

Warehouse manpower planning strategies in times of financial crisis: evidence from logistics service providers and retailers in the Netherlands

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Abstract

The economic crisis that is experienced in Europe has a large influence on transport and logistics companies. Since turnover typically drops strongly during a crisis, companies try to reduce costs in order to survive. The study reported in this paper has investigated how manpower planning in warehouses has been used to counter effects of the crisis and what the results are of the measures taken. A survey was carried out among warehouses run by retailers and logistics service providers. The results of the survey show that there is a significant relation between a decrease in turnover and the four investigated manpower planning strategies. Furthermore, the study shows that the most effective manpower planning strategies are flexible planning of employees and balancing the workload. Hence, the study concludes that in particular better operational planning is a key strategy to counter the effects of the financial crisis, which is an important insight for the management of warehouses.

Keywords: manpower planning, logistics service providers, retailers, financial crisis

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1. Introduction

Due to the financial crisis in the Western world, growth in many supply chains has slowed down. Economic data show that for example in 2009 – the most critical year of the recession for the Netherlands – 55% of the retailers had to deal with decreasing turnover and the number of bankruptcies nearly doubled from Q1 2008 to Q1 2009. The total consumer household spend of both 2009 and 2011 shows negative figures. Companies operating in retail supply chains are struggling to cut costs, especially when they operate in areas where margins are thin.

According to economic figures of the Dutch Institute of Statistics (CBS 2012), the turnover of logistics service providers in the Netherlands had decreased in 2009 and the number of bankruptcies had increased compared to previous years. In 2009 there were 75% more bankruptcies among logistics service providers in the Netherlands than the year before (there were 155 bankruptcies reported in 2009) and the number of bankruptcy petitions filed by retailers rose from 460 in 2008 to 700 in 2009 (CBS 2012). In the same year 65% of the logistics services providers in the Netherlands had to cope with decreasing demands while 35% of the companies still had to deal with overcapacity of personnel (TLN 2012). At the same time, retail turnover showed a decline in 2009, which was not expected to stabilize until 2010 (Dallinga and Langbroek 2009). In fact, retail sales showed a decrease again in 2011, particularly for non-food items (HBD 2012).

In this article we focus on how retail companies and logistics service providers are dealing with the economic situation in the context of their warehouse operations. We focus on labour costs since these are a significant part of supply chain costs, particularly in warehouses (Van den Berg 2007). Hence, an important question that arises in times of crisis is how companies can control their labour costs in warehousing to cope with the effects of an economic downturn.

Our research objective is to understand manpower-planning measures that companies take in warehouses during a financial crisis and their potential effects on performance. The next section first discusses manpower planning in warehouses; we then discuss our research design. Consecutively we discuss the empirical part of our research and our results. Last, we conclude our article.

2. Manpower planning strategies in warehouses

2.1. Warehouse management

De Koster *et al.* (2007) describe warehousing as a contribution to overcome the time and space difference between producers and customers, support of customers service policies, providing temporary storage, and meeting changing market conditions. Van den Berg (1999) describes the warehousing process more specifically, including all movements of goods within a warehouse, which vary from receiving the goods to value added logistics. The movements of goods can be split up into several warehousing activities, which Van den Berg (2007) connected to warehouse flows. Figure 1 illustrates these physical activities and flows, from receiving goods to shipment of the goods.

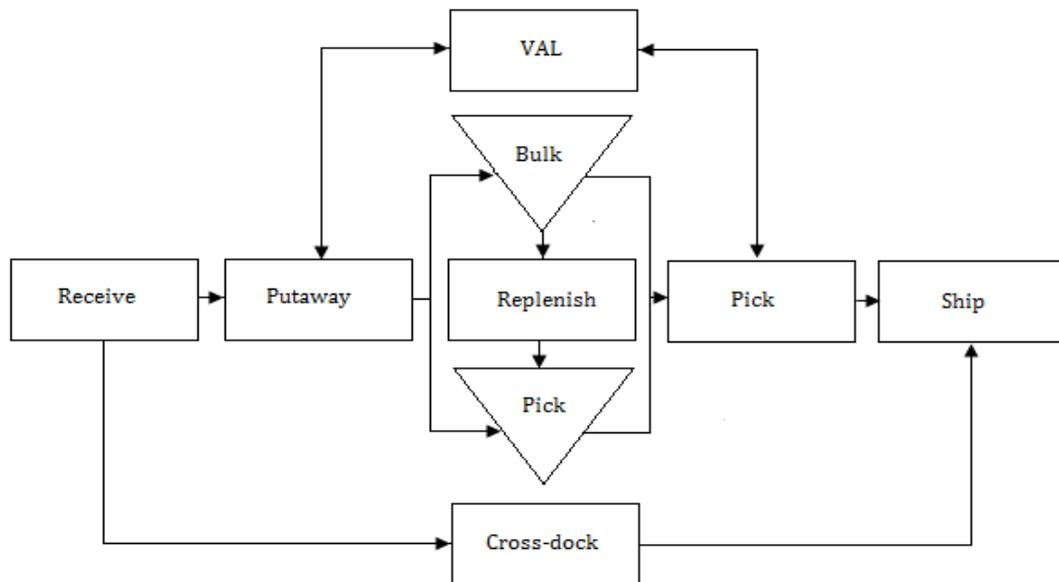


Figure 1. Warehouse operations (source: Van den Berg (2007))

2.2. Manpower planning

Manpower planning has been described as consisting of three parts, including predicting the demand for manpower, predicting the future supply of manpower, and reconciling the differences between demand and supply (Edwards, 1983). Strategies to plan manpower in warehouses are needed because the workload in warehouses fluctuates. Sometimes these fluctuations are predictable (e.g. seasonal patterns, sales promotions), at other times they come totally unexpected (Van den Berg 2007). The financial and economic crisis is an example of an unexpected event that causes fluctuations within the warehouse. There are several mechanisms to cope with fluctuations, and in our research we focus on four mechanisms: the types of contracts with employees, flexible planning of employees with fixed contracts, job rotation and workload balancing.

We define a permanent contract as a contract without a specified end date and all non-permanent contracts as flexible or temporary contracts. Job security for temporary workers in the Netherlands is limited: only 20% of the flexible workers working for a job agency has a permanent contract after 2 years, and for employees with a temporary contract at the employer, one-third gets a permanent contract in this period (UWV, 2010).

To end a permanent contract, from the perspective of many employers a laborious and expensive procedure needs to be followed, involving the district court. Temporary contracts are much easier to end – they have a specified end date, and some can be ended even with very short notice. Some temporary contracts allow for flexible hours. Flexible contracts include capacity that is hired from job agencies and independent contractors. Because flexible contracts are easier to end, these will be the first affected when demand for labour declines. When there is less demand for labour, flexible contracts are typically phased out. Furthermore, the remaining work may be transferred to permanently contracted employees (FNV, 2009; SCP, 2012). This effect has been observed in the Netherlands during the aftermath of the dot-com bubble burst (2002 – 2003) and the first years of the financial crisis (2008 – 2009).

There have been many publications in the media that flexible workers, and especially

independent contractors, have served as a ‘buffer’ to absorb a significant part of the effects of the financial crisis on the labour market (e.g. Cörvers *et al.* 2011). This has absorbed the effect of the financial crisis on unemployment figures to some extent, although unemployment itself has led to a rising number of flexible contractors. This is illustrated by the fact that, in many European countries, the unemployment rate is much higher for young people, which has stimulated them to become flexible contractors. In the Netherlands, for people under 20 year old, three-quarter of the workforce have some kind of flexible contract, whereas this is only the case for 10% for 59 year-olds (UWV, 2013).

2.3. Manpower Planning Performance

Manpower planning performance can be defined as the efficiency and effectiveness of a certain manpower planning strategy (Khoong 1996). According to Khoong (1996), effectiveness is the extent to which an objective has been achieved, while efficiency is defined as the degree to which resources has been used economically. Implementing a measurement system has been shown to positively affect supply chain performance (de Leeuw and van den Berg 2011): in the first place it increases understanding; staff members know what the company goals are and have a precise view on their achieved performance. Furthermore, De Leeuw and van den Berg show that being able to see how their own performance contributed to the company results does not only increase understanding but also has the effect of increased productivity and decreased number of mistakes made. Furthermore, a measurement system results in increased motivation among personnel and a focus on optimization (de Leeuw and van den Berg 2011).

It is important to know what the effect is of manpower planning strategies on performance so that changes can be made in time (Chowdhury *et al.* 2009). Four commonly used manpower planning performance indicators within warehousing are (Van den Berg 2007):

- a) Idle time (or productivity, two sides of the same coin),
- b) Utilization
- c) Workplace absenteeism
- d) Overtime

Idle time arises when employees do not perform tasks even though there is work to be done and they are at work (Van den Berg 2007). This situation may occur when for example an employee stays in the coffee corner longer than the regular fifteen minutes break. This means that the productivity of an employee decreases. Utilization rate is the ratio of the actual level of output in relation to the maximum level of output (Corrade and Matthey 1997). Absenteeism occurs when employees do not come to work at all. Higher satisfaction of employees, through for example a variety of tasks, has proven to decrease absenteeism at work (cf. Autry and Daugherty 2003). Keeping employees motivated by choosing the right manpower planning strategies thus is of importance, for example by using job rotation. The last performance measure we use is overtime, which relates to the hours worked in excess of agreements. Certain strategies, such as balancing the workload or a flexible planning for fixed employees can lead to reductions of (expensive) overtime (Evers and Verhoeven 1999).

In this paper we focus at flexible ways of planning manpower that are expected to get more attention in times of crisis. We postulate that all of these strategies will be used during a financial crisis and that in turn these manpower-planning strategies are

expected to affect warehouse performance. Figure 2 shows the high-level conceptual model of our research.

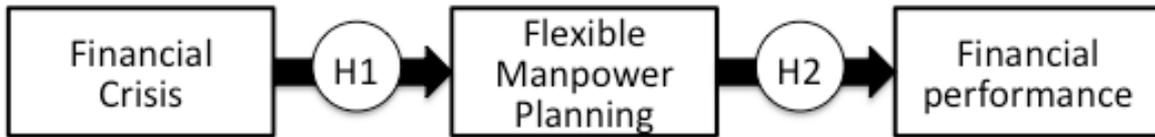


Figure 2: High-level conceptual Model

To test the relations identified above we have developed hypotheses and tested these in empirical research. We expect that the financial crisis will lead to more flexible ways of planning manpower (H1), such as more flexible contracts, which in turn will increase warehouse performance (H2). In the next section we will further detail our hypotheses starting with hypotheses on the relation between flexible ways of manpower planning and performance. After that we focus at the relation between the financial crisis and flexible ways of manpower planning.

3. Manpower planning strategies

3.1. Flexible contracts

Turbulent market times and globalisation necessitate the ability to react flexibly to fast changing environments. In such situations, companies are careful with offering fixed-term contracts (Bratton and Gold 1999; Kalleberg 2000; Moorman and Harland 2002). Holmlund & Storrie (2002) showed that in Sweden, a recession leads to an initial decline in temporary employment, followed by a sharp rise when the economy seems to recover. An increase in permanent contracts is only visible when an economy approaches a cyclical peak (Holmlund and Storrie 2002). Research on temporary work in the Netherlands (CBS 2012) also illustrates the existence of this relation. In fact, it turns out that compared to the nineties, these days employees have temporary contracts more frequently during their careers and for longer periods (Anon., 2013)

Flexible contracts are expected to have an impact on the utilization of personnel, as these allow employers to be more responsive in matching demand and supply of labour in the warehouse. In this study, we assume that the actual labour performed under a flexible or a fixed contract is equal, and therefore we do not expect a relationship between flexible contracts and productivity, absenteeism and overtime.

Stated as a formal hypothesis we expect the following relation:

H2a: The more a company uses flexible contracts in a warehouse the higher the utilization rate.

3.2. Flexible planning

When demand drops sharply, overcapacity of personnel might still exist after releasing the flexible manpower pool; changes in manpower planning strategies may then be needed. Companies will try to flexibly plan employees with fixed contracts, within the boundaries of their contracts in terms of contracted hours and free days (De Leede *et al.*, 2002).

A flexible planning of standard contracts can be implemented in different ways, for example by agreeing on an certain number of worked hours per year, that can be distributed flexibly throughout the year, or individual schedules, in which the team is split up in small sub-groups and change the duration of work shifts. Flexibility can also

be obtained by taking demand into account when planning holiday and other non-working days. One can furthermore decide to have flexibility in start times for employees or one may decide to provide flexibility in the number of hours a person has to work in a given period of time (Stolletz 2010).

Such a planning can help to capture demand changes, but may also result in a better balance between supply and demand of personnel, less overtime and better utilization of employees, as well as in a faster reaction time towards customers. Flexible planning may also benefit employees in terms of a better balance in work and free time. This again can provide profits to the company, as it may result in higher job satisfaction. This may in turn lead to less absenteeism (Autry & Daugerty 2003) and thus higher productivity of employees.

Formally stated, we expect the following relation:

H2b: The more a company applies flexible planning in a warehouse the higher the utilization rate and productivity and the lower absenteeism and overtime.

3.3. Job rotation

Job rotation can be defined as the systematic movement of employees from one job to another (Malinski 2002), which means that employees have to be capable to fulfil multiple activities in a warehouse. They become multi-skilled. This element of resource planning is currently getting more attention; many companies see the importance of such activities in providing a dynamic, productive and satisfied staff and especially in turbulent market times flexibility is important (Collinson 2001). Job rotation creates a more varying workload for workers. Furthermore, the result of job rotation is a decrease of boredom, work stress, and job absenteeism (Michalos *et al.* 2010; Schaufeli and Kompier 2001). Furthermore the fulfilment of an order may be realized with fewer employees as multiple employees can fulfil each process. In addition, job rotation furthermore creates an increase in innovation, productivity and loyalty (Cheraskin and Champion 1996). In warehouses, however, such rotation of jobs may not always be evidently possible, as employees may need to have certain skills. Not every employee is for example capable of driving a forklift or able to receive the incoming goods (Van den Berg 2007). Furthermore, experienced staff often does not want to learn new job skills or does not want to move to other locations.

Job rotation is not expected to have an impact on overtime, as the total amount of work does not change and the job rotation is assumed to assign the same volume of work to different people. We state the following hypothesis:

H2c: The more companies use job rotation in a warehouse, the higher the utilization rates and productivity and the lower absenteeism.

3.4. Workload balancing

During periods of crisis, the ‘self-contradiction of hands shortage and idleness’ dilemma may arise, which means that due to unstable workloads manpower shortages are followed by completely idle times during working hours (Huang *et al.* 2007). To overcome this problem, workload balancing can be helpful. Not all orders need to be performed on the indicated day; advancing or postponing certain orders can balance the workload. Workload balancing can be defined as shifting workloads between busy and quiet days, so overtime and idle times can be reduced (Van den Berg 2007). Via this strategy the mood and physical fitness of employees may increase, whereas the work stress, boredom and job absenteeism decrease (Jurkowiak *et al.* 2001). Furthermore the

costs for overtime and temporary staff can be reduced.

Particularly during times of crisis the calculation of workload balancing is quite hard (Huang *et al.* 2007; Post and Whitehead 2001). Quick response to changing demands can be realized by collaborating with clients and by planning within the warehouse. Inbound processes, which are initiated by the arrival of goods, can be balanced by better collaboration between parties (Van den Berg 2007). To be able to balance the workload, warehouses for example have introduced time slots for incoming trucks. This means that the warehouse guarantees an available dock during the indicated time. This efficient operation will prevent long waiting times for the supplier, if they are on time, and prevent an unbalanced workload for the warehouse employees (Boysen *et al.* 2010). One may furthermore distinguish between activities that must be performed immediately and activities that can be performed over a longer period of time, such as certain value added activities (VAL). Such orders that may be postponed can also be used to balance the workload. A drawback of this strategy is the required space in the staging area of a warehouse for postponed orders and for orders already picked (Van den Berg 2007).

In this paper, we assume that workload balancing is done independently from varying the amount of employees, as work is moved in time but not in volume. Hence, on the longer term, the average amount of work done per person stays the same. This means that we do not expect a relation between workload balancing on the one hand, and utilization and productivity on the other.

We state the following hypothesis:

H2d: The more companies use workload balancing in a warehouse the less absenteeism and overtime.

We relate turnover decrease (as an indicator of financial crisis) to manpower planning strategies in the following way (see Figure 2 for a summary). We expect that turnover decrease will lead to a reduction in the number of temporary forces, which is in line with Holmlund and Storrie (2002) who observed that an increase in permanent contracts is typically only visible when an economy approaches a cyclical peak. We furthermore expect more use of flexible planning of employees with fixed contracts (H1b) when turnover decreases. De Leede *et al.* (2002) observed that companies attempt to plan work more among employees with fixed contracts when the financial situation worsens). Third, we expect more job rotation when turnover decreases (H1c) since job rotation increases productivity (Cheraskin and Campion 1996). Last we expect more workload balancing (H1d) if turnover decreases since it can improve warehouse performance (Van den Berg 2007). Stated more formally:

H1a: The more turnover decreases the more companies increase the number of temporary forces

H1b: The more turnover decreases the more companies positively use flexible planning of employees with fixed contracts

H1c: The more turnover decreases the more companies use job rotation

H1d: The more turnover decreases the more companies use workload balancing

Figure 3 summarizes the hypotheses.

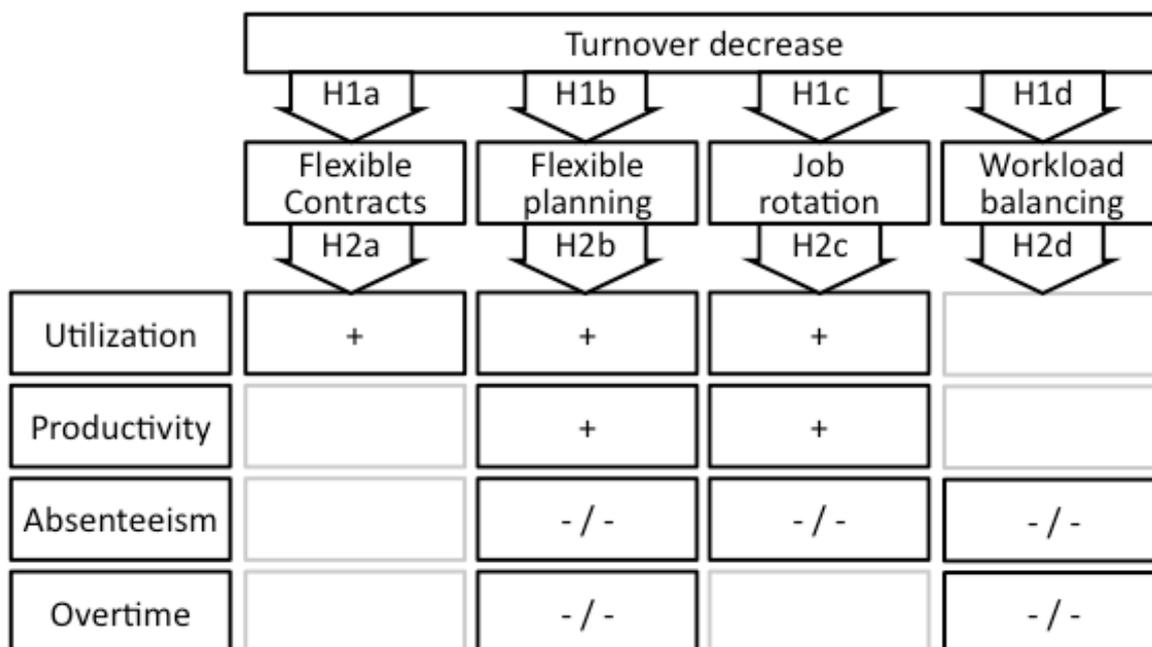


Figure 3. Graphical overview of hypotheses
 (+ implies a positive relation and -/- a negative relation; an empty cell means no relation is expected)

4. Research design

4.1. Methodology

We focused on survey research as surveys provide a good way to test existing theories. We developed a questionnaire based on literature discussed above and consulted four experts to verify the questionnaire contents and the questions. Two experts had extensive experience with the design of questionnaires as well as knowledge of warehousing and two had experience with the sectors we analysed.

We divided the questionnaire into three main parts. The first part consisted of general company characteristics. The second part of the questionnaire consisted of questions related to effects of the financial crisis. As we expected respondents to be reluctant to provide detailed information on these questions (e.g. turnover rate), we used a five-point Likert scale which is considered better under such circumstances (Ruane 2005). The third part of the questionnaire concerned the manpower planning strategies that respondents applied and the associated planning performance. We again used five-point Likert scales to avoid issues with non-response. Our target sample was selected from research on the best retailers in the Netherlands in 2010, conducted by research institute TNO and the Dutch professional journal ‘Elsevier’.

A typical drawback of questionnaires is that they often suffer low response rates (Ruane 2005). To persuade companies to participate in the study the first step was phone calls. During these phone calls we particularly emphasised the role of the university and participation of experienced researchers in the field. Companies that agreed to cooperate were sent a letter with more information on the research (e.g. background, relevance) and a link to the webpage, where the online questionnaire could be found.

A further issue is respondent honesty, as persons tend to answer questions in a socially appropriate way; they like to present themselves favourably. This tendency is called the

social desirability bias (Ruane 2005). The bias tends to be higher when the questions relate to self-reflection or when it concerns confidential information (King & Bruner, 2000). In the questionnaire there is therefore chosen for measurements on Likert scale when confidential information was involved (e.g. turnover rates). This has proven to give more honest results than using the more accurate ratio level (Ruane 2005). Furthermore anonymity reduces the social desirability bias.

In the questionnaire we have asked to describe the manpower planning situation as well as performance in three periods of time: before the economic crisis (2007), from 2007 – mid 2009 and from mid 2009 – end 2010 (i.e., when we administered the survey). We asked for the occurrence of decrease in demand in a similar fashion. In this way we could relate changes in manpower planning strategies to changes in performance and to changes in turnover.

A questionnaire was sent to 89 retailers and 97 LSPs. In total 50 LSPs responded as well as 52 retailers. Respondents represented a good spread over different markets and we did not observe a skew in company sizes. Descriptives are presented below in Table 1. The Cronbach's alphas were 0.833 (retail questionnaire) and 0.837 (LSP questionnaire), which is above the limit of .7 (Hair *et al.* 2006).

Table 1. Sample descriptives

	RETAIL			LSP		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
N° of M ²	52	37,369	14,861	49	33,549	33,937
N° of Pallet places	52	26,875	10,660	47	29,611	31,262
N° of Clients	52	194	364	48	95.9	309
N° of SKU	52	6,150	7,705	39	11,676	18,533
N° of Fixed personnel (FTE)	52	134	43.6	47	98.5	147.3
N° of Flex personnel (FTE)	52	9.5	10	50	43	77.0

5. Results

The first set of hypothesis (1a-1d) test the relation between the presence of a financial crisis and manpower planning strategies. We discuss each of these four hypotheses below.

Hypothesis 1a states that a decrease in company turnover is related to a decrease in the number of temporary forces used in the warehouse. We therefore expect that companies that experienced a decreased turnover were the ones that decreased the number of temporary contracts. The dependent variable is the decrease in number of temporary forces, which is measured at a nominal scale (decreased YES or NO compared to the year before). The independent variable is the decrease in turnover, which has been measured on a five-point Likert scale (1=Less turnover decrease than the year before; 5=Higher turnover decrease than the year before).

Data for both the retailers and for logistics service providers were not normally distributed so we had to revert to non-parametric tests. Using a Mann-Whitney U test we found that both for retailers and for logistics service providers hypothesis 1a can be accepted (see Table 2).

Table 2. Mann-Whitney U-test results for hypothesis 1a: The more turnover decreases the more companies reduce the number of temporary forces (1-tailed).

	N	Significance level Mann Whitney U-test
LSP	50	0.003
Retail	52	0.000

Hypothesis 1b states that decreasing turnover of logistics service providers positively relates to the use of flexible planning of fixed employees. The degree of flexible planning of fixed employees has been measured on a five-point Likert scale and so was the decrease in turnover. Linear regression analysis is useful to predict one variable based on another (Sekaran 2006). This method thus fits hypothesis 1b as we aim to identify the relation between decreasing turnover and the use of flexible planning. Assumptions for linear regression are met. Table 3 shows the linear regression models, based on which we can accept Hypothesis 1b.

Table 3. Linear regression results for hypothesis 1b: The more turnover decreases the more companies positively use flexible planning of employees with fixed contracts (independent: Turnover decrease; dependent: Flexible Planning) (1-tailed).

1	N	R2	Coefficient	Intercept
LSP	50	,331	1,581**	,514**
Retail	52	,415	,948*	,665**

Hypothesis 1c states that job rotation becomes more used the more demand decreases. Both variables were measured on a five-point Likert scale. Similar to hypothesis 1b linear regression is an appropriate method to test this hypothesis. However, we found that the assumption of normality cannot be met in this case, and thus linear regression cannot be applied. We therefore reverted to correlation analysis using Spearman's Rho. Based on the test result we can accept hypothesis 1c for retailers but not for logistics service providers (see Table 4).

Hypothesis 1d predicts that the more turnover decreases the more the use of workload balancing increases. Linear regression would thus again be a suitable method to test this. However, the assumption of normality can not be met, which means Spearman rho should again be used. Both for retailers and for logistics service providers we can accept hypothesis 1d (see Table 4).

Table 4. Correlation results for hypothesis 1c: The more turnover decreases the more companies use job rotation and for 1d: The more turnover decreases the more companies use workload balancing (1-tailed).

	Decrease in turnover	
	Retail (n=52)	LSP (n=50)
Job Rotation	,322**	n/a
Workload balancing	,346**	,238*

*n/a: no significant correlation; *: correlation significant at ,05 level; **: correlation significant at ,01 level*

The second set of hypotheses (2a-2d) test the relation between manpower planning

strategies and performance outcomes. Table 5 summarises the results of a correlation analysis between the four manpower planning strategies and the four performance metrics. Due to non-normality of the data, we applied a non-parametric correlation analysis.

Table 5. Correlation results of manpower planning strategies vs. performance metrics (1-tailed; Spearman's correlation)

	Manpower planning strategy		N	Utilization	Productivity	Absenteeism	Overtime
H2a	Use of flexible contracts	Retail	52	n/a	✗	✗	✗
		LSP	50	n/a	✗	✗	✗
H2b	Use of flexible planning of fixed employees	Retail	52	.308*	,273*	-,266*	-,457**
		LSP	50	n/a	n/a	n/a	-,297*
H2c	Use of job rotation	Retail	52	.406**	,301*	n/a	✗
		LSP	50	n/a	n/a	n/a	✗
H2d	Use of workload balancing	Retail	52	✗	✗	-,253*	-,445**
		LSP	50	✗	✗	n/a	n/a

*n/a: no significant correlation; *: correlation significant at ,05 level; **: correlation significant at ,01 level. ✗ in a cell means no data has been collected for this item*

Hypothesis 2a states that the more a company uses flexible contracts in a warehouse the higher the utilization rate. We did not find support for this relation in our data.

Hypothesis 2b postulates that the more a company uses flexible contracts in a warehouse the higher the utilization rate and productivity and the lower absenteeism and overtime. We do find support for this hypothesis for the retailers. For LSPs we only find a significant relation between the use of flexible planning and overtime.

Hypothesis 2c focuses on the relation between the use of job rotation on the one hand and an increased in utilization and productivity and a decrease in absenteeism on the other. None of these relations are significant for LSPs. For retailers, the relation between job rotation on the one hand and utilization and productivity on the other are significant but not the relation between job rotation and absenteeism.

The last hypothesis (2d) deals with the extent to which the use of workload balancing in a warehouse relates to less absenteeism and overtime. We find that this relation is only significant for retailers.

6. Discussion

Our results show that a generally significant relation exists between a decrease in turnover as a result of the financial crisis and the application of manpower planning strategies, in line with what we have hypothesized (H1a – H1d). There is only one exception: for LSPs we do not find a relation between decrease of turnover and the use of workload balancing.

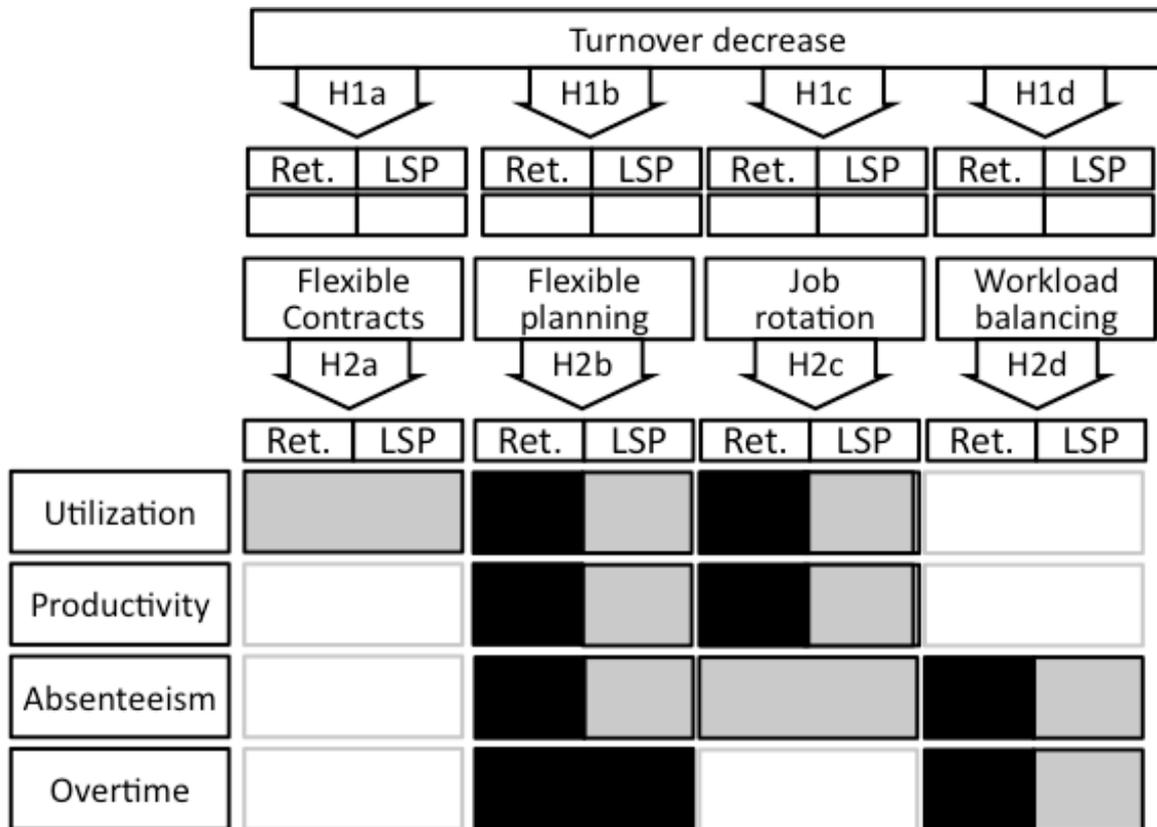


Figure 4: Overview of results. Black means a significant relation was found. Grey means no relation was found. An empty cells mean that the relation was not investigated.

We see a more diverse picture for the relation between the manpower planning strategies and warehouse performance. For both sectors, using a partly flexible workforce did not relate to warehouse performance. This may be related to the fact that particularly in 2009 there was quite a significant amount of overcapacity in warehouses in the Netherlands (TLN 2010) and that many warehouses still had to deal with an overcapacity of personnel, even after releasing the flexible pool. Using partly flexible workforces might therefore be insufficient to improve performance of warehouses in a situation of a serious crisis (compared to for example regular seasonal fluctuations). Alternatively, making the workforce more flexible offers fewer possibilities due to legislation on labour contracts laws in countries such as the Netherlands (Remery et al., 2002).

Our finding that the effect of the strategies used is stronger for retailers may be related to the fact that LSP's already were more mature in applying these strategies than retailers. In other words, LSP's were more advanced than retailers in applying manpower planning strategies even before the crisis started. For a retailer, a warehouse is one of the elements of the supply chain, whereas for a LSP, the warehouse has the

primary focus. The manpower planning strategy that has the strongest relation with warehouse performance is flexible planning. This is an indication that there is still much to be gained by warehouses by a better planning of the workforce. The same effect can be observed in other industry sectors that have adopted advanced planning and scheduling techniques – where for example the process industry has been an early adopter of such techniques, other sectors have started to use such tools later as the business case was less prevalent (Günther and Van Beek, 2009). A need for a strong focus on planning in crisis situations is also acknowledged in the area of crisis management in the Netherlands: today planning and preparing for large unexpected crises such as floods is more common than in the past (Wesselink, 2007).

Retailers may reap more benefits from job rotation and workload balancing than LSP's. Although no complete data was gathered on this, several LSPs indicated in the survey that they already had extensive experience in job rotation. It is therefore likely that LSP's have had a stronger focus on these costs reduction strategies for a longer period, including workload balancing, even before the financial crisis started.

7. Conclusions

This paper presented a study where the use of manpower planning strategies during the financial crisis has been investigated at logistics service providers and retailers. A conceptual model was developed to investigate the link between a decreased turnover resulting from the crisis, the manpower planning strategies used, and four characteristics of performance. A survey was conducted to test the hypothesized use of the strategies.

The outcome of the study is that most hypothesized manpower planning strategies are used by retailers and by LSPs during times of crisis. However, not all are found to be equally related to warehouse performance measures. There seems to be a difference between warehouses run by retailers and the ones run by LSP's: the relation between manpower planning strategies and performance seems to be stronger for retailers warehouses.

Although the results of our research can never suggest causation due to the approach used, we are convinced that planning the warehouse workforce can be a good way to improve the warehouse performance in times of economic crisis. Other measures can be effective as well, but the effect is less clear and this either depends on the level that these measures are already applied, or how difficult it is to apply them effectively. Job rotation might not always be possible due to limited skills, especially when temporary forces are applied. Also, the costs of the implementation of job rotation can be high (education, training, etc.) which is a limiting factor in times where cost reduction are important (Carnahan *et al.* 2000).

To summarize, a better operational planning and balancing of employees in warehouses appears to be a good strategy to counter the effects of the economic crisis. In a situation of severe economic crisis being prepared through appropriate planning strategies may be a more efficient approach than relying on operational flexibility. As operational planning of manpower in warehouses is typically a manual task as opposed to for example in factories, there might be more opportunities for improvement by supporting this task by Advanced Planning and Scheduling systems, potentially in a centralised control tower to avoid large investments in a single warehouse.

Although we have attempted to structure our research in line with suggestions to limit respondent bias answers are still provided by only one respondent per questionnaire.

This may lead to common method bias (Podsakoff *et al.* 2003). Our conclusions are furthermore impacted by our target group (retail and LSP) and may not apply to for example wholesalers. Future research may focus on analysing the effects in different industries.

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