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KEY PERFORMANCE INDICATORS AND DASHBOARDS FOR TRANSPORTATION AND LOGISTICS

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Abstract: *This article deals with the problems of obtaining of good results in doing business in the area of transportation and logistics, which is the key foundation upon which all other economic sector depend. Based on the data trends evident in the 2012, it can be concluded that the period of recession has been prolonged, and still has negative influence on logistics and transportation companies and on society generally. Operators are focused on costs reduction and efficiency improvement. To analyze and measure their progress toward aimed goals, companies use numerous indicators, especially Key Performance Indicators (KPIs). The article gives a comprehensive overview of KPIs commonly used in the transportation and logistics. It is highlighted that KPIs should be relevant, specific, measurable, achievable, realistic and timed. On that basis, KPIs are divided into six groups, and analyzed. In the analysis the application of dashboards for monitoring of business and performances trends is suggested. Dashboards make possible to visualize recorded and processed data, and give an opportunity to managers to make their decisions faster and more accurately. At the end of the article a dashboard example is shown as well as a graphical representation of the data flow during data processing in one popular system of data collecting, processing, and representation. The article ends with conclusions and a rich list of references.*

INTRODUCTION

Organizations working in the area of transportation and logistics operate with mass amounts of data. Today's problem is not to collect data, but understand collected data and analyze them on appropriate way, to improve efficiency. It is a difficult task. To create useful data companies must define the most significant indicators and monitor them in time. It is difficult to monitor great number of specific data formatted as tables. Diagrams and charts are much more convenient. But, sometimes it is difficult to keep up to date these graphical presentations.

Managers don't use transportation management systems (TMS) transactionally (their people such as load planners/dispatchers do this for them), but they do want to see how they are doing and view and present their "image in the mirror" for their executive team and within the industry. [1] Some of TMS programs have only daily transactional information, but it is

not good enough. Dan Walker at MeadWestvaco thought “that all transportation metrics come down to four letters: DRUM, representing Distance, Rates, Utilization, and Mode.” [1] In this light performance, availability, cost, and utilization appear to be significant. For named parameters indicators should be created. Vital business indicators can be: on time pickup and delivery, “degree of lateness”, “pay for performance”, cost per lane, cost per unit of weight, trailer utilization by weight and/or cube etc.

Transportation and logistics companies increasingly adopted business intelligence dashboards solutions in last a few years. They use them to display data on clear and comprehensive way and make quick, ad hoc decisions. Transportation companies frequently need to make analyses about the cost of fuel, vehicle downtime and cost of vehicle maintenance. Reviewing of those data could be very cumbersome, especially in cases of large fleets. However, users can find some benefits of this information when use visual transportation dashboards and monitor their KPIs such as: incoming orders, percentage of fulfillment, average time to ship, and so on. Focused on quick fulfillment and efficiency, managers want access to such information quickly – and logistics dashboards provide them this opportunity. [2]

KPIS IN TRANSPORTATION AND LOGISTICS

When an organization analyzes its mission, its goals, and identifies its stakeholders, it has to define a way to measure its progress. For measurements of its progress toward organizational goals, a company can use Key Performance Indicators (KPI). KPIs as quantifiable measurements reflect the critical success factors of the company. They differ depending on the type of the company, and can be for example: the percentage of company’s income that comes from return customers, a number of clients assisted during the year, or percentage of customer calls answered in the first minute, etc. [3] Whatever KPIs are selected, they must be key, must reflect the company's goals, and must be measurable. KPIs are long-term lasting, and their definition can be changed, but rarely. Commonly, changes take a place when the company's goals change. Also, KPIs can be changed when the company gets closer to achieving aimed goal.

There are a great number of KPIs that can be used for performance measuring in transportation and logistics companies. A KPI should be relevant and SMART – Specific, Measurable, Achievable, Realistic and Timed. [4]

- *Specific* - means that KPIs should be easy to understand and simple to use.
- Under term *measurable* should be considered that it is not correct to compare "Apples and Oranges". Different drivers on different routes can achieve results that are useless to compare them. If, for example, a transportation company wishes to find the best driver, then it has to rotate all drivers on the same track and route, or to rotate drivers onto different vehicles and different routes.
- Set targets should be *achievable*. If targets are too high, men can be disappointed with constant failing attempts. Decisions and management actions are a result of the collected and presented data. It is very important that the data collection method is *realistic*, reliable and consistent, collected on regular basis and easily over time.
- *Timed* – means that the frequency of monitoring depends on the measure and particular business needs.

So, for example, for Premdor Ltd, a set of KPIs for transport costs includes [4]:

- Total costs per trip;
- Total cost per drop;
- Total costs per gallon; and
- Miles per gallon.

For customer service, KPIs cover number of failed deliveries due to [4]:

- Not loaded;

- Damaged;
- Driver out of time;
- Product not required; and
- Delivery point problem.

According to Dreamorbit [5] the KPIs, important for logistics companies can be generally classified into six main categories:

- *Sales Forecast KPIs* usually based on weekly operational follow-up of:
  - % of Reliability; and
  - Ratio of Global forecast difference/ Actual Sales.
- *Inventory KPIs;* Inventory KPIs can be typically divided into three categories [6]:
  - *Raw facts and figures*: like fill rate, turns, stockouts;
  - *Percent complete:* applied to goals with a clearly defined finish state; and
  - *Trend line scores:* or directional scores, related to projects or goals without a defined finish state. These move up and down – things like production efficiency, productivity and safety stock.
- *Supply Control & Replenishment KPIs;* for defining of supply control KPIs it is necessary to take into account: sales forecasts, supply planning, supply function, suppliers and quality of service. Key data for KPIs are: forecast reliability, planning reliability, productivity of supply function and number of active items, purchasing annual value and ranking of suppliers by their importance concerning their share in total purchasing value and/or total orders number. In the quality of service, key data can be: delivery discrepancies, deliveries on time rate (DIFOT), average lead time and lead time deviation, percent of customer claims and/or returns, and availability.
- *Warehouse KPIs;* Warehousing is a kind of business which requires close monitoring. It generates tremendous amount of data. In today's world, warehousing is a very competitive business with every day more and more demanding customers. Most often, the clients define KPIs as part of service agreement. Different business models demand different measurements, and choosing appropriate criteria for the KPIs defining is an important task. From that of, for example, KPIs for 2PL[1] and 3PL[2] warehouses are different. For a specific warehouse, relevant parameters need to be measured before defining a KPI. It is always good to identify the key processes in a warehouse and attach them to the specific process. KPIs must be always aligned need to constant with a process of business. Warehouse KPIs cover processes costs, costs, HR, absenteeism, activities, service and quality of service, and productivity. There are a great number of data for this purpose. Among them there are [7]:
  - the number of hours effectively worked by the warehouse's operative HR (excluding holidays, absenteeism, training…);
  - receiving, order picking, cross docking, shipping, and stock control HR (temporary & proper workers) and equipment;

[1] 2PL - Second-party logistics provider, an asset-based carrier that owns the means of transportation.

[2] 3PL - According to the Council of Supply Chain Management Professionals, 3PL is defined as "a firm that provides multiple logistics services for use by customers. Preferably, these services are integrated, or bundled together, by the provider. Among the services 3PLs provide are transportation, warehousing, cross-docking, inventory management, packaging, and freight forwarding."

  - cost evolution vs. budget, rent of annual amortization of warehouse, total cost rent, warehouse capacity use rate; ratio of temporary workers/ total HR;
  - seasonality; receiving-, order picking-, and shipping flow/capacity;
  - warehousing discrepancies, dispute (for suppliers and clients); and
  - number of lines or heterogeneous/homogeneous pallets received per man hour, number of line or pallets put away per man hour, number of lines picked per man hour, number of lines or pallets shipped per man hour.
- *Transportation KPIs;* for defining of transportation KPIs it is necessary to cover inbound-, outbound-, and between-entities transportation, as well as quality of service. For this purpose companies have to collect data of: capacity use rate, transport cost/ transported value (at cost), number of km, number of hours in use, waiting time per trip, average cost per pallet and/or ton, average number of stops per trip, value of goods transported vs. total goods flow, etc. [8]
- *Reverse Logistics KPIs;* Companies that take a care about effectively reverse logistic managing have an opportunity of cost cutting and recapturing lost revenue. The reverse logistics process involves logistics, sales/marketing, finance, and customer service. According to Aberdeen Group [9] significant percent of firms "consider reverse logistics very or extremely important to overall company performance". Their results are shown in the table 1.

  Table 1 Percent of firms that consider reverse logistics very or extremely important to overall company performance (Authors' interpretation of data from [9]

Area	Percent of respondents
Aerospace & Defense	86
High Tech	73
Medical Device Mfg.	67
Industrial Mfg.	62
Consumer	59
Telecom / Utilities	44

  Each of industries has its own KPIs, but all together they keep track of total repair/refurbishment costs. Furthermore, this KPI is the most important for aerospace & defense, high-tech mfg., telecommunications/utilities and medical device mfg. For consumer goods the most important KPI is *product returns/exchange as a % of sales*, and for industrial equipment manufacturing, *number of defects per new product.*

Collected data should be transformed into form convenient for monitoring. Today, there are many convenient solutions in a different forms of dashboards that allow managers to better understand their business by obtaining easy view into companies' operations, mission critical KPIs highlighting, performance metrics monitoring and alerting, and allowing ad hoc querying and reporting capabilities.

DASHBOARDS

As mentioned above, Logistics Service Providers constantly need to collect and analyze operational data and transform them into useful information to provide value added services, remove bottlenecks and improve business processes continuously. KPIs can deliver such information in a unified view of the entire supply chain. [5]

Dashboards appeared as very popular solutions of data presenting. Stephen Few [10] defined dashboard as "a visual display of the most important information needed to achieve

one or more objectives; consolidated and arranged on a single screen so the information can be monitored at a glance."

One example of dashboards is shown on the figure 1.

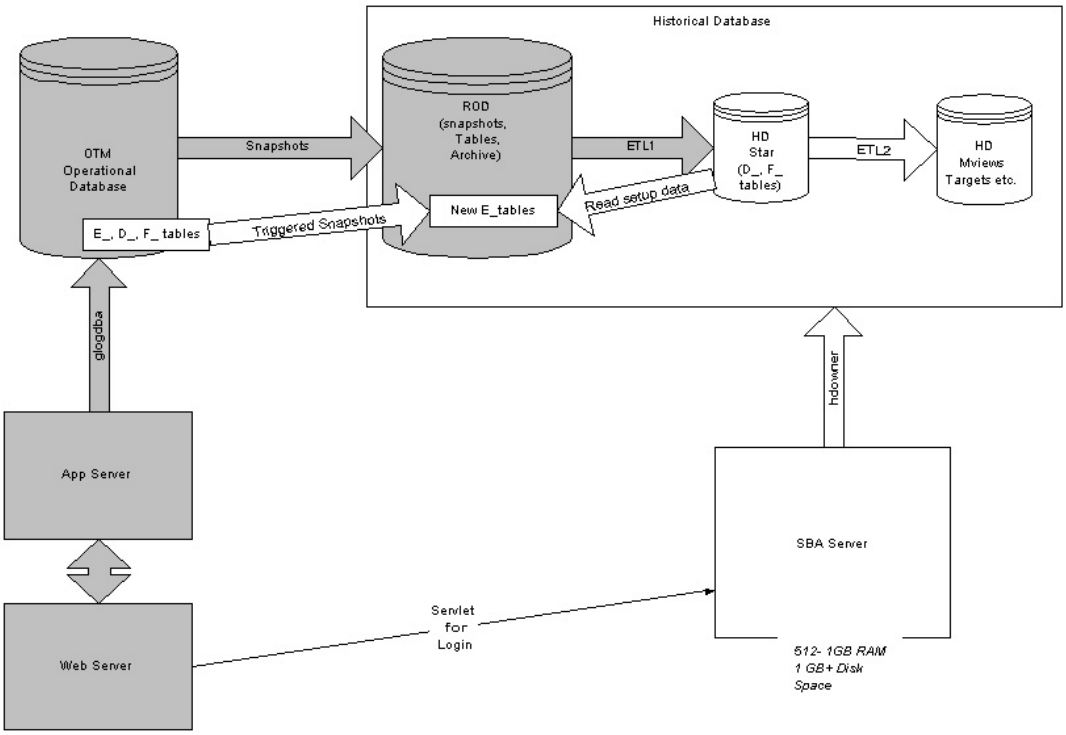
For example, customers who use the Oracle Fusion Transportation Intelligence option are able to [11]:

- Quickly identify bottlenecks in the supply chain;
- Measure key performance metrics which leads to an improvement in overall logistics efficiency;
- Identify underperforming service providers and take action;
- Highlight the highest cost areas within company's logistics operations; and
- Raise overall awareness within the organization on the importance of effectively managing transportation and logistics.

But, how data comes to the screen? That will be analyzed on the example of Fusion Transportation Intelligence (FTI), which provides an environment for managing business metrics by monitoring, analyzing and reporting metrics at various levels of the organization. The principle of operation is shown on Figure 2.

Data from Oracle Transportation Management flows to the replicated online database (ROD) via a manual process or a nightly process. This includes snapshots (combinations of dbms_refresh jobs) and tables. ETL1 and ETL2 are combined into one job (ETL stands for Extraction, Transformation and Loading).

Figure 1 An example of the dashboard: Transportation & Logistics – Order Fulfillment [12]



Note: The SBA Server should be a separate machine.

Figure 2 Data flow from Oracle Transportation Management for Fusion Transportation Intelligence (FTI) [11]

The ETL process extracts the data from parent database, transforms and massages the data to adhere to the HD database and loads this data. It runs nightly at midnight, by default. [13] Transportation intelligence roles need to be set up to access different functionality. Some of roles are predefined, and access to other roles can be defined by administrators. The list with transportation intelligence roles is shown in [14]. All the data movement is in the back-end. It is possible to update manually the ROD or FTI data using process management.

CONCLUSIONS

Based on above analysis it is easy to conclude that excessive transportation and logistics processes monitoring and analyzing is closely connected with use of KPIs and dashboards as the most convenient tools for today's level of technology. Dashboards give fast overview of vital business performances, including weakness of the companies' processes. Users can quickly identify bottlenecks, can measure key performances, identify underservice providers, highlight the highest costs, and improve overall company's logistics efficiency. And best of all, all the visualizations are shown on a single computer screen, and displayed data are automatically updated without user's action. For dashboard creation no limits exist, so they stay as a very favorable solution for manager's needs.

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КЛЮЧОВИ ПОКАЗАТЕЛИ ЗА ЕФЕКТИВНОСТ И ТАБЛА ЗА УПРАВЛЕНИЕ НА ТРАНСПОРТА И ЛОГИСТИКАТА

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Ключови думи: *транспорт, логистика, табла за управление, ключови показатели за ефективност, системи за управление на транзакции, инвентар, склад, обратна логистика*

Резюме: *Тази статията третира проблемите за получаване на добри резултати от правенето на бизнес в областта на транспорта и логистиката, което е ключова база от която зависят всички други сектори. Въз основа на тенденциите от данните за 2012 г. може да се направи извода, че периода на рецесия се удължи и все още има негативно влияние върху транспортните и логистични компании и обществото като цяло. Операторите са насочени към намаляване на разходите и подобряване на ефективността. За да анализират и измерят напредъка си към желаните цели, компаниите използват множество показатели, особено ключови показатели за ефективност (КПЕ). Статията прави цялостен преглед на КПЕ, които обикновенно са използвани в транспорта и логистиката. Подчертано е, че КПЕ трябва да бъдат приложими, конкретни, измерими, постижими, реалистични и определени във времето. На тази база КПЕ са разделени на шест групи и анализирани. Таблата за управление визуализират записаните и обработени данни и дават възможност на мениджърите да взимат бързи и точни решения. В края на статията е даден пример за табло за управление, както и графично представяне на потока от данни по време на обработка на данни в една популярна система за събиране, обработка и представяне на данни.*