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Information Flow and Physical Distribution Planning in Newspaper Delivery

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Licentiate Thesis

Royal Institute of Technology

Department of Numerical Analysis and Computer Science

Media Technology and Graphic Arts

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Abstract

Today morning newspaper publishing is a competitive market. Besides a declining circulation, the morning newspapers compete with each other and with other media such as TV, radio, the WWW and other on-line services. In order to be competitive in the media landscape of today, morning newspapers need to improve the production and the distribution of newspapers as well as other processes within the newspaper companies. Newspaper pre-press, newspaper production as well as the editorial process have been the focus of a number of research projects in the last decade [Alasuvanto et al, 1994], [Enlund, 1994], [Tuukkanen, 1994], [Nordqvist, 1996], [Stenberg, 1997], [Northrup, 1999], [Rosenqvist, 2000], [Sabelström Möller, 2001]. Research regarding the newspaper distribution process has also been in focus during the last decade; however, the aim of this research has mainly been route planning [Mantel, 1993], [Canen, 1994], [Gerdessen, 1996], [Dillmann et al, 1996], [Malmborg, 1996], [Berger, 1997].

The use of computers is limited within distribution organizations, therefore the implementation of computer aid to improve planning of the physical distribution and the information flow can be of importance in order for the newspaper companies to remain competitive [Lalonde et al, 1995].

To cope with these challenges, a research project at the Royal Institute of Technology, in cooperation with Tidningsutgivarna, ten newspapers and newspaper distribution companies, started in March 1999. The three main areas of interest for this project were:

- What are the characteristics of the processes within morning newspaper distribution?
- How are the processes within morning newspaper distribution related?
- How can morning newspaper distribution be improved?

A model of morning newspaper distribution can be used to increase our understanding of the process. By understanding the process it becomes possible to determine where improvements can be of value. The model can serve as the basis for finding processes within the field of distribution to be improved. It may be possible to improve each process; however, each process must be a project of research. In this licentiate thesis, a model was created in order to find which process could be improved. It was found that it would be valuable to improve two processes within morning newspaper distribution: the information flow and the coordination between the production and the distribution.

The information flow within the distribution process can be improved with electronic devices used by the truck drivers and the carriers, e.g. mobile telephones. However, the information sent and received should be logged so that the tracking of problems can be maintained. Depending on the agreements reached with telecommunication companies, the cost for using such a system will vary. Examples of the benefits of using a so-called mobile field system are a faster flow of information, possibilities for tracking the distribution and possibilities for solving problems that occur during the night.

Preface

This licentiate thesis is the result of research work conducted over 2,5 years, between 1999 and 2001, at the Numerical Analysis and Computer Science/Media Technology and Graphic Arts.

During the mentioned period the electronic distribution such as the www and other on-line services has been in focus for several newspaper companies. However, the last year I have felt that the physical distribution of newspapers have been of great improtance for the newspaper companies and it seems like the physical distribution will be one of the processes that the newspaper companies will invest in, both IT-solution material as well as human capital.

Since my licentiate thesis is focusing on the information flow and the physical distributionplanning within newspaper distribution, I find it very interesting to see how the newspaper and newspaper distribution companies will act in the newspaper distribution question. Will they use the newspaper distribution network to offer other products that are not printed on paper?

During my research work several number of people have been of great importance for me. First of all I would like to thank my supervisor Professor Nils Enlund for guiding me in my research work and Dr Johan Stenberg for helping me with the creative part in my research and for a several number of nice conversations about newspaper distribution and about life as a whole. Christopher Rosenqvist was the one that showed me that it is fun to be a research student, thank you. I would also like to thank Dag Olsen for a great Master thesis and a number of laughs during our trips. I am also grateful to all my colleagues.

The employess of the companies that have been involved in this research project have helped me during these years which I am very thankful of, thank you!

A sincere gratitude to You, family and friends, for letting me be a part of your life.

Jonas Rehn

Stockholm in October 2001

List of included papers

The work presented in this thesis is based on studies from a total of 14 newspaper companies and newspaper distribution companies. The work has previously been presented in the following papers:

Paper I

Methods for Modeling the Newspaper Distribution Process, by Jonas Rehn and Johan Stenberg. Presented at TICGC – Taipei International Conference on Graphic Communications, October 1999, Taipei, Taiwan. Submitted to TICGC Proceedings. To be published.

Paper II

Improving Metropolitan Newspaper Home Distribution, by Jonas Rehn, Johan Stenberg, Björn Hedin and Fredrik Fällström. Presented at TAGA's 52nd Annual Technical Conference, April 2000, Colorado Springs, Colorado, USA. Published in TAGA 2000 Proceedings, TAGA Office, Rochester, New York, USA, pp. 349-364.

Paper III

Improving Newspaper Distribution with Mobile Field Systems, by Jonas Rehn, Johan Stenberg and Björn Hedin. Intergraphica. Accepted for publication in Acta Graphica.

Paper IV

Dynamic Pre-Loading of Newspaper Bundles, by Jonas Rehn and Johan Stenberg. Presented at TAGA's 53rd Annual Technical Conference in San Diego, May 2001, California, USA. Submitted to TAGA 2001 Proceedings. To be published.

Table of contents

1. Introduction

1.1 Background

Today morning newspaper publishing is a competitive market. Besides a declining circulation, the morning newspapers compete with each other and with other media such as TV, radio, the WWW and other on-line services. In order to be competitive in the media landscape of today, morning newspapers need to improve the production and the distribution of newspapers as well as other processes within the newspaper companies. Newspaper pre-press, newspaper production as well as the editorial process have been the focus of a number of research projects in the last decade [Alasuvanto et al, 1994], [Enlund, 1994], [Tuukkanen, 1994], [Nordqvist, 1996], [Stenberg, 1997], [Northrup, 1999], [Rosenqvist, 2000], [Sabelström Möller, 2001]. Research regarding the newspaper distribution process has also been in focus during the last decade; however, the aim of this research has mainly been route planning [Mantel, 1993], [Canen, 1994], [Gerdessen, 1996], [Dillmann et al, 1996], [Malmborg, 1996], [Berger, 1997].

In this thesis, studies of newspaper distribution companies in the Nordic countries are presented. The distribution process, which is carried out by the newspaper distribution companies in the Nordic countries as well as in other countries, is a process where "conflicts" may occur between the management of the newspaper company and the customers, e.g. readers and advertisers. The management, on the one hand, would like the start of the production and the distribution to occur as late as possible in order to include the latest news [Hurter et al, 1996]. On the other hand, the readers would like to receive the newspapers before a certain time in the morning, which is also in the interest of the advertisers. By a determined printing start and delivery deadline, the time for distribution is predetermined. This predetermined distribution time must be used effectively and therefore the planning, the physical distribution and the information flow, among other things, are important areas of improvement for the newspaper companies. The newspaper distribution is a major expense for the total newspaper, making up approximately 20% of the total cost, which makes it important to improve upon this research area in order for the newspaper companies to be competitive.

The use of computers is limited within distribution organizations, therefore the implementation of computer aid to improve planning of the physical distribution and the information flow can be of importance in order for the newspaper companies to remain competitive [Lalonde et al, 1995].

To cope with these challenges, a research project at the Royal Institute of Technology, in cooperation with Tidningsutgivarna, ten newspapers and newspaper distribution companies, started in March 1999. The three main areas of interest for this project were:

- What are the characteristics of the processes within morning newspaper distribution?
- How are the processes within morning newspaper distribution related?
- How can morning newspaper distribution be improved?

These three areas involve a number of sub-questions, which were uncovered and answered during the course of the project. However, the third interest needed a focus. Therefore, two fields within the newspaper distribution chain were chosen for further studies; the information flow and the connection between the production and the distribution.

1.2 Related work

The research field of distribution has been covered for several decades. This research has and is covering information logistics as well as physical distribution logistics, and has a forum in several journals, e.g. [International Journal of Logistics Management], [Logistics Information Management], [International Journal of Physical Distribution and Logistics Management], [Supply Chain Management]. This research has mainly been focused on vehicle routing and scheduling rather than on the connection between production and distribution [Gerdessen, 1996], [Dillmann et al, 1996], [Malmborg, 1996], [Berger, 1997]. However, some research has been carried out focusing on both newspaper production and newspaper distribution [Stenberg, 1997]. Most of the research mentioned above has not been focused on the information flow within a newspaper distribution company nor the planning of production and distribution the related work has mostly been valuable for the understanding of which processes that are included in the total distribution process. However, the related research has addressed problems that are important to consider when planning production and distribution.

2. The aims of the research work

The aims of this research work have been divided into two phases. The aim of phase one was to find the characteristics of morning newspaper distribution and to create a model of the distribution process.

The aim of phase two was to find out how morning newspaper distribution could be improved. Two processes were studied and chosen in consideration with the companies involved in the project. The aims of the improvements were to shorten the lead times within the newspaper distribution process and to find a method for tracking and following up the distribution process.

3. Method

This thesis is based upon research work carried out between March 1999 and June 2001. The work is based on quantitative and qualitative studies at three Swedish morning newspaper distribution companies that distribute approximately 70,000 to 300,000 morning newspapers daily. Qualitative studies and semi-structured interviews [Westlander, 1999] were conducted at 7 newspaper companies/newspaper distribution companies and an additional 7 companies were visited [Appendix].

The studies were divided into two phases, in which phase one included semi-structured interviews, qualitative studies and literature studies. Phase two included semi-structured interviews, quantitative studies, qualitative studies and literature studies. After the two phases of study, a third phase consisting of summary writing and analysis of the two first phases was included.

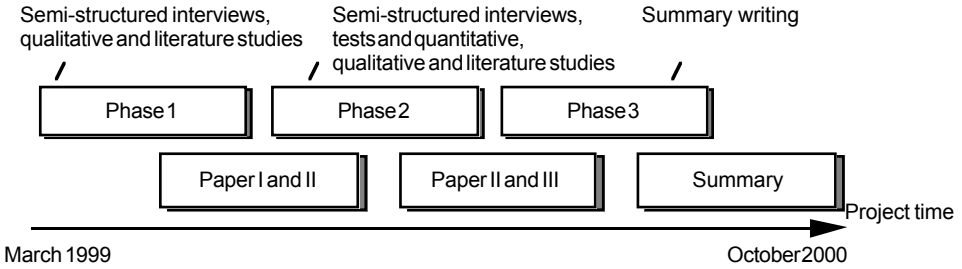

Figure 1: The phases of the research project.

4. Modeling of the newspaper distribution process

In order to handle newspaper distribution, the distribution companies in the Nordic countries use a day organization and a night organization. The day organization, which normally consists of five operations, see figure 2, is responsible for production and distribution planning, answering the questions what, how, by whom and when [Enlund, 1998].

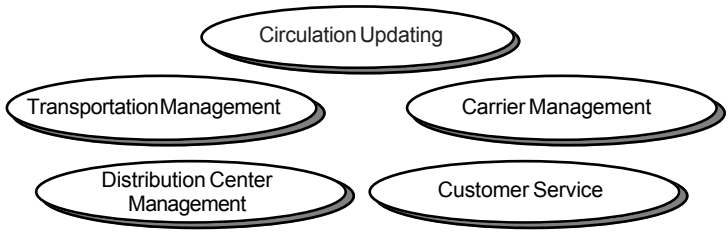

Figure 2: The five operations in the day organization, which plans the production and the distribution, assists the personnel involved in the distribution and provide services for the customers [Rehn et al, 2000].

The night organization is responsible for the execution of the production and the distribution. These operations are carried out in the mailroom, at the distribution center, at the loading dock, at the operation center, by the truck drivers and by the carriers, see figure 3. The questions asked could be: what newspapers need to be distributed, how will the newspapers be distributed, who will distribute the newspapers and when will the newspapers be distributed?

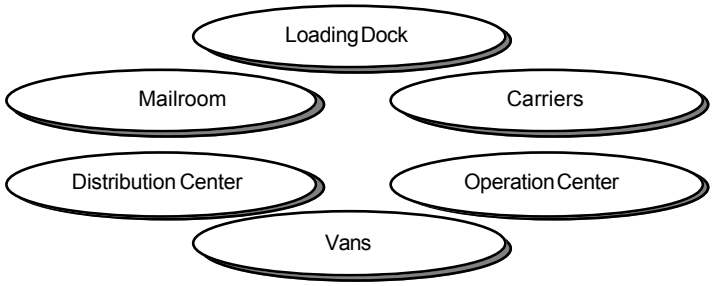

Figure 3: The night organization is responsible for the activities necessary to handle the distribution of newspapers. These activities are carried out in the mailroom, at the distribution center, at the loading dock and at the operation center, by the truck drivers (vans) and by the carriers [Rehn et al, 2000].

4.1 Physical distribution of newspapers

The newspaper distribution system consists of several hierarchical levels. According to Mantel there are three different hierarchical levels: the central shipping node, the transfer node and the delivery node [Mantel et al, 1993]. Figure 4 shows a rough model of the different levels in Swedish distribution, which contains five hierarchical levels: the loading dock, the transportation (carried out by the truck drivers), the distribution center, the carriers and the readers. Not all levels are constantly involved in the distribution, since the combination of the five levels depends on the geographical structure of the distribution area.

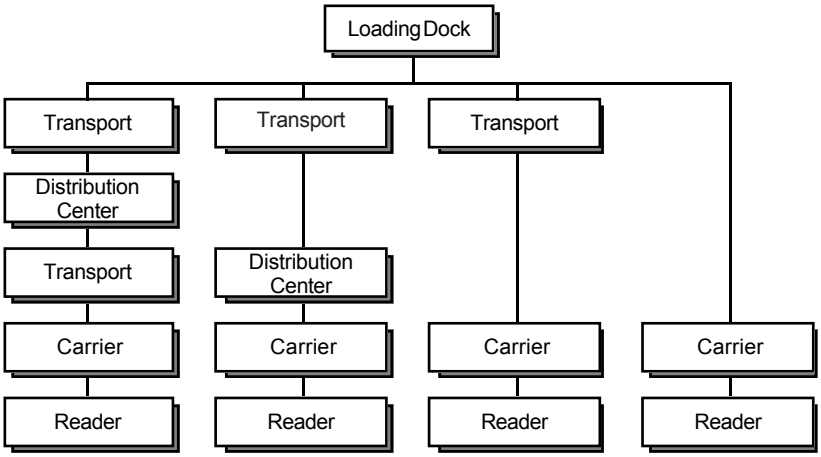

Figure 4: A rough model of the different hierarchical levels in the Swedish distribution system [Modified from Rehn et al, 1999].

As seen in figure 4, the distribution always starts from the loading dock, which is where the bundles are transported to on conveyer belts from the mailroom. Thereafter, the distribution either starts with a transport, which is carried out by a truck driver, or a carrier, which has a specific carrier route with a specific number of readers. After the transport process, the copies can be distributed to a distribution center, directly to a carrier or to another truck driver for further transportation. The distribution center can either be a loading dock or a place where the bundles are re-loaded to another transportation route, e.g. a node where the bundles are re-loaded to another transportation or a carrier. This model is an improvement on the model presented in Rehn et al, 1999, figure 2. This improved model is more general since the distribution center is a node for re-loading the bundles, which was not the case in Rehn et al, 1999.

4.2 Information flow within the newspaper distribution

The information flow within the newspaper distribution logistics moves in both directions. A forward flow of information comes from carriers, employees of the distribution center, truck drivers, staff at the printing facility, circulation department or newspaper management. A backward flow of information comes from all the employees with the exception of the newspaper management. In order to be able to deal with day-to-day changes in the newspaper distribution, correct information must be forwarded to the correct people at the correct time. Within most organizations the flow of information moves between all departments and employees [Kotler, 1997].

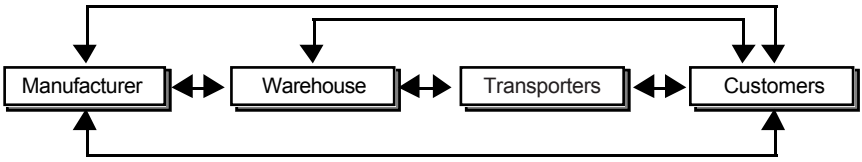

Figure 5: The information flow moves in both directions through the wole process chain [Modified from Kotler, 1997].

4.3 A model of the morning newspaper distribution

In figure 6, an entity-relationship model of the distribution process is displayed [Fällström, 1998]. The model in figure 6 is a further developed model based on the existing IFRAtrack model. The gray objects and resource classes, and those links with bolder lines are added to the existing IFRAtrack model. The resource classes are van and carrier while the rest are object classes. All classes are linked to one or several other classes. Depending on the structure of the object and resource classes, the links between them can be one-to-one, one-to-one or many, one or many-to-one or many-to-many. All object classes have attributes and activities and the resources classes only have attributes. These attributes have to be defined for each object and resource class.

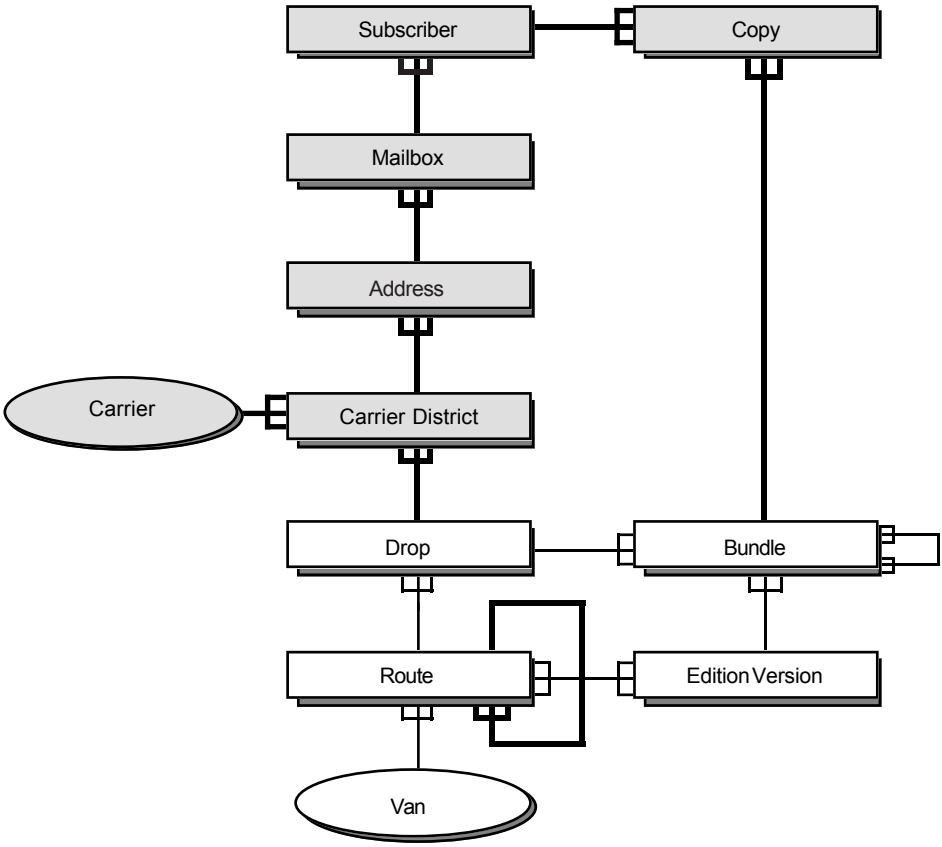

Figure 6: The IFRA*track object and resource classes in the newspaper distribution. This is a suggested extension to the existing* IFRA*track model [Rehn et al, 2000].*

The modeling of the newspaper distribution process was carried out in order to understand the process. By modeling the whole newspaper distribution process, new models can be developed without loosing important sub-processes.

5. Improving the information flow within newspaper distribution

Morning newspaper distribution involves a daily information flow in order to know which subscribers are to receive a newspaper as well as to know how the distribution was carried out. A new or a cancelled subscription involves both the printing department as well as a number of employees within the distribution department. The printing department must be aware of new and cancelled subscriptions in order to print the correct number of copies in each bundle. The truck driver must know how many - and sometimes which - bundles to load and unload and the carriers must know who the copies are to be delivered to.

	Information to receive	Information received from	Information to send	Information sent to
Customer Service	-Starting and finishing times of the carriers	Carriers	-Customer complaints -Start and stop of subscriptions -Changes in subscription data	Carriers
	-Customer complaints -Start and stop of subscriptions -Changes in subscription data	Readers	-When and where will I receive my newspaper	Readers
Operation Center	-Start and finish for carriers -Problems for the carriers	Carriers	-Starting time for carriers	Carriers
			-When to start loading	Truck drivers
	-Start and finish for truck drivers -Problems for the truck drivers	Truck drivers	-Problems for the carriers and the truck drivers	Customer service
Truck Driver	-When will I start to load -Amount of load -Which drop-offs are included in the route -When shall the newspapers be distributed to the drop-offs -Load to each drop-off -Alarm calls	Operation center	-Departure time from the loading dock -Arrival at the drop-offs -Problems during the work	Operation center
Carrier	-When will I start -What do I have to distribute and to whom -Customer complaints -Changed conditions such as door codes etc. -Alarm calls -Which carrier district information	Operation center	-Subscription updates -Customer complaints -Shortage of newspaper copies -Changes in door codes -Start and completion time	Operation center
Reader	-When and where will I receive my newspaper	Customer service	-Changes in subscriptio	Customer service
Re-seller	-When will the newspaper be delivered	Customer service	-Order of newspapers	Customer service

Figure 7: Required information to send and receive within the distribution organization and towards the readers and re-sellers [Rehn et al, 2001a].

In order to know how the distribution was carried out, information from the truck drivers and the carriers must be acquired. This information is of outmost importance when problems occur during the distribution process and when changes in the distribution plan are to be dealt with. In figure 7, the information to and from the involved departments and employees are displayed.

A mobile field system can improve the information exchange within an organization that uses mobile field workers. The mobile field workers within a newspaper distribution organization are the truck drivers and the carriers. However, the techniques used depend on the organization using the mobile field system. Mobile field systems fall into three main categories. These are Process Management System (PMS), Information Resource System (IRS) and Automated Vehicle Locations System (AVLS) [Tadpole Technology: The Business Case for Field Force Automation. – Report on the business value of mobile computing to support field workers, 2000].

The newspaper distribution organization could use the mobile field system in order to exchange information between the operation center, customer service, truck drivers and carriers. However, the information, which the operation center receives from the truck drivers and the carriers, should be used to make assignments in the work force. Additionally, if this system, combined with the mobile devices used by the mobile field workers, is integrated with a Geographic Information System, it can be used to locate and track vehicles as well as carriers. Therefore, the mobile field system for the newspaper distribution companies should be described as all the three main categories mentioned above.

Since the carriers may walk, ride a bicycle or drive a car when delivering the newspapers, the mobile devices used for information exchange require some degree of mobility and connectivity. The mobility should enable walking, bicycling or driving and the connectivity should enable uploading and downloading of information at any time, continuously [Masliah, 1998].

These handheld devices must be connected to a mobile network, such as the GSM network. The GSM networks can be GSM 900, 1800 or 1900, in which the GSM 900 and 1800 is most common in Europe and GSM 1900 is more frequently used in North America. All handheld devices do not support all networks; however, some devices may support more than one [gsmworld].

A number of the service technologies that have been studied and considered valuable for the information exchange are SMS (Short Message Service), SIM Application Toolkit (STK) and WAP (Wireless Application Protocol). These techniques are available on the market today and can be integrated with future networks such as GPRS (General Packet Radio Service) and the third generation mobile telephone system, UMTS (Universal Mobile Telecommunication System). These two systems, GPRS and UMTS, will give the users shorter access time and higher data rates [Bettstetter et al, 1999]. However, the handheld devices must support these network systems in order to be able to use the same services.

The information exchange between the distribution organization and the mobile field workers are both oral and textual. When using the GSM (Global System for Mobile Communication) radio net, transmission speeds up to 9.6 kbit/s are supported. However, by using the GPRS (General Packet Radio Service) network, which provides packet-based access, bit rates up to 171.2 kbit/s per user can be achieved [Ermel et al, 2000]. The UMTS is aimed to provide a diversity of services up to 2 Mbit/s, which will enable a faster transmission speed than both the GSM and the GPRS [van den Broek et al, 1995].

The potential improvements with a mobile field system are assigned to the improved information exchange within the organization. The personnel involved are able to exchange information wherever they are, whenever they choose, which will ensure that the required information is available at an earlier stage. This will increase the time for solving problems that occurred during the night and minimize the time and resources required for the information exchange.

The specific improvement for the operation center is that they will be able to learn if or when the carriers and truck drivers have started and finished their work, which failures have occurred and where to deploy available resources. The carriers will be able to electronically receive customer complaints, customer updates, starting times and changed conditions for their specific carrier district and to send alarm calls and report other complications that have developed during the work process. The truck drivers will be able to electronically receive starting times and load and transport information as well as to send alarm calls and other complications that have developed during the work process. The customer service will be able to receive information on when the newspapers are delivered. This improved information exchange will in return improve the relations to the readers, who will be able to receive accurate information concerning the distribution.

Since statistics and problems from each carrier district and transport can be collected on a daily basis, the effects of the changes will be seen instantly. Moreover, the problems and statistics collected can be evaluated and taken into consideration from one day to the next. This information will be helpful for those involved in the distribution planning.

6. Planning of the physical newspaper distribution

Newspaper distribution usually has to be carried out during a pre-defined period of time, since the production start and the delivery deadlines are often fixed. However, the production start can vary due to late deliveries from the pre-press department. According to Stenberg et al, the actual output of the printing process is often 50-80% of the cruising press speed, depending on the number of pages and inserts [Stenberg et al, 1998]. Due to late production starts and stops in the production, the input, in terms of printed products, to the distribution organization varies from day-to-day even though the planned distribution start is the same for each day.

There are two loading strategies that can be used when loading newspaper bundles. The first strategy is to load the bundles online, in sequence with the printing process and the mailroom activities. The other strategy is to pre-load the bundles on pallets, and thereafter load the pallets onto the trucks.

The physical newspaper distribution process involves carrier districts, truck routes and loading [Rehn et al., 2000], [Stenberg, 1996]. However, the distribution start depends on the printing start and the mailroom activities. Therefore, the printing process and the mailroom process, hereafter called the production process, have to be considered in the distribution planning. All processes have to be planned to meet the delivery deadline. Therefore, the planning of the process should occur in the reverse process order.

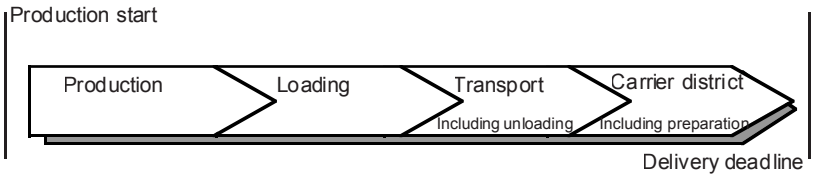

Figure 8: Those processes to be considered in the planning of the physical distribution. The planning should be in the reverse process order [Rehn et al, 2001b].

When the delivery deadline is set, an analysis of the process times for each process in figure 8 will generate the required starting times for each pro-cess. The carrier districts have to be finished by the delivery deadline and therefore the carriers have to start at a certain time, which is called carrier install time. The transports have to depart from the loading dock at planned departure times in order to arrive at the drop-offs before or at the same time as the carriers start their districts. When the transports depart from the loading dock, the correct load, - edition and edition version of the newspapers - have to be loaded and therefore the production of a specific load has to be finished before the planned departure times of the transports [Fällström, 1998].

The existing distribution plans at the studied companies can be changed in order to shorten the lead times as well as to reduce slack in the distribution process. By changing the distribution plan and pre-load the newspaper bundles, a buffer of newspapers could be used to prevent late truck departures as well as to reduce the waiting times and delays for the truck drivers and the carriers.

By pre-loading the newspaper bundles, the loading process does not have to be adjusted to and be dependent upon the production process. A buffer between the production and the distribution will make the overall process more reliable. It is therefore easier for the trucks to depart at the planned departure time. By using pallet loaders, the production flow from all presses in use can be adjusted to one load. All copies produced during a period of time can therefore be loaded onto one truck.

In this case study, the press output and the number of copies required for the distribution were studied. The same newspaper edition is printed on all presses in parallel. Each press produces newspaper copies for a determined line in the mail-room and a specific number of truck routes. As shown in figure 9, all presses except press 3, which is slightly delayed in the beginning of the production run, will meet the planned demand for the trucks.

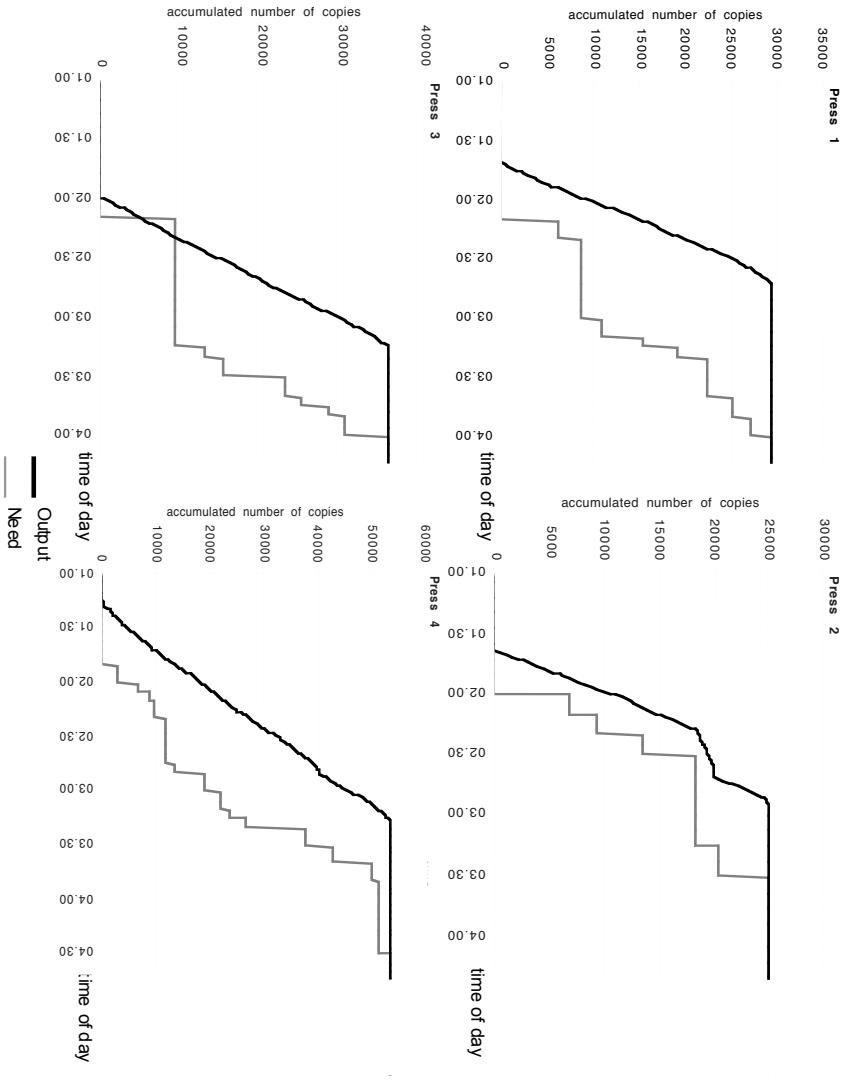

Figure 9: The press output and the number of copies required for the truck loading at different times during the night [Rehn et al, 2001b].

However, by adding the output from all presses and adding the demand for the trucks, the supply will meet the demand, see figure 10. Therefore, the pallet loading which will make it possible to adjust the supply from all presses to one load at a time will increase the independence of the distribution. One aspect regarding the accumulated production, not taken into consideration, is that the overall control system should be able to move the bundle order between the mailroom lines.

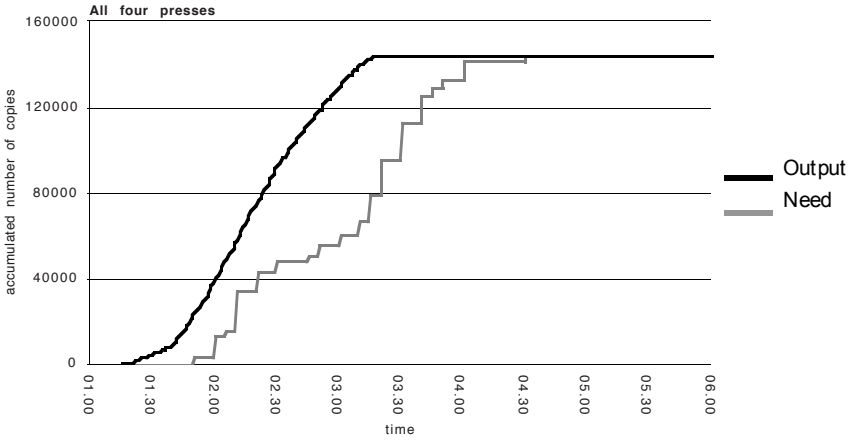

Figure 10: The total printing output from each press and the required number of newspaper copies each press must supply for the trucks in order to meet the planned departure times [Rehn et al, 2001b].

7. Discussion/Conclusion

A model of morning newspaper distribution can be used to increase our understanding of the process. By understanding the process it becomes possible to determine where improvements can be of value. The model can serve as the basis for finding processes within the field of distribution to be improved. It may be possible to improve each process; however, each process must be a project of research. In this licentiate thesis, a model was created in order to find which process could be improved. It was found that it would be valuable to improve two processes within morning newspaper distribution: the information flow and the coordination between the production and the distribution.

The information flow within the distribution process can be improved with electronic devices used by the truck drivers and the carriers, e.g. mobile telephones. However, the information sent and received should be logged so that the tracking of problems can be maintained. Depending on the agreements reached with telecommunication companies, the cost for using such a system will vary. Examples of the benefits of using a so-called mobile field system are a faster flow of information, possibilities for tracking the distribution and possibilities for solving problems that occur during the night.

The coordination between production and distribution is important since the time for distribution is dependant upon the production output. Most newspaper distribution companies make use of trucks for further delivery, and the truck drivers manage the loading process in sequence to the production. If the copies could be loaded onto pallets before they are loaded onto the trucks, the time spent by truck drivers on the loading dock can be decreased. However, this will make the loading process completely different from a loading process managed in sequence to the production. Apart from the pallet loader, space for pallets must be available and staff to work with loading the pallets must be hired. Moreover, the trucks must be able to carry pallets and the distribution organization should be able to recycle the empty pallets.

By changing the information flow and the planning of the loading process, the distribution can be more effective. The proposed changes might increase the costs initially for the distribution company, both in terms of investment costs and in running costs. However, in the long run, improved planning and a faster information flow with correct information can bring about rationalizations and an increased delivery quality.

Future work within the sphere of morning newspaper distribution involves two major fields. These two fields are new businesses for the newspaper distribution companies and the improvement of the physical distribution.

Major questions to be answered within the field of new businesses are – which products other than newspapers can and should be delivered? How will these products be delivered?

New businesses for the distribution companies may involve both tangible and intangible products. The distribution of these products may involve physical distribution as well as electronic distribution. The improvement of physical distribution may involve an improved information flow with new electronic devices and an optimization of physical flow.

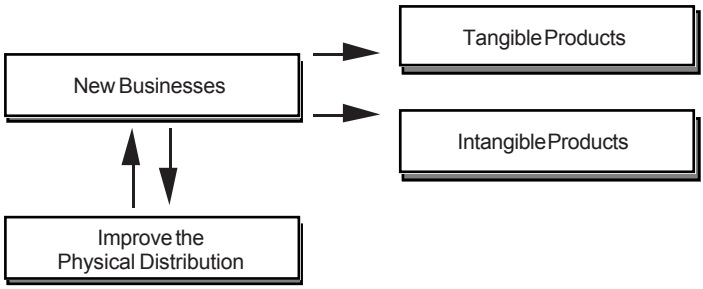

Figure 11: Some of the aims for future research work for newspaper distribution companies.

With declining circulation and an increased distribution cost per copy, the needs for new businesses that can result in other sources of income are crucial for the newspaper distribution companies. In order to be able to provide other services, newspaper distribution companies need to develop other systems for planning and information. Research must be carried out in order to find different distribution models describing how new businesses will affect the newspaper distribution companies. For example, can the distribution of digital products constitute a new business, e.g. these are intangible products. However, digital products can evolve into physical products before they reach the customers. In figure 12, a few examples of how a digital product can be distributed are shown. Digital products that somehow evolve into physical products might require an organization for distribution, which can entail a new business for the newspaper distribution companies of today.

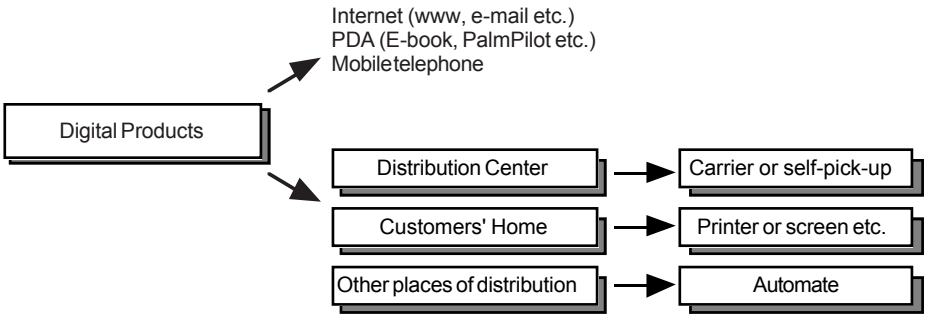

Figure 12: A few examples how digital products can be distributed.

In order to improve the physical distribution, one must know how and what products are to be distributed. By modeling a number of scenarios, the pros and cons for each scenario can be evaluated. In figure 13, a model of a few different scenarios is displayed. Products can come from the press, the mailroom or the distribution center. These products are then distributed by the distribution organization, e.g. truck driver, a carrier or both. The products are distributed to a distribution center for re-loading or transportation direct to a customer. Research of the different scenarios should be carried out in order to find new businesses for the newspaper distribution organizations.

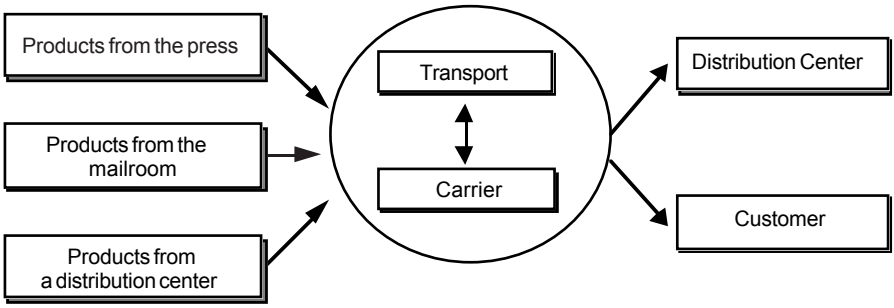

Figure 13: Different scenarios for the physical distribution for the newspaper distribution companies.

8. Author's contribution to the papers

PAPER I

The author's contribution to the papers has been the gathering and compilation of data. Johan Stenberg's contribution to the paper has consisted of proofreading the papers and adding his thoughts and ideas to the conclusions.

PAPER II

The author's contribution to the papers has been the gathering and compilation of data. Johan Stenberg's contribution to the paper has consisted of proofreading the papers and adding his thoughts and ideas to the conclusions. Björn Hedin and Fredrik Fällström have been involved in discussions regarding the technical sections in the paper.

PAPER III

The author's contribution to the papers has been the gathering and compilation of data. Johan Stenberg's contribution to the paper has consisted of proofreading the papers and adding his thoughts and ideas to the conclusions. Björn Hedin has been involved in discussions regarding the technical sections in the paper.

PAPER IV

The author's contribution to the papers has been the gathering and compilation of data. Johan Stenberg's contribution to the paper has consisted of proofreading the papers and adding his thoughts and ideas to the conclusions.

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Appendix

The 15 newspaper and newspaper distribution companies that were involved in discussions and/or studied/visited during the research project.

- GP Distribution – VTD
- Värmlands Folkblad AB
- Distributionstjänst i Örebro AB
- Metro
- Svenska Dagbladet
- Everyday
- The Idaho Statesman
- Nova Distribution
- Dagens Industri
- Norrtelje Tidning
- VLT Distribution
- HD Tidningsservice
- Distributionscentralen i Borås
- Helsingin Sanomat
- Los Angeles Times