

Article citation info: Spyropoulos, T. S., Benefits of shift automation systems in logistics & transportation. Transport & Logistics: the International Journal, 2018; Volume 18, Issue 45, December 2018, ISSN 2406-1069

## BENEFITS OF SHIFT SCHEDULING AUTOMATION SYSTEMS IN LOGISTICS & TRANSPORTATION

**Theocharis Stylianos Spyropoulos**

*Department of International Business, Perrotis College, Marinou Antipa 54, Thessaloniki 55102, Greece, hspyro@afs.edu.gr*

### **Abstract:**

*The study examines the role of Shift Automation Systems in Logistics and Transportation. With Logistics Centers and Transportation Companies 24/7 operations, the need to automate processes becomes critical for success. Despite the increase of information and automation systems applied in logistics and transportation, employees and equipment schedules also need to be monitored carefully to ensure productivity and smooth operations. In addition 3<sup>rd</sup> party employees may have significant role in overall productivity. The study examines potential areas for performance and productivity improvements in Logistic Centers and Transportation companies using latest Shift Automation Technologies.*

### **Keywords:**

*Logistics, Shift Automation, Human Resources Management, Transportation, Innovation, Shift Scheduling Automation Software, Shift Management, Shift Work, Employee Scheduling*

## INTRODUCTION

The role of Logistics is critical in today's economy – international trade growth, e-commerce and international transportation all depend on effective Logistics. The role of human capital in logistics and transportation still remains a critical element for success. "Academic & trade literature identify the human element as critical for achieving the logistics goals of organizations and entire supply chains." [1, p. 379]. Employees in logistic and transportation sectors often work in shifts, which create additional complexity for both management and employees. Shift working from a business perspective is related to compliance requirements of labor legislation; however the need to run effective operations and achieve operational goals in a competitive environment remains. From an employee perspective, shift working is associated with pressure on social and family life, health issues, motivation and loyalty. The study focuses on identifying the areas where shift scheduling software solutions can contribute to companies in Logistics & Transportation sectors meeting their business needs. In order to understand the challenges these industries face today, we need to have a deep

understanding of the complexity of the problems Logistic & Transport companies and employees face.

## **1 LITERATURE REVIEW**

Recent research [2] highlights the problems related to shift management for employees. “Shift work disrupts the sleep-wake cycle, leading to sleepiness, fatigue, and performance impairment, with implications for occupational health and safety. For example, aircraft maintenance crew works a 24-hour shift rotation under the job stress of sustaining the flight punctuality rate. If an error occurs during the aircraft maintenance process, this error may become a potential risk factor for flight safety.” [2, p.1].

Recent research examines several transportation-related challenges for Logistics [3] summarizing previous studies and concluding that “the average length of transport distances has been growing longer and longer. In addition, logistics companies have been forced to follow customers who have employed off shoring strategies - that is, the relocation of production to far-off low-wage countries. In this process, the necessary route potential must be created. In addition, strategic, operational and legal issues are becoming increasingly complex. Actions like the European Union’s enlargement to the east are adding fuel to this development. Particularly in the transport sector, longer transport distances and times are being created. Only those companies that are able to fulfill given requirements have a chance to survive. They will have to avoid empty runs, to design schedules as efficiently as possible and to minimize transshipping frequency and times as well as personnel costs and damage to goods”

Further research [4] highlights the role of Human Resources in Logistics sector. The conclusion is that even though the functions of recruitment, selection, training and personnel development were contributing to overall success, both performance management and reward management had to be improved. Additional study [5] also examines the importance of strategic human resource management in Logistics industry, highlighting problems such as the need to improve collaboration and the high turnover rate for employees, especially drivers.

Another study [6, p.6] examines the benefits of cloud technology solutions in value creation. “Cloud technology can enable platform solutions, which in turns makes it possible to use new business models, such as ‘virtual freight forwarding’. It can also provide flexibility and scalability, as well as standardized and harmonized processes across the whole organization. That’s especially important for those LSPs or carriers who have grown through acquisitions, and currently rely on a patchwork of legacy systems.” They highlight that “the potential is huge, but the industry has thus far been slow to seize it.... The percentage of T&L companies that rated themselves as ‘advanced’ on digitization was just 28%. Some of the industry’s customers are already well ahead of this – 41% of automotive companies and 45% of electronics companies already see themselves as advanced. The lack of a ‘digital culture’ and training is thus the biggest challenge for transportation and logistics companies. T&L firms are in line with other industries in planning to invest 5% of their revenues per annum until 2020, but the next few years will be critical: companies that don’t start soon risk being left behind permanently”. The study [6, p.16] concludes that “Logistics companies will need to focus on “digital fitness”, cost efficiency, asset productivity and innovation if they want to meet changing expectations. Building and refining these and other capabilities, and

then bringing them to scale across the enterprise, will be key as they translate the strategic into the everyday”.

In addition, further studies [7] highlight an increase of interdependent supply chain partners; this includes sets of relationships between organizations where each shipment closely relates with operations of both parties – this is evident in cases of raw materials delivered to manufacturers, or supplies delivered to intermediate distributors. In such cases, shipment delivery triggers a complex set of operations for both sending and receiving parties, and such relationships last for long periods of time. Closer connections increase the needs of both information exchange and in addition require human resources of both organizations to support co-related operations.

Furthermore [8] the role of employee skills is highlighted, concluding that relevant literature describes more than 280 skills for logistic managers. There are differences across levels, and focus more on cognitive than social skills. The value of the research is that it highlights the complexity of skills that needs to be managed from a managerial point of view. In addition the research highlighted that contrary to literature review, focus is given to cognitive instead of social skills. In addition recent studies [9] also highlight the role of local logistic activities in supply chain management, highlighting the importance of localization of processes, and the role of different entities (governments, MNEs, NGOs, etc) which actions can determine the local supply management conditions.

Past research [10, p.5] examines the role of shift scheduling automation in services industries. “Because of the difficulty in obtaining optimal solutions to problems typical of those occurring in service organizations, heuristic procedures have played the dominant role in service labor scheduling research. The heuristics may be categorized as: (1) those creating schedules from scratch; and (2) those using starting schedules obtained by some other means.”

Further study examines provides advices for maximizing benefits of shift management systems through effective communication with employees and customers. “A number of innovative approaches for matching service supply and demand have emerged, and all of these methods have merit. Aside from effective employee scheduling, hospitality operations can: (1) make more use of employees by cross-training them, (2) bring in part-time employees for peak customer volumes, (3) manage demand levels with variable pricing, and (4) inform or train customers about the service so that they increase their participation delivering that service.” [11, p. 69]. The research, focusing on hospitality industry, provides guidelines for other service-based industry, including Logistics and Transportation.

Finally, further study [12] examine the effects of standard, non standard shifts and link shift scheduling with employee preferences and attitudes and employee retention. They conclude that working nonstandard days and times has an impact on employment relationship. They also conclude that better shift scheduling management with increased flexibility will improve employee satisfaction and retention.

## **2 MANAGEMENT IMPLICATIONS**

Shift and Operations Managers face a number of challenges. Previous studies [13] highlight the psychological and health issues associated with employee shifts, and the use of

more advanced shift systems to minimize critical problems, especially sleepiness and associated issues, taking into critical information regarding job tasks and employees.

Additional research emphasizes the importance of innovation adoption for Operation Management. “Operations managers must also understand and take advantage of ‘ecosystem’ connections facilitated by industrial policy. They must find a balance between focusing on their own operations and immediate supply chains, and on the wider activities of maintaining and developing the extended ecosystem, often in conjunction with policy and intermediate organizations.” [14, p.16]

Previous research [15, p. 1282] summarize findings of previous studies of health and social issues related to shift employees. “Many studies have reported a variety of adverse biological, psychological and social effects of shiftwork and other atypical work schedules on the worker. For instance, effects on a wide set of health and well being components have been observed, including sleep, eating behaviour, gastrointestinal, neuro-psychic and cardiovascular functions, menstrual cycle, work accidents, absenteeism, family role”.

Further research [16] also examines the impact of shifts on health, family and social life, relationship with co-workers and communication. The research concludes that there is a variety to people reactions, with older people been less motivated and younger people having higher rates of absenteeism. The research also indicates that shift work is associated with higher employee turnover and impact on marriage and family life for married employees. Age of employees also becomes a critical issue. “Challenges also include managing changes associated with an aging work force that is yielding to a new generation of youth performing frontline logistics activities. [1, p.379] ”

More recent studies [2] focus on resolving shift scheduling automation developing relevant models, and making efforts to take into account employee requirements whenever possible. “Because of manpower and other requirements, employees usually will not be able to have their desired days off schedule. To make the scheduling problem feasible while trying to satisfy employees’ desired days off schedule, we first find all the possible days off schedule in a week and allow each employee to place the weightings on these days off selections based on their preferences. A lower weighting means that the selection is much preferred by the employee than the selections with higher weightings..... To formulate the optimal shift-scheduling problem, we first estimate the workload coefficients for each employee working for all types off work shifts.” [2, p.7]

From a business perspective, shift and operations managers spend considerable time scheduling shifts, and trying to respond to various employee requirements. Furthermore, labor legislation is becoming more complex, and compliance with relevant labor regulations at national level is required.

The literature review highlighted two key facts. First, that there is a wide range of challenges faced by Logistic sector today. For the purpose of this research, two subcategories were identified – one that includes problems related to the business (such as performance, culture, size, complexity, need for innovation) and those related to human resources management and more specifically to employees who actually work in shifts (motivation, retention, absences, work-life balance, impact of working in shifts to employee’s health, family and social life).

The second critical finding from the literature review is that it appears to be a link between the two categories of challenges identified above. More specifically literature suggests that key issues related to human resource management and shift operations can have significant impact in overall company performance. Further study [17] focuses on recruitment and retention problems in USA warehouses. He concludes that employee shortage is a significant problem, and furthermore, larger firms are the ones with the highest risks to high employee turnover. Considering the large investment in employees (recruitment and training) and the complexity of skills and specialization in the industry, it is easy to understand the financial aspect of high employee turnover.

Furthermore, additional studies also concluded that “successful organizations realize by having an effective employee retention plan will help them sustain their leadership and growth in the marketplace.” [18, p. 487]. Finally, most recent studies reinforce the importance of human resources management and conclude that “in the 21st century it has been a very crucial and difficult task to manage and retain employees. So the management needs to know and understand the perception and mobility of employees dynamically because preference can change rapidly” [19, p.12]

Previous studies [20] highlight the importance of innovation in competitive environments, while other studies [21] highlight the role of organizational change and strategy. In addition more recent studies [22] highlight the role of processes for strategic and leadership success. Further studies [23] highlights the role and importance of a number of small, different changes, with a strong focus on performance improvement. Finally [24] highlights the use of Key Performance Indicators in business setting principles for success. Furthermore, additional research [25] highlighted the positive impact of introduction of Warehouse Management Software Systems in Logistic companies, with positive impact on competitiveness and subsequently in overall performance.

As a conclusion, [1, p.387] summarizes previous studies and suggest that in order for the logistic companies to achieve “a customer oriented environment requires that managers provide frontline employees with:

- A positive work environment;
- Opportunities to develop basic and advanced knowledge;
- The tools to drive employee success;
- Timely response to employee issues (proactive and reactive)

Further studies [26] conclude that personnel capacity utilization improves monitoring of personnel allocation and provides alerts for inefficiencies across job function categories, roles, units and divisions. Such cases are also highlighted to shift level, using relevant shift scheduling automation software.

### **3 METHODOLOGY**

Literature review presented a number of issues related with shiftworks, and in addition, implications for management business that arise from shiftworking. In order to evaluate the features of shift scheduling solutions an evaluation of the actual features of the software took place.

As part of the research, an analysis of the benefits of Shift Scheduling Software for Logistic Industries was concluded. More specifically, this included identification of companies offering shift scheduling automation software, and comparison of their features. In order to evaluate software capabilities, information on the web sites that was made publically available was used. Furthermore, ShiftAutomated.com provided full access on software features and functionality (2018 release), and several test cases were analyzed in order to verify actual benefits of Shift Scheduling Automation Software for the Logistics industry.

The approach used for the test included the following stages: first of all, literature review provided a wide range of problems related to Logistic sector and to employees working in shifts. The next stage was to provide a clear link between business functions and related business problems on the one hand, and between findings of academic studies on the other. Finally, a number of test cases was created using ShiftAutomated Software (2018 version, available at [www.shiftautomated.com](http://www.shiftautomated.com)) in order to evaluate the ways shift scheduling automation software can resolve or reduce actual challenges for logistics and transportation companies.

#### 4 DISCUSSION

A number of software features examined addresses some business problems as identified by relevant academic literature, and an attempt was made to link specific business challenges with software features. Key findings are described on the table below:

**Tab. 1** *Shift Automated Software Benefits*

No	Business Function	Business Problem	Academic Reference	Benefit
1	Performance Management	Poor Performance Monitoring	[4]	Link Job & Task requirements with skilled employees
2	Reward Management	Poor Reward Management	[4]	Link Rewards with Shifts and secure fair distribution
3	Operations	Longer transport distances and times	[3]	Schedule Shifts across geographical areas. Allocate employees with relevant Hard/Soft Skills (certifications, languages)
4	Legal Compliance	Complex legal Issues	[3]	Schedule Shifts and Working hours across different countries.
5	Strategy	Lack of Digital Culture	[6]	Regular digital communication regarding shifts (including requests, and assignments) between employees and managers promotes digital culture across the organization
6	Operations & Logistics	Interdependence of Shipments	[7]	Secure additional employees available to run operations required on shipment arrival from partner.
7	Training & Promotions	Complexity of skills required (more than 280)	[8]	Establish Links between employee skills and job tasks
8	Collaboration,	High Turnover	[5],	On-time information regarding

	Employee Retention & Turnover	rate for drivers	[18], [19]	shifts, resulting less stress for employees
9	Employee Retention	Employee Retention and Satisfaction, non standard shifts	[12]	Secure additional flexibility for Shift Scheduling, satisfy employees, and increase employee retention.
10	Employee requirements and business needs balancing	Employee Health, Requirements, Sleepiness and operational performance	[1], [2]	Include Employee requirements for shift scheduling  Run different scenarios and proper parameter settings to avoid employee burnout.

## 5 CONCLUSIONS

Based on the findings presented above the following conclusions can be made: First of all the literature review reveals a wide range of employee related issues that are affected by shift work. These issues have significant impact on employee motivation, retention, and can be critical for operational and business performance.

Second, software systems that automate shift scheduling can have positive impact to both management and employees, since they help shift and operations management to address a number of challenges related to shift working. For example, managers can organize much more effective and flexible shifts taking into account employee skills. Furthermore they can consider employee requests to be assigned in specific shifts or avoid specific ones.

In addition, introduction of innovative software and processes appears to be a key challenge for Logistic companies. There is evidence of positive impact from the introduction of Warehouse Management Systems, however, studies indicate that the next 5 years there will be a struggle for Logistic companies to invest in advanced systems. To this end, introduction of software systems that affect the daily routine of a significant number of employees working in shifts can promote digital change culture within the organization and increase employee collaboration and commitment.

## 6 LIMITATIONS & AREAS FOR FUTURE RESEARCH

Even though the present study exams findings across different geographical areas, working on shifts and non standard days and hours may have different impact on employees across different cultures, age groups and geographical areas. The additional complexity that derives from issues related to logistics and transportation across different nations, areas and legal system may be additional stress factors.

In addition introduction of software systems for automating shift scheduling may have a different impact, depending the priorities and needs of each individual company, and of course the ability of each software system to be customized in order to fit to the special needs of different Logistic companies. There may be significant benefits for the employee's point of view such as consideration of his specific requests regarding shifts, and a feeling of fairness. On the other hand, companies interested on investing more on innovation and digital

transformation may find it easier to use shift automation software to communicate to the employee base the need to change and collaborate.

Complexity of Logistics will be increasing in the near future, and companies should explore technologies as part of their competitive advantage. Shift and Operations managers in Logistics sector may gain competitive advantages and improve both Operational and Human Resources related goals with the use of advanced automated solutions for shift scheduling. Moreover, company culture will be more digital-friendly, thus making easier digital transformation strategies and introduction of additional innovations.

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