A comprehensive guide to Reproductive Health Commodity Security:

mapping and analysis of the supply-chain and suggestion for improvements

Joakim Kembro I-01
790814-4137
kembro@unfpa.org
Joakim.Kembro@unfpa.dk
Preface

This master thesis was mainly written during the summer of 2005 at UNFPA in New York, USA. It is a thesis with dual purposes, whereas one of them is slightly more advocating than the other. Firstly, and most significantly, the thesis strives to suggest improvement guidelines for UNFPA and countries building capacity related to the area of supply chain management. Secondly, it has been a chance for me to learn, and also to get others at UNFPA involved in Reproductive Health Commodity Security (RHCS) and its denotation; because RHCS is, or, let me rephrase, has been an expression used by many yet comprehended by few, including myself!

As a matter of fact, I have spent most of the summer 2005 discussing reproductive health, condoms and peoples’ sexual habits. This summer has been tremendously rewarding, in many ways, and I sincerely wish for another opportunity to work within the UN again, will it be condoms or not.

At this point I would like to mention Eva Weissman, who has been an excellent mentor at UNFPA and moreover provided me with substantial input to the area of reproductive health and other issues related to the thesis; plus, I must say, an abundance of good laughs in between the serious parts. Also, Everth Larsson, my professor and tutor at Lund Institute of Technology, has assisted and guided me in the process of writing this thesis; especially in the cases of selecting focus and finding literature relevant to the context of supply chain management.

Thank you!
Summary

Title: A comprehensive guide to Reproductive Health Commodity Security (RHCS): mapping and analysis of the supply-chain and suggestion for improvements

Author: Joakim Kembro

Tutors: Everth Larsson, Department of Industrial Management and Logistics, Lund Institute of Technology
Eva Weissman, Costing Unit – a branch within the Technical Support Division, UNFPA

Purpose:
The purpose of the thesis is to map and analyze the UNFPA supply chain of reproductive health commodities at the global and local level. The global supply chain is comprehensively applicable while the local supply chain is based on a case study on one country involved in the progression of RHCS.¹

The mapping and analysis, apart from giving insight to the contraceptive supply chain of UNFPA, is used as a foundation on which suggestions to improvements are given. The suggestions are meant to serve as guidance for developing countries on how UNFPA headquarter and country-level representatives can proceed with logistics management in order to enhance RHCS.

Problem statement:
With reference to the purpose and focus of the thesis the problem statement is as follows: How can the forecasting tool be modified and what actions need to be taken to create a stimulating environment for the purpose of enhancing RHCS?

Conclusions:
Some of the most important recommendations given in this thesis are, as concluded from the analysis:

- Increase collaboration between UNFPA and other contraceptive distributors. Share information, ideas and progress on how to improve forecasting and distribution. A first step could be to establish a database with all historical distribution and consumption data of UNFPA gathered in one place. Also, it is of greatest importance to build further on the initiative of the RHInterchange and thereby extend the database to include all the major contraceptive distributors.

¹ Reproductive Health Commodity Security (RHCS) is defined as "All individuals can choose, obtain and use affordable, quality reproductive health commodities, whenever they need them."
Advocate a stimulating financing environment, which allows for strategically longer planning periods. This action would encourage UNFPA and country governments to start building capacity such as investing in divisions for procurement, forecasting and quality testing.

Enhance coordination between financing, procurement planning and forecasting. Integration of these three functions could prove to be prosperous for UNFPA, for example by achieving benefits through economy of scale.

Transparency of data and information is of uttermost importance and clear guidelines must be implemented so that historical data is saved for future consumption calculations. This would imply the possibility of using moving averages as a part of the Country Commodity Manager, which in turn could lead to a situation where UNFPA takes a leading position of forecasting contraceptive commodity consumption.

Recent findings

Due to continuous development of the UNFPA supply chain some changes to the warehousing structure in Bangladesh have taken place during my writing the thesis. These changes are briefly presented in the end of the thesis, directly under the conclusions chapter.
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<td>CCM</td>
<td>Country Commodity Manager</td>
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<td>CMB</td>
<td>Commodity Management Branch</td>
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<td>CO</td>
<td>Country Office</td>
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<td>CPR</td>
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<td>CPT</td>
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<td>CU</td>
<td>Costing Unit</td>
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<td>CYP</td>
<td>Couple Year Protection</td>
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<td>DFP</td>
<td>Director of Family Planning</td>
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<td>ECOSOC</td>
<td>Economic and Social Council</td>
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<td>EMA</td>
<td>Exponential Moving Average</td>
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<td>FEO</td>
<td>First to Expire First Out</td>
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<td>FPLM</td>
<td>Family Planning Logistics Management</td>
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<td>GCCP</td>
<td>Global Country Commodity Programme</td>
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<td>HIV</td>
<td>Human Immune Deficiency Virus</td>
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<td>ICPD</td>
<td>International Conference on Population Development</td>
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<td>International Planned Parenthood Federation</td>
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<td>IUD</td>
<td>Intra Uterine Device</td>
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<td>KfW</td>
<td>the German Government Aid Bank</td>
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<td>LMIS</td>
<td>Logistics Management Information System</td>
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<td>MMR</td>
<td>Maternal Mortality Ratio</td>
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<td>MOHFW</td>
<td>Minister of Health and Family Welfare</td>
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<td>NGO</td>
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<td>NIPHP</td>
<td>National Integrated Health and Population Programme</td>
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<td>PoA</td>
<td>Programme of Action</td>
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<td>RFI</td>
<td>Request for Information</td>
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<td>Reproductive Health</td>
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1 Introduction

This chapter is an introduction and overview to the thesis where the background, including problem analysis, purpose, focus and delimitations, is described. In addition, a short but yet complete description of the United Nations Population Fund is presented initially.

1.1 UNFPA

The United Nations Population Fund (UNFPA) began operations in 1969 as the United Nations Fund for Population Activities. UNFPA is the world's largest international source of funding for population and reproductive health programmes. Since the Fund was established in 1969 it has provided approximately $6 billion in assistance to developing countries.2

1.1.1 UNFPA in the UN system

UNFPA was originally administered by the United Nations Development Programme (UNDP). In 1971, the United Nations General Assembly designated UNFPA to play a leading role in the UN system in promoting population programmes.

A year later, in recognition of the growth in its resources and scope of its operations, UNFPA was placed under the UN General Assembly's direct authority, raising it to the same status as UNDP and UNICEF. The UNDP Governing Council was named as its governing body, subject to overall policy guidance of the Economic and Social Council (ECOSOC), which provides policy guidance and ensures that the policies of the General Assembly are implemented.3

1.1.2 Organization overview

UNFPA works closely together with governments and non-governmental organizations (NGOs) in well over 140 countries, at their request, and with the support of the international community. The Fund supports programmes that help women, men and young people:

- Plan their families and avoid unwanted pregnancies
- Undergo pregnancy and childbirth safely
- Avoid sexually transmitted infections (STIs) - including HIV/AIDS

Moreover, UNFPA assists governments in the world's poorest countries to formulate population policies, strategies and procedures in support of sustainable development.

UNFPA's work is guided by the Programme of Action (PoA) adopted by 179 governments at the International Conference on Population and Development (ICPD) in

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2 http://www.unfpa.org/about/index.htm 2005-06-15
3 http://www.unfpa.org/about/unsystem.htm 2005-07-01
1994. The conference agreed that meeting people's needs for education and health, including reproductive health, is a prerequisite of sustainable development. The main goals of the PoA are:

- Universal access to reproductive health services by 2015
- Universal primary education and closing the gender gap in education by 2015
- Reducing maternal mortality by 75 per cent by 2015
- Reducing infant mortality
- Increasing life expectancy

These goals were refined and amplified in 1999 in a programme which has been named ICPD+5. One of the most important additions concerned HIV/AIDS:

"HIV infection rates in persons 15-24 years of age should be reduced by 25 per cent in the most-affected countries by 2005 and by 25 per cent globally by 2010."

1.1.3 Structure of UNFPA

UNFPA is headed by the Executive Director, who is appointed by the Secretary-General for a four year term. As shown in Appendix I, there are a number of different branches and divisions within UNFPA. The thesis was written in relation to the aims of the Commodity Management Branch (CMB) branch, which in line with the structure chart is a part of the Technical Support Division (TSD).

To further specify this somewhat complex structure of UNFPA, it is pointed out in the chart that the Reproductive Health (RH) division consists of the CMB, and as part of this branch, the Costing Unit (CU) works with calculating future estimated costs of reproductive health related work. As a matter of fact CMB has recently been moved out of the RH branch and thus gained the status of being a separate division within the TSD. Furthermore, CU might become a separate branch in the future, directed by its own management and budget. This speculation is significantly based on the fact that the CU, in reality, provides services not only for the CMB, but also for all the different branches within the TSD.

TSD works on a continuous basis with all the four different geographical divisions. Also, the different branches within the TSD are collaborating on a daily basis. As of today, these divisions including Human Resources and the finance department are gathered in New York. However, with reference to an action plan of regionalization, most of UNFPA headquarter will be moved abroad. Each geographical division will be placed in its respective region and the other functions, for example financing, will probably be placed in one of the local offices.

4 http://www.unfpa.org/icpd5/icpd5.htm 2005-06-16
5 UNFPA has local offices in Copenhagen, Brussels, Geneva and Singapore.
1.2 Background

The term Reproductive Health Commodity Security (RHCS) was first mentioned and became a priority area for UNFPA at the International Conference on Population and Development (ICPD) in Cairo in 1994. The definition of RHCS is:  

“All individuals can choose, obtain and use affordable, quality reproductive health commodities, whenever they need them.”

At the ICPD, as mentioned earlier, 179 countries agreed on meeting an ambitious goal: universal access to reproductive health care by 2015. This initiative was based on a recognition that demand far exceeds supply, and inadequate systems of logistics and health care leave many people vulnerable to for example unwanted pregnancies and sexually transmitted infections (STI) including HIV/AIDS.  

As shown in Figure 1, contraceptive costs for 2005 are approximately $1.1 billion and total estimated contraceptive requirements grow rapidly. Going back to 2003, donors provided only $209 million in 2003 for contraceptives. If donors had complied with the ICPD commitment of one third cost sharing, their share should have been $376 million, which calculates a shortfall of $167 million in 2003.

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Figure 1 – Donor support report (given in $ million), UNFPA 2003

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6 Benedict Light 2005-06-06  
7 http://www.unfpa.org/icpd/icpd.htm 2005-06-15  
8 Donor support report, UNFPA, 2003
As of 1 May 2005, data shows that for the 70 countries that have submitted information on the current 12-month RH commodity projected shortfalls total US$100 million. (In Sub-Saharan Africa, 28 countries require US$46 million; in Arab States and Europe, 11 countries require US$3 million; in Asia and Pacific, 23 countries require US$39 million; in Latin America and Caribbean, 8 countries require US$12 million).9

Moreover, UNFPA estimates that every $1 million shortfall in contraceptive supply assistance can lead to 360,000 more unwanted pregnancies; 150,000 additional induced abortions; 800 maternal deaths; 11,000 infant deaths; 14,000 additional deaths of children under 5. Combining these facts calls for global action; this is why RHCS has become and will continue to be one of the primary areas of UNFPA.10

1.2.1 Problem analysis

In 2004 US$ 75 million was pledged, from a number of European Union member states, the European Commission and the government of Canada, by UNFPA to fill part of the global reproductive health commodity gap (90 percent) and to strengthen country capacity development in RHCS (10 percent). To manage these funds, UNFPA established the RHCS Thematic Trust Fund with the purpose of motivating countries to start building or merely start up the process of discussing how to achieve long-term national capacity and create sustainable solutions for RH commodity supply.11

However, as of June 2005 many countries, especially outside of Africa, solely handled short-time commodity requests without sufficient plans for long-term capacity building and sustainability. There could be many tentative explanations to why this situation has arisen. One is lack of commitment and supportive environment at country level. Another one is lack of coordination. Amongst all the possible reasons there is one that would explain all the other – the lack of a clear and concrete guide on how to actually achieve RHCS.

In order to continue to create an environment for the countries to achieve RHCS, UNFPA recently created a document called Global programme to enhance RHCS, which is a formal request to the donor community to:

- Provide a minimum of US$150 million per year for an initial period of five years (extendable on a rolling basis for a further five years to cover the period up to 2015).
- Ensure that developing countries build the necessary capacity for sustainable RHCS; and that immediate shortfalls are avoided through the provision of reproductive health commodities.

The purpose of the global programme proposal is to build on the work made possible by the RHCS Thematic Trust Fund which itself sought to build on earlier UNFPA efforts in the area of RHCS. Though, as indicated before, the work that has been carried out with the TTF can be developed further in order to achieve and improve global RHCS.

9 Global programme to enhance RHCS, UNFPA, 2005
11 Thematic Trust Fund, UNFPA, 2005
It is in this context, where a modified and enhanced approach to RHCS could prove useful, that the thesis serves a purpose. With the aim of making RHCS more concrete and understandable the thesis will complement the document *Global programme to enhance RHCS* in order to:

- Help promote strategic international support for RHCS.
- Secure more regular and dependable funding flows necessary to undertake the multi-year plans required to enhance capacity and facilitate development of sustainable procedures and mechanisms to achieve durable RH commodity security at the national level.
- Facilitate increases in national domestic financing for RHCS in developing countries.\(^\text{12}\)

### 1.2.2 Purpose

The purpose of the thesis is to map and analyze the contraceptive supply chain of UNFPA at the global and local level. The global part of the supply chain is comprehensive whereas the local supply chain is based on a case study on one country involved in the progression of RHCS.

The mapping and analysis is, apart from giving insight to the entire contraceptive supply chain of UNFPA, used as a foundation on which suggestions to improvements are given. The suggestions are meant to serve as guidance, for UNFPA headquarters as well as country-level representatives, on how to proceed with logistics management in order to enhance RHCS.

### 1.2.3 Focus and delimitation

The support to national efforts to achieve RHCS is to use an integrated and systematic approach. The elements of the interventions at the national level are to come within the following 3 broad categories, as stated in the document *Global programme to achieve RHCS*:

- Ensuring the secure **supply** of RH Commodities: immediate RH commodity needs met systems; capacity enhancement in areas including forecasting, procurement, logistics, LMIS, distribution, storage, transportation, etc. *Strong emphasis is to be on national capacity enhancement and the development of sustainable national systems, procedures and mechanisms.*

- Development of an **enabled environment** at the national level: Promoting RHCS in policy dialogues and development frameworks; advocacy (and resource mobilization); eradicating obstacles (physical, legal, cultural, etc.) to RHCS at national level.

- Ensuring **access and demand** are met (and, where necessary, increased) for RH Commodities: social marketing and insurance, market segmentation and cost recovery strategies. *Strong emphasis is to be on the development of a total market*

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\(^\text{12}\) Global programme to enhance RHCS, UNFPA, 2005
approach (encompassing cost recovery and market segmentation strategies) that ensures access is maximized through cross-subsidization of RH commodities made available at no or minimal price for those least able to pay.

As outlined in the purpose description the thesis will be focused on the supply issues only. The areas of enabled environment and access and demand are yet to be analyzed and dealt with by the CMB and UNFPA in the future. Moreover, considering the supply chain, the focus has been narrowed down to a thorough study of the forecasting function, which provides a crucial instrument with dual purposes:

- Provide information on how many contraceptive commodities are being consumed in the future. This kind of data can help country offices and the global procurement unit to ameliorate processes such as planning, ordering and distribution in order to prevent shortfalls and expensive emergency deliveries.
- Advocate the participation and collaboration of donors to empower multi-year support plans.

Another delimitation, which requires to be commented, is the fact that the study is based on merely one country’s supply chain. The reasons for this choice are to keep the size of the thesis to a reasonable level together with the fact that the focus of the thesis, i.e. the forecasting mechanism, is more or less extracted from being country specific. The latter reason will be discussed more in the method chapter.

1.3 Problem statement
With reference to the purpose and focus of the thesis the problem statement is as follows: How can the forecasting tool be modified and what actions need to be taken to create a stimulating environment for the purpose of enhancing RHCS?

1.4 Structure of the report
The structure of the thesis is based on a fairly common and often used structure of writing reports, see Figure 2. As such, a chapter on method, describing the main ideas of the study approach, is given initially to provide the reader with an insight to which research approach has been used; knowledge about the case study method; how data has been collected; how the data has been analyzed; and what could be expected from the report with consideration to the research quality.

Figure 2 – Structure of the report
The next three chapters are the main chapters of the thesis and, hence, form an essential base for the substance of the thesis. As seen in Figure 2, the chapters are theory; empirical studies; and analysis. In the theoretical chapter several sources of input to, for example, logistics, supply chain management and also forecasting are given. Chapter 4, the empirical studies, is presented after that. In this chapter the reader will be able to follow a complete mapping and description of the contraceptive supply chain at the global as well as the local level. After giving a broad description of the supply chain the forecasting function of UNFPA is described in more depth.

As chapter five of the report, the analysis is carried out as a process where the empirical studies are compared with the theoretical framework. This comparison will in the final chapter, the conclusion, lead to suggestions for improvements, which aim to answer the question given in the problem statement.
2 Method

The method chapter gives a description how the research of the thesis has been carried out and how data has been collected and analyzed. In addition, since the thesis partly is based on a case study method, a sub chapter has been assigned to this area. This chapter is, because of the aforementioned reasons, very important for the report as it gives the reader the possibility to evaluate how reliant and qualitative the conclusions are.

2.1 Research approach

A positivistic approach implies that reality is objective, tangible and also subject to be fragmented. This form of progression appears to be very popular and predominant in logistics research, potentially because of the fact that positivistic findings are viewed as time-free and context independent. Moreover, the approach stands for a common understanding that causal relationships can be discovered.\(^{13}\)

However, the positivistic approach is not the only way of conducting research. In an article from 2003, Britta Gammelgaard says: “If one looks beyond the positivistic approach, other perceptions of research and reality will be discovered and hence questions that can and should be asked and answered.” To build further from this statement, Arbnor and Bjerke present three alternative approaches in their methodological framework. As seen in Table 1, these are: analytical approach; systems approach; and actors approach. According to Gammelgaard, this framework comprises the systems approach as a methodology in line with positivism. And, as systems thinking plays an essential role in logistics, it is a major advantage in the analysis of logistics research.\(^{14}\)

<table>
<thead>
<tr>
<th></th>
<th>Analytical approach</th>
<th>Systems approach</th>
<th>Actors approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theory type</strong></td>
<td>Determining cause-effect relations. Explanations, predictions. Universal, time and value free laws</td>
<td>Models. Recommendations, Knowledge about concrete systems</td>
<td>Interpretations, understanding, Contextual knowledge</td>
</tr>
<tr>
<td><strong>Preferred method</strong></td>
<td>Quantitative (qualitative research only for validation)</td>
<td>Case studies (qualitative and quantitative)</td>
<td>Qualitative</td>
</tr>
<tr>
<td><strong>Unit of analysis</strong></td>
<td>Concepts and their relations</td>
<td>Systems: links, feedback mechanisms and boundaries</td>
<td>People – and their interaction</td>
</tr>
<tr>
<td><strong>Data analysis</strong></td>
<td>Description, hypothesis testing</td>
<td>Mapping, modeling</td>
<td>Interpretation</td>
</tr>
<tr>
<td><strong>Position of the researcher</strong></td>
<td>Outside</td>
<td>Preferably outside</td>
<td>Inside – as part of the process</td>
</tr>
</tbody>
</table>

\(^{13}\) Gammelgaard B. 2003, p 479

\(^{14}\) Ibid, p 480-481
2.1.1 The analytical approach

According to the analytical approach, there is an objective reality, in which patterns and causal relations can be investigated and disclosed through research. The researcher must stay outside the research object and refrain from interacting with it to avoid exerting an influence on the object and thus distort the reality he or she is trying to disclose.

In theory, a logical consequence of the efforts to uncover patterns and relations is to find explanations, generalize the results and predict future incidents. In turn, this means that the way to approach reality methodologically is to decompose reality into the smallest possible elements, transform the elements into concepts and finally try to reveal cause-effect relations by hypothesis testing. The basic assumption is that the world actually can be analytically decomposed and that each concept can stand alone.

2.1.2 The systems approach

From a systems perspective, decomposing reality into parts is meaningless. According to the systems theory, the world must be understood in terms of mutually dependent components, as a system with parts, links, goals and feedback mechanisms. This approach is often termed holistic as opposed to the atomistic, fragmented approach of positivism.

The researcher’s task is to create an understanding of a given part of the world, to identify the system parts, links, goals and feedback mechanisms in order to improve the systems. Therefore, the theory in the systems approach is contextual rather than universal. To derive knowledge, it is necessary to analyze and compare cases instead of seeking universal cause-effect-relations. The systems approach is pragmatic in nature, and the search for an absolute truth is replaced by the search for a problem solution that works in practice.

The pragmatism of the approach means that the researcher should be very close to the research object. In fact, the researcher should influence the object, as the primary purpose of systems research is to improve systems in practice. In a classical systems approach though, the researcher stands outside the research object. This way the researcher observes the object, gains information and subsequently proposes improvements, reflecting a view of reality that is objective, but susceptible to influence. As a final comment to this approach, Gammelgaard comments that the ideal method in systems analysis is case studies. Both quantitative methods, primarily simulations, and qualitative methods can be used in the systems approach.

2.1.3 Actors approach

A completely different anticipation of reality is inherent in the actors approach. From this perspective, reality is not objective, but the result of various social constructions. Reality is seen as a construction, and knowledge is perceived as socially constructed, i.e. knowledge creation depends on the researcher’s interpretation. In theory, the ideal is to understand and construct the future from within, the researcher being part of the research reality.
2.1.4 Choice of research approach

In the process of writing the thesis the author found it suitable to follow the path of the systems approach. Mostly, this decision was based on the fact that identifying a continuous supply chain demands a holistic perspective. With reference to Table 1, the author coherently worked with models; a case study; systems; and mapping. Furthermore, when investigating the forecasting mechanism as a part of the supply chain also analytical approach was taken into consideration. As indicated in Table 1, the author used quantitative data as a basis for testing concepts, tools and their relations. Therefore it is concluded that the initial approach has been of systems characteristics in order to establish a supply chain framework within which the author applied the analytical approach.

2.2 Case study method in logistics research

The case study method generally emphasizes qualitative, in-depth study of one or a small number of cases. As of 1996, according to Lisa M. Ellram, qualitative techniques had not yet received widespread use and acceptance in logistics management research. However, research methods have developed and today qualitative approaches are commonly used within the field of logistics.

2.2.1 Overview of methodologies

As shown in Table 2, research methodologies can be classified according to the type of data used and the type of analysis performed on the data. The type of data can be empirical, which is data gathered for analysis from the real world, often via surveys or case studies. The data may also be modeled data, which means it is either hypothetical or real world data to be artificially manipulated by a model.

<table>
<thead>
<tr>
<th>Type of data</th>
<th>Primarily Quantitative</th>
<th>Primarily Qualitative</th>
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<tbody>
<tr>
<td>Empirical</td>
<td>Survey data, secondary data, in conjunction with statistical analysis</td>
<td>Case studies, participant observation, ethnography. Limited statistical analysis.</td>
</tr>
<tr>
<td>Modeling</td>
<td>Simulation</td>
<td>Simulation</td>
</tr>
<tr>
<td></td>
<td>Linear and mathematical programming</td>
<td>Role playing</td>
</tr>
</tbody>
</table>

Empirical research has not been as popular as modeling within commodity management for a number of reasons. First, empirical research poses a greater risk than modeling.

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15 Ellram, L. M. 1996, p 95
16 Larsson, Everth 2005-09-15
When using real world data, results tend to be less predictable and less controllable. Significant effort may be expended without achieving any meaningful results. However, empirical methods are receiving increased attention due to the increasing call to incorporate real world data to improve the relevance of business research.\textsuperscript{17}

### 2.2.2 Methodological choice

In exploratory research, as this thesis mainly signifies, the issue could be how or why is something being done. A case study methodology would be desirable in those circumstances because it provides depth and insight into a little known phenomenon.

If explanation of a phenomenon is a goal, qualitative methods are preferred because they provide a depth and richness, allowing the researcher to really investigate the how and why questions and construct idiographic knowledge. A more common application of a case study research is to build theory that can then be tested using further case studies, survey data, or another relevant method.

### 2.2.3 Single versus multiple case design

One of the fundamental issues in case study analysis is to determine whether a single case study or multiple case studies should be used. If a multiple case design is chosen, the question becomes, how many cases are necessary to achieve the desired generalizability of results?

Thus, a single case, like one experiment, is suitable when that case represents a critical case to test a well-formulated theory, an extreme or unique case, or a case which reveals a previously inaccessible phenomenon. A great deal of background preparation is required to minimize the probability of misrepresenting the single case and associated findings. Multiple cases, like multiple experiments, represent applications that allow for development of a rich, theoretical framework. Thus, multiple case design should be used to either predict similar results among replications, or to show contrasting results, but for predictable, explainable reasons.\textsuperscript{18}

Intuitively, a multiple case design should have been the natural, unquestionable choice for writing this thesis. The aim was also, initially, to describe the supply chains of a number of demographically different countries. By doing that, it would be possible to establish a generalizable model for how developing countries could improve the development of RHCS. However, as time moved on and

1. Focus of the thesis was narrowed down to the forecasting mechanism
2. It proved to be difficult to obtain relevant data from potential country offices

The author came to the conclusion that one country was an appropriate choice. The underlying reasoning for this decision was that the forecasting mechanism is more or less implemented the same way regardless of country characteristics. Of course, it could be possible to make a stronger case extending the research to involve more examples of

\begin{footnotesize}
\begin{enumerate}
\item Ellram, L. M. 1996, p 96
\item Ibid, p 101
\end{enumerate}
\end{footnotesize}
country supply chains. Though, the analysis and conclusions are written from a rather broad and general perspective, thus lack of multiple case studies does not pose a major hinder to the credibility of the conclusions given in the thesis.

2.2.4 Choice of case study

The criteria on which the choice of country to study was based on were: ready access to documents and reports; possibility to establish communication with country representative; and level of acknowledged work within the area of RHCS.

Within UNFPA, Bangladesh is regarded as one of the most committed countries in terms of developing the work on RHCS. Together with the fact that the author early on got in contact with Jawher L. Das who works as procurement officer with UNFPA in Bangladesh made a strong case for this particular choice. Thirdly, both UNFPA and USAID have performed a number studies in Bangladesh, which facilitated the availability of multiple information sources.

2.3 Data collection

The material being used and relied on in this thesis has been collected by either using qualitative or quantitative techniques. In addition, the author would like to stress the fact that both primary and secondary sources have been employed. Primary data implies that the author collected the data himself while secondary data refers to data that was gathered by someone else.

2.3.1 Qualitative data collection techniques

The qualitative method for data collection is used for acquiring human experience using different methods, such as interviews and observations. This method is further used to discover the essential meaning of the problem situation under the researcher’s investigation. In contrast, the quantitative method is mostly used in descriptive statistics.\[19\]

The three primary qualitative techniques that may be used as part of the case study method are direct observation; recordings; and interviews. As is outlined in more detail in the following chapters, the author has acquired the qualitative material for this thesis through interviews. Most of the interviews have been informal but also included a selected few structured interviews where the author aimed to attain control of what questions were asked in order to get specific information.

2.3.2 Interviews

During the internship at UNFPA the author performed interviews with staff working both at headquarters and at a local country office. The interviews were meant to serve as strict qualitative sources with the purpose of attaining an in-depth understanding of the organization; procedures and tools in use; the design and management of the contraceptive supply chain, just to mention a few. While performing these numerous interviews the author tried to create an atmosphere of great confidence so that the

\[19\] Taylor, G. R. 2000
interviewee would feel completely relaxed and speak without filtering any information. Initially the plan was to conduct stricter interviews; however, the author noticed almost immediately that the strict structure made the interviewee feel slightly uncomfortable. Instead, the author afterwards returned to the interview person with specific questions that needed to be elaborated on further. This way the author managed to avoid the loss of vital information.

Moreover, one interview was performed via email correspondence, which unfortunately is not a flexible and fail-proof interview technique. The fact that the interview person was situated on the other side of the planet created a situation where choices were limited. The author considered the option of performing a telephone interview instead. Though, time difference together with vacation and other scheduling obstacles prevented the author from pursuing this particular option. To assist the emails, documents were received with the purpose of confirming some of the information given in the interviews.

2.3.3 Literature studies

Literature studies are a typical way of collecting secondary data. When collecting secondary data it is imperative to be sure that a source is considered to be reliable. Otherwise there is a risk of losing credibility of the findings of the thesis. The author has used three different sources of literature to build the foundation of the thesis on. These are: printed books; articles; and reports within the relevant fields of the thesis.

2.3.4 Statistics

As a very important part of the discussion and evaluation of the forecasting mechanism several population related databases have been used; for the purpose of creating one extensive family planning database. These databases are publicized on the internet by highly reputable organizations. Therefore no doubt should be raised whether this kind of information is to be considered as reliable.

In the process of creating the family planning database, which has been the foundation for the population data forecasting tool, the author has been guided by Eva Weissman, tutor at UNFPA. Moreover, statistics from the forecasting tool Country Commodity Manger has been extracted for the purpose of conducting comparisons with data acquired from other sources. All extractions and comparisons of forecasting data has been carried out by the author and the Costing Unit.

2.4 Method of analysis

In relation to data collection it is imperative to establish how the presented data has been analyzed. There are several possible approaches, of which the author has chosen to interlink the analysis with what UNFPA could appreciate for further development of the supply chain. Therefore the author has performed an analysis which is more of a generic character instead of very detailed and embedded in technical terms.

Initially, the discussion on the six rights has been adopted to provide a basis for identifying areas of potential development. Together with a thorough discussion and evaluation of the forecasting tool the analysis is rounded up by assessing and categorizing the UNFPA contraceptive supply chain. The reason behind the choice of method of
analysis is that the author believes the conclusions of this thesis will be most useful to UNFPA when presented with long-term and strategic guidelines. However, regarding the forecasting tool it has been the aim to perform the analysis at a slightly more detailed level. Thus, the author has both analyzed the strategic impact of the forecasting function as well as evaluated how the tool could be improved to better match future global and local forecasting development and functional integration.

2.5 Research quality

Whether quantitative or qualitative, good research design requires external validity; reliability; construct validity; and internal validity. In this section these areas are discussed, what the definitions are and how they relate to this thesis. 20

2.5.1 External validity

External validity refers to whether or not the study findings are possible to generalize beyond the immediate study. Although a single case can serve as basis for broader generalization, it can pose a restriction by the fact that some factors are case specific. Hence, lack of generalizability is a topic that needs special attention for the purpose of this thesis.

As was discussed earlier in this chapter, see paragraph number 2.2.3, the author chose to base the thesis on a single case study. The main reasons for this decision are, as already stated, lack of sources and the fact that the forecasting mechanism focus eradicates some of the case specific factors. Of course the implications of the forecasting tool are different for different countries. But, yet, the implementation and fundamental structure of the tool is the same wherever it is used.

2.5.2 Reliability

The second issue in research design quality is reliability. Reliability addresses the repeatability of the experiment, and denotes whether or not a researcher should arrive at the same findings and conclusions if he or she followed exactly the same procedures as a previously carried out study. 21

The reliability of the thesis is highly connected to any possible errors. For example, it is the aim of this thesis to not partake in any subjective reflections. Still, interpretation of the collected data may be wrong. In an interview situation, due to the respondent not answering the questions accurately or simply because the researcher interprets the answers incorrectly reliability is subject to decrease significantly.

Regarding the process of collecting information through interviews, the author strove to explain questions very clearly in order to prevent misunderstandings. The usage of a tape recorder could have proven to be very successful for the thesis. Despite the obvious potential this tool possesses it is not included in the method approach. This decision was taken as the author realized how important it is to make the respondents feeling at ease when answering the questions asked. However, to avoid committing errors, which would

20 Ellram, L. M. 1996, p 104
21 Taylor, G. R. 2000
lead to incorrect facts being presented, meticulous notes were taken during the interviews. Also the author spent a significant amount of time immediately after the interview to go through the material, since the information would then be easily accessed from top of the mind.

2.5.3 Construct validity

Construct validity, the third issue in research design quality, addresses establishment of the proper operational measures for the concepts being studied. Thus, it is part of the data collection phase, and is closely tied to reliability. Three elements are associated with the establishment of construct validity: using multiple sources of evidence, establishing a chain of events, and having key informants review the case study research. Each is summarized below.\(^2^2\)

- **Multiple Data Sources.** A primary element of construct validity in research is through triangulation. Triangulation is the use of multiple data sources to corroborate evidence. Informant bias has been a criticism of research that involves interviewing human subjects. Triangulation of data helps to overcome this potential problem by using some combination of multiple informants, internal company memos, procedures and other documents, use of direct observation, written questionnaires, and other data gathering techniques.

- **Establish and Maintain a Chain of Evidence.** This second element of construct validity relates to the ability of the reader of the case study to follow the case study data and analysis from the initial formulation of the research questions to its final conclusions.

- **Draft Review by Key Informants.** The third element to support construct validity was to have each of the key informants review the overall case study report compiled by the researcher for his or her organization.

With regard to the thesis the key issue has of course been to establish a chain of evidence throughout the entire report. Therefore the author has reviewed the many different parts of the thesis numerous times. Continuously, changes have been made: the focus has been narrowed; literature has been added and altered; and synchronization between chapters has been fine-tuned over and over again. In order to increase the construct validity two other criteria mentioned in this section have been taken into consideration. Firstly, the author’s aim has been to triangulate any given information, by either performing interviews with different people or by comparing the information from an interview with attained documents. Secondly, interviewees were encouraged to review all information presented in the thesis. For example, Thidar Myint, who was one of the main sources for the purpose of mapping the global supply chain, had the opportunity to read and comment on the information presented in the report.

\(^{22}\) Ellram, L. M. 1996, pp 105-106
2.5.4 Internal validity

The fourth and final issue in research design quality, internal validity, is only a concern in explanatory case studies, where the researcher is trying to demonstrate that some outcome was caused by an independent variable. It is irrelevant for those case studies that are solely exploratory or descriptive in nature. Internal validity in case study research relates to making proper inferences from the data, considering alternative explanations, use of convergent data, and related tactics.\(^{23}\)

Internal validity usually shows how well the results from an empirical study are related to the reality i.e. whether the results do capture the reality or not. In other words, internal validity tries to measure whether the researcher has investigated what was supposed to be investigated. The validity of the case study can be affected if the researcher makes systematic errors, for example if the researcher has used the wrong method.\(^{24}\)

Again, for the purpose of increasing the validity of the thesis, the author has continuously worked together with the interviewees as well as with Eva Weissman, tutor of this thesis. By following this procedure it has been possible to add missing information and also change data that the author seemed to have misunderstood.

\(^{23}\) Ellram, L. M. 1996, p 107
\(^{24}\) Lekvall, P. och Wahlbin, C. 2000
3 Theoretical framework

In this, the third chapter, a theoretical framework for the thesis is presented. The acquired theory is divided up in five sections: Logistics and supply chain management; Managing the global pipeline; Development of the supply chain; Forecasting; and Mapping of processes. In turn, these different areas of theory are divided into several subchapters, with the purpose of creating a clear and logical approach to the relevant literature.

3.1 Logistics and supply chain management

In the 1980s and the 1990s many authors sought to give an accurate and comprehensive definition of supply chain management and its characteristics. As an opening to this chapter a few of these examples are depicted, all gathered and presented by J. T. Mentzer in his extensive publication “Supply Chain Management”.

Stevens (1989)

The objective of managing the supply chain is to synchronize the requirements of the customer with the flow of material from suppliers in order to effect a balance between what are often seen as conflicting goals of high customer service, low inventory management, and low unit cost.

Monczka and colleagues (1998)

SCM is a concept whose primary objective is to integrate and manage the sourcing, flow and control of material using a total systems perspective across multiple functions and multiple tiers of suppliers.

Houlihan (1988)

The supply chain is viewed as a single process. Responsibility for the various segments in the chain is not fragmented and relegated to functional areas such as manufacturing, purchasing and distribution.

1. Supply chain management calls for and in the end depends on strategic decision making. Supply: is a shared objective of practically every function in the chain and is of particular strategic significance because of its impact on overall costs and market share.

2. Supply chain management calls for a different perspective on inventories, which are used as a balancing mechanism of last - not first - resort.

3. A new approach to systems is required – integration rather than interfacing.

25 Mentzer, J. T. 2001, p 8
Supply chain management is an integrative philosophy to manage the total flow of a distribution channel from supplier to the ultimate user.

While introducing the many definitions of SCM it is also of great interest and importance to define the concept of logistics. Logistics is today a widely used term, which attracts more and more attention for the purpose of saving a substantial amount of money for any given company.

The term logistics stems from military organization and was in use in the days of Louis XIV of France; as A. J. van Weele describes the scene: “Even then it was clear that the effectiveness of the military organization did not depend solely on the weapons, the fighting strength and the fighting spirit of the soldiers. It was also affected by the possibilities of transportation and the efficient supply of ammunition and food. The rationalized consideration of the transportation and supply of materials, food and ammunition was called logistics. The French military successes of that time were mainly due to the importance attached to logistics.”

A description of logistics, which according to van Weele covers most characteristics mentioned in the literature, is as follows:

Logistics management encompasses all materials flows, from the flows of purchased materials into a facility, through the manufacturing process, and out to the customer. The starting point is the short-term sales plan and the related product plan. The total logistics function therefore involves short-term materials planning, the supply of raw materials and other purchased goods, internal transportation, storage and physical distribution.

### 3.1.1 Defining the supply chain:

Before entering deeper into the world of SCM it is imperative to clarify what a supply chain denotes. In comparison with the definitions of SCM, it seems as if authors agree to a greater extent on how to define a supply chain. Similar to the aforementioned examples, Mentzer put together a number of explanations of what a supply chain is:

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27 Ibid, p 207
28 Mentzer, J. T. 2001, p 5
La Londe and Masters (1994)

A supply chain is a set of firms that pass materials forward. Normally, several independent firms are involved in manufacturing a product and placing it in the hands of the end user in a supply chain – raw material and component producers, product assemblers, wholesalers, and retailer merchants are all members of a supply chain.

Lambert, Stock, and Ellram (1998)

A supply chain is the alignment of firms that brings products or services to the market.

Christopher (1992)

The supply chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer. In other words, a supply chain consists of multiple firms, both upstream (i.e. supply) and downstream (i.e. distribution).

With these definitions in mind, Mentzer suggests his own characterization of a supply chain as: a set of three or more companies directly linked by one or more of the upstream and downstream flows of products, services, finances, and information from a source to a customer. As a complement, the author defines four different supply chains of which two are presented below:

- Basic supply chain
- Ultimate supply chain

According to Mentzer, a basic supply chain consists of a company, an immediate supplier, and an immediate customer directly linked by one or more of the upstream and downstream flows of products, services, finances, and information. An ultimate supply chain, however, includes all the companies involved in all the upstream and downstream flows of products, services, finances, and information from the initial supplier to the ultimate customer. For a visual example of the ultimate supply chain, see Figure 3.²⁹

²⁹ Mentzer, J. T. 2001, p 6
3.1.2 Reproductive Health Commodity Supply Chain

Yet another suggestion to what constitutes the supply chain is presented in Figure 4. This conceptualized layout is, as indicated in the heading, more specific to family planning logistics, but still it consists of similar elements as presented in Mentzer’s so called ultimate supply chain. In the article where Figure 4 is to be found it is argued that the objective of the supply chain is to deliver the right product, in the right quantity, in the right condition, to the right place, at the right time, for the right cost. Though, as simple as it may seem, family planning logistics is very complex.\(^{30}\)

![Figure 4 – Conceptualized Supply Chain, FPLM 2000](image)

Contraceptive supply chains consist of numerous organizations, people, and procedures that, together, must accurately forecast demand and then efficiently negotiate, purchase and deliver the right amount of contraceptives from one level to the next until they reach family planning clients. Procurement and forecasting, together, form an important part of Program managers and policy makers at central level. To further discuss the relationship of these two important supply chain functions it is argued by the US Agency for International Development (USAID), experienced in global forecasting and procurement of health commodities, that forecasting cannot be disconnected from procurement.\(^{31}\) Forecasting is, as commented earlier, being discussed in chapter 3.4.

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\(^{30}\) Strengthening the Supply Chain, FPLM, 2000  
\(^{31}\) Forecasting of anti-retrovirals and diagnostics, WHO-UNICEF, 2004
3.1.3 Defining the supply chain management

As illustrated initially in this chapter, the definitions of SCM are rather different between authors. Though, Mentzer argues that SCM and the many definitions can be classified into three categories:\textsuperscript{32}

- a management philosophy;
- a set of activities to implement a management philosophy;
- or a set of management processes.

3.1.3.1 SCM as a management philosophy

With regard to the existing literature, it is proposed that SCM as a management philosophy has the following three features:

- A systems approach to viewing the channel as a whole, and to managing the total flow of goods inventory from the supplier to the ultimate customer
- A strategic orientation toward cooperative efforts to synchronize and converge intra-firm and inter-firm operational and strategic capabilities into a unified whole\textsuperscript{33}
- A customer focus, to create unique and individualized sources of customer value, leading to customer satisfaction

3.1.3.2 SCM as a set of activities to implement a management philosophy

In order to absorb an SCM philosophy, firms must establish practices consistent with the urged philosophy. Mentzer suggests that previous research identifies the following activities necessary to implement an SCM philosophy successfully:

- Integrated behavior
- Mutually sharing information
- Mutually sharing channel risks and rewards
- Cooperation
- The same goal and the same focus of serving customers
- Integration of processes
- Partners to build and maintain long-term relationships

3.1.3.3 SCM as a set of management processes

It is proposed that, to successfully implement SCM, all firms within a supply chain must overcome their own functional silos and adopt a process approach. Thus, all the functions within a supply chain are reorganized as key processes. The critical differences between

\textsuperscript{32} Mentzer, J. T. 2001, p 9-13

\textsuperscript{33} Intra-firm = within the specific firm; inter-firm = between different firms
the traditional functions and the process approach are that the focus of every process is on meeting the customer’s requirements and that the firm is organized around these processes.

3.2 Managing the global pipeline

Managing a global supply chain is, not surprisingly, more complex than managing a strict single-country pipeline. To clarify, the global approach of securing supply involves a number of specific considerations that do not have to be taken into account for in-country SCM. Martin Christopher has identified five factors to be critically important to global supply chains. Though these factors exist in the planning of all supply chains they are relatively more dominant in terms of mix and extent in a global context and as such they create the need for different solutions. The five factors are given a further description in the subsequent order:\(^{34}\)

- Extended lead times of supply
- Extended and unreliable transit times
- Multiple consolidation and break bulk options
- Multiple freight mode and cost options
- Intermediate component shipping with local added value

3.2.1 Extended lead times of supply

The consolidation of global production into a single or a limited number of manufacturing sites creates contention in terms of the demands of the various markets, possibly requiring local product variations. Leading edge practice shows that the imposition of long manufacturing lead times is a largely artificial constraint. It is possible to make to order on very short time scales for specific customers in contrast to supplying from inventory.\(^{35}\)

It is often also essential for the global chain to hold a level of intermediate inventory between manufacturing and the customer to buffer against extended transit times. However, if the size of the buffer reflects inflexibility in manufacturing or poor commodity management procedures, the need for facilities and stock holding in specific markets could be suspect.

3.2.2 Extended and unreliable transit times

Sea freight from Japan has a transit time to Rotterdam of about five weeks. In contrast, the total elapsed time from dispatch to receipt of air freight, if used, is about five days. The use of sea freight can represent considerable investment in inventory; it also seriously constrains the application of the basic logistics principle of postponement: i.e. delay shipping decisions until the last possible moment.

\(^{34}\) Christopher, M. 2004, p 109
\(^{35}\) Ibid, p 115
Increasingly it is the case that as true supply chain costs become more clearly understood the use of air freight is growing. Such are the penalties of high inventories and inflexible response to market place needs that the trade-off will increasingly swing towards shorter transit times and hence swifter transit modes.

Shipping, consolidation and customs clearance all contribute to delays and variability in the lead time of global supply chains. Experience confirms this as a major issue for most companies operating globally. It has the consequence that local managers tend to compensate for this unreliability by over-ordering, double buffering, and competitive pressure on manufacturing and the central allocation organization.36

3.2.3 Multiple consolidation and break bulk options

The options for management of international freight are several and the trade-offs will be complex and may be different for different product/market channels. They can be summarized under four main headings.

- Direct ship from each source to final market in full containers
- Consolidate in the supply region for final market in full containers
- Consolidate from each source for each area of operation with break bulk/intermediate inventory available for specific markets
- Consolidate in the supply region and also break bulk in the theatre of operations

Obviously the inventory holding, warehousing, customer service and freight costs balance will be different for each of these and will be determined by the characteristics of the product and the profile of demand.37

3.2.4 Multiple freight mode and cost options

The mix of freight methods which may be practical in the context of the required lead time must be overlaid on the point above. Shipping companies offer mixed sea/air services, different container sizes, scheduled and unscheduled services. As previously observed the extended lead times involved in long sea passages are forcing companies to use air freight to an extent which appears costly but which, in the context of inventory holding costs, potential lost revenue and market flexibility, may be a worthwhile expense.

In the context of global logistics the transportation management function needs to broaden to include responsibility for pipeline management and, in particular, end-to-end lead times. In the past it was often the case that the lead time for international logistics flows were poorly managed. Partly this was due to a fragmentation of control, so that many key decisions would be taken independently, by export departments, shipping departments and external agencies such as freight forwarders. A further problem with the conventionally organized international business is that if transport decisions are taken

36 Christopher, M. 2004, p 115
37 Ibid, p 116
purely on the basis of costs – as they frequently are – then this will tend to lead to suboptimal decisions in many cases.\textsuperscript{38}

### 3.2.5 Intermediate component shipping with local added value

The option of intermediate component shipping is beginning to move onto the agendas of the more sophisticated operators. These companies have re-examined their entire value chain to seek out opportunities for delaying or postponing the final configuration of the product until it is as close to the customer as possible. It is often possible to achieve lower costs and improved flexibility to demand with lower inventory by shipping generic subassemblies in intermediate shipping packs. The local operation then provides:\textsuperscript{39}

- Localization and finishing
- Kitting to different product options
- Local language packing
- Central inventory holding for the theatre of operation
- Direct customer delivery for all the markets within the theatre without further handling

### 3.2.6 Global vs. local

The implementation of global pipeline control is highly dependent upon the ability of the organization to find the correct balance between central control and local management. It is unwise to be too prescriptive but the experience that global organizations are gaining every day suggests that certain tasks’ functions lend themselves to central control and others to local management see Table 3.

<table>
<thead>
<tr>
<th>Global co-ordination</th>
<th>Local management</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Network structuring for production and transportation optimization</td>
<td>o Order fulfillment and customer service management</td>
</tr>
<tr>
<td>o Information systems development and control</td>
<td>o Inventory management and control</td>
</tr>
<tr>
<td>o Inventory positioning</td>
<td>o Warehouse management and local delivery</td>
</tr>
<tr>
<td>o Sourcing decisions</td>
<td>o Customer profitability analyses and channel cost control</td>
</tr>
<tr>
<td>o International transport mode and sourcing decisions</td>
<td>o Liaison with local sales and marketing management</td>
</tr>
<tr>
<td>o Trade-off analyses and cost control</td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{38} Christopher, M. 2004, p 117  
\textsuperscript{39} Ibid, p 118
Much has been learned about the opportunities for cost and service enhancement through better management of logistics at a national level. Organizations are faced with applying those lessons on a much broader stage. As international competition becomes more intense and as national barriers to trade reduce, the era of the global business has arrived. Increasingly the difference between success and failure in the global marketplace will be determined not by the sophistication of product technology or even of marketing communications, but rather by the way in which we manage and control the global logistics pipeline.

3.3 Development of the supply chain

3.3.1 Supply chain integration

In order to achieve supply chain integration it is necessary to identify and assess four different stages. These are discussed below, concerning planning and operating implications of each stage:

- **Stage 1**: represents the baseline case; the supply chain is a function of fragmented operations within the individual company and is characterized by: staged inventories, independent and incompatible control systems and procedures, and functional segregation.

- **Stage 2**: begins to focus internal integration characterized by an emphasis on cost reduction rather than performance improvement, buffer inventory, initial evaluations of internal trade-offs, and reactive customer service.

- **Stage 3**: reaches toward internal corporate integration and is characterized by full visibility of purchasing through distribution, medium-term planning, tactical rather than strategic focus, emphasis on efficiency, extended use of electronics support or linkages, and continued reactive approach to customers.

- **Stage 4**: achieves supply chain integration by extending scope of integration outside the company to embrace suppliers and customers.

3.3.2 Strategies to develop a supply chain

As a first step to identifying opportunities for supply chain improvements, understand how your performance compares to your competitors, to other industries, and to best-in-class. As a second step to identifying opportunities for supply chain improvements, understand the status of all departments within your link and all links in your supply chain as compared to the *Six Levels of Supply Chain Excellence*. This process includes:

- **Business as Usual** – working hard to instill best practices in individual departments within your link

- **Link Excellence** – Looking within your link for opportunities to remove boundaries between departments and pursue continuous improvements

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40 Christopher, M. 2004, p 119
41 Ibid, p 123
Visibility – turning the lights on outside your organization to see the information that needs to be shared with other members of your supply chain, revealing what is and isn’t working

Collaboration – working with other suppliers, vendors and customers to maximize customer satisfaction and drive out costs throughout the chain

Synthesis – synchronizing new ways of thinking and strategies to provide even greater cost reduction and enhanced customer satisfaction

Velocity – Reducing the lead time to incorporate continuous improvements throughout the supply chain

As a last step in identifying opportunities for supply chain improvements, use the information from your benchmark and assessment efforts to identify specific targets for supply chain enhancements. Do not take on more than you can accomplish, and establish momentum for results. Be aware that your weakest department within your link and the weakest link in your supply chain will drive performance. Your weakest link will not rise to the level or your strongest link – the opposite will occur. Communicate, and even over-communicate, with all involved in your supply chain so that everyone understands what, why, when, who and where. Let there be no surprises. Only join with supply chain partners who are ready to partner. Working to establish a partnership with a link that has not achieved Level 2 Link Excellence will not get positive results. On each supply chain initiative, identify the proper skill sets required to lead the effort. Assure clarity of roles and responsibilities and cultural compatibility. Identify your core competencies and outsource the rest. Determine the unique business processes that make you successful, and then use a robust process to outsource other functions so that you are able to focus on core competencies.

3.4 Forecasting

3.4.1 Forecasting in the supply chain

Forecasting professionals constantly keep asking one question: What can be done to improve forecasting performance? Mentzer suggests four key areas of understanding that can help practitioners improve forecasting performance:

3.4.1.1 Understanding of techniques

The first key area of understanding is related to alternative forecasting techniques, including benefits as well as drawbacks. Computer-based forecasting systems have done much to eliminate the need to recognize specific mathematical formula, which is why mathematical knowledge in depth is not a critical issue. However, comprehending the different techniques available does require a good conceptual understanding of how different techniques establish forecasts and the factors that drive those techniques. Furthermore, forecasting techniques are more than just quantitative measurements. An understanding of which variables influence demand for commodities frequently can be

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42 Richardson, H. L. 2005

43 Mentzer, J. T. 2001 pp 175-177
acquired more effectively through the application of qualitative techniques as a means to adjust quantitative forecasts or establish initial forecasts for products and services.

**Technical indicators**

Forecasting demand is in many situations related to something called a moving average (MA). A moving average is a trend-following device. It helps you see when an old trend has reversed and a new trend has begun. While it does not have any fail-proof predictive qualities, it can provide excellent guidance. Moreover, a moving average is a smoothing device making it much easier to see the underlying trend. Its purpose is to track the progress of the trend. In this section, the following three main types of MAs are discussed and given examples of:

- Simple moving average (SMA)
- Weighted moving average (WMA)
- Exponential moving average (EMA)

The SMA handles input on demand the same- it is a basic average of all the periods. A WMA stresses some periods over others, typically giving more recent data greater weight. Thirdly, the EMA also emphasizes the most recent data input, but considers all past demand figures to some degree by using the exponential moving average of the last period as well as the current period’s data input.

Exponential and weighted MAs usually follow demand more closely than simple MAs. MAs are lagging indicators and therefore will follow demand changes in the market. Furthermore, MAs work best in trending markets and not well in non-trending markets. It is important to stress that MAs often capture big trends but can indicate false signals in some situations.

**Indicator examples**

In the examples given in this section the three different MAs are illustrated using artificial numbers on annual commodity consumption for a given country, see Table 4.

To calculate a simple MA, based on the numbers from Table 4, add up the consumption data for each period in the range and divide the sum by the number of periods: \((C1+C2+C3 \ldots + Cn) / n\). A ten-year SMA, for example, would be the sum of each of the ten years total consumption divided by ten. For next year, i.e. 2006, the consumption data from the earliest year in the series is dropped and the data of years 1997 through 2006 are averaged. The averages are always consisting of the same number of periods and shift as the periods pass, hence the *moving* part.

\[
\text{SMA} = 5,820,000
\]

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44 Salcedo, Y. 2003
Table 4 – Forecasting indicator consumption data

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Consumption of male condoms</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>2,400,000</td>
<td>1</td>
</tr>
<tr>
<td>1997</td>
<td>3,500,000</td>
<td>1</td>
</tr>
<tr>
<td>1998</td>
<td>4,000,000</td>
<td>2</td>
</tr>
<tr>
<td>1999</td>
<td>9,100,000</td>
<td>2</td>
</tr>
<tr>
<td>2000</td>
<td>3,200,000</td>
<td>3</td>
</tr>
<tr>
<td>2001</td>
<td>6,500,000</td>
<td>3</td>
</tr>
<tr>
<td>2002</td>
<td>5,000,000</td>
<td>4</td>
</tr>
<tr>
<td>2003</td>
<td>9,000,000</td>
<td>4</td>
</tr>
<tr>
<td>2004</td>
<td>7,500,000</td>
<td>5</td>
</tr>
<tr>
<td>2005</td>
<td>8,000,000</td>
<td>5</td>
</tr>
</tbody>
</table>

The formula for a ten-year weighted moving average, where \( W = \) weight is: 
\[
(C1W1 + C2W2 + C3W3 + \ldots + C10W10) / (C1 + C2 + C3 + \ldots + C10).
\]
In this example, Table 4, the weights are numbered between 1 and 5 giving the later years more significance than the earlier input.

**WMA = 6,490,000**

An exponential MA uses a smoothing constant, usually between 0.01 and 0.30, that varies with the length of the moving average. Today’s EMA value depends on the prior year’s calculated value. To calculate the smoothing constant = \( A \), where \( Z \) is the number of periods, the formula is: 
\[
A = 2 / (Z + 1).
\]
Then insert the smoothing constant into the formula for calculating the exponential moving average, where \( C \) is current consumption and \( EMA_{t-1} \) = the last period’s EMA: 
\[
EMA_{t-1} + [A \times (C - EMA_{t-1})].
\]
In this theoretical exercise \( EMA_{t-1} \) is defined as the WMA of the years 1996 to 2004 and \( C \) is the consumption of 2005.

**EMA = 6,550,400**

MAs can be created in every shape and size according to the personal tastes of the trader. There are infinite time spans and periods that can be used. After deciding on the interval (that is, whether you will calculate a monthly, annual or some other period moving average), you need to decide on the number of periods to use. Using fewer periods may reflect a trend sooner, but it also might be totally misleading in non-trending demand situations. Also, the longer the moving average, the more likely it is to be less effective.
3.4.1.2 Forecasting management

Forecasting management includes the four dimensions: functional integration; approach; systems; and performance measurement. Mapping current forecasting processes and evaluating the present status of forecasting management may reveal areas that can improve forecasting management performance.

3.4.1.3 Supply chain implications

Supply chain implications of improved forecasting should be taken into consideration. An organization that adopts the supply chain orientation recognizes the potential benefits that may be realized through improved synchronization with suppliers and customers. Here again, the impact of improved forecasting can be documented. Documenting and sharing such an assessment with trading partners can establish a collaborative relationship that leads to shared performance benefits across the supply chain.

3.4.1.4 Functional integration

What factors can help ensure that companies throughout the supply chain are forecasting in a collaborative manner, thus ensuring better synchronization of operations? Extending functional integration to the supply chain requires coordination, cooperation and collaboration across functions in the focal company, as well as for those responsible for forecasting management in other companies in the supply chain. Reconciliation and feedback must extend to the forecasting and operations planning organizations within each supply chain participant.

3.4.2 Forecasting and family planning

Accurate forecasting of contraceptives provides a means to ensure that enough supplies will be available to meet client demand, without having too many. It is the aim of an effective procurement and forecasting unit to calculate how many contraceptives should be ordered, of what type, and when they should be shipped in order to ensure that the program receives a continuous supply.\(^\text{45}\)

Forecasting the number of each type of contraceptive that clients are likely to use is the only way to ensure that programs order the right amount of each. Having too few contraceptives may result in stock-outs and dissatisfied clients, while too many wastes resources and overburdens the supply system. Of course, factors other than inaccurate forecasts -- including budget constraints, fluctuations in product availability from manufacturers, introduction of new products, special promotional events, and complications in donor coordination -- can cause supply disruptions.

At a minimum, a commodity forecast should be done annually to cover a three-year period. The LMIS provides the information needed to make forecasts and to develop procurement plans. Three sources of data help estimate contraceptive needs.\(^\text{46}\)

\(^{45}\) Population Reports “Strengthening the Supply Chain”, FPLM, 2002, p 13

\(^{46}\) Ibid, p 14
3.4.2.1 Historical consumption data

The quantities of each contraceptive method that clients have received over a specific period of time provide a guide to future needs. To obtain the most accurate estimates, programs should use data on quantities actually provided to clients. If these data are unavailable, other statistics can help – for example, data on supplies issued to service delivery points or inventory levels in the distribution system closest to the client. A drawback of these other data is that they make no distinction between contraceptives actually distributed to clients and contraceptives lost, destroyed, or stolen.

3.4.2.2 Historical service data

Regular management reports at service delivery sites provide other data for forecasting the number of new clients and revisits for each method (or brand). Forecasts prepared from service data can be inaccurate, however, if reporting systems are weak, if variations exist among programs in definition of service data, or if demand is growing rapidly.

3.4.2.3 Population data

Information from population surveys helps to project demand for contraceptive use several years ahead. Such data are most appropriate for new programs that do not have historical consumption or service data. Forecasts based on population data must make assumptions about growth of demand.

3.4.3 Validation of forecasts

Because it is about the future, a forecast can never be perfectly accurate. The forecast must find ways to reduce forecasting errors as much as possible, however – that is, to validate the forecast.

To validate a forecast, the forecaster assesses the strengths and weaknesses of each type of data and, if needed, makes adjustments to the forecast. For example, a forecast based on historical consumption data from 90% of facilities reporting will be more accurate than – and thus should be used instead of – a forecast based on 50% of facilities. Also, service data from a period during extensive stock-outs will not reflect actual demand.

The forecaster must account for the effect on future consumption of program plans, new methods, and other influences on demand, such as publicity campaigns. The forecaster also must plan for the growth in the number of people of reproductive age and the percent using contraceptives. Program managers should be involved throughout the forecasting process because of their familiarity with their program needs and their knowledge of program plans. In addition, less predictable events, such as political and economic turmoil, and even bad weather, affect contraceptive demand and supply.\(^{47}\)

3.4.4 Estimating requirements

While forecasting predicts future consumption, the process also must take into account supplies already on hand and on order. The estimated quantity of each type of contraceptive required in a given planning period can be calculated as shown in Figure 5.

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\(^{47}\) Population Reports “Strengthening the Supply Chain”, FPLM, 2002, p 14
If the net supply requirement is a negative number, then that amount must be obtained to maintain the desired stock level. If the number is positive, then there is a possible oversupply of stock, and no order needs to be placed. An overstock may suggest the need to reallocate contraceptive supplies so that clients in all locations have enough supplies.

Estimated requirements can be calculated using computer software programs designed for contraceptive logistics management. Such programs are powerful tools that can help managers with forecasting, managing supplies through the supply chain, and procurement planning.

### 3.4.5 Inaccuracy of forecasts

A continuing problem for many organizations is the inaccuracy of forecasts. It seems that no matter how advanced the forecasting techniques employed, the volatility of markets ensures that the forecast will be wrong! Whilst many forecasting errors are the result of inappropriate forecasting methodology the root cause of these problems is that forecast error increases as lead time increases.

The evidence from most markets is that demand volatility is tending to increase, often due to competitive activity, sometimes due to unexpected responses to promotions or price changes and as a result of intermediaries’ re-ordering policies. In situations such as these there are very few forecasting methods that will be able to predict short-term changes in demand with any accuracy. The conventional response to such a problem has been to increase the safety stock to provide protection against such forecast errors. However it is surely preferable to reduce lead times in order to reduce forecast error and hence reduce the need for inventory. If shorter lead times are the route to more effective competitiveness, how can lead time reduction be achieved?

### 3.4.6 The lead time gap

Most organizations face a fundamental problem: the time it takes to procure, make and deliver the finished product to a customer is longer than the time the customer is prepared to wait for it. This is the basis of the lead time gap. The customer’s order cycle refers to the length of time that the customer is prepared to wait, from when the order is placed through to when the goods are received. This is the maximum period available for order fulfillment. In some cases this may be measured in months but in others it is measured in

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Christopher, M. 2004, p 129
hours. Clearly the competitive conditions of the market as well as the nature of the product will influence the customer’s willingness to wait. Thus a customer may be willing to wait a few weeks for delivery of a car with particular options but only a day for a new set of tires.

In the conventional organization the only way the gap between the logistics lead time (i.e. the time taken to complete the process from goods inwards to delivered product) and the customer’s order cycle (i.e. the period they are prepared to wait for delivery) is by carrying inventory. This normally implies a forecast. Hence the way most companies address this problem is by seeking to forecast the market’s requirements and then to build inventory ahead of demand. Unfortunately experience suggests that no matter how sophisticated the forecast, its accuracy is always less than perfect. It has been suggested that all mistakes in forecasting end up as an inventory problem – whether too much or too little. Whilst improving forecast accuracy will always be a desirable goal it may be that the answer to the problem lies not in investing greater sums of money and energy in improving forecasting techniques, but rather in reducing the lead time gap. The challenge for logistics management is to search for the means whereby the gap between the two lead times can be reduces if not closed.\footnote{Christopher, M. 2004, p 145}

### 3.4.7 USAID – lessons learned

Since the late 1960s, USAID has been one of the major donors of contraceptives and condoms. With ongoing activities in more than 130 countries by 2004, USAID has become a key player in the development of software for forecasting, procurement planning and management of country supply chains. Through this long interactive exercise USAID has learnt various lessons, which they officially present and share with others in order to ameliorate the many different contraceptive supply chains existing. Some of them, related to forecasting are presented below:\footnote{Forecasting of anti-retrovirals and diagnostics, WHO-UNICEF, 2004}

- There is a need for a paradigm shift in countries to conduct forecasts based on the principle of medium to long-term forecasts rather than only short-term estimates
- Forecasting of needs for new and expanding programmes cannot be based on logistics data because these are often unavailable or not predictive of demand
- Forecasting is based on informed assumptions rather than real evidence until better quality data become available
- Forecasted quantities need to be reviewed and updated frequently
- Better coordination between financing and procurement planning will improve commodity availability both in-countries and at global level
- Robustness of a forecasting tool does not necessarily have to be influenced by decentralized, national or private procurement systems. Also, differences in prevalence status and stigma between countries or continents must not affect the success of a forecasting tool
3.5 Structuring of processes

Ljungberg and Larsson (2001)

A process is a repeatedly utilized network, which consists of consecutively linked activities that make use of information and resources in order to transform "object in" to "object out", from identification of, and through, to the satisfaction of client demand.

Recalling a discussion from the method chapter, distinguishing between the systems and the analytical approaches, is fundamental for the paradigm of processes. Instead of focusing on the fragments and functions of a supply chain, as is the path of the analytical approach, the process paradigm advocates for acknowledging organizations to be social rather than technical systems. This implies that one has to partake in a holistic point of view and viewing all the parts of the organization to form a whole, one complex unit that calls for a more circular than linear approach.

3.5.1 Identification

A fundamental first step to be able to develop a supply chain is to understand and identify which are the relevant processes involved. It is suggested that there are three different types of processes: main processes; supportive processes; and management processes.

Briefly described, main processes are general in character and cover the basic processes in order to define the purpose of the business. Supportive processes, on the other hand, do not possess any substantial value but are required to alleviate the functionality of the main processes. Examples of this type are: invoicing customers; plan production; and maintenance of equipment. In comparison with main processes the latter type is often present in a much greater number. Therefore it is suggested that effort should be put into identifying the most important ones for purpose of mapping the conceptual process. Finally, the third type of processes, control processes, are needed to plan and coordinate the other two. Control processes are used to describe and structure the role of management. In reality this type is often neglected, though still essential for running any kind of process.\footnote{Ljungberg, A. och Larsson, E. 2001, pp 184-187}

3.5.2 Structuring

Processes can be defined not only based on what role they are playing in the supply chain, but also depending on how detailed and on what level they are positioned. In this context a process are built up by sub-processes, which in turn are constituted by several activities, see Figure 6.\footnote{Ibid, p 193}
The number of levels outlined can vary depending on the actual process that is being mapped. In some cases it is necessary to brake down a process in many levels in order to achieve the desired result. In other situations it can be enough to describe the process in a more general manner. The next issue raised in the case of mapping a supply chain is how to give clear definitions to the different components of the process. For this reason there is a suggestion of five different keywords that together connotes the process: object in; object out; activity; resources; and information, see Figure 7. These are all explained further in consecutive order.

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53 Ljungberg, A. and Larsson E. 2001, p 194
54 Ibid
55 Ibid
A process always starts with an object in. Without the object in all activities that build up the process will remain non-initiated. With a logical order of the comprehensive process, object in stems from the precedent activity or process. An example of this component is a purchase order. Not surprisingly, object out is the result of a process and moreover this component depends on the transformation enabled by the linkage of activities and resources. The third component of the process, activity, can be described as a series of events that make use of the available resources. Since the comprehensive process is made up by several activities the object out of the last activity will be the object out of the entire process.

The two final components to be described are resources and information. Briefly, resources are bound to certain activities and pose a significant impact on the end result. Information, on the other hand, is supporting or controlling the process. An important observation in this case is that information can be the object in, in which case it serves as a trigger for the process.

3.5.3 Pragmatic approach

Because of practical reasons the actual mapping procedure is subject to balance between the amount of information presented and the usability for the observer. It is recommended that the final map should not include too much information. It is imperative for the mapping to break down the main process chart into more detailed descriptions of each sub-process. The purpose of the descriptions is to clarify how the process proceeds from the establishment of a client demand throughout the chain to the final stage of satisfying that client’s demand.\footnote{Ljungberg, A. and Larsson E. p 199}

It is important to stress the fact that the process chart does not take into consideration where an activity is carried out, but instead what is actually being done in the specific activity.
4 Empirical studies

The empirical studies chapter is based primarily on facts from reports and on interviews carried out with UNFPA staff at global and country level. The aim of this chapter is to present: how the global UNFPA supply chain functions and what parts it is based on; and a case study in the form of mapping the supply chain of a specific country. For the purpose of keeping the focus of the thesis intact the entire supply chain is first described, and thereafter the specific forecasting function is emphasized and presented in more depth.

4.1 Global supply chain

The global UNFPA supply chain was before primarily managed from the headquarters situated in New York City, USA. However, since May 2005 the procurement unit has physically moved and is now situated in Copenhagen, Denmark. There are mainly three reasons why procurement moved to Copenhagen:

- The Danish Government had expressed a strong enthusiasm for UN organizations to have offices in Copenhagen. They most strongly advocated the case for UNFPA to move the whole of its procurement section to Copenhagen and offered significant funding support.
- There was a significant advantage to be gained from being co-located alongside procurement colleagues in IAPSO, UNOPS and UNICEF that are all based in Copenhagen.
- Copenhagen is a suitable location from a time perspective. Since UNFPA has offices, suppliers and clients all over the world the opportunities to manage an effective communication will be easier to facilitate from Copenhagen. This is especially true for the Africa and Asia regions where UNFPA has most part of its customers.

At present, UNFPA takes part in two different contraceptive supply chains: ordinary supply chain and emergency supply chain. Moreover, UNFPA provides kits which are a part of the emergency supply chain. Briefly, the distribution of kits relate to products such as medicine and condoms that are put together in numerous boxes. These kits are stored in warehouses and are to be distributed to locations and areas subject to catastrophes. For the purpose of the thesis the kits will not be handled separately but instead implicitly constitute the emergency supply chain.

4.1.1 Ordinary supply chain

As of today, the ordinary supply chain represents most of all distributed reproductive health commodities within the UNFPA system. To begin with, the comprehensive

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57 David Smith, 2005-10-24
58 Thidar Myint, 2005-07-06
process chart is presented, see Figure 8. This chart shows the main sub-processes of the ordinary supply chain and consecutively its different components will be described in more detail.  

As stated in the introduction, UNFPA collaborates with well over 140 countries worldwide and there is an abundance of commodity requisitions coming in from field offices at an annual basis. With regard to Figure 8, again, the forecasting mechanism has been extracted and is given a more outlined focus in a separate section later on in this chapter.

![Figure 8 – Supply chain process](image)

### 4.1.1.1 Submission

The first input to the ordinary supply chain is *client demand*, as shown in Figure 8. A requisition is submitted from a representative at the country office via *ATLAS*, which is a newly developed IT-based financial system. The requisition is the output of this process and is to be used by the following two parallel processes.

According to Thidar Myint, the situation of how and when requisitions are sent is very stressful and not very prosperous. The reason for this is that country offices tend to wait until the end of the year when they can get a good idea of what the annual budget will come to. The interviewee adds: *“Imagine 140 countries reasoning this way, sending their requests at the same time”*. Moreover, the procurement division has a set date in the end of the year before which they have to procure. The result is a few days of very hasty requisition handling.

### 4.1.1.2 Encumbrance

Since country offices go on a budget mainly set up by UNFPA, all requisitions are entered into *ATLAS*. Thereby, each requisition is automatically checked with the matching budget and if, for any reason, money is not available the requisition can not be processed.

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59 Supplementary Procurement Guidelines, 2003  
60 Joycelyn Crane-Moore, 2005-10-13  
61 Thidar Myint, 2005-07-06
As the requisition is being handled by the procurement unit in Copenhagen required funding is encumbered, which means that the budget is virtually charged and can not be used for other purposes. The encumbrance is taking place at the same time as a supplier is selected for the specific order.\footnote{Joycelyn Crane-Moore, 2005-10-13}

As stated in the previous stage of the supply chain process, country offices tend to wait until the very last week of the year because they want to use their annually allocated budget. Thidar Myint comments: “This behavior is partly a result of the structure of the allocation of UNFPA country budgets. The money is only good for that specific year”. Today, it is practically impossible in today’s situation to change this as donors tend to only grant support on an annual basis. In addition, countries must use this allocated support by the end of the year to avoid budget deficit the following year. A fictive example will clarify the latter statement: Imagine a country receiving US$ 20 million to spend this year. If only 10 million is spent, next year’s budget is automatically cut down to be maximum 10 million. Therefore, this country would try to spend all the money by the end of the year in order to avoid budget deficit in the future, and moreover, placing an order for contraceptive commodities is one of the easier ways to spend money.\footnote{Eva Weissman, 2005-06-06}

4.1.1.3 Supplier selection

Up until this point of the process the supply chain is identical for any type of reproductive health commodity. Also, the process is somewhat straightforward to carry out on a regular basis. In the case of choosing suppliers the situation is, however, slightly different. There are a number of issues that have to be taken into consideration and for this reason the main process chart has to be described on a more detailed level.

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Figure 9 – Choose supplier process
The process of choosing what supplier should be awarded with a specific contract can be divided up in two different categories. Initially, suppliers are pre-qualified for the mere purpose of being considered for future contracts. Secondly, supplier contracts are separately compared with each and every request for shipment of commodities. Because of this, the pre-qualification and negotiations are being managed in the very beginning of every year and when requisitions are entered by country offices the requests are compared with the existing price lists, including freight and insurance costs.\textsuperscript{64}

There has been raised a question whether UNFPA should be able to negotiate new contracts during the year, but according to the interviewee and with reference to earlier discussion on request organizing this would not be a sustainable structure of working. The interview person continues: “\textit{How is it possible to negotiate new contracts for each shipment when countries send in their requests the 25\textsuperscript{th} of December and we have to send procurement orders before the year has ended.}” For this reason UNFPA negotiates two different contract types, which are presented in more detail in the discussion of contract awards, see below.\textsuperscript{65}

\textit{Supplier Selection for long term agreements}

As seen in Figure 9, the first stage is called \textit{supplier request for information (RFI)}. A request for information is most often sent out to suppliers registered at the UN web page of United Nations Global Marketplace.\textsuperscript{66} After receiving the output, which refers to a tentative yet selected list of reproductive health commodity suppliers, UNFPA proceeds and performs a preliminary screening to decide on potential suppliers. This screening is based mostly on factors such as technical capacity; potential quantities of production; condition of the manufacturing plant; and implemented quality procedures.\textsuperscript{67} A brief comment on the screening process is that condom suppliers are present in abundance whereas suppliers of, for example injectables are available in a very restricted number. This fact has implications on several parts and procedures of not only procurement but also for the entire supply chain.\textsuperscript{68}

The third, dual sided, part of the selecting supplier process is \textit{pre-qualification}. The criteria for this process are predetermined and clearly specified to all parties involved. In a few words, factory inspection involves a two-day inspection visit to individual premises by a team of consultants, one interpreter as needed and one procurement officer. The purpose of the visit is to determine whether the manufacturer can produce commodities in compliance with UNFPA quality measures. To do this, UNFPA reviews quality management systems, equipment and raw material technology. In addition, the sampling and testing are carried out both as visual inspections, examination of finished products as well as independent laboratory testing.

\begin{itemize}
\item \textsuperscript{64} Thidar Myint, 2005-07-06
\item \textsuperscript{65} Ibid
\item \textsuperscript{66} See www.ungm.org
\item \textsuperscript{67} Ingegerd Nordin, 2005-10-13
\item \textsuperscript{68} Supplementary Procurement Guidelines, UNFPA, 2003
\end{itemize}
The last two phases of the supplier selection are invitations to bid and contract award. Invitations to bid are issued only to suppliers who have been pre-qualified and who have passed the pre-qualification criteria before a stipulated time. Any suppliers that go through also this stage can partake in negotiations to settle a contract that often reaches for a time limit within 12 to 36 months. The following two contracts are possible:

- Long term agreements – prices are guaranteed for the entire contract period and quantities used by UNFPA in the tenders are just estimates
- Fixed quantity contracts – UNFPA procurement enters into fixed quantity contracts with a supplier for the delivery of a specific quantity of a generic RH commodity for a specific project

The most common type of contract is the long term agreement. An example from the RH commodity price list for this type is given in Table 5. In addition, the following bullet point list shows a few of the suppliers that UNFPA has established long-term agreements with. Please note that within the brackets it is outlined what commodities or services are supplied by each company: 69

- The Female Health Company (female condoms)
- Crown Agents (sampling and testing) 70
- Wyeth (oral contraceptives)
- Innotech (spermicides)
- Organon (injectables & implants)

The unit prices for the RH commodity price list are of FOB or FCA type according to Incoterms 1990. In some cases, such as for example female condoms, UNFPA negotiates contracts of Ex-Works type. Freight and inspection costs are not included. 71

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microgynon 30 (oral contraceptive pill)</td>
<td>0.225 EUR</td>
<td>&lt; 50,000 cycles &lt; 50,000 cycles: 5 % discount &gt; 100,000 cycles: 7.5 % discount &gt; 200,000 cycles: 10 % discount</td>
</tr>
</tbody>
</table>

4.1.1.4 Initiation of purchase order

To initiate a purchase order two different input data are needed. As seen in Figure 9, these data are outputs from the two preceding processes: allocate funds and choose

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69 RH commodities price list, UNFPA, 2005
70 See http://crownagents.com for further information on this agent.
71 See Annex II for explanations of the Incoterms FOB, FCA and Ex Works.
supplier. The purchase order is issued to the vendor and distributed to all parties involved. Finally, the output of this sub-process is an acknowledgement and also a trigger to launch the delivery process.

4.1.1.5 Delivery of goods

As the purchase order has been sent and the acknowledgement has been received the sub-process *goods delivery* is initiated. This process can be viewed in detail, see Figure 10. As in the situation of negotiating contracts, also, this process varies slightly between different types of contraceptives.

Prior to shipment, each consignment of condoms will be sampled at the factory or supplier’s warehouse in accordance with the certificate ISO 2859-1 and technical specifications governing this contract by an independent organization appointed by UNFPA or its authorized agent. These samples will then be tested by an independent testing organization. It must be pointed out that this procedure is specific for condoms only. This means that other contraceptives also are inspected and tested, however, just a selection of the entire shipment and in some cases solely random inspections are carried out. Condoms are shipped in great quantities and, as will be explained, are subject to many different kinds of defects. Therefore condoms are tested batch-by-batch for every single shipment that goes through UNFPA procurement.\(^{72}\)

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\(^{72}\) Supplementary Procurement Guidelines 2003

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![Sampling Compliance Programme](image_url)

**Figure 10 – Goods delivery process**

The Sampling Compliance Programme (SCP) includes the three activities inspecting; sampling; and testing. These activities together form a very time consuming part of the
commodity supply chain. To just go over a few issues that have to be analyzed in the case of the SCP, this list gives a brief idea:

- **Dimensions:** Wall thickness, length and width – the acceptable quality level is 1%, which means that the measures are approved within the range of plus or minus 1%
- **Quantity of lubricant:** Through a process of multiple weighing, it is possible to check that quantity of lubricant; powder; and viscosity of the silicone are within acceptable limits
- **Bursting volume and pressure test**

After the SCP is completed, the batch of commodities is to be transported to the country that initially posed the request. The body in charge of the transportation is a freight forwarder company, which is chosen by the supplier and not by UNFPA. In the process of selecting freight forwarder the supplier is taking full responsibility for the contract and for controlling that the forwarder maintains timeliness as well as full coverage insurance. Because of this, UNFPA in reality is dependent on other parties to make the supply chain flow smoothly and effectively.

As for transportation mode, most of the commodities are sent by boat. This is the most economic way of transporting most commodities but, alas, this means of transportation also brings a major downside to the supply chain – the time it takes to get the shipment to the receiver. Boat, as a mode of transporting goods, is well known to be very time consuming, which is why UNFPA has an aim to select the supplier that offers: best price of commodities – this includes both commodity prices as well as freight costs; and lowest lead times – lead times are very long, sometimes up to almost half a year which implies that a significant reduction could be of a very substantial value to UNFPA. Depending on the urgency involved, number and types of commodities requested and the time of the year, the delivery lead times vary substantially. As seen in Table 6, lead times differ quite a lot. Though, for planning purposes these numbers give substantial guidelines.73

<table>
<thead>
<tr>
<th>Contraceptive</th>
<th>Lead time (wks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condoms</td>
<td>24</td>
</tr>
<tr>
<td>Injectables</td>
<td>10</td>
</tr>
<tr>
<td>Orals/Pills</td>
<td>12-20</td>
</tr>
<tr>
<td>IUDS</td>
<td>16</td>
</tr>
<tr>
<td>Spermicides</td>
<td>20</td>
</tr>
<tr>
<td>Implants</td>
<td>20</td>
</tr>
</tbody>
</table>

73 [http://www.unfpa.org/procurement/faq_clients.htm](http://www.unfpa.org/procurement/faq_clients.htm) 2005-08-16
4.1.2 Emergency supply chain

In the case of an emergency shortfall there are many similar as well as rather different characteristics compared to the ordinary supply chain. The one observation that is rather apparent in relation to the word emergency is that the supply chain has to respond swiftly to any identified short-fall situation. With Table 6 in mind, for example the lead time of condom supplies, it is noticeable that the situation calls for a different approach to supply chain design and management. Another observation which has to be outlined is that UNFPA does not possess any warehouses at all. Then, how is the emergency supply chain built up in order to respond to time-critic demand issues?

Theoretically, the main process chart is almost identical to the one presented in Figure 8. However, since the supply chain must be more flexible, the sub-process allocate funds does not play the same role, but instead comes into the picture in the very end as an administrative phase for future funding purposes. Thus, the apparent problem to solve would be how to shorten the often-lengthy lead times for commonly requested contraceptive products for the international public sector. The solution to this matter is to arrange contraceptive stock holdings with a number of suppliers. In addition, these holdings of each commodity also comply with quality assurance measures. The outcome of these facilitations is that when a request for emergency delivery arrives at procurement, commodities will be ready to send at that very moment.

Moreover, most of these shipments are transported not by boat, but by plane, to shorten the lead times further. Regrettably, this entails much higher costs for transports. Another difference is that UNFPA negotiates a different contract in terms of Incoterms. Instead of signing FOB, FCA or Ex Works procurement of UNFPA applies CPT for this type of transports. Based on this discussion, looking into a more detailed description of the virtual main process chart for emergency deliveries, it does not coincide very much with the ordinary supply chain process.

As soon as the rushed delivery has been taken care of there are a number of things that have to be sorted out by procurement and the country office posing the request. Firstly, procurement inquires the suppliers to replenish stocks for future emergencies. Secondly, actual costs of the commodities delivered inclusive of sampling, testing, actual freight costs and other miscellaneous charges are calculated. Finally, funds are transferred from the client specific account into Global Contraceptive Commodity Programme (GCCP) account. The GCCP is the name of the mechanism that allows UNFPA to keep buffer stocks of essential contraceptives and Reproductive Health Kits at suppliers’ premises, which, as argued earlier, enables UNFPA to respond immediately to emergency requests from developing countries.

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74 Thidar Myint 2005-07-06
75 See Annex II for explanation of the Incoterm CIP.
76 http://www.unfpa.org/procurement/faq_clients.htm 2005-08-26
4.2 Country-level supply chain

In this chapter, the findings from a study on the contraceptive supply chain in Bangladesh are presented. Following a brief introduction of the country, the following areas are presented in consecutive order:

- Donors
- Distribution channels
- The contraceptive supply system

4.2.1 Overview of the country

Bangladesh is situated in the southern parts of Asia, bordering the Bay of Bengal, between Burma and India, see Figure 11. This subchapter is not allocated for the purpose of entering deeper into geographic education; however, the author found it suitable to create a tangible instance to which further information can be referred to. Also, for information on population data please see Table 9.

Figure 11 – Map of Bangladesh

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78 Ibid
4.2.2 RHCS initiative
As part of the global agenda of UNFPA every country office is obliged to perform a situational analysis on RHCS and publish a report of ongoing and future programmes. For the mere interest on where the country office of Bangladesh stands it is of interest to include the following statement, taken directly from the annual report of 2004.79

“Government attaches highest priority to ensure the availability of RH commodities specially contraceptives. A national Reproductive Health Commodity (Contraceptive) Security committee regularly monitors the stock and pipeline situation of RH Commodities. UNFPA takes lead role in the committee as UNFPA procures RH commodities on behalf of the Government with donor funds. UNFPA participates in the Contraceptive forecasting exercise of the Government along with other Development Partners.”

4.2.3 Donors
Among the donors involved in procuring contraceptives or supporting the logistics management activities of Bangladesh are, in addition to UNFPA, the following.80

- USAID, working through the National Integrated Health and Population Programme (NIPHP)81 partners, provides major support to NGOs, and some support to the GOB through FPLM, for health, population, and nutrition activities. These activities include the donation of oral contraceptives and condoms to the social marketing companies (SMC).
- The German Government Aid Bank (KfW) provides money for contraceptive procurement for the Bangladesh government and, until recently, used UNFPA as its procurement agent. Due to delay over appointment of a government procurement agent, KfW is procuring pills for the government on its own.
- CIDA has been providing assistance with contraceptive procurement for the Bangladesh government for more than 20 years. CIDA uses UNFPA as a procurement agent but holds some money back for emergency supplies.
- Department of International Development, of the British government, has been providing increasing support since 1990. In particular, they supplied the social marketing program, e.g. SMC, with some pills in 1998 and 1999.

4.2.4 Distribution channels
The donors mentioned above are today providing most of the contraceptives distributed in Bangladesh. For the purpose of distribution there are mainly four different channels of supply.82

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81 See http://www.usaid.gov/bd/files/niphp.doc for further information on NIPHP.
82 Jawher L. Das 2005-08-03
Directorate of Family Planning (DFP) of the Ministry of Health and Family Welfare

SMC

Non-Governmental Organizations (NGOs)

Private commercial sector

In general, all contraceptives provided to DFP and NGO outlets flow through the logistics system of the DFP. SMC has its own logistics system consisting of a central warehouse, eight area stores and five zone stores. The system serves approximately 150,000 retailers nationwide.

In addition to the provision of contraceptives, the donor community provides vehicles, other equipment, medical supplies, building construction and other forms of support. Donors, mainly UNFPA and USAID, have also provided technical assistance in logistics management through short-term and resident experts for several years. At present, USAID is supporting the logistics programme through resident experts from the FPLM Project of JSI/Deliver.

4.2.5 The contraceptive supply system

4.2.5.1 Warehousing

The DFP’s contraceptive supply system is managed by the Director of Logistics and Supply. The supply system is constituted by five different levels with:

- One central warehouse (built in the late 1970s) at Dhaka
- Three regional warehouses (built in early 1990s) at Chittagong, Khulna and Bogra, which is situated just northwest of Dhaka
- 20 district reserve stores
- 460 Thana stores
- 5000 permanent service delivery outlets
- 31000 satellite clinics

The numbers on which the list above is based on were initially found in a country report from 1994. Of course that is a much too long period for the numbers to be reliable in any way. Therefore, Jawher L. Das was consulted; who in turn updated and validated the numbers to be good approximates of today’s storage sites. A brief example of different stores together with a mix of stock information is given in Table 7 and Table 8. The system that is in use for inventory control is called Min-Max and briefly implies that as soon as the inventory level decreases to a certain level a signal will alert reordering. The reordering will according to the system only allow request for commodities up to a preset maximum inventory level. In addition, warehouse management follows a procedure

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83 Thana store equals warehouse of sub-district level.
called *FEFO*, which stands for First-to-Expire-First-Out. This is not to confuse with the commonly used FIFO (First-In-First-Out) since expire dates can differ significantly between deliveries.

<table>
<thead>
<tr>
<th>Region</th>
<th>Chittagong</th>
<th>Chittagong</th>
<th>Chittagong</th>
<th>Bogra</th>
<th>Bogra</th>
<th>Bogra</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>Comilla</td>
<td>Coxs Bazaar</td>
<td>Rangpur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size (sq ft)</td>
<td>13,373</td>
<td>12,000</td>
<td>12,000</td>
<td>2,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock out in November 1999 (Shukhi)</td>
<td>1 day</td>
<td>7 days</td>
<td>-</td>
<td>1 day</td>
<td>7 days</td>
<td>24 days</td>
</tr>
</tbody>
</table>

In 1999 a JSI study showed that low does oral pills (Shukhi) had been stocked out for 67 days over a six month period at the Chittagong warehouse. Since Chittagong is a regional warehouse this finding implies that the stock-out had an effect all the way down the supply chain. For example, one regional store in Chittagong could provide only one-third of the pills (Shukhi) required by one of its districts; Comilla District was completely stocked out of pills. This effect is also vaguely illustrated in Table 7.

Furthermore, with regard to the supply structure, central and regional warehouses also serve as district stores for thanas in their immediate vicinity. Also, the Chittagong regional warehouse serves as a transit store for goods imported through the port of Chittagong while awaiting shipment to the central warehouse.

<table>
<thead>
<tr>
<th>Region/District</th>
<th>Thana</th>
<th>Service Delivery Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depo-Provera</td>
<td>1.0</td>
<td>1.1</td>
</tr>
<tr>
<td>IUD</td>
<td>2.2</td>
<td>2.9</td>
</tr>
<tr>
<td>Pill</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Condom</td>
<td>2.5</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Finally, reports on warehouse staff show that in the end of the 1990s, all staff at the regional and district levels has received between 5 and 30 days of training in logistics and storekeeping. In addition, most of them have participated in one or more refresher courses in recent years.

### 4.2.5.2 Transportation system

DFP-owned trucks provide transportation down to the thana level, although some NGOs use their own trucks or commercial transportation. Transportation from thana to field levels is accomplished by staff of outlets and Family Welfare Assistants, who attend monthly meetings at the Thana Family Planning Office (TFPO) for receiving salaries, 

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85 Shukhi is a local brand of oral contraceptive pill solely distributed in Bangladesh.
resupply and monthly staff meetings. The TFPO pays any costs related to transporting supplies back to the outlet or work station.

There are schedules for monthly deliveries to regional warehouses, district reserve stores and thanas; however, deliveries may be at intervals greater than one month because of unequal storage capacity at thanas and the inability to predict well ahead of time when scheduled importations will be received.

Looking back ten years, a study of the DFP transportation system, found the following:

- DFP owned 59 vehicles for transporting the contraceptives and other materials managed by the system. Of this number, only 35 were serviceable
- 72 thanas (15 per cent) were inaccessible by vehicle year-round and 8 more were inaccessible during the monsoon season
- There was no unit to manage transport and no transport officer
- There were no maintenance schedules, and no vehicles received routine preventive maintenance. Government regulations prevented timely maintenance and repair

However, as of today, many of these problems have been eradicated. Jawher concludes “Transport from both the regional and district levels to distribute supplies to the thana level is adequate. Routing plans are efficient, and most vehicles are operational.”

Although most contraceptives enter the country by sea through the port at Chittagong, condoms and IUDs are transported by the shipper from the port to the central warehouse at Dhaka for customs clearance; pills and inevitable are cleared through customs at Chittagong. The regional warehouse at Chittagong retains stock for the Chittagong Region, and the rest is shipped by government vehicles to the central warehouse for national distribution. All air shipments come to Dhaka Central Warehouse, where they are cleared through customs; these are usually small quantities or emergency shipments.86

The LMIS supporting the system is extensive, consisting of inventory control registers, performance records and a series of monthly reports. At the time of inventory controls, all records are corrected; staff is given instructions, as appropriate. All contraceptives and strategic family planning supplies are included in the LMIS. Contraceptives are shipped to all programme levels down to the thanas according to these reports. The present policy is to maintain two months’ supply at field levels and three months’ supply at each of the higher levels, for a total of 14 month’s supply in the system; a month’s supply is defined as the monthly average dispensed to users over the most recent six months. These quantities are necessary at present to ensure that minimum stock-out and low stock conditions do not occur. In addition, the LMIS produces annual reports of the condition of the logistics system, including problems identified and recommendations for action.87

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86 Jawher L. Das 2005-08-03
87 Ibid
4.2.5.3 Forecasting

Long-term projections of contraceptive consumption are prepared in conjunction with the preparation of the Government’s five-year development plans. These projections are converted into proposed procurement plans after taking present inventories into consideration. The projections also include requirement for the NGOs that are served through the DFP logistics system.

Forecasts for three years’ use and costs are prepared annually. These forecasts are called *Contraceptive Procurement Tables* (CPTs) and include the beginning inventory, actual consumption for the past two years, and anticipated consumption for the next three years, and the quantities of each contraceptive that must be procured to maintain desired stock levels. Copies of the CPTs are provided to the donors, and quantities and shipping schedules are negotiated. This information is also entered into CCM, though; CCM software is not installed in the warehouse but in the UNFPA country office.

Going back five years in time data from the monitoring process were published separately in a “Monthly Pipeline Report” to keep donors and key programme officials up to date with the system. From time to time, an ad hoc committee, usually composed of senior programme officials, reviewed the forecasts and the forecasting process. Nowadays, this information is mainly distributed through headquarters by using CCM.

Forecasts for the SMC are generally based on past performance and future marketing strategies. CPTs are prepared for the SMC contraceptives, and sales and receipts are reported to the LMIS each month. The supply status is monitored in the same way as that for the DFP.

4.2.5.4 Procurement

As international financial assistance for family planning programs has diminished and donors have begun phasing out their support for contraceptive supplies, many developing countries now face the responsibility of procuring their own contraceptives and medical supplies. Procurement practices can have a profound impact on product quality and program costs. Therefore, as programs move toward independence from donor-supplied health care commodities, it is important to ensure that a sound procurement system staffed with competent personnel is in place to help countries procure safe and effective products at reasonable prices. The government of Bangladesh secured funding for contraceptive supplies as part of the IDA/World Bank funded Health and Population Sector Program. But, lack of procurement capacity within the Ministry of Health and Family Welfare (MOHFW), particularly in complying with IDA/World Bank procurement requirements, was a barrier to using the funds. In 2002, JSI/DELIVER began providing assistance to strengthen the capacity of MOHFW personnel to procure contraceptives and medical supplies in accordance with World Bank regulations. The project, with assistance from PATH, identified gaps and constraints in conducting international procurement, and developed a customized training program to address specific steps in the procurement process, from preparing bidding documents to awarding contracts. As a result, the MOHFW independently issued an international tender for 446 million pieces of condom requirements, which resulted in a product price below what was available through the services of a large international procurement organization. World
Bank-financed procurements have totaled U.S. $92 million and Bangladesh’s ability to procure large quantities at competitive prices resulted in lower unit costs and a savings of more than U.S. $17 million compared to prices paid by donors.\textsuperscript{88}

Bangladesh’s World Bank-sponsored programmes provided the opportunity for national contraceptive procurement to generate economies of scale in purchasing contraceptives. For this to be realized, JSI/DELIVER and PATH provided technical assistance to strengthen the national procurement capacity in the Directorate of Family Planning in the Ministry of Health and Family Welfare (MOHFW). The benefits from this capacity building meant that, with the high volume of condoms and pills purchased, the DFP was able to obtain unit prices from the winning Indian suppliers at a far lower than typically quoted international price; for example, US $0.07 and $0.11 per cycle of pills compared to $0.23 per cycle for commodities procured by CIDA and KfW in 2000. The MOHFW estimated savings may be as large as a billion Taka or US $17.2 million. The Ministry of Finance, for the first time, approved U.S. $690,000 to fund contraceptives from the government’s own revenue budget in 2004 and again in 2005. Forecasts of Bangladesh’s funding needs for 2010 were reduced downward from $60 million estimated in 2000 prices to $40 million for the same volume of commodities at the lower prices obtained.

4.2.5.5 Quality assurance

At present, quality assurance consists of visual inspection of shipments received and in storage. All manufacturers providing contraceptives to family planning programmes have been pre-certified for product quality. At present, the Government has no capability for conducting PSI/laboratory tests of contraceptives, which are important especially for contraceptives.

As a general rule, condoms should be tested before they are shipped, and again for quality when they are one and a half to two years old, provided they have been properly stored. The recommended testing procedures are being formulated by the World Health Organization (WHO) and should be available in near future.\textsuperscript{89}

4.3 Forecasting in the supply chain

4.3.1 Population data forecasting

As part of the UN system UNFPA has access to immense databases filled with population data. This data has been collected through extensive surveys carried out by for example the UN population division and Demographic Health Surveys.\textsuperscript{90} In these databases it is possible to find a variety of information related to population issues from most of the countries around the world. Examples of different areas of information that can be extracted from the databases are presented in the following bullet point list:

- Number of women of reproductive age (15 – 49 years)
- Unmarried women sexual activity

\textsuperscript{88} Sarley, D. Et al 2005
\textsuperscript{89} Jawher L. Das, 2005-08-03
\textsuperscript{90} See http://www.measureDHS.com for more information
Contraceptive prevalence and method mix

HIV prevalence

By exploring the many databases containing population data it is possible to access information related to the area of family planning in order to create a customized database for forecasting purpose. As of June 2005 there had been attempts to forecast, verify and justify country contraceptive requests by using population data, in CCM, which will be explained in more detail in the next subchapter.

The idea of using population data for the purpose of managing forecasting or for the justification of present and future donor support was stressed in July 2005 as the Thematic Trust Fund was becoming an urging issue to handle. As mentioned in the introduction, the TTF is supposed to cover the commodity shortfalls for countries without sufficient funding instruments and the amount to be used for commodity procurement in 2005 is approximately US$ 67.5 million. The reason why the issue of request validation has become such a focused topic can be explained in two ways: Firstly, the many commodity requests from countries to the TTF went beyond the available sum of money. Therefore, not all countries can receive their requests. Secondly, since UNFPA budget in 2004 was US$ 331 million the TTF alone matches a fourth of that. Because of this, it is crucial for UNFPA to manage the validation of country requests solidly and professionally since the process will be monitored closely.

By setting up a population database, which was accomplished in July 2005, means were facilitated to create two tables for the purpose of forecasting contraceptive consumption in a country. The first one, see Table 9 – Population data, Bangladesh, is a sheet containing general information on a selected country. In this thesis, Bangladesh is used to illustrate the substance of the forecasting model. To begin with, a further explanation of the variables being used, as given in Table 9, is:

- WRA stands for Women of Reproductive Age and refers to women in the age of 15-49
- MWRA is Married Women of Reproductive Age
- TFR denotes Total Fertility Rate
- CPR means Contraceptive Prevalence Rate
- MMR is short form for Maternal Mortality Rate

In order to forecast contraceptive consumption the procedure is to calculate number of couples using a certain method and multiply by number of units required for one year’s protection. On the following page a detailed list is presented to clarify the columns and calculations of Table 10.
Table 9 – Population data, Bangladesh, UNFPA 2005

1. General Information

<table>
<thead>
<tr>
<th></th>
<th>2004 Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>UNPD, Population Projections, 2004 Revision</td>
</tr>
<tr>
<td>WRA</td>
<td>UNPD, Population Projections, 2004 Revision</td>
</tr>
<tr>
<td>MWRA</td>
<td>UNPD, Population Projections, 2004 Revision</td>
</tr>
<tr>
<td>WRA as % of Total Population</td>
<td>=WRA/Population</td>
</tr>
<tr>
<td>TFR</td>
<td>UNPD, Population Projections, 2004 Revision</td>
</tr>
<tr>
<td>Annual Number of Births</td>
<td>UNPD, Population Projections, 2004 Revision</td>
</tr>
<tr>
<td>CPR (all methods)</td>
<td>UN Pop Division, World Contraceptive Use 2003</td>
</tr>
<tr>
<td>CPR (modern methods only)</td>
<td>UN Pop Division, World Contraceptive Use 2003</td>
</tr>
<tr>
<td>Unmet Need</td>
<td>DHS, 1999/2000</td>
</tr>
<tr>
<td>Prop. of Demand Satisfied</td>
<td>=CPR/(CPR+Unmet Need)</td>
</tr>
<tr>
<td>HIV Prevalence</td>
<td>No data available</td>
</tr>
<tr>
<td>MMR (per 100,000 live births)</td>
<td>WHO, UNICEF, UNFPA: Maternal Mortality Estimates 2000</td>
</tr>
<tr>
<td>Number of Maternal Deaths</td>
<td>=Births*MMR</td>
</tr>
</tbody>
</table>

From the general population data table it was achievable to estimate and compute the data further in order to establish numbers useful for family planning forecasting purposes. The following steps were, as shown in Table 10, to calculate:

- **Number of users** = % of WRA using a method multiplied by total number of WRA. Taking condoms as an example: 17.9 % * 35,456,815 = 6,332,040
- **Annual number of commodities required** - CYP stands for *Couple Year Protection* and implies a measure, which indicates the amount of commodities of a specific type that provide contraceptive protection for one year. Thus, to continue the previous example: 6,332,040 * 15 = 94,980,597
- **Governmental share of annual consumption.** UNFPA distributes contraceptives through country governments, not through private and commercial sectors, which in this case adds up to: 94,980,597 * 56 % = 53,569,057

Table 10 – Estimation of annual commodity request of Bangladesh, UNFPA 2005

3. Projected Commodity Requirements based on Population Data

<table>
<thead>
<tr>
<th>Methods</th>
<th>% of WRA using this method</th>
<th>No. of Users</th>
<th>Commodities Required per CYP</th>
<th>Annual No. of Commodities Required</th>
<th>% Supplied by Govt</th>
<th>Annual Commodities Required (Govt’s Share)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pills</td>
<td>17.9%</td>
<td>6,332,040</td>
<td>15 cycles</td>
<td>94,980,597</td>
<td>56%</td>
<td>53,569,057</td>
</tr>
<tr>
<td>Injectables</td>
<td>5.7%</td>
<td>2,009,734</td>
<td>4 injections</td>
<td>8,038,937</td>
<td>85%</td>
<td>6,849,175</td>
</tr>
<tr>
<td>Condom - Male</td>
<td>3.3%</td>
<td>1,183,816</td>
<td>120 condoms</td>
<td>142,057,937</td>
<td>20%</td>
<td>28,127,471</td>
</tr>
<tr>
<td>Condom - Female</td>
<td>NA</td>
<td>NA</td>
<td>120 condoms</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>IUD</td>
<td>0.9%</td>
<td>330,367</td>
<td>1 IUD = 3.5 CYP</td>
<td>94,391</td>
<td>90%</td>
<td>84,763</td>
</tr>
<tr>
<td>Implant</td>
<td>0.3%</td>
<td>110,122</td>
<td>1 Implant = 3.5 CYP</td>
<td>31,464</td>
<td>83%</td>
<td>26,178</td>
</tr>
</tbody>
</table>

4.3.2 CCM

4.3.2.1 General description

The purpose of the Country Commodity Manager is to assist country offices in their efforts to assess their reproductive health commodity requirements, stock positions, and possible shortfalls. As explained by Joseph Abraham, the creator of CCM, this is an easy-to-use program which can quickly generate models and reports which will:

1. Forecast RH commodity requirements based on logistics and inventory data
2. Validate this forecast utilizing demographic data
3. Warn of future reproductive health commodity shortfalls

CCM also provides a mechanism to readily transmit each country’s data to UNFPA headquarters from their country offices for use in generating global level reports of the purposes of planning, advocacy and resource mobilization. Today, CCM is installed in 75 countries, mainly situated in Africa and it is a goal for UNFPA to continue the implementation of the software in additional countries within the next few years.

4.3.2.2 Structure

For the purpose of forecasting, CCM provides three sets of data tables: stock; commodity; and procurement plan, see the following bullet point list. As a complement to these there are several possibilities to automatically calculate future inventory, requirements and predicted shortfalls. For a quick idea of how the main menu is built up, see Appendix III.

The program is meant to be very easy to understand and manage, which is a rather stressed characteristic. The reason for this is that the data tables are to be filled out by country office staff that in some cases is not very familiar to working with computers.

- To begin with, the stock table is used to store the data depicting the current inventory levels of the various commodities in the central warehouse where the CCM is installed. The data records should consist of the quantities of each commodity from the most recent inventory as well as the stock currently in the pipeline. Moreover, staff is supposed to fill in the name of the provider for each delivery, the arrival date as well as the expiry date.

- The second data table that is used for forecasting is the commodity table. This data simply states the average monthly consumption of any given commodity article.

- The third table is the procurement plan table, which is used to record the amount of commodities planned to be ordered in an upcoming time period. It records the total amounts to be ordered and the amounts to be provided by UNFPA.

4.3.2.3 Functionality

The function of the computer model is to forecast and display the quantities of a selected commodity-formulation for the next one to five years (even longer, if required). The
The model displays two years worth of data on a single screen. Hence, the screen is divided into 24 monthly containers. Each container is labeled as to which month it denotes. Inside the container are records, detailing the quantity and expiration date of the amount of stock it represents in the warehouse.

The model fills the monthly containers with the data from the Stock Table depicting the quantity, the arrival date, and the expiration date of the stock. Then, based on the monthly consumption figures in the Commodity Table, the model reduces the monthly stock quantities employing the FEFO (First to Expire First Out) method to simulate usage. The model also reduces the supply amounts based on stock that meets its expiration date before it is consumed. The user may select which two-year time period he or she wishes to display. For the purpose of predicting future procurement in order to prevent shortfalls the estimated consumption is deducted from the given inventory levels. Months where there will be a shortfall of the commodity modeled are shown with a red banner.

To calculate what quantities of each commodity that leave the warehouse in a given time period CCM uses the latest defined monthly consumption data. For example, the consumption of male condoms in Bangladesh from now and a year forward is calculated according to Table 11. However, the monthly consumption is based on an annual consumption estimate, or explained other words: the average consumption presented in CCM is a snapshot of the estimated annual average consumption, which is then divided by 12 to achieve average monthly consumption of a certain contraceptive commodity. In addition, historical data is, as of today, not fully stored in the program.

<table>
<thead>
<tr>
<th>Country</th>
<th>Commodity</th>
<th>Monthly consumption (latest data)</th>
<th>12 months consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Male condoms</td>
<td>7,000,000</td>
<td>7,000,000 * 12 = 84,000,000</td>
</tr>
</tbody>
</table>

As of today, CCM has not yet been implemented with the procurement unit of UNFPA. The procurement division is currently focusing its efforts towards developing an online system called *e-procurement*. This software is a means of internet communication, which allows the buyer to partake in product catalogues, place orders and receive confirmation at a faster pace than before. Meanwhile UNFPA plans to release CHANNEL, which fundamentally is the same program as CCM but meant to be installed and used by layers below central warehouse. In this way expectations are that the supply chain will be more transparent and easier to access.

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91 The procurement division is currently implementing not only e-procurement, but a number of tools for ameliorating procurement processes and procedures, for example CAPOW, Order Tracking System and Super Office.
4.3.3 Comparison of population data and CCM

In order to evaluate the commodity requisitions made by countries to the TTF the CU was assigned to compare the latest population data, which was discussed earlier in this chapter, with the figures that were indicated by CCM. To give examples of this analysis there are two tables that show consumption data for oral contraceptives and male condoms, see Table 12 and Table 13. In these tables several columns containing projected annual consumption are presented. In addition, both tables show respective country request from the TTF. The only difference is that Table 13 contains a separate column with each country’s data on HIV prevalence.

<table>
<thead>
<tr>
<th>CCM Countries</th>
<th>Request TTF</th>
<th>Annual consumption - CPR</th>
<th>Governmental share - CPR</th>
<th>Annual consumption (CCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BANGLADESH</td>
<td>0</td>
<td>5,071,907</td>
<td>4,554,572</td>
<td>282,000</td>
</tr>
<tr>
<td>BENIN</td>
<td>30000</td>
<td>199,604</td>
<td>178,845</td>
<td>4,332</td>
</tr>
<tr>
<td>BOLIVIA</td>
<td>0</td>
<td>3,499,181</td>
<td>2,396,939</td>
<td>21,324</td>
</tr>
<tr>
<td>BURKINA FASO</td>
<td>2800</td>
<td>282,354</td>
<td>247,907</td>
<td>1,524</td>
</tr>
<tr>
<td>CAMEROON</td>
<td>1300</td>
<td>289,892</td>
<td>185,531</td>
<td>1,200</td>
</tr>
<tr>
<td>COMOROS</td>
<td>0</td>
<td>35,709</td>
<td>20,390</td>
<td>216</td>
</tr>
<tr>
<td>ETHIOPIA</td>
<td>4000</td>
<td>171,546</td>
<td>76,681</td>
<td>3,636</td>
</tr>
<tr>
<td>KENYA</td>
<td>0</td>
<td>2,698,709</td>
<td>1,319,669</td>
<td>28,164</td>
</tr>
<tr>
<td>MADAGASCAR</td>
<td>0</td>
<td>124,132</td>
<td>42,205</td>
<td>1,800</td>
</tr>
<tr>
<td>MAURITANIA</td>
<td>0</td>
<td>289,461</td>
<td>179,176</td>
<td>19,056</td>
</tr>
<tr>
<td>MOZAMBIQUE</td>
<td>0</td>
<td>622,445</td>
<td>609,996</td>
<td>18,840</td>
</tr>
<tr>
<td>MYANMAR</td>
<td>59320</td>
<td>1,515,568</td>
<td>-</td>
<td>35,592</td>
</tr>
<tr>
<td>NAMIBIA</td>
<td>0</td>
<td>123,548</td>
<td>65,851</td>
<td>-</td>
</tr>
<tr>
<td>NIGER</td>
<td>0</td>
<td>126,788</td>
<td>114,363</td>
<td>288</td>
</tr>
<tr>
<td>NIGERIA</td>
<td>87456</td>
<td>8,098,556</td>
<td>5,304,554</td>
<td>70,032</td>
</tr>
<tr>
<td>PHILIPPINES</td>
<td>192000</td>
<td>7,027,551</td>
<td>5,629,069</td>
<td>116,400</td>
</tr>
<tr>
<td>ROMANIA</td>
<td>20000</td>
<td>3,937,080</td>
<td>-</td>
<td>8,184</td>
</tr>
<tr>
<td>SAO TOME AND PRINCIPE</td>
<td>100</td>
<td>947</td>
<td>-</td>
<td>300</td>
</tr>
<tr>
<td>SENEGAL</td>
<td>9224</td>
<td>967,742</td>
<td>646,452</td>
<td>3,528</td>
</tr>
<tr>
<td>SRI LANKA</td>
<td>0</td>
<td>1,394,948</td>
<td>1,325,201</td>
<td>75,000</td>
</tr>
<tr>
<td>UGANDA</td>
<td>5000</td>
<td>337,858</td>
<td>224,338</td>
<td>6,996</td>
</tr>
<tr>
<td>UZBEKISTAN</td>
<td>322700</td>
<td>50,526,150</td>
<td>49,869,310</td>
<td>720,000</td>
</tr>
<tr>
<td>VIETNAM</td>
<td>1000000</td>
<td>83,433,793</td>
<td>78,344,332</td>
<td>1,558,620</td>
</tr>
</tbody>
</table>
A quick glance at Table 12 and the comparison of pill consumption indicates that the figures constitute a fairly linear equation between CPR (governmental share) and CCM consumption data. In fact, a regression analysis was performed on this relation and showed on a R2 value of 0.95 (1.00 would denote perfect correlation). Although this comparison might not mean all that much it is still an indication that CCM covers a constant, but yet small, percentage of the total governmental distribution. Moreover, regarding the respective TTF request for each country more or less all requests seem reasonable in relation to both CPR and CCM data. Even though consumption data and comparison for all the generic contraceptives are not presented with tables and figures it should be highlighted that they all seem to match quite well to the comparison of oral contraceptives data.

Table 13 – Comparison of CCM and population data (male condoms), units

<table>
<thead>
<tr>
<th>CCM Countries</th>
<th>Request TTF</th>
<th>Annual consumption male condoms (CCM)</th>
<th>Annual consumption male condoms (CPR)</th>
<th>Condoms supplied by Gov't (CPR)</th>
<th>HIV Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>100,000,000</td>
<td>84,000,000</td>
<td>145,394,663</td>
<td>28,788,143</td>
<td></td>
</tr>
<tr>
<td>Benin</td>
<td>300,000</td>
<td>9,891,672</td>
<td>9,734,400</td>
<td>798,221</td>
<td>2%</td>
</tr>
<tr>
<td>Botswana</td>
<td>-</td>
<td>20,028,000</td>
<td>2,441,610</td>
<td>1,706,685</td>
<td>37%</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>1,652,800</td>
<td>934,140</td>
<td>31,195,134</td>
<td>1,902,903</td>
<td>4%</td>
</tr>
<tr>
<td>Burundi</td>
<td>1,440,000</td>
<td>3,686,832</td>
<td>228,057</td>
<td>-</td>
<td>6%</td>
</tr>
<tr>
<td>Cambodia</td>
<td>-</td>
<td>3,107,868</td>
<td>57,901,652</td>
<td>15,575,544</td>
<td>3%</td>
</tr>
<tr>
<td>Cameroon</td>
<td>1,415,000</td>
<td>24,756,000</td>
<td>29,523,297</td>
<td>1,269,502</td>
<td>7%</td>
</tr>
<tr>
<td>Eritrea</td>
<td>-</td>
<td>5,330,400</td>
<td>8,015,751</td>
<td>905,780</td>
<td>3%</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>8,000,000</td>
<td>13,835,004</td>
<td>91,008,879</td>
<td>29,122,841</td>
<td>4%</td>
</tr>
<tr>
<td>Ghana</td>
<td>-</td>
<td>37,150,008</td>
<td>38,572,895</td>
<td>2,005,791</td>
<td>3%</td>
</tr>
<tr>
<td>Guatemala</td>
<td>-</td>
<td>3,238,452</td>
<td>10,973,616</td>
<td>801,074</td>
<td>1%</td>
</tr>
<tr>
<td>Guinea</td>
<td>-</td>
<td>11,952</td>
<td>11,274,594</td>
<td>1,420,599</td>
<td>3%</td>
</tr>
<tr>
<td>Haiti</td>
<td>-</td>
<td>25,920,000</td>
<td>26,101,649</td>
<td>1,174,574</td>
<td>6%</td>
</tr>
<tr>
<td>Kenya</td>
<td>-</td>
<td>104,226,492</td>
<td>40,162,130</td>
<td>6,466,103</td>
<td>7%</td>
</tr>
<tr>
<td>Liberia</td>
<td>-</td>
<td>3,462,360</td>
<td>-</td>
<td>-</td>
<td>6%</td>
</tr>
<tr>
<td>Madagascar</td>
<td>-</td>
<td>6,180,000</td>
<td>6,172,231</td>
<td>141,961</td>
<td>2%</td>
</tr>
<tr>
<td>Mauritania</td>
<td>504,000</td>
<td>1,016,796</td>
<td>406,750</td>
<td>132,601</td>
<td>1%</td>
</tr>
<tr>
<td>MOZAMBIQUE</td>
<td>-</td>
<td>18,000,000</td>
<td>3,643,317</td>
<td>910,829</td>
<td>12%</td>
</tr>
<tr>
<td>NAMIBIA</td>
<td>20,000,000</td>
<td>3,969,360</td>
<td>597,666</td>
<td>430,917</td>
<td>21%</td>
</tr>
<tr>
<td>NIGER</td>
<td>-</td>
<td>727,380</td>
<td>7,448,057</td>
<td>2,703,645</td>
<td>1%</td>
</tr>
<tr>
<td>NIGERIA</td>
<td>8,648,976</td>
<td>4,324,488</td>
<td>71,353,242</td>
<td>2,925,483</td>
<td>5%</td>
</tr>
<tr>
<td>SENEGAL</td>
<td>2,030,000</td>
<td>2,964,000</td>
<td>30,074,384</td>
<td>6,887,034</td>
<td>1%</td>
</tr>
<tr>
<td>UGANDA</td>
<td>-</td>
<td>87,600,000</td>
<td>81,817,265</td>
<td>7,445,371</td>
<td>4%</td>
</tr>
</tbody>
</table>
In the case of male condoms CCM consumption data does not match neither the CPR data nor the TTF requests to the same extent as in the case of oral contraceptives. It must be strongly pointed out that these figures are not expected to be correlated since male condoms are mostly connected to prevention of HIV. This fact makes it very difficult to forecast the actual consumption of male condoms for family planning purposes; and, a comparison between the given consumption data and the current HIV prevalence numbers indicates that the numbers tend to vary more as HIV prevalence is higher in a country. Examples, as presented in Table 13, are the countries Botswana, Mozambique and Namibia. For these countries there is a great variation between the estimated consumption based on either CPR or CCM.

4.3.4 PipeLine

Apart from UNFPA there are many other organizations that are committed to aiding in the supply of contraceptive commodities. The main players are, except from UNFPA, U.S. Agency for International Development (USAID) and International Planned Parenthood Federation (IPPF), but there are numerous other organizations operating in countries around the world. Historically, these organizations have all, more or less, been following individual paths of working methods, which is why the situation in some countries is close to being absurd. For example, in a number of African countries, there are as many as ten different logistic management information tools in use.92

The one tool that is gaining most recognition besides CCM is called PipeLine. The PipeLine software was developed by JSI in a project called DELIVER and is designed to assist programme and logistics managers with forecasting, pipeline management, and procurement planning. PipeLine is currently used by programme logistics staff and managers in over 20 countries in Asia, Africa, and Latin America.

A more detailed explanation of what data PipeLine captures is as follows:93

- Monitors total quantities of contraceptives consumed (actual and forecast)
- Keeps track of shipments of new products (planned, ordered, shipped, or received, and their value)
- Manages inventory levels, and can calculate changes in inventory based on physical inventory checks (due to such events as loss or expiry)

4.3.5 Coordination of forecasting

To advocate the coordination concerning contraceptive supply information and procedures, the RHInterchange has recently been established. The RHInterchange is a programme that is being developed within the framework of the Supply Initiative, which is managed by JSI. As of today, this programme consolidates procurement data from IPPF, UNFPA and USAID.94

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92 Eva Weissman 2005-06-06
According to the official homepage the RHInterchange standardizes regular transmissions of data from the three above mentioned donor agencies, allowing users to create reports either at a global, regional or country level for user-defined periods of time. Information at any of the geographic levels includes quantity, value, and method. Via the consolidation and open exchange of reproductive health commodity procurement data, the RHInterchange will:

- Improve the collection and use of contraceptive management information by and among major purchasers of contraceptives and condoms for developing countries
- Improve the efficiency and cost effectiveness of participating contraceptive funders' programmes
- Demonstrate the benefits of collaborative planning and management among donors' contraceptive programmes

Following the initial phase of the RHInterchange, other large-scale supply donors, such as the German Reconstruction Bank, and the UK Department for International Development, are expected to join the data pool.  

5 Analysis

In chapter 5, the aim is to analyze the comparison of the findings from the empirical studies with the theoretical framework that has been presented in chapter 3. The focus of the analysis will be of partly holistic character but also narrowed to discuss the particular forecasting function as one critical component of the supply chain. The discussion in this chapter will form the basis for recommendations given in the conclusions.

5.1 Contraceptive supply chain issues

Consider yet again the objective of a contraceptive supply chain: deliver the right product, in the right quantity, in the right condition, to the right place, at the right time, for the right cost. What is the supply focus for UNFPA today and how are these so called six rights related to forecasting? As an introduction to the analysis chapter these questions are explored in order to establish a foundation to build further analysis on; and also to point out the essence of forecasting and what impact it has on supply chain management. Please find any calculations made in this chapter to serve as indicators rather than exact facts.

5.1.1 Provide the right product

UNFPA provides a long list of several different contraceptive commodities. Not only standardized items, but also many alternatives of each method are distributed around the world. Take condoms as an example: small condoms; average size condoms; big condoms; non-labeled condoms; flavored condoms (banana or strawberry). In addition, some countries have their own requests for a specific brand or design; see Appendix IV for more examples.

The above mentioned variations create a substantial assignment for UNFPA to manage. And also it adds on a dimension of constraint to procurement division since some donors and countries earmark money for specific brands and manufacturers. In the case study of Bangladesh the oral contraceptive brand Shukhi was mentioned as an alternative to Microgynon, Rigevedon or Marvelon. In the long term there is an increased urge for standardization. Some commodities must be provided in different variations, although the tendency of an increased number of country-specific brands, such as Shukhi in Bangladesh calls for a different approach for procurement.

5.1.2 Quantity is crucial

As was stated in the introduction chapter of this thesis, $1 million shortfall in contraceptive supply assistance can lead to 360,000 more unwanted pregnancies; 150,000 additional induced abortions; 800 maternal deaths; 11,000 infant deaths; 14,000 additional deaths of children under 5. Hence, a shortfall of contraceptive commodities could prove to be devastating. But, at the same time distributing too many commodities to a given area is also alerting. The latter scenario would lead to over-stock, expired products and ultimately to a situation where the commodities could have been better off
in other countries where shortfalls are drawing closer. Hence, quantity is crucial, and it is a vital task to ensure that neither too few nor too many commodities are distributed to countries.

Then, how should one approach such an imperative task and what should be best practice for management and continuous improvements? It would be very useful to look into the crystal sphere and tell, but up until now that is not possible. Instead, the suggestion being discussed in this thesis is to use a forecasting tool, which should be based on information that could give indications about the future. The mathematics of forecasting is quite easy: the more relevant information provided - the better the forecasting will or has the potential to be. Though, the end result will also depend much on the person analyzing the information.

Another perspective of quantity is the relatively common term *economy of scale*. Basically, as shown in Table 5, quantity has a great influence on purchasing prices. Also, in the same sense, transport prices per unit will reduce as quantity goes up. This is the simple basics of *economy of scale* and for UNFPA it plays an important role for the overall end result of contraceptive commodity supply. UNFPA is, as stated earlier, one of the major procurement agents of contraceptive commodities. The reason why UNFPA is widely used by organizations and countries is the ability to consolidate quantities and negotiate better prices of commodities. For further discussion on this area please see section 5.1.6.

### 5.1.3 Condition and quality concerns

Most contraceptive consumers would be comforted by reading the UNFPA compliance and testing manual for contraceptive commodities. As described in the empirical study, quality conformance is of highest priority and, alas, adds on a significant amount of time to the total lead time of the supply chain. Of course, this matter must remain in the absolute front of stressed issues because of the severe effect any lost credibility would have. Therefore, quality compliance is a so called non-negotiable order qualifier.

Related to this area of concern is the tendency to initiate their own procurement division with their own testing facilities. Thus, testing will maybe not be under the direct control of the global UNFPA procurement and compliance unit. This trend has in this thesis been illustrated by the initiative taken in Bangladesh with technical assistance provided by the DELIVER and PATH projects. Not going through UNFPA but procuring on its own, Bangladesh will be required to establish a reliable and fully functional compliance unit.

This path that Bangladesh is choosing is completely in line with RHCS strategy to increase country capacity. The goal of RHCS is, as indicated earlier, to help countries become almost self-reliant in areas such as funding, procurement and forecasting. Therefore UNFPA can take on a role as providing technical support through country support teams and also auditing and ensuring acceptable quality conformance procedures.

### 5.1.4 Know the right place

When talking about contraceptives the right place of the supply chain refers to the numerous service delivery points, which are the closest link to the end consumer. Thus, it is not really useful to people in need if the central warehouse is overloaded with
contraceptives. Furthermore, the matter of importance is how well these products are carried downstream in the supply chain. As was pointed out in the case study, even though transportation and warehousing work properly, the delay of information in combination with the five-layer supply chain will cause an increased amount of stock-out days further down the pipeline. Just a blunt analysis of Table 7 gives an indication that a supply problem grows rapidly in dimension within the supply chain. More specifically, a day’s stock-out at the central warehouse could easily become a week’s delay at the regional level. Picture the delay in a five layer system and it is imaginable to suffer a month’s delay further down the pipeline.

In relation to the previous sections concerning quality and quantity it is interesting to analyze the consequences of reducing the number of layers in the supply chain. As shown in Table 8, inventory at every level is in general between one and three months and, moreover, the average of the given numbers is 2.02 months. With five layers each keeping inventories of two months that would count as ten months or roughly a year’s inventory (taken into account that some of the figures are much too low and thus should not be included). Provided more frequent deliveries, inventory could be kept at a lower level and also one or two levels of the supply chain could be removed. The result of such a strategic move would be abundantly freed bound capital, which could be used for investing in future capacity building, such as improving and training a conformance and testing unit, in order to approach the goals of RHCS.

5.1.5 A battle of time

To build on the discussion of right place concerns, the issue of right time is also of greatest importance for the structure and efficiency of the supply chain. Going through the immense conformance procedures and the very long lead times UNFPA procurement present together with the five level supply chain of Bangladesh makes it understandable that such a system is very slow to respond to rushed upcoming needs at a local service delivery point. But, how does one change this inflexible market response?

In chapter 3.2.1 Martin Christopher argues that the imposition of long manufacturing lead times is a mostly false constraint. He continues by saying that in reality it is possible to make to order on very short time scales for specific customers. A comment significant to this discussion is that sampling and testing times seem to be non-negotiable, which makes it difficult to cut total lead time this way. Furthermore, the author insists that it is essential for the global chain to hold a level of intermediate inventory between manufacturing and the customer to buffer against extended transit times. In UNFPA’s situation no warehouses are in possession since all logistic services such as transportation and warehousing are outsourced to manufacturers and freight forwarders. An argument speaking for UNFPA’s choice would be that yet another level in the comprehensive supply chain would reflect inflexibility and poor commodity management in the case of having increased wastage because of expired products.

But, imagine if an intermediary warehouse at global level would be combined with the removal of two layers of the in-country supply chain. UNFPA would have better control of how the global warehouse is managed including procedures, information systems and data collection. In addition, the total lead time down to the end client would probably be
shorter, which would contribute to less need for the more expensive emergency supply chain.

Finally, suggested in the literature, a comparison of pros and cons for sea freight and air freight should be carried out respectively. As for UNFPA most shipments go by boat, which is clearly necessary because of the great quantities. For example, Bangladesh is, according to CCM data, consuming 84,000,000 male condoms, which is practically impossible to send by plane. Alas, sea freight is very time consuming; please be reminded of the blunt example of transit time from Japan to Rotterdam which would be five weeks in comparison with air freight on a convincing five days transit. Time will be discussed again in the process of analyzing the forecasting function. However, there is a final comment to be added to the lead time discussion. As was stated in the theory chapter, long lead times can have the consequence that local managers tend to compensate for unreliability by over-ordering or double buffering. This phenomenon can be identified as a bull-whip effect. Together with the structure of UNFPA programme budgets, which forces country offices to spend allocated money in the end of every year, an environment of building up unnecessary stock is created.

5.1.6 How to cut costs?

In addition to the time perspective, the cost perspective adds a dimension when comparing the two potential means of transportation for global distribution: sea and air freight. Referring back to the example of Bangladesh’s CCM data consumption of 84,000,000 male condoms, imagine that, if nothing else, it would be extremely expensive, which is why air freight is to be kept to a minimum at all times.

However, as indicated in the empirical studies, approximately 20% of all shipments go through the emergency supply chain and therefore will most often be shipped by plane. What could the savings be if it was possible to minimize this type of supplies and instead build intermediate warehouses and ship everything by boat; would increased warehousing costs nullify the winnings or is it a potential area of interest for future supply chain development? There is yet to be carried out an extensive investigation and comparison on potential savings, however, this discussion will be brought up again when analyzing the forecasting function within the supply chain.

The cost issue of the supply chain is not all about transporting and warehousing, but also about procurement. As being commented over and over again, UNFPA is handling immense amounts of contraceptives and therefore purchases goods for a great deal of money every year. From the study of the global supply chain of UNFPA it was more or less explicitly stated that procurement had a strategic function and direct impact on costs by managing price negotiations. To yet again mention the example of the 84,000,000 male condoms that Bangladesh are consuming according to CCM, understand the savings by lowering unit prices half a cent – approximately half a million US $. To continue this example, cut costs would enable more contraceptives to be bought for other clients in need or more investments to be made in country capacity building.

With the aforementioned example in mind, let us go back to the findings of the local supply chain study and more specific to the procurement issues. Thanks to capacity building of the in-country procurement unit carried out with assistance of the DELIVER
and PATH projects Bangladesh has been able to attain surprisingly low prices on contraceptive commodities from an Indian supplier. Facts showed that on hand prices of pills were: US $0.07 and $0.11 per cycle of pills compared to $0.23 per cycle for commodities procured by CIDA and KfW in 2000. A quick look at the price tables that are negotiated by UNFPA indicates a price range between lowest US $0.224 all the way up to prices at around $0.31. As a tentative but still significantly indicating example the highest price negotiated directly by Bangladesh is compared with the lowest price negotiated by UNFPA. This comparison suggests a difference of US $0.114 per cycle of pills. Moreover, taken into consideration that annual pill consumption in Bangladesh is estimated to be, according to both CPR and CCM data, more than 90,000,000 units a potential saving would be (counting again at the low end of the scale in order to avoid overestimates):

\[
\text{US}\ 0.11\ \times\ 90,000,000 = \$9,900,000
\]

In the empirical study, it is claimed that Bangladesh’s ability to procure large quantities at competitive prices resulted in savings of more than US $17 million compared to prices paid by donors. These numbers do seem reasonable when looking at the exercise carried out in this section. Though, it must be stressed that the report does not mention anything about whether the manufacturer is pre-qualified or not, which is a crucial aspect for UNFPA procurement.

### 5.2 Forecasting in UNFPA

Forecasting is the better alternative to guessing. As said before, information is the key to be able to say anything about the future, and by implementing a forecasting tool in the supply chain, not only one, but numerous advantages could be benefited from. With regard to the six rights mentioned in the previous subchapter forecasting could prove to be very useful in order to:

- Determine demanded quantities
- Cut costs
- Improve time management
- Support adequate donor support requests

All advantages mentioned in relation to forecasting build on one basic principle: to forecast quantities. Therefore next subchapter will be focused on this matter.

#### 5.2.1 Forecasting quantities

In the literature on family planning three suggestions are given on what data that can be used to forecast demand of contraceptive commodities: historical consumption; historical service; or population data.

As described in the empirical study UNFPA utilizes two different types of forecasting data: historical consumption and population data. The population data collection and
analysis was described in chapter 4.3.1 as being based on demographic surveys. Although this forecasting method seems to be refined and rather comprehensive it is still suggested that population data is most appropriate for new programs that do not have historical consumption or service data. And, it should be stressed over and over again that population data are just theoretical calculations with limited credibility. As said in the theoretical studies, USAID states that forecasting is based on informed assumptions rather than real evidence until better quality data become available. An example pointing out this reflection is the many assumptions, such as only married women being included, taken into consideration when calculating annual consumption numbers. Moreover, calculated quantities are sometimes based on surveys carried out many years ago and therefore will undermine the reliability of the figures.

During the last couple of years UNFPA has been developing CCM, which is forming a basis for forecasting RH commodity requirements. In relation to population data CCM provides data of more historical character, which according to the literature is more credible and increases the validity of the forecast. However, there have been a few issues implicitly pointed out concerning CCM that maybe must be given special attention:

- CCM does not save historical data on a mandatory basis. As of today, CCM is only meant for taking a snap-shot of the current situation in the central warehouse and sometimes historical data is discarded. Any calculations have to be based on manually documented figures.

- The software is not installed in the warehouse but in the country office, which means that data is not put in on a continuous basis. Instead, every time headquarters in New York require latest data warehouse management will report their estimated inventory and average monthly consumption in that specific moment.

- In the case study of Bangladesh it is indicated that not all commodities go through the central warehouse, which is why CCM never can show what really goes through the entire supply chain. For example, commodities that are shipped by boat to Chittagong are not transported to the central warehouse in Dhaka if they are to be distributed in the vicinity of Chittagong. To further stress this issue, the example of pill consumption shows that CCM data only constitutes a small percentage of the governmental distribution share.

- Data used to calculate average monthly consumption in CCM is kept in-country, which makes it impossible for headquarters to validate, audit or fully understand figures presented in the CCM. Instead, when analyzing CCM data, it is only possible to foresee upcoming shortfalls based on inventory, future deliveries and given average monthly consumption.

In relation to these comments USAID said, as stated before, that forecasting of needs for new and expanding programmes cannot be based on logistics data because these are often unavailable or not predictive of demand. Thus, as RHCS is an expanding programme SCM must take into consideration that data is not all that reliable and predictive.

USAID also argues that forecasted quantities need to be reviewed and updated frequently. In the literature it is indicated that commodity forecasts should be done
annually to cover a three-year period. Forecasting should moreover be based on quantities provided to end clients in order to exclude contraceptives that is lost, destroyed, expired or stolen. In response to the latter remark UNFPA is about to launch a software program called CHANNEL, which is supposed to be installed in the many various layers of the in-country supply chain. This is a very good initiative, which could prove to be greatly rewarding and prosperous for the development of RHCS. Though, similar to the issues raised concerning CCM, questions need to be answered: What is the true output of this computer software? Will it be possible to cover substantial and complete information or will there be gaps similar to the ones in CCM? These matters remain to be answered after the program has been implemented and thoroughly tested.

There is yet another issue related to consumption data that calls for special attention: the fact that consumption data does not always show actual consumption because of various shortfalls taking place in all the different layers of the supply chain. CCM is, as explained before, a tool that takes into account what goes out of the warehouse. Though, if there is a shortfall no commodities can leave the warehouse, and thus it seems as if consumption would be lower than it actually is. In the case study this situation is illustrated by the many accounted days of shortfall in Bangladesh’s in-country supply chain.

5.2.2 Cause and consequence

In 3.4.5 it was stated that no matter how advanced the forecasting techniques employed, the volatility of markets ensures that the forecast will be wrong. So far the analysis has pointed out volatility factors such as demographic changes and HIV prevalence. Another factor to explain imperfect forecasts would be a latent change in method mix in a region. However, method mix, CPR figures and demographic changes seem to either remain fairly steady or they are predictable, which means that as soon as a functioning forecasting technique has been established the forecasts will prove to be almost right on target. Though, the unawareness of other suppliers’ presence and agendas in a given region can cause any forecasted quantity to be off target. The latter issue is of great importance for the purpose of validating countries’ TTF requests. For example if USAID and other donors would be planning to distribute immense quantities of contraceptives to a region UNFPA must be aware of this in order to prevent over-supply to a country.

A major concern of the contraceptive supply chain is the very long lead times. As indicated for male condom lead times it takes approximately half a year from identified demand to supplied product. It has already been indicated what a shortfall would result in for the case of the people lacking the contraceptives. But, what are the consequences for the supply chain with a management perspective?

In relation to the literature the conventional response to a problem such as long lead times is to increase the safety stock to provide protection against a potential shortfall. Consistent with this, the country requests from the TTF in some cases illustrate a situation where countries, well aware of the supply chain rigidity, ask for quantities beyond their annual consumption levels. And again, this structure of overstocking is even more stimulated because of the budget allowance system where countries buy contraceptives for unspent money in order to receive more money the next year.
5.2.3 Improvements of UNFPA forecasting

The author Helen L. Richardson suggests a number of key areas of understanding that can help improving forecasting performance for UNFPA. The author would like to highlight a few of them, beginning with visibility and searching the information that needs to be shared with other members of the supply chain, revealing what is and is not working. For UNFPA this implies first to realize what is the supply chain and what members together with UNFPA that are required to provide contraceptive commodities to consumers.

Combined with link excellence, visibility urges UNFPA to intensify communication with not only members of its own supply chains but also with other organizations, for example USAID. This has already been initiated through the RHInterchange, but more work can be done. In this specific case, different to an ordinary competitive business environment, the organizations involved are not fighting with each other and have nothing to lose by sharing information. And, as concluded earlier, it is pertinent for UNFPA to have complete information about what the other distributors deliver to each country. Otherwise, any given forecast can be perfect without achieving a satisfying result of delivery to customers. Therefore, it could be of great interest for UNFPA to sit down with for example USAID and also to have a look at the PipeLine software. Maybe the greater distributors can increase the collaboration and help each other to improve the forecasting mechanism. This could also help countries by unifying the software programs that each country office is required to utilize, recalling the mentioned scenario of up to ten different software packages used in a country.

Continuing the discussion, as Helen L. Richardson comments, collaboration and synchronizing strategies are effective ways to appreciate even greater cost reduction and enhanced customer satisfaction. When discussing the many possibilities that forecasting could provide, it must be commented that forecasting today mostly is a means for UNFPA to motivate future donor support. Simply the fact that CCM has not been implemented with the procurement unit in Copenhagen indicates that cost benefits of economy of scale character are not taken fully into consideration. This is why Bangladesh has been able to negotiate lower prices on its own, given that this country has the opportunity to purchase a very large amount of contraceptives.

Also, it is important to realize and understand what is noted by Helen L. Richardson: that the weakest department within the chain and the weakest link in your supply chain will drive performance. The weakest link will not rise to the level or your strongest link – the opposite will occur. What this discussion leads to is that UNFPA for each supply chain initiative must identify the proper skill sets required to lead the effort and assure clarity of roles and responsibilities and cultural compatibility.

Furthermore UNFPA should identify its core competencies and outsource the rest - determine the unique business processes that make you successful, and then use a robust process to outsource other functions so that you are able to focus on core competencies. As of today, the Population Fund has outsourced global transportation to freight forwarders and does not carry any intermediary inventory because no warehouses are in possession.
A question that arises is if UNFPA today are focusing on the right competencies or if focus should be altered in the future. More specifically, could it prove to be of value to invest in intermediate inventory in order to cut lead times and increase control of global distribution? Secondly, should UNFPA integrate CCM further with procurement so that strategic and economic benefits can be taken advantage of? The latter question must be answered with a yes, or else the purpose of implementing CCM worldwide would be slightly vague. Since there are so many different other tools for forecasting contraceptives, probably some of them will be phased out in the future. And, there are so many prosperous effects of improving and integrating the forecasting tool with procurement, referring back to for example the discussion of economy of scale. In this thesis the author has also tried to give a few guidelines on how to improve the forecasting tool, which are more or less based on the fact that CCM will in the future save historical data. By storing data it will be possible to combine demographic development data with consumption data from separate countries in order to forecast quantities more exactly. An example of method to be used could be weighted moving average where later years are emphasized to a greater extent.

5.3 Assessment of UNFPA supply chain

Based on the facts and analysis presented so far the aim is, in order to further clarify potential areas of improvement, to assess how UNFPA has positioned itself with regard to logistic management. The assessment is performed within the four stage framework described in 3.3.1.

As has been identified so far, the supply chain of UNFPA is going from being a function of fragmented operations towards focusing on internal integration with emphasis of driving down costs. The procurement division has initiated great opportunities by implementing the software e-procurement in relevant countries worldwide. Though, regarding forecasting this function is still separated from procurement, which means that the full potential of forecasting consumption of contraceptives is not fully taken into consideration. Moreover, when looking at the case study, it is indicated that many countries are operating many different forecasting systems, which, in turn, can cause a much too wide focus.

Regarding inventories and transportation, UNFPA has developed an advanced system which can deal both with ordinary as well as emergency supply issues. By not carrying its own intermediate inventory many fixed costs are avoided, although it implies some inflexibility with long lead times or high transportation costs. However, this is an area where much money could be saved, merely by improving the forecasting mechanism of UNFPA so that emergency deliveries reach a minimum amount.

Looking at stage three in the assessment framework UNFPA is not yet characterized by full visibility of both local and global purchasing and distribution. Issues that require utmost attention are missing historical consumption data and collaboration between UNFPA and other contraceptive distributors. However, these areas are developing, for example the RHInterchange is growing stronger as this thesis is written.
Although there are many opportunities for UNFPA it must be pointed out that the financial donor environment, as of today, makes the situation rather challenging. In this thesis it has been commented that:

- Better coordination between financing and procurement planning will improve commodity availability both in-countries and at global level.

- There is a need for a paradigm shift in countries to conduct forecasts based on the principle of medium to long-term forecasts rather than only short-term estimates.

These ideas and suggestions are superior, however, with the present system of annually granted finances and country budgets being annulled in the end of every year, these characteristics are very demanding to achieve.

As a final comment to the assessment the author strives to make a just analysis of which stage UNFPA has positioned itself. And, the conclusion, based on the discussion in this subchapter is that UNFPA currently is positioned in stage two, moving towards stage three as transparency and communication increase. Other areas requiring attention are changes in the forecasting mechanism as well as coordination of strategic funding, procuring and forecasting.
6 Conclusions

In the final chapter, the analysis is summarized and developed. In the conclusions the aim is to meet the objective of the thesis and to give recommendations on how UNFPA can proceed with the work of enhancing RHCS. Therefore, the author seeks to primarily provide suggestions to how logistics management might be improved and secondly how the forecasting tool could be altered in order to better assist future logistic management.

With RHCS becoming a part of UNFPA it means that countries strive to be more self sufficient in meeting contraceptive demand. As shown in the case of Bangladesh RHCS work has already come quite a bit on the way, and for future development it is important to make clear what, how and at what level certain functions should be managed.

From a procurement perspective the thesis has shown that a country of the size of Bangladesh is able to, with the aid of consultants or organizations, establish an efficient purchasing function including negotiation, contracting and testing. Though, it must not be forgotten that procurement is a complex procedure, which was illustrated in chapter 4.1. From that study it is concluded that selecting and contracting suppliers is a very demanding process which will require extensive guidance, from for example UNFPA, to implement successfully at country level.

A further remark to the area of supplier contracting, which today involves thorough quality assurance, is that testing today is carried out not only one time but often two times in the supply chain. Quality is, as has been pointed out, of highest concern. However, since testing increases the total lead time significantly it could be beneficial to enhance global and local coordination in UNFPA. In several cases, especially when procurement is moved down to country level, testing could also be subject to country management.

As presented in the analysis, UNFPA has developed an advanced inventory and transportation chain, which handles ordinary as well as emergency supply issues. By not carrying its own intermediate inventory many fixed costs are avoided, although it implies some inflexibility concerning long lead times or high transportation costs. Again, this is an area where much money could be saved, potentially by improving the forecasting mechanism of UNFPA.

It is imperative to recall two statements presented in the theory chapter: Robustness of a forecasting tool does not necessarily have to be influenced by decentralized, national or private procurement systems. Also, differences in prevalence status and stigma between countries or continents must not affect the success of a forecasting tool. Thus, centralized forecasting could prove to be very successful with few alterations. Transparency of data and information must be improved and clear guidelines must be implemented so that historical data is saved for future consumption calculations. This would imply the possibility of using moving averages as a part of the CCM, which in turn could lead to a situation where UNFPA takes a leading position of forecasting contraceptive commodity consumption.

Finally, some of the most important recommendations given in this thesis are, as concluded from the analysis:
Increase collaboration between UNFPA and other contraceptive distributors. Share information, ideas and progress on how to improve forecasting and distribution. A first step could be to establish a database with all historical distribution and consumption data of UNFPA gathered in one place. Also, it is of greatest importance to build further on the initiative of the RHInterchange and thereby extend the database to include all the major contraceptive distributors.

Advocate a stimulating financing environment, which allows for strategically longer planning periods. This action would encourage UNFPA and country governments to start building capacity such as investing in divisions for procurement, forecasting and quality testing.

Enhance coordination between financing, procurement planning and forecasting. Integration of these three functions could prove to be prosperous for UNFPA, for example by achieving benefits through economy of scale.

Recent findings

In line with what was discussed in the analysis chapter logistics management in Bangladesh has changed the structure of warehousing the supply chain. Just recently, district reserve stores have been abolished and all distribution to thana stores is being handled through central or regional warehouses. According to latest information, by reducing one tier, i.e. district reserve stores, the distribution system has been more efficient and less time consuming. However, no concrete savings have yet been obtainable.

The present system is as follows:
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7.4 Contacts

o Benedict Light, *Technical Specialist*, UNFPA, 2005-06-06
o David Smith, Chief of Procurement Services, UNFPA, 2005-10.24
o Elaine Friis, *Expediting and Finance Assistant*, UNFPA, 2005-08-18
o Eva Weissman, *Technical Advisor*, UNFPA, 2005-06-06
o Everth Larsson, *Assistant Professor*, LTH, 2005-09-15
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- Joycelyn Crane-Moore, *Procurement Specialist*, UNFPA, 2005-10-13
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Appendices
I. Organizational chart UNFPA
Incoterms is short for international commerce terms and relate to several important standard conditions in connection with the delivery and transportation of, and risk attached to, goods. The Incoterms have been carefully defined: it has been established how each condition must be interpreted. Using the Incoterms may prevent misunderstandings between supplier and buyer. Below is given a short explanation of the three, out of total, 13 Incoterms that are incorporated in UNFPA’s transportation business.

- **EXW** stands for Ex Works. In the case of EXW the buyer is responsible of arranging and settling everything. The supplier only makes the goods available for the buyer, who has to collect these from the factory or warehouse.

- **FOB** stands for Free On Board and entails characteristics such as the buyer arranges most of the physical delivery. As soon as the supplier has delivered the goods on board the ship can leave at the expense and risk of the buyer.

- **FCA** stands for Free Carrier and implies that the supplier has met his obligations as soon as the goods have been transferred to a transporter at the agreed location. In this situation also, the supplier carries the costs and responsibility up until the moment that the goods are delivered.

- In the case of CPT, which is short form for Carriage Paid To, the supplier carries the risk and pays for transportation to the agreed end destination.

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III. CCM menu
### IV. Frequently purchased contraceptives

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Formulation/Generic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONDOMS</strong></td>
<td></td>
</tr>
<tr>
<td>Condoms* [53mm]</td>
<td>Natural colour, straight and parallel sided reservoir pouch at tip, lubricated with silicone, width: 53 +/- 2mm single wall thickness 0.065 +/- 0.015mm, length 180mm</td>
</tr>
<tr>
<td>Condoms* [49mm]</td>
<td>Natural colour, straight and parallel sided reservoir pouch at tip, lubricated with silicone, width: 49 +/- 2mm single wall thickness 0.065 +/- 0.015mm, length 170mm</td>
</tr>
<tr>
<td><strong>PILLS</strong></td>
<td></td>
</tr>
<tr>
<td>Combined Pills</td>
<td></td>
</tr>
<tr>
<td>LEVONORGESTREL 0.15 mg + ETHINYL OESTRADIOL 30 mcg</td>
<td></td>
</tr>
<tr>
<td>DESOGESTREL 0.15 mg ** + ETHINYL OESTRADIOL 30 mcg</td>
<td></td>
</tr>
<tr>
<td>Progestagen-only pills</td>
<td></td>
</tr>
<tr>
<td>LEVONORGESTREL 0.03 mg</td>
<td></td>
</tr>
<tr>
<td>LEVONORGESTREL 0.0375 mg</td>
<td></td>
</tr>
<tr>
<td>LYNESTRENOL 0.5 mg</td>
<td></td>
</tr>
<tr>
<td>NORLUSTYRONE 0.35 mg</td>
<td></td>
</tr>
<tr>
<td>Phasic Pills**</td>
<td></td>
</tr>
<tr>
<td>LEVONORGESTREL 0.15/0.2 mg + ETHINYL OESTRADIOL 30/40 mcg</td>
<td></td>
</tr>
<tr>
<td>LEVONORGESTREL 0.05/0.075/0.125 mg + ETHINYL OESTRADIOL 30/40/30 mcg</td>
<td></td>
</tr>
<tr>
<td>Emergency Contraception</td>
<td></td>
</tr>
<tr>
<td>LEVONORGESTREL 0.75 mg</td>
<td></td>
</tr>
</tbody>
</table>

* Design can be adopted to suit specific requirements, e.g. Trust, Panther, Raja, and Sensation.97

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97 https://unfpa.org/procurement/commodities 2005-07-01