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LOGISTIČKI KOORDINATOR KAO SASTAVNI DIO PROCESA DOBAVNOG LANCA

LOGISTIC COORDINATOR AS INEVITABLE PART OF SUPPLY CHAIN PROCESSES

SAŽETAK

Rad elaborira važnost ljudskih resursa u sustavu dobavnog lanca na primjeru logističkog koordinatora i logističkih timova. Istraživanje je usmjereno na analizu informacijskog toka isporuka prema distribucijskim centrima u cementnoj industriji. Potpuni nadzor i pregled procesa dobavnog lanca omogućava logističkom koordinatoru i logističkom timu osiguravanje razine uspješnosti sustava dobavnog lanca. Logistički koordinator je središnji čimbenik informacijskog toka logistike isporuka te predstavlja osnovni nezaobilazni element procesa dobavnog lanca. Glavna namjera autora ovog istraživanja je sustavan prikaz važnosti uloge logističkog koordinatora unutar sustava dobavnog lanca.

***Ključne riječi*:** *dobavni lanac, logistika, logistički koordinator*

SUMMARY

The paper elaborates the importance of human resources within the supply chain system and refers to logistic coordinators and logistic teams. The study has been basically aimed at the analysis of the information flow of deliveries to distribution centers within the cement industry. Respecting a complete overview of supply chain processes enables the logistic coordinator and logistic team to ensure the efficiency of the supply chain system. A logistic coordinator is the core figure of the information flow in delivery logistics thus representing the inevitable and essential part of supply chain processes. The principal aim of the authors of this paper is to systematically elaborate the role and importance of a logistic coordinator within the supply chain system.

Key words: *supply chain, logistics, logistic coordinator*

1. UVOD

Tehnološki napredak modernog poslovanja tijekom prošlog stoljeća zainteresirao je znanstvenu zajednicu prema istraživanjima izazova logistike i dobavnog lanca što je rezultiralo teorijskim i praktičnim rješenjima. Razna istraživanja su obradila različite aspekte dobavnog lanca o kojem postoje mnoge definicije i objašnjenja sustava dobavnog lanca kao i njegovih sastavnih komponenata. Jedna od kraćih te istovremeno i sveobuhvatnijih definicija jest da se dobavni lanac može definirati kao mreža organizacija uključenih u različite procese i aktivnosti koje proizvode vrijednost u obliku proizvoda i usluga prema krajnjem korisniku [1]. Jednostavnija definicija glavnih ciljeva dobavnog lanca jest pružanje dobrog i efikasnog servisa krajnjem korisniku, istovremeno upravljajući troškovima i vremenom provođenja narudžbe tako da ih se svede na najmanju moguću mjeru (vrijeme provođenja narudžbe se odnosi na vrijeme od početka do završetka procesa, npr. od mjerenja razine zaliha u distribucijskom centru do isporuke prema krajnjem korisniku) [4]. Osnovna zadaća dobavnog lanca je optimalna opskrba organizacije i krajnjeg korisnika materijalima, proizvodima, uslugama i informacijama. Logistika kao dio dobavnog lanca preuzima ulogu rješavanja problema povezanih s protokom robe i informacija te je zadužena za koordinaciju svih procesa i aktivnosti povezanih s protokom robe i informacija od dobavljača do organizacije te do krajnjeg korisnika [6]. Razvoj modernih sustava dobavnog lanca i logističkih procesa je usko povezano s poboljšanjima procesuiranja i distribuiranja informacija prema svim sastavnicama dobavnog lanca.

Uspješno ispunjavanje potreba kupaca, odnosno krajnjih korisnika je vjerojatno jedini način uspjeha na današnjem natjecateljskom tržištu. Uspješan dobavni lanac jednostavno mora isporučiti pravi proizvod u pravoj količini i ispravnom stanju s ispravnom dokumentacijom na pravo mjesto u pravo vrijeme po pravoj cijeni [8]. Optimizacija proizvodnih procesa je direktan rezultat tehnološkog i informacijskog napretka, a sljedeći korak u optimizaciji poslovnih procesa predstavlja optimizacija logistike kao dijela procesa dobavnog lanca. Sustavi dobavnih lanaca mogu biti različitih stupnjeva kompleksnosti, međutim, i manje kompleksni i više kompleksni sustavi dobavnog lanca se sastoje od brojnih informacijskih procesa i aktiv-

1 INTRODUCTION

Modern business technological development in the last century intrigued the scientific community in researching logistics and supply challenges related to modern organizations that resulted in theoretical and practical solutions. Various researches attended different aspects of the supply chain and there are many definitions and explanations related to the supply chain systems and their components. One of the shorter but more elaborate definitions is that the supply chain can be defined as a network of organizations that are involved in different processes and activities that produce value in the form of products and services provided for the ultimate consumer [1]. A simple definition of the main supply chain goals is offering a good and efficient service to the final customer while managing costs and lead-time by keeping them low (lead-time is defined as time between the start and the end of the process, for example, from measurement of the stock level at the distribution centre to the delivery to the final customer) [4]. The main purpose of the supply chain is an optimal supply of the organization and final customers with materials, products, services and information. Logistics as a part of the supply chain is a problem solver related to the goods and information flow and it is responsible for the coordination of all activities and processes related to the goods and information flow from the supplier to the organization and to the final customer [6]. The development of modern supply chain and logistic processes is closely linked to the improvements in distributing and processing information along all parts of the supply chain.

The only possible way to succeed in the competitive market is to successfully fulfill the customer needs. An effective supply chain at the end simply needs to deliver the right product in the right quantity and in the right condition with the valid documentation to the right place at the right time and at the right price [8]. The optimization of the production process is a direct result of the technological and informational development and the next step in the optimization of business processes is certainly the optimization of logistics as a part of the supply chain processes. Supply chain systems can consist of different stages of complexity. Both the simple and the complex supply chain systems consist of many information processes and functions as well as of decision making processes that are all reflected in the information flow

nosti kao i procesa donošenja odluka koji se reflektiraju u poveznicama informacijskog toka. Uspješnost upravljanja informacijskim tokom, kao i upravljanje materijalnim i financijskim tokovima, predstavlja osnovu za uspješne dobavne lance i uspješne organizacije.

Stalna poboljšanja dobavnog lanca su postala osnova na današnjim tržišnim previranjima te vode učinkovitijem i uspješnijem dobavnom lancu [3]. Razmjena informacija između sastavnica dobavnog lanca predstavlja osnovu učinkovitog procesa kao i osnovu za poboljšanje procesa.

Znanstveni problem koji je potaknuo istraživanje jest pravilno definiranje važnosti logističkog koordinatora i logističkih timova kao osnovnih ljudskih resursa unutar informacijskih tokova dobavnih lanaca. Razvoj ljudskih resursa jest prioritet naprednih sustava dobavnih lanaca. Više istraživanja je naglasilo važnost ljudskih resursa i upravljanja znanjem kod uspješnih i efikasnih dobavnih lanaca. Ljudski resursisu nezaobilazni kod robnih i informacijskih tokova. Sposoban stručnjak unutar organizacije treba integrirati različite sastavnice, preuzeti kontrolu i vodstvo prateći posebnosti svih etapa procesa od početka do kraja [3].

U okviru istraživanja definiran je predmet znanstvenog istraživanja koji se odnosi na istraživanje teorijskih i praktičnih problema suvremenih dobavnih lanaca s naglaskom na informacijske tokove povezane s isporukama prema distribucijskim centrima. Istraživanje predstavlja važnost ljudskih resursa i informacijskog toka u logistici kao sastavnom dijelu dobavnog lanca.

Temeljna znanstvena hipoteza je postavljena sukladno znanstvenom problemu i predmetu znanstvenog istraživanja: Ljudski resursi su osnovni čimbenik informacijskih tokova organizacije isporuka unutar dobavnih lanaca. Ljudski resursi predstavljaju osiguranje kontrole uspješnosti procesa te su znanje i ljudski resursi unutar dobavnog lanca postali organizacijska dodana vrijednost.

links. The efficiency of the information flow management and of the material and financial flow management is essential for effective supply chain systems and effective organizations.

Continuous improvements of the supply chain are a necessity in the current changing markets and lead to an effective and efficient supply chain [3]. The exchange of information between supply chain members is essential for an efficient process and represents a basis for the process improvement as well.

The scientific problem that has motivated this research is the correct definition of the importance of a logistic coordinator and of logistic teams as essential human resources within the supply chain information flow. The development of human resources is a priority of the advanced supply chain systems. Several researches have emphasized the importance of human resources and knowledge management in successful and efficient supply chains. In the actual case of goods and information flow, human resources are a necessity. A competent expert within the organization has to integrate different parties, take over the control and leadership by following the specific stages of the process from its beginning to the end [3].

The subject of the scientific research has been defined and related to the research of the theoretical and practical problems of modern supply chains pointing out the distribution centers deliveries information flows. The authors have elaborated the importance of human resources and of the information flow within logistics as an integral part of the supply chain.

The main scientific hypothesis has been defined according to the scientific problem and scientific subject: Human resources are the essential element of the supply chain information flow related to deliveries. Human resources are an assurance that someone is controlling the efficiency of the process. Therefore, knowledge and human resources within the supply chain have become an added value of the organization.

2. TEORIJSKE ZNAČAJKE DOBAVNIH LANACA ISPORUKA CEMENTA

Cementna industrija je specifična s obzirom na velike količine proizvoda i manje cijene finalnog proizvoda, što rezultira iznimnom važnosti logistike za učinkovitost, produktivnost i profit [2]. Globalizacija i moderno poslovanje sa sve većim tržištima prouzročili su nastajanje većih i kompleksnijih sustava dobavnih lanaca ovisno o zemljopisnim udaljenostima i vremenu potrebnom za izvršenje naloga, odnosno usluge [5]. Ta činjenica nezaobilazno podrazumijeva veću važnost logistike kao i razvoj različitih strategija. Jedna od strategija jest razvoj distribucijskih centara kako bi se optimizirao sustav isporuka prema krajnjem korisniku. Cementna industrija se oslanja na distribucijske centre, odnosno terminale s obzirom na svojstva proizvoda. Distribucijski centri se opskrbljuju direktno iz tvornica cementa te predstavljaju posljednju poveznicu u lancu prema krajnjem korisniku. Održavanje optimalnih zaliha u distribucijskim centrima predstavlja osnovnu zadaću logistike kao i najveći logistički izazov u cijelom procesu. Svaka promjena u tržišnoj potražnji ima direktan utjecaj na razinu zaliha u distribucijskom centru kao i na razinu zaliha i proizvodnju u tvornici cementa. Uslijed toga je neophodno imati učinkovit informacijski tok koji osigurava pregled stvarnih zaliha u distribucijskim centrima i u tvornici, raspoloživih transportnih kapaciteta i ostalih specifičnih usluga. Informacijski tok može biti potpuno automatiziran, poluautomatiziran i neautomatiziran. Narudžbe kao i prijedlozi narudžbi mogu biti:

- potpuno automatizirane – potpuno automatiziran sustav od razina zaliha i prognozirane potražnje do narudžbi
- poluautomatizirane – automatiziran sustav kod kojeg ljudski resursi predstavljaju konačnu odluku ispunjenja narudžbe
- neautomatiziran – baziran na neautomatiziranom prijenosu podataka (telefon, faks uređaj, elektronička pošta itd.).

Stvarna praksa je pokazala potrebu za ljudskim resursima neovisno o stupnju automatiziranosti toka informacija. Automatizirani sustavi koji koriste EDI (*Electronic Data Interchange* – elektronička razmjena podataka) imaju mnogo

2 THEORETICAL CHARACTERISTICS OF THE CEMENT DELIVERY SUPPLY CHAIN SYSTEM

The cement industry is a specific one as it deals with high product volumes and final product low prices, thus causing a great influence of logistics on the efficiency, productivity and profit [2]. Globalization and modern business with larger markets have caused the formation of larger and more complex supply chain systems depending on the geographical distances and time needed to execute orders or perform services [5]. That has implied a greater importance of logistics and the development of different strategies. One of the strategies is the development of distribution centers in order to optimize deliveries to final customers. The cement industry relies on its distribution centers or terminals due to the nature of the product. Distribution centers are supplied directly from the cement plants and they are the final link in the chain to the final customers. Keeping an optimal stock level at a distribution center represents the essential logistic task and the greatest logistic challenge in the process. Every single change in sales demand has a direct impact to the distribution center stock levels and subsequently to the production and stock levels at the cement plant. Therefore, it is essential to have an efficient information flow that will ensure a good overview of the actual stock levels at the distribution centers and plants, available transport capacities and other specific services. The information flow can be completely automated, semi – automated and non - automated. Orders or order suggestions can be placed:

- completely automated; based on a completely automated system from the stock levels and the forecasted demand to orders,
- semi-automated; based on an automated system that requires human resources in having the final order decision,
- non-automated; based on a manual data transmission (telephones, fax machines, e-mails etc).

The current practice has shown the necessity of human resources regardless of the information flow automatics. The automated system that uses the EDI (electronic data interchange) has a lot of advantages in comparison to a non-automated system, but even automated systems

prednosti u usporedbi s neautomatiziranim sustavima, ali čak i potpuno automatizirani sustavi zahtijevaju ljudske resurse koji sudjeluju u specifičnim dijelovima čitavog procesa sa zadaćom konačnog pregleda i kontrole procesa.

3. GLAVNI IZAZOVI KOD ISPORUKA U DOBAVNOM LANCU

Razvoj dobavnog lanca ovisi o uspostavljanju teorijskih i praktičnih poslovnih modela. Učinkovit menadžment dobavnog lanca koristi modele u svrhu osiguranja poboljšanja sustava. Modeli predstavljaju učinkovite alate koji koriste simulacije stvarnih i mogućih procesa. Modeliranje procesa dobavnog lanca je obično podijeljeno na tri razine [4]:

- strateška razina (poslovno upravljanje)
- taktička razina (poslovni procesi)
- operativna razina (informacijski sustavi i sustavi radnih tokova).

Detaljnije modeliranje procesa povezano sa strukturama informacijskih i radnih tokova je dio operativne razine modeliranja procesa. Navedeni modeli procesa predstavljaju strukturalni prikaz toka aktivnosti povezanih s procesnim objektima. Osnovni dio procesa modeliranja jest prepoznavanje i identifikacija problema i izazova stvarnih poslovnih procesa. Proces koji ovaj rad istražuje je dio operativne razine informacijskog toka. Glavni izazovi stvarnog realnog informacijskog toka su:

- netočne ili zakašnjele informacije o razini zaliha na terminalu
- nedovoljna i nepotpuna komunikacija između različitih dijelova dobavnog lanca
- neučinkovit ili spor informacijski tok
- nepotpuna informacija o transportnim kapacitetima
- nedostupnost informacija
- ljudski resursi, odnosno ljudska ograničenja.

Postojanje navedenih izazova i problema unutar organizacije rezultira neučinkovitim dobavnim lancem. Pravovremena detekcija i evaluacija problematičnih dijelova dobavnog lanca jest osnova razvitka boljeg i učinkovitijeg procesa.

require human resources in order to cover specific parts of the process and have a final overview and control of the process.

3 MAIN CHALLENGES IN THE SUPPLY CHAIN DELIVERY

Supply chain development depends on the formation of theoretical and practical business models. An effective supply chain management uses models in order to ensure a continuous improvement. Models are effective tools that use the simulation of real and possible processes. The supply chain process modeling is usually divided into three important levels [4]:

- strategic (business management),
- tactical (business process),
- operational (information and workflow systems).

A detailed process modeling, related to the workflow and information flow structures, is a part of the operational level. These process models are structural presentations of the order of activities related to the object of the process. The essential part of the modeling process is the identification of problems and challenges of the real business process. The process this research attends to is a part of the operational information flow level. The main challenges related to the real information flow are:

- inaccurate or late information related to the terminal stock levels
- inadequate communication between different parts of the supply chain
- ineffective or slow information flow
- inadequate information of the transport capacities
- unavailability of information
- human resources or human limitations

The existence of these problems and challenges within the organization leads to an ineffective supply chain. An adequate timely detection and evaluation of the problematic parts of the supply chain process is essential in the development of a better, more effective process.

4. POLOŽAJ LOGISTIČKOG KOORDINATORA U DOBAVNOM LANCU

Logistički koordinator je veoma važan element dobavnog lanca te se može smatrati dodanom vrijednošću čitavog lanca kao i organizacijskim resursom (pojam transportni koordinator se također koristi umjesto logističkog koordinatora; transportni koordinator jest uži pojam te predstavlja samo operativnu razinu logističkih procesa). Zadaće poslovnih procesa za koje je zadužen logistički koordinator se mogu promatrati s upravljačke, odnosno menadžerske razine i s operativne razine s obzirom da logistički koordinator predstavlja poveznicu upravljačke i operativne razine. Osnova specifičnog znanja i vještina koje logistički koordinator mora posjedovati predstavljaju kombinaciju upravljačkog i operativnog znanja. Glavna zadaća logističkog koordinatora na operativnoj razini jest osiguranje toka procesa bez poteškoća te kontrola i nadgledanje cijelog procesa. Logistički koordinator također ima zadaću uočavanja i prepoznavanja problema i poteškoća unutar procesa te razvoja i implementacije uporabljivih rješenja što predstavlja zadaće i operativne i upravljačke razine. S obzirom na važnost uloge logističkog koordinatora u strukturi znanja i upravljanja resursima, ciljevi upravljanja znanjem su slični ciljevima upravljanja resursima te ciljevima dobavnog lanca [7]:

- isporučeno u pravo vrijeme
- dostupno na pravom mjestu
- prisutno u pravom obliku
- zadovoljava zahtjeve kvalitete
- dobavljeno uz najniže moguće troškove.

4.1. Logistički koordinator i procesi dobavnog lanca

Sustavi dobavnog lanca se sastoje od specifičnih procesa te je u ovom istraživanju korišten SCOR – *Supply Chain Operations Reference Model* [8] (dobavni lanac – model operativnih referenci) koji daje jednostavne i uporabljive smjernice za specifične procese sustava dobavnog lanca. SCOR se bazira na pet različitih upravljačkih procesa – planiranje, nabava, proizvodnja, isporuka, povrat:

4 LOGISTIC COORDINATOR'S POSITION IN THE SUPPLY CHAIN SYSTEM

A logistic coordinator within the supply chain is a very important figure and can be considered as an added value to the entire chain and represents a company resource (the term transport coordinator is also used instead of the logistic coordinator, but the transport coordinator refers to a strictly operational level of the logistic processes). The logistic coordinator business process tasks can be viewed from the management and operational level taking into consideration the fact that the logistic coordinator links the management and operational level. The basis of a specific knowledge and skills that the logistic coordinator must have is a combination of the management and operational knowledge. His main task on the operational level is to ensure that the process runs smoothly while controlling and over-viewing the entire process. The logistic coordinator also undertakes the tasks of identifying the process problems and flows, development and implementation of applicable solutions that correspond to both the operational and management levels. Considering the importance of the logistic coordinator in the structure of knowledge and resource management, the knowledge management goals are similar to all resource management goals and consequently to the supply chain goals [7]:

- delivered at the right time
- available at the right place
- present in the right shape
- satisfying the quality requirements
- obtained at the lowest possible costs

4.1 Logistic coordinator and the supply chain processes

The supply chain systems consist of specific processes and the Supply – Chain Operations Reference – model (SCOR) [8] was used in order to give a simple and applicable guideline for specific processes within the supply chain system. SCOR is based on five distinctive management processes: plan, source, make, deliver and return:

- plan refers to planning and management processes,

- planiranje se odnosi na procese planiranja i upravljanja
- nabava se odnosi na nabavne procese dobave proizvoda i usluga
- proizvodnja se odnosi na proizvodne procese
- isporuka se odnosi na procese isporuke proizvoda ili usluge
- povrat se odnosi na procese povezane s povratom proizvoda.

Svaki pojedini element procesa je povezan s modelom dekompozicije, odnosno raščlambe procesa. Dekompozicija i segmentiranje čitavog procesa u manje, lakše upravljive dijelove omogućava optimizaciju čitavog procesa dobavnog lanca. Proces planiranja dobavnog lanca zahtijeva poznavanje čitavog sustava sa svim procesima te je jedini način stvaranja uspješnog dobavnog lanca upravo dekompozicija i segmentiranje. Dekompozicija i segmentiranje podrazumijevaju da se pojedini dijelovi povezanog procesa trebaju odijeliti u svrhu analize, ocjene, pregleda i kontrole učinkovitosti procesa.

Logistički koordinator i logistički tim imaju zadatke povezane sa sljedećim dijelovima procesa: planiranje, nabava, isporuka i povrat. Logistički koordinator i logistički tim su uključeni u planiranje tako što pružaju korisnu povratnu vezu od operativne razine. Logistički koordinator je povezan i s nabavnim dijelom procesa tako što preuzima ulogu operativne podrške u nabavnom odjelu organizacije. Ovisno o organizaciji i specifičnostima dobavnog lanca, logistički koordinator i logistički tim su uključeni u procese povrata kao podrška prodaji i kupcima. Rad predstavlja informacijski tok povezan s distribucijskim centrima (isporukama prema distribucijskim centrima, odnosno terminalima) što predstavlja procese isporuke SCOR modela. Logistički koordinator je povezan s procesima isporuke SCOR modela što znači da je logistički koordinator ili logistički tim odgovoran za kontroliranje procesa od *inputa* iz distribucijskih centara ili upita kupaca do konačne isporuke. Ti procesi uključuju upravljanje narudžbama, upravljanje transportom i upravljanje isporukama. Provedba procesa isporuke ovisi o učinkovitom informacijskom toku, dok učinkovit informacijski tok ovisi o kvaliteti informacije kao i o pravovremenoj informaciji.

- source refers to processes of the procurement of goods and services,
- make refers to production processes,
- deliver refers to processes that deliver products or services ,
- return refers to processes associated with returning products.

Every specific process element is linked to the process decomposition models. Decomposing and segmenting the entire process into smaller easily manageable parts make the optimization of the entire supply chain process possible. The supply chain planning process requires a complete picture of the entire system with all processes and the only way to build an effective supply chain is decomposing and segmenting. Decomposing and segmenting implies that the specific parts of the connected process should be separated in order to analyze, evaluate, overview and control the effectiveness of the process.

The logistic coordinator and the logistic team are charged with the following parts of the process: plan, source, deliver, return. The logistic coordinator and the logistic team are involved in planning by giving the valuable feedback from the operational level. The logistic coordinator is also linked with the source part of the process by providing operational support to the procurement department of the organization. Depending on the actual organization and its supply chain system, the logistic coordinator and the logistic team are also included in the return process by providing support to sales and customers. The paper elaborates the information flow related to the distribution centers (deliveries to distribution centers or terminals) and, therefore, it refers to the deliver part of the SCOR process. The logistic coordinator is linked to the deliver part of the SCOR processes which in reality means that the logistic coordinator or the logistic team is responsible for controlling the processes from the input from the distribution centers or customers' inquiries to the final deliveries. These processes include order management, transportation management and distribution management. The execution of the delivery process relies on an effective information flow. The effective information flow relies on the quality of the information as well as on having the information on time.

In reality, from theory to the actual practice, the logistic coordinator and the logistic coordi-

U stvarnosti, od teorije do prakse, logistički koordinator i logistički koordinacijski tim su odgovorni za sve proizvodne i tržišne interakcije, od razumijevanja ukupne potražnje do ispunjenja svake narudžbe krajnjih korisnika, odnosno kupaca.

5. LOGISTIČKI KOORDINATOR KAO KLJUČNI DIO LOGISTIKE ISPORUKE PROIZVODA

Supply Chain Operations Reference model (SCOR) definira proizvode na sljedeći način: skladišni proizvod, proizvod napravljen po narudžbi, proizvod projektiran po narudžbi i maloprodajni proizvod [8]. Dobavni lanac i sve njegove specifične sastavnice se uspostavljaju ovisno o vrsti, odnosno tipu proizvoda. Rad obrazlaže dio dobavnog lanca povezan uz isporuke cementa koji se smatra skladišnim proizvodom te je sustav dobavnog lanca uspostavljen za skladišni proizvod. Informacijski tok za isporuke cementa prikazan na shemi 1. prikazuje koordinatora ili koordinacijski tim u centru informacijskih procesa.

Koordinator ili koordinacijski tim prima *input* s distribucijskog centra ili od kupca o potrebi za proizvodom. Ovisno o stupnju automatizacije korištenog sustava, *input* se može dobivati dnevno, tjedno ili mjesečno. Logistički koordinator ili logistički tim je zadužen za pripremu mjesečnih i tjednih planova otpreme ovisno o prognozama prodaje, stvarnoj prodaji i informacijama o isporukama (dok je glavna zadaća transportnog koordinatora organizacija isporuka). Informacije vezane uz proizvodnju i razine zaliha mogu biti automatizirane te generirati specifične izvještaje ili neautomatizirane te biti primane putem telefona, faks uređaja, elektroničke pošte i dr., dnevno, tjedno i mjesečno. Logistički koordinator ili logistički tim mora imati mjesečnu, tjednu i dnevnu informaciju o raspoloživim transportnim kapacitetima od prijevoznika. Osnova organizacije sljedeće isporuke za distribucijski centar je posjedovanje svih neophodnih informacija. Kod potpuno automatiziranih ili poluautomatiziranih sustava, sustav alarmira i naručuje sljedeću isporuku, odnosno daje prijedlog za organizaciju sljedeće isporuke koju moraju konačno odobriti ljudskih resursi u logistici. Većina sustava korištena u logistici nije još automatizirana na takvom stupnju da bi se ljudski resursi mogli

nating team are responsible for all product and market interactions, from the aggregate demand perception to the actual execution of every single order made by the end user or costumer.

5 LOGISTIC COORDINATOR AS AN ESSENTIAL PART OF PRODUCT DELIVERY LOGISTICS

The Supply Chain Operations Reference model (SCOR) defines products as: stocked products, made to order products, designed to order products and retail products [8]. Depending on the actual nature of the product, an adequate supply chain is developed along with all specific parts of the chain. The paper aims at explaining a part of the cement delivery supply chain, the cement being considered as a stocked product and, therefore, the supply chain system is designed as for a stocked product. The information flow for the cement delivery shown in Scheme 1 includes the coordinator or the coordinating team as the centre of the information process.

The coordinator or the coordinating team receives the input from the distribution center or from the customer regarding the needs for the product. Depending on the actual system used, this can be done automatically or non-automatically on a daily, weekly or monthly basis. The logistic coordinator or the logistic team is responsible for preparing monthly and weekly dispatch plans depending on the sales forecast, actual sales and dispatch information (while the transport coordinator's main responsibility is the organization of deliveries). Information regarding production and stock levels can be delivered by automated systems through specific reports or non-automatically by phone, by fax, as an e-mail, etc. on a daily, weekly and monthly basis. Transport operators must furnish the logistic coordinator or the logistic team with monthly, weekly and daily information of available transport capacities. It is essential to have all the necessary information when organizing the next delivery to the distribution center. In fully automated or semi-automated systems, the system raises alarm and orders the next delivery or gives suggestion for the next delivery which has to be finally approved by human resources within logistics. Most of the systems used in logistics are still not automated on such a level that human resources can be bypassed or avoided completely. Even the ad-

potpuno zaobići i izbjeći, čak i napredniji automatizirani sustavi još uvijek zahtijevaju ljudske resurse za kontrolu i poboljšanja. Ukoliko je sustav potpuno neautomatiziran i u potpunosti ovisi o ljudskim resursima, logistički koordinator je odgovorna osoba za odlučivanje o sljedećoj isporuci kao i za organiziranje isporuke.

Logistički koordinator je odgovoran za izvršenje isporuka prema distribucijskim centrima i krajnjim korisnicima neovisno o stupnju automatiziranosti sustava. Planiranje i upravljanje pojedinim isporukama kao i izrada dnevnih, tjednih i mjesečnih planova otpreme predstavljaju osnovne logističke zadaće.

Koordinator ili koordinacijski tim integriraju sve informacije od unutarnjih i vanjskih objekata i osiguravaju neprekinuti informacijski i dokumentacijski tok. Potpuni pregled procesa omogućava brz odaziv na moguće promjene i poremećaje u dobavnom lancu poput promjena u dobavi, promjena u vremenu isporuke i dr. Učinkovit dobavni lanac ima brz i učinkovit odaziv na izvanredne situacije što se postiže strukturiranim procesima kao i stručnim i sposobnim ljudskim resursima.

vanced automated systems require human resources for control and improvements. If the system is a fully non-automated one and relies completely on human resources, the logistic coordinator is the person responsible for taking a decision about the next delivery and about the organization of the delivery.

The logistic coordinator is responsible for the execution of product deliveries to the distribution centre and to the final customers regardless of the level of the system automatism. Scheduling and managing individual deliveries as well as developing daily, weekly and monthly dispatch plans are essential logistic tasks.

The coordinator or the coordinating team integrates all the information from internal and external facilities and ensures a continuous information and documentation flow. Having a complete overview of the process enables quick responses to possible changes and disruptions in the supply chain such as changes in supply, changes in delivery time and other. A successful supply chain has a quick and effective response to extraordinary situations. That is achieved by having structural processes and competent and expert human resources.

Shema 1. Logistički koordinator – centar informacijskog toka
Scheme 1 *Logistic coordinator – Centre of the Information Flow*

Izvor / *Source*: autori / *authors*

Neovisno o stupnju automatiziranosti sustava, logični tok procesa je isti. Razina zaliha udistribucijskom centru ili na terminalu je početak procesa te se može mjeriti automatski ili neautomatski. Informacija o razinama zaliha se šalje automatski ili neautomatski prema logističkom odjelu gdje se skupljaju i integriraju sve važne informacije. Ovisno o stupnju automatiziranosti sustava, nalozi za isporuke se planiraju i ispunjavaju s raspoloživim transportnim kapacitetima. Konačna isporuka do distribucijskog centra je zadnja, završna točka procesa. Logistički koordinator je odgovorna osoba za osiguranje izvršenja procesa brzo i bez poteškoća te bez pogrešaka u naručivanju i planiranju transporta.

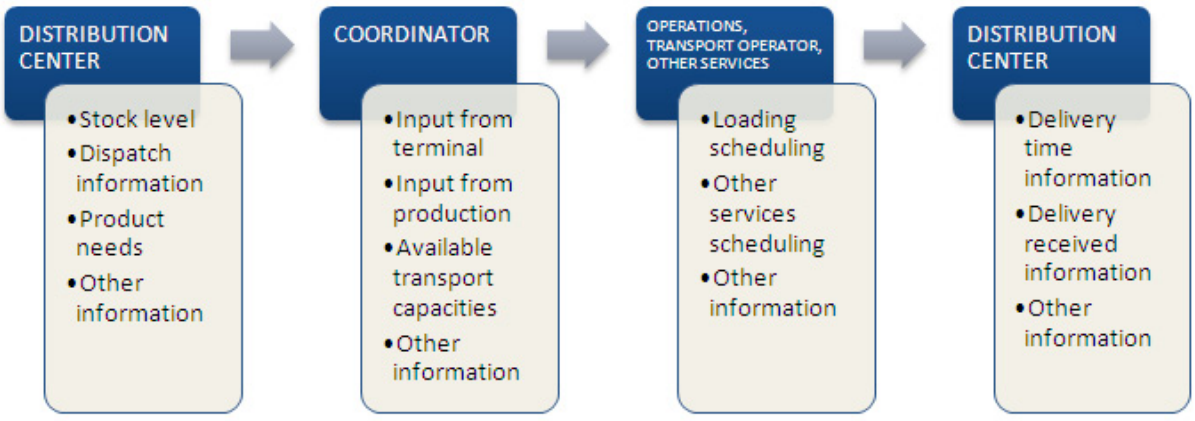
Informacijski tok se može nadgledati i kontrolirati prema stupnjevima prikazanim na shemi 2. Prvi stupanj su informacije u distribucijskom centru, odnosno informacija o zalihama, informacija o isporukama i potrebe za proizvodom. Ostale operativne informacije su osnovne i korisne; na primjer informacija o radnom vremenu distribucijskog centra, planiranom održavanju opreme u distribucijskom centru i drugo. Sve te informacije su osnova za logistički početak procesa te mogu biti prikupljene automatski ili neautomatski.

Drugi stupanj procesa se odnosi na logističkog koordinatora, odnosno logistički tim i posjedovanje svih važnih informacija za organizaciju transporta koje uključuju *input* s distribucijskog centra, raspoložive transportne kapacitete te ostale korisne informacije poput vremenske prognoze, vijesti o prometnicama i drugo. Drugi stupanj jest, zapravo, stupanj logističke operativ-

Regardless of the automated degree of the process, the logical flow of the process is the same. The distribution centre or terminal stock level is the starting point of the process and it can be measured either non-automatically or automatically. Stock level results are sent non-automatically or automatically to the logistics department where all relevant information are collected and integrated. Depending on the automated level of the system, delivery orders are scheduled. Delivery orders are scheduled and fulfilled with available transport capacities. The final delivery to the distribution centre is the final, ending point of the process. The logistic coordinator is the responsible person for ensuring that the process runs smoothly and quickly without errors in ordering and transport scheduling.

The information flow can be viewed and controlled by stages as shown in Scheme 2. The first stage is the distribution centre information which in reality is the stock level information, dispatch information and product needs input. Other operational information are inevitable and valuable, for example: working hours of the distribution centre, scheduled maintenance of the equipment at the distribution centre and so on. All these information are essential for the logistic start of the process and can be collected and delivered either manually or automatically.

The second stage of the process refers to the logistic coordinator and the logistic team having all relevant information for the organization of transport, including the input from the distribution centre, available transport capacities and all other relevant information such as weather conditions, traffic information and reg-



Shema 2. Kontinuirani ciklus informacijskog toka podijeljen po stupnjevima
Scheme 2 *Continuous Information Flow Cycle Divided into Stages*

Izvor / *Source*: autori / *authors*

ne odluke. Logistički koordinator je odgovorna osoba koja donosi odluku i planira isporuku kod neautomatiziranih sustava kao i kod automatiziranih sustava nižeg stupnja.

Treći stupanj procesa jest konačna organizacija i narudžba usluga što predstavlja informiranost svih sastavnica dobavnog lanca o svim aspektima izvršenja isporuke; količina, prijevoz, vrijeme i mjesto utovara i ostalo. Primjer: logistički koordinator planira ukrcaj broda sukladno raspoloživim brodskim kapacitetima i dogovoru s brodarom. Operacije su konzultirane i informirane o željenim datumima ukrcaja. Po donošenju konačne odluke o datumu ukrcaja, špediter i inspektor mjerenja gaza broda su obaviješteni. Konačno, informacija o dovršenom ukrcaju broda je dostavljena svim zainteresiranim stranama.

Četvrti i zadnji stupanj procesa predstavlja informaciju o isporučenom proizvodu u distribucijski centar koja ide povratnom vezom do logističkog koordinatora i logističkog tima.

Navedeni proces je kontinuirani ciklus s obzirom da se isporuke trebaju organizirati dnevno, tjedno i mjesečno ovisno o prognoziranoj i stvarnoj potražnji.

6. ZAKLJUČAK

Moderno poslovanje se uvelike oslanja na računalne i automatizirane sustave jer se stalno razvijaju novi logistički informacijski računalni alati. Unatoč tome, ljudski resursi su još uvijek nezaobilazni u većini dijelova procesa, pogotovo procesa unutar dobavnog lanca. Dobavni lanac mora biti učinkovit što ukratko znači da mora biti brz, djelotvoran i pravovremen. Informacijski tok jest osnovica dobavnog lanca. Djelotvoran informacijski tok dobavnog lanca povećava razinu usluge kod distribucijskih centara i krajnjih prodajnih mjesta. Također, osigurava raspoloživost proizvoda, brz odziv na promjene potražnje, što rezultira manjim brojem poremećaja kod isporuka kao i smanjenjem pogrešaka. Informacijski tok može biti automatiziran do određenog stupnja, ali automatizirani sustavi još uvijek nisu umanjili važnost ljudskih resursa unutar dobavnog lanca koji moraju imati pravovremenu informaciju. Konačno, ljudski resursi trebaju informaciju i proizvod jer ljudski resursi nadgledaju i kontroliraju procese dobavnog lanca.

ulations etc. The second stage is in fact a logistic operational decision making stage. In non-automated systems, as well as in simple low level automated systems, the logistic coordinator is the responsible person who makes the final decision and schedules the delivery which leads to the third stage of the process.

The third stage of the process is the final organization and service order which in reality means that all parts of the chain are informed of all aspects of the order execution: volume, transport, date and place of loading etc. For example: the logistic coordinator schedules the loading on board a ship according to the available transport capacities and the agreement made with the ship-owner. Operations are consulted and informed on the desirable loading dates. Upon making a final decision on the loading date, the forwarding agent and draft surveyor are informed. Finally, the information on the loading procedure being completed are delivered to all interested parties.

The fourth and final stage of the process is the information on the delivered product at the distribution centre that again goes back to the logistic coordinator and logistic team.

This process is a continuous cycle since deliveries need to be organized on daily, weekly and monthly basis depending on forecasted and real demand.

6 CONCLUSION

Modern business greatly relies on computerized and automated systems while new logistic software tools are constantly developing. Nevertheless, the human resources are still inevitable in major parts of the processes, especially in the supply chain ones. A supply chain needs to be effective which in reality means that it needs to be quick, effective and on time. The information flow is an essential part of the supply chain. An effective information flow in the supply chain increases the service level at the distribution centre and final selling points. It ensures product availability, quick response to changes in demand which leads to fewer disruptions in deliveries and reductions of errors. The information flow can be automated to a certain degree, but automated systems still did not diminish the importance of human resources within the supply chain that needs to have the right information on time. Finally, human resources are the ones that need both the infor-

Sposobni stručnjaci unutar dobavnog lanca su odgovorni za razvijanje procesa dobavnog lanca i oni su ti koji ih koriste. Logistički koordinatori su operativni stručnjaci dobavnog lanca koji su zaduženi i odgovorni za učinkovitost procesa te pružaju korisnu povratnu vezu planiranju dobavnog lanca. Logistički koordinatori i logistički timovi organiziraju i kontroliraju isporuke prema distribucijskim centrima i krajnjim korisnicima. Učinkovit i djelotvoran sustav dobavnog lanca uvelike ovisi o sposobnim stručnjacima unutar dobavnog lanca na upravljačkoj i operativnoj razini. Ljudski resursi unutar sustava dobavnog lanca su nezaobilazni i predstavljaju osnovnu i dodanu vrijednost procesa dobavnog lanca.

mation and the product; and human resources are the ones that overview and control the supply chain processes.

Competent supply chain professionals are responsible for developing supply chain processes and they are the ones who use them. Logistic coordinators are the operative supply chain professionals that are responsible for the effectiveness of the process and they can give a valuable feedback to the supply chain planning. Logistic coordinators and logistic teams are the ones organizing and controlling the deliveries to a distribution centre and to the final customers. Effective and efficient supply chain system greatly relies on capable supply chain professionals on management and operative levels. The human resources within the supply chain system are inevitable and represent an essential and added value to the supply chain processes.

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