels of sales increase due to credit provision

**Sales representative number of visits per day: most substantial driver of its total profit**

Figure 23 shows the deviation of margin when a sales representative visits less or more than the current 3 visits per day ($p_{e}$). This impact is substantial and more relevant for smaller stores. This great impact results from the fact that the number of visits per day does not influence the sales per visit (section 4.2.2), hence one third less visits means one third decrease in sales per sales representative. The effect on margin is larger for smaller stores because the margin per store depends on how many stores you can visit. For smaller stores, with smaller margin, that effect is absolutely similar but relatively larger.
5.4.4. Interactions and trade-offs among variables

Amount of store sales needed depending on the number of visits per day a sales representative can conduct in a certain area

Figure 24 shows, for different fixed profit margins (\(\pi\)), how the average sales per store needed in a sales route (\(d_0\)) depends on the number of sales visits per day a sales representative can do (\(p_{50}\)). This is for example relevant in rural areas where the distance between stores is larger, or, on the other hand, in highly dense areas where more visits per day can be conducted. It shows that sales have to be substantially higher when fewer stores can be visited per day.

Figure 24 Average sales per store per month needed, depending on the number of visits per sales representative per day, for different fixed profit margin percentages

Number of visits per sales representative per day needed depending on the sales frequency per store per month

Figure 25 shows for a fixed average sales per store (\(d_0\)), fixed profit margin (\(\pi\)), fixed effect for sales frequency decrease (\(\beta_{fd} = 50\%\)), but for different effects of a sales frequency increase (\(\beta_{fi}\)), how the number of visits per day (\(p_{50}\)) is dependent on sales frequency (\(f\)).

When changed sales shift to or from the wholesale channel (left), the figure shows that it is practically impossible to increase sales frequency and keep the profit margin constant by visiting more stores per day. When changed sales does not shift to or from the wholesale channel (right), one can make a trade-off if one wants to increase sales frequency by visiting more stores per day, depending on the effect of increased sales frequency.
Figure 25 Number of visits per sales representative per day depending on sales frequency, for different effects of sales frequency increase (left: $\beta_w = 1$, right: $\beta_w = 0$)

**Sales increase needed depending on cost inflation**

Figure 26 shows how the average sales per store per month ($d_0$) need to increase for a certain increase in variable cost ($C_v$). The figure shows that the effects go pretty much along, i.e. when sales increase with the same percentage as cost, profit margins remain approximately the same.

Figure 26 Sales increase needed depending on cost increase, for different fixed profit margin percentages
6. **Conclusions and recommendations**

This section denotes the conclusions and recommendations of this master thesis project, mainly based on the analyses that have been discussed in the previous two sections. Section 6.1 lists the main recommendations of the thesis, and discusses its supporting conclusions. Section 6.2 entails the contribution of this thesis to literature after which section 6.3 will give some recommendations for further research, which are both academically and practically relevant.

6.1. **Design recommendations and conclusions**

The results of this project show that 1) many currently uncovered urban stores could be profitably covered using the current distribution model, 2) the efficiency of the model execution can be increased in order to cover smaller stores with the same cost, and 3) an additional low cost model is proposed to increase coverage even further to the smallest nanostores. The corresponding recommendations are now discussed one by one, supported by their conclusions.

6.1.1. **Recommendation 1: Determine a sales threshold corresponding with a lower bound profit margin, implying the allowed increase in number of stores covered**

**Conclusion 1.1: Average sales to stores can be decreased by adding lower-throughput stores, which lowers profit margin but increases total profit due to increased volume**

In recent years, the number of stores covered has been consciously kept constant, because the last increase had increased distribution cost as a percentage of sales. Obviously, when sales of the added stores are smaller than the current average sales per store, the profit margin decreases. However, total profit in absolute terms grows. It does not really matter how small individual stores are, as long as the average sales per store are higher than a certain threshold that makes distribution profitable.

Using the Excel implementation of the quantitative model, which is proposed in this thesis, one can easily read the sales threshold given the actual distribution model and required lower bound of profit margin. More specifically, a profit margin of \(x\%\) requires average sales per store per month of \(y\) (Figure 17). The current average sales per store of the considered nanostores (channel 2BC3 in XYZ terms) more than doubles the sales threshold for a profit margin of \(\frac{1}{2}\%\). Hence, there is ample room to decrease the average sales per store by covering more (smaller) stores.

**Conclusion 1.2: The sales threshold is subject to changing distribution cost, and most sensitive to the sales representatives' efficiency and the store's sales frequency**

Given India’s rapid economic growth and the corresponding increase in wages and purchasing power, both store sales and distribution cost rise substantially. Therefore it is important to recalculate the needed sales threshold to profitably supply stores, on a yearly basis. Again, one could use the Excel model, and change the input parameters. Furthermore, the results of the model have shown how changes in the distribution model's design influence profitability. The most influential factors, next to variable cost, are a sales representative’s number of visits per day and the monthly sales frequency per store.

An increase in the number of visits sales representatives (can) make per day linearly increases profit. This is due to the fact that the sales per bill have shown not to suffer
from a sales representative that makes more visits per day than others. When the number of visits per sales representative per day is kept constant, an increase in the monthly sales frequency of stores decreases the number of different stores that can be visited with the same ratio. Therefore, if one wants to increase sales frequency to stores, this is only possible without decreasing profit when either the number of sales visits per day or the monthly sales per store increases with the same ratio.

A final remark on factors influencing profitability has to do with the interaction between sales via the direct and indirect channel. A store typically buys its inventory via direct sales visits, conducted by an exclusive distributor, and from a wholesaler, which is a somewhat larger store that is also supplied by the distributor. When sales via the direct channel increase or decrease, this affects sales via the indirect channel. Therefore, both channels should be taken into consideration when deciding on the results of pilots for changes in the distribution model.

6.1.2. Recommendation 2: Increase the sales representatives’ adherence to the distribution model and improve the distribution model systematically

**Conclusion 2.1: Substantial variation in sales representatives’ number of visits per day provides opportunities for increased efficiency by discussion and stricter execution**

Currently, the average number of bills per sales representative per day varies between ☐ and ☐, while the design prescribes ☐. Since the number of bills per day does not correlate with the size of these bills, this leads to a substantial variation among the profit that sales representatives bring in. Therefore priority should be with making as many visits per day as possible without compromising severely on the relationship with the shopkeeper. It has been argued that the reason for this effect is that the size of the bill is determined based on the nanostores’ inventory, rather than the effort of the sales representative.

The variation in the number of visits per day seems to be a result from a sales representative’s personal choices, such as spending more time in stores to sell more, or visiting more stores per day. The monthly meeting with sales representatives is a great opportunity to discuss these choices and distil and apply the most effective ones generally. Points for discussion include at least the variation among sales representatives in terms of number of bills per day, number of bills per store per month, number of negative bills, number of small bills, and the balance between the number of visits and the relationship with shopkeepers.

A more rigorous way to increase the number of stores covered by reducing the variation among sales representatives is to put more attention to a strict execution of the distribution model. It seems reasonable to request sales representatives to hold on to their daily store list, while extreme methods include blocking PDAs of sales representatives when they do not follow the prescribed route. In either way it is important to keep up discussions, as sales representatives are the ones actually executing the distribution model and might have ideas to improve it.

**Conclusion 2.2: Sales representatives that make more visits, visit the same stores more often, which provides an opportunity to increase effectiveness by changing incentives**

Besides the variation among sales representatives, the total number of visits per day also goes up during the month. Sales representatives on average make one third more visits in the last week of the month versus the first week. This seems to be a result from the current incentive structure, which leads to sales representatives that want to
make additional visits to achieve their monthly sales targets. The problem is that these visits are made to already covered stores instead of additional stores. The additional visits are unstructured and comprise third, fourth or even more visits to a store, while the design for example prescribes two. This results in relatively more too small bills, because a shopkeeper might just have replenished at the wholesaler when he did not expect a sales representative.

As argued in conclusion 1.2, increasing sales frequency only makes sense financially, when either the number of visits per day per sales representative or the sales per store increase with the same ratio. Hence, for example, making a third visit should at least result in the same bill size as the first two. If that is thought to be possible for specific stores, the store should be upgraded to a different channel with a higher designed sales frequency. If not, the current additional visits should be used to cover more new stores.

If the goal is to increase the number of stores, the number of stores covered should also be reflected in the sales representatives’ targets. Only a sales target is not enough, because stores might not have the required amount of sales today, but are going to be larger in the future and shelf space should be secured today, or they just need to be covered in order to increase volume or market penetration. If there are currently uncovered stores with higher sales than the current average sales per third or fourth bill, another change to the incentives could be to include a relatively high fixed sales target for all bills. This would incentivize searching for new stores instead of focusing on smaller additional bills for currently covered stores.

**Conclusion 2.3: The distribution model could be improved by benchmarking across countries, and by more systematic data collection of pilots and current execution**

It has been shown that there is much variation in the execution of the distribution model, and local circumstances differ substantially. Therefore, it could be a good idea to benchmark distribution model variables among different countries and, for large countries such as China and India, parts of countries. For each range of sales per store, variables to benchmark could be the actual average number of sales visits per day, deliveries per day, sales frequency to stores, credit provision, and merchandiser visits. This alone would most likely be very interesting, but including distribution cost parameters would show even more opportunities for efficiency improvement. The Excel implementation of the model could help to create a coherent image per country.

Furthermore, it turned out that previous undertakings such as pilots could have been used more effectively with relatively little extra effort. They have been very useful to conduct analyses, but more data would have made stricter conclusions possible. In the case of the phone sales pilot, one could think of scoring the number of attempts to call a shopkeeper in order to draw the conclusion that he could not be reached. For the more visits per day pilot, in one branch the number of visits did not increase at all. Knowing why this happens is really useful to execute future pilots more effectively and improving the current situation by understanding it. Additionally, the proposed Excel model could be used to find out which pilot would have the highest projected impact.

Finally, in the default situation, it would be useful to ask delivery boys and sales representatives to score the nature of return bills and really small bills. That information could be used to decrease the number of these unprofitable bills. For example, if it is known that many deliveries are returned because the shopkeeper cannot pay, one could try to find a solution for that specific problem, such as credit. If many deliveries are returned later because the products are not sold, that is a different
problem to be sold. Small bills could be the result of unstructured additional visits to the same stores as well as subsequent deliveries. A possible reason for the latter is that inventory information during sales visits is not real-time. Sales representatives can sell the same inventory, and the branch is not yet replenished before the next-day delivery. Before sales representatives’ PDAs are equipped with 3G and inventory information is made real-time, it should be made sure that this actually solves the right problem.

6.1.3. Recommendation 3: Pilot a low-cost model for the smallest nanostores in order to lower the sales threshold and expand the number of stores covered even further

Conclusion 3.1: Simple distribution model adaptations reduce sales threshold for profitable coverage by almost %

The sales per store threshold for viable coverage decreases when distribution costs are decreased. Three reasonable adaptations are considered: removing the merchandiser from the distribution model, reducing sales frequency from two times per month to once per month, and designing sales representatives to conduct visits instead of sales visits per day. Making these changes would reduce the sales per store needed for profitable coverage by . This makes it possible to increase coverage to even smaller stores that are currently considered unprofitable to supply.

Removing the merchandiser makes sense since it is not expected to decrease the sales more than its cost, specifically due to the stores’ small size. Regarding sales visits, currently some sales representatives already make visits per day. As discussed in conclusion 2.1, they seem to make different choices regarding the number of visits per day and time they spend in stores. Definitely for small stores, it is therefore thought to be reasonable to visit stores per day. The reasoning behind decreasing sales frequency is elaborated on more extensively in the next conclusion.

A separate pilot that could be considered is providing credit. This decreases the probability that a shopkeeper cannot pay at the moment of delivery, a phenomenon that results in orders that are immediately returned. However, reduced inefficiencies alone are not likely to provide many financial benefits over the cost of credit. If providing credit would also increase sales, due to increased visibility and reduced out-of-stocks, credit provision becomes interesting. It also adds to social responsibility since it helps shopkeepers with their cash problem. A pilot would give a definite answer on the considered effect.

Conclusion 3.2: For the smallest nanostores, direct coverage is important, but multiple visits add little value

Typically, for XYZ, direct coverage in addition to indirect coverage increases the total XYZ sales of a store by a factor . Among other things, this makes it important to make a direct visit to a store, in addition to already occurring sales of that store via the wholesaler. The sales increase mainly result from broadening the stores’ (XYZ) assortment. This is however a one-time effect, as it turns out that selling more SKUs after the initial phase is not correlated with spending more time in the store. Combined with observations, this implies that the main goal of a direct sales visit is not to ‘sell’, but rather to replenish (conclusion 2.1).

Due to cash constraints, shopkeepers buy only several days of needed inventory a time. They restock at the wholesaler, where they need to go anyway because not every manufacturer makes direct sales visits. The shopkeeper will most likely buy more of his XYZ products there, when he is visited only once instead of twice. There will be
some decrease in total XYZ sales for that store, because of increased out of stocks and decreased visibility, but this effect will be far outnumbered by being able to double the number of stores visited per sales representative per month.

6.2. Contribution to literature

The first contribution of this thesis is an understanding of the distribution model of one of the world’s largest consumer packaged goods manufacturers to nanostores in India, in several dimensions: a process view of the distribution model itself, the cost to serve, and the way execution differs from design in both pilots and the default situation. These points are merely made in section 3 and 4.

The second contribution is a new quantitative model of the distribution model to nanostores. As far as the author and supervisors know, this is the first attempt in its field. It has made a balance between fitting the specific reality and remaining generally applicable. The model is useful for evaluating the impact of distribution model design changes on store sales and distribution cost. The results show both the sensitivity of these design choices and trade-offs between them.

6.3. Research recommendations

Since this thesis is one of the first in this research area, both for the university and XYZ, still many directions for (joint) follow-up research exist. Three interesting avenues in the area of distribution models to nanostores in emerging megacities are listed below.

There is also an opportunity in rural stores (section 3.1.3), which could be a direction for future research as well.

**Optimizing sales routes and sales representatives’ efficiency**

This thesis already makes some points on efficiency improvements, but it is suggested that there could be achieved more in this area.

First, the current situation can be investigated in a semi-qualitative way, by joining sales representatives while visiting stores, observing and clocking them, and conducting interviews with them. This would most likely show differences among sales representatives, drivers for productivity and opportunities for efficiency improvement.

Second, quantitative modelling using static or dynamic geocode data could be done in order to design optimal sales routes. Hereby the current efficiency and capacity can be taken into account. The routes could be sophisticated and dynamic, for example in the sense that it might be better to visit some larger stores in the same route more times per month than other stores.

For both of the previous points it is interesting to benchmark the results over countries and companies. Also within XYZ it would be very interesting to see the differences in for example the average and variation of the number of visits per sales representative day over different countries.

**Interaction between direct and wholesale sales**

The interaction between direct sales visits and indirect sales of nanostores via wholesalers remains complex and interesting. Here it is very important to retrieve relevant data, which might be qualitative and obtained in the local market. Some ideas are studying a small sample of stores and ask the shopkeepers for their bills at
wholesalers, or a larger survey that includes questions about for example the frequency of replenishments, importance of consumer requests for products, and the impact of promotions on shopping behaviour at wholesalers. Quantitatively, geocodes could be used to couple nanostores and their wholesalers geographically. The interaction of store sales and wholesale sales could be studied, taking into account various design choices in the direct distribution model.

Impact of store environment, characteristics and growth on profitable coverage

More data on the store and the area where a store is located could help to explain a greater deal of variation in store sales and distribution costs. For example, store density (not only covered stores), distance to branch, store size (e.g. surface or total/category throughput), store assortment, population density, and income per capita – all on a local level. Furthermore, in this highly dynamic environment, it would be interesting to study effects over time. Stores continuously grow, both in individual size and in their number. Distribution models might be adjusted for increasing store sales or covering a store today that might become profitable in the near future.
7. References


8. **Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tr>
<td>2BC3 channel</td>
<td>XYZ’s customer classification that corresponds with nanostores</td>
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<tr>
<td>ACV</td>
<td>All Commodity Volume</td>
</tr>
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<td>Direct coverage</td>
<td>Stores that are visited by an exclusive XYZ distributor</td>
</tr>
<tr>
<td>DSE</td>
<td>Direct sales employee, XYZ’s term for sales representative</td>
</tr>
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<td>HFS</td>
<td>High frequency store, XYZ’s term for unorganized retail incl. nanostores</td>
</tr>
<tr>
<td>Indirect coverage</td>
<td>Stores that buy XYZ products at wholesalers</td>
</tr>
<tr>
<td>INR</td>
<td>Indian rupee. EUR 1 ≈ INR 78.49 (21 June 2013)</td>
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