BUILDING A COMPETITIVE BUSINESS INTELLIGENCE ARCHITECTURE THAT CAN FOSTER PERFORMANCE IN THE ROMANIAN NATIONAL RAILWAY COMPANY

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Today many industry players from banking, financial services, insurance, IT, healthcare, telecommunications and transportation are deploying competitive business intelligence to grow their company's financial results. The use of such advanced business applications is one key enabler to increase their spread which provides them an edge over their competitors. Companies of the future are buiding a new culture developed on fact-based decisions. (BusinessWeek Research Services, 2009) These decisions are made through analysis using the business analytics systems which encourage the anticipation in solving complex business problems in the entire organization. Embracing this approach, these companies focus on their most profitable customers, define the right pricing, a faster product innovation, optimize supply chains and identify the real drivers of financial performance. This research paper will detail the theorethical importance of using competitive business intelligence architectures to gain competitive advantage.

Keywords: Competitive business intelligence, railway, new silk road, market liberalization, IRIS

JEL Code: O19, O32, O33, O52, R41

1. Timeliness and appropriateness of the proposed theme

„A competitive business "intelligence system" is defined as "the organizational means to systematically collect, analyze, and disseminate information as intelligence to users who can act on it". (Herring, 1996) This definition makes a particular reference to those people in an organization who choose to act taking into account the sifted and noteworthy data that is introduced to them. It is basic to understand that just assembling information for its own purpose in a professional workplace is of next to no utilization to anybody, unless it aides focus an activity or reaction, if essential.

Intelligence systems are bolstered commonly by cutting edge data get-together and investigation innovation. Second, these frameworks convey particular sorts of data that are vital deliberately to every organization in its own particular connection, for instance advertising or contender particular data. Third, every one of these frameworks have particular beneficiaries for their items, and not everyone is the beneficiary of the yield from such a framework.

All major companies and even some of the smaller ones have some sort of in-house library service that gathers systematically or on-demand, stores, and presents basic clipping-service type abstracts and reports to whoever wishes them. This is not, however, an organized intelligence system, such companies often have so-called technology assessment functions and even dedicated offices.

The end-product of a competitive business intelligence system is what is known as a competitive intelligence digest, which is a representation of the actionable information tailored to the requirements and needs of each company. (Biotechnology, Oct 1, 2000) The real nature of the information needs of a National Railway Company from other sectors determines the exact structure of such a digest, and understanding the nature of these information needs is critical to the success of such an effort.

Ultimately, the National Railway Company requires two major types of information: one is science-related and the other is business-related. It is important to note that in both cases the nature of the information is essentially the same. What is required is knowledge of one's own field, of related fields, and also of the broader contextual parameters that characterize the industry as a whole.

Thusly, a great insight overview would need to convey significant data in every one of the three data zones: in particular, more extensive, and context oriented. It is additionally imperative to recollect that if significant data is built absolutely in light of data that is assembled from outsider open sources, one runs the danger of conveying noteworthy data that conveys with it the same predispositions as the source, which is an exceptionally critical threat in reality.

The way to great focused insight overviews is that they originate from competitive business intelligence system that start with data that is freely accessible, and utilize this as a premise to get further information specifically from human sources. As it were, the knowledge framework starts by social event open information, and after that this outsider information is coordinated with data acquired straightforwardly from human sources. At long last, organization particular connection is utilized to convey this data in a noteworthy arrangement, specifically one that will empower chiefs to act in an educated way.

2. Implementation of a Competitive Business Intelligence Architecture

A traditional BI architecture has analytical processing first pass through a data warehouse. (Rosebt, 2012) In the new, Competitive Business Intelligence architecture, data reaches users through a multiplicity of organization data structures, each tailored to the type of content it contains and the type of user who wants to consume it.

The modern CBI architecture can analyze large volumes and new sources of data and is a significantly better platform for data alignment, consistency and flexible predictive analytics. Thus, the new CBI architecture provides a modern analytical ecosystem featuring both top-down and bottom-up data flows that meet all requirements for reporting and analysis.

Making a uniform perspective of the business from heterogeneous arrangements of information is not simple. It requires some serious energy, cash, and persistence, frequently more than most departmental heads and business analyst are willing to endure. They regularly relinquish the top-down world for the underworld of spread stores and information shadow frameworks. Utilizing whatever instruments are promptly accessible and inexpensive, these information hungry clients make their own particular perspectives of the business. In the long run, they invest more energy gathering and incorporating information than dissecting it, undermining their profit and a steady perspective of business data.

The bottom up world is a different process. Modern CBI architecture creates an analytical ecosystem that brings prodigal data users back into the fold. It allows an organization to perform true ad hoc exploration (predictive or exploratory analytics) and promotes the rapid development of analytical applications using in-memory departmental tools. In a bottom-up environment, users can't anticipate the questions they will ask on a daily or weekly basis or the data they'll need to answer those questions. Often, the data they need doesn't yet exist in the data warehouse.

Combining top-down and bottom-up worlds is challenging but doable with determined commitment. CBI professionals need to guard data semantics while opening access to data. Business users need to commit to adhering to data standards. Further, well designed data governance programs are an absolute requirement.

Modern CBI platforms enable organizations to process massive amounts of data in real-time, to search and analyze any type of unstructured or semi-structured data, to perform predictive analytics, and deliver this information to anyone, almost anywhere.

Depending on the size of the company and its needs, an intelligence system can consist of anything from one to five or more people who already work for the company, with their associated costs, but nothing more. This would be an example of an essentially virtual intelligence system, since it does not have full-time employees. The system would require no more than two full days per month to deliver a monthly digest, which is a good frequency for this (anything more regular would probably be noise). Since a critical component of the process is the delivery of actionable information, this would be the responsibility of one or two senior individuals. The system here is one that any company can put into place.

3. Transformation of the 21st century – Intelligent Railway

„The digital railway revolution can increase velocity, reduce congestion and capital expenditure and seamlessly integrate greater capacity for both passengers and freight. We are telling carriers to have higher expectations, because there is no doubt that we will be able to exceed them". (Dorfmeister, 2014)

Railways have always been associated with social and economic change. From early wagonways to the steam locomotives that powered the Industrial Revolution, rail has had a profound effect on commerce, industry and the movement of people and goods—shrinking distances and opening up exciting new horizons.

After a decline in the twentieth century, partly due to cheaper air travel, rail is undergoing something of a renaissance, with global demand currently outpacing available capacity. Ageing systems and operating models cannot keep up with demand for this inherently efficient, resource and emission-friendly mode of transport. Yet rail can easily be transformed into an agile, efficient and responsive operation using new and existing technologies, integrating real-time information to intelligently address operational, capacity and management issues.

The global rail market is currently estimated at about $200 billion with predicted annual growth of 2.6% to 2017 at least.1 Although Europe has the largest market for railway equipment—with spending of more than $70 billion annually—some Asian countries, especially China, have invested massively in railway networks over the last decade. With an annual spend of more than €63 billion, Asia is beginning to rival Europe in terms of market size. This trend is forecasted to continue. Supply, demand and simple logistics are driving this growth in many areas. (Dorfmeister, 2014)

In what is termed the 'new silk road', a railway-driven conveyor of computers, TVs, car parts, and steel products moves west across continental Asia and into Europe. Recycled products, auto components, wine, and luxury goods make the journey in the other direction. Advances in manufacturing, commerce and retailing mean that delivery speed is more important than ever. Compared to container shipping, rail makes the journey in half the time and in a fraction of the carbon footprint by air or sea.

The story is the same way everywhere throughout the world. Vitality expenses and environmental change limitations progressively support payload transport by rail over its multi-purpose rivals. Urbanization is driving development sought after for traveler rail in the megalopolises of Europe, Asia and North America, with rapid frameworks moving more travelers from plane to rail, especially in the mid-separation venture division. An arrangement of a few variables is driving interest for proficient rail transport, with the overall business anticipated to double by 2035.

A significant number of the old, complex IT and control frameworks as of now set up were intended to fill a solitary need and were not constructed to be perfect with different frameworks. A few bearers even have diverse frameworks on distinctive lines. To exploit the new markets in cross‑continental rail, transporters' frameworks and data innovation must have the capacity to "talk" to one another. Then again, new rail administrators and multimodal contenders have the capacity to receive new, adaptable IT foundations intended to boost the opportunities introduced by developing interest for the proficient development of individuals and products. Most limit issues can actually be overcome with more shrewd interest administration and better composed support of track and rolling stock.

Market liberalization has added further complexity to this picture in recent years. Major reorganizations and restructurings have shed jobs, often losing intellectual property and know-how in the process. The blunt separation of many previously heavily-integrated operations runs the risk of problems in resource allocation, planning management and future strategy.

Using better IT which seamlessly integrates with the existing business will allow operators to make more informed, sustainable responses to demand pressures in the rail sector, rather than simply answering increased demand with increased capacity.

The final challenge for rail operators will be to combine growth with a further improvement in safety standards. A number of tragic accidents in the recent past have reinforced a growing expectation that railway operators will use the latest safety systems designed to prevent collision and other types of accidents. (Dorfmeister, 2014)

4. The romanian competitive business intelligence architecture for The National Railway Company

The Romanian industry of railways plays a very important part in economy of the European Union because of its geostrategic positioning. Usually such companies are known as the largest employers also taxes payers in the country, consequently their importance is really great. It is also noticed that the companies, which belong to the sector of railways compete in the market with the companies of other sectors of transport. That is why the matter of planning and implementing of the methods of competitive intelligence has taken on a special topicality as one of the ways to get a competitive advantage in the market. Usually to frame such methods on their own is a very difficult task for business organizations, so they seek assistance from to the companies, which provide them with such service. However it is necessary to remark that competitive intelligence is a continuous process with no interruption and only in this circumstance it is possible to expect the positive results. In our opinion, this process should be started with framing of the methods. (Vaidas G, Stasys D, 2013)

The competitive business intelligence architecture of the Romanian railway company was not sufficiently developed and strengthened. Existing databases worked freely so that certain capacities, combination, examination, pointers are dealt with exclusively. Computerization control strategies and including cautioning part chain choice data framework means adjusting and executing a satisfactory data framework. He who has the general goal of improving institutional limit area organization, enhance quality and amount of data needed for choice rolling out and conduct improvement in connection to the foundation's current recipients and inside and outside accomplices. For these reasons it had been implemented a complex and competitive business architecture that meets Romanian National Railway Company and it's called IRIS.

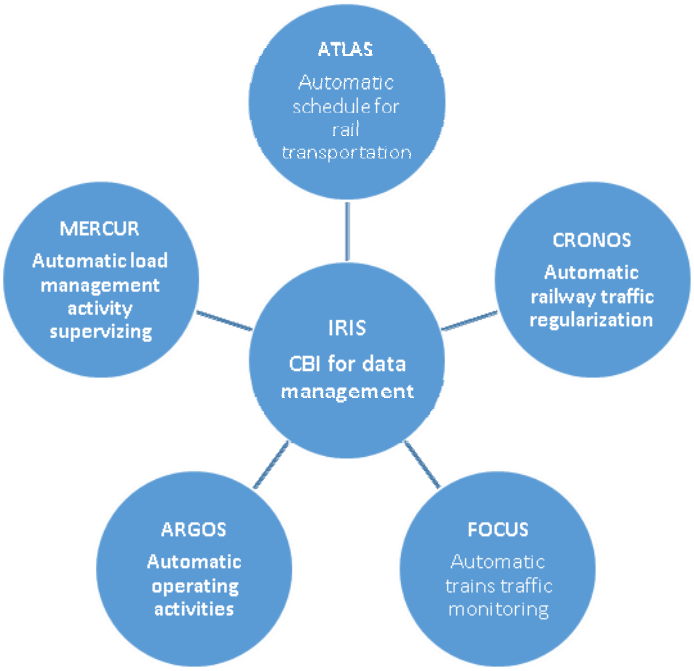

Fig. 1. IRIS framework

IRIS is a very complex CBI architecture, which was bought for 30 million dollars, and was developed with funding from the World Bank as part of the restructuring of the railway transport system in Romania. This clarification is important because it reveals the special effort made to modernize the Romanian Railways, under severe financial restrictions. There was an urgent need to design and implement such a CBI because Romania is in the process of aligning it's industries to the EU standards, which requires procedural compatibility. The Romanian National Railway Company (RNRC from now on) is in need to reduce the difference in competitiveness compared to other railways. Sure, IRIS being a CBI is aimed at harmonization the procedural way; it must be regarded as a "tool" available to users - in this case, railway companies The Infrastructure Company, The Freight Transportation Company and Passenger Transportation Company - to help in their quest to provide better quality services.

From a technical standpoint, in the development of the CBI named IRIS were adopted cutting – edge solutions: client server applications with central database ORACLE – it is a very complex architecture with multiple databases, and whom are using specialized software for transactions management.

IRIS viewed as a CBI architecture, can be presented as an integrated collection of different application, each defined as complex systems. As its main functions, they cover these applications: management of commercial activities for loading and unloading of freight and passengers, contract management and customer management.

In developing this CBI architecture they were 22 individuals involved as part of the design and implementation team, including specialists in IT, infrastructure, freight and passengers transportation and let's not forget experst in commercial departments. Hundreds of prospectives users of this CBI architecture were trained in several centers, thousands of data processing equipment has been bought and installed in many units plus it was set up a complex communications link that will allow fast and secure acces to raw and complex data.

Given the particular pressures faced by railway companies from steakholders, implementing a CBI architecture as IRIS will help improve the quality of rail services.

Work on this CBI architecture began in conditions of rapid developments of data transfer and importance at the international level and therefore could not keep up with this pace of development, because you are forced to put in budget restrictions. Another difficulty has been to create a unique design team. This project is an effort of experts in IT, railway experts from the three railway subsidiaries of the RNRC involved and has enjoyed the technical assistance of a British Consortium. The difficulty in creating a unique design team was manifested particularly in collaboration with British experts, who had not only enlighten them in connection with the technical terms, but also with the practices of the RNRC that are sometimes different from those of the British rail system.

Creating this complex CBI architecture was not very easy, neither because these applications were developed in-house, the whole architecture was conceived by the design team, in the aforementioned team. Then followed the experimentation and implementation of applications, which represented a great challenge through the installation of over 2000 PCs and servers, all interconnected into a network, and training to thousands of users. Also, in the case of a working system in real time (trains never stops), this requires ensuring the functioning of the system and of technical assistance in terms of use of the application continuously.

Therefore, IRIS should be regarded as a condensation of intelligence specialists in IT and in combination with rail experts working side by side, thus being a special effort because it should be noted that for rail professionals involved was a supplementary activity-were occupied by IRIS alongside the other work tasks they had within the railway companies where they were hired.

The IRIS CBI architecture was designed by putting the spotlight mostly on the commercial character of railway activities. The essence of the RNRC and the reform of European Union directives is that you cannot perform activities in a loss, the railway must cover their costs and make a profit. The second feature that gives a distinct personality of this CBI is the integrated approach to activities that are conducted in different companies, but ensuring the privacy of each company. Although it is only in the implementation phase, the IRIS is already known in Europe and beyond. IRIS is made up of multiple applications.

The first application of this CBI architecture is called – ATLAS – and refers to the preparation, adaptation and the launch of the trains schedules. With its help, the user (in this case The Infrastructure Company) can enter in the program the scheduled repaires for the following period. This program needs to be amended, largely because it knows in advance what the trains not running or what additional trains are introduced; Therefore, using this computer tool prepares the movement prior to the start of the work day by rail.

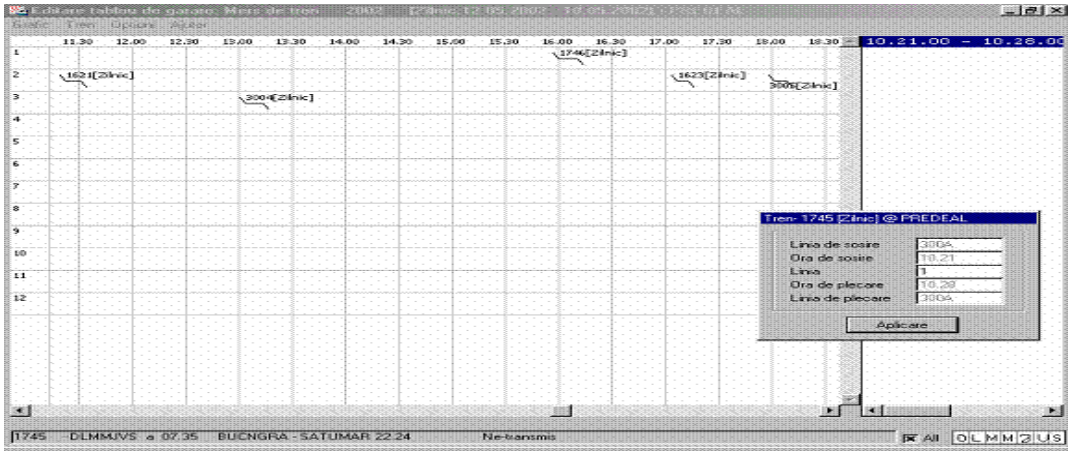

Fig.2. Print screen of ATLAS module

The second application of this CBI architecture is called – CRONOS – which reffers to being an automatic railway traffic regularization instrument whos purpose is consisting in deviation and reporting circulation and management of the programme and the provisions regulating the movement of data. The emergence of late trains bear the obligation of provision for regulating shipment movements. They have already preformed in texts and normal system that are much simpler and faster to send; They propagate in a similar e-mail system, of course, protected-mode application that users only can access.

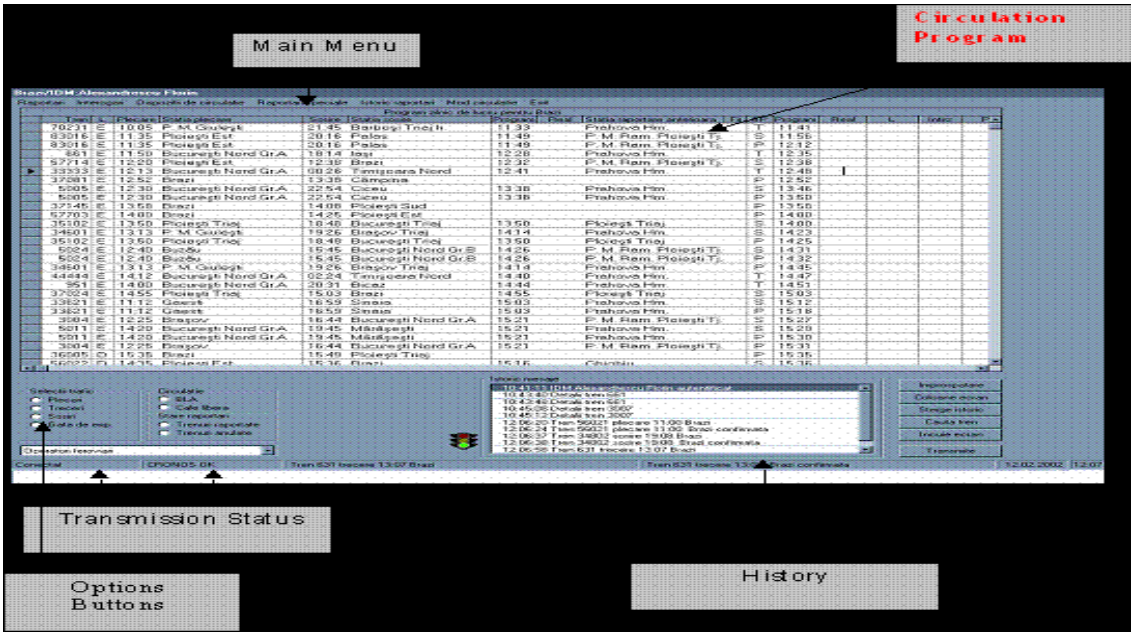

Fig. 3. Print screen of CRONOS module

The third application of this CBI architecture is called – FOCUS – and it is the automatic monitoring of train movements in real time. All reports are of course included in the database of the CBI and appear in five forms of visualization, on screens available to operators in the central regulator and the central dispatcher station traffic. Thus there is a graphic format of circulation with RNRC are ordinary employees, and tabulated in the form of a geographical scheme, with flags that show the position of each train at any time of the day.

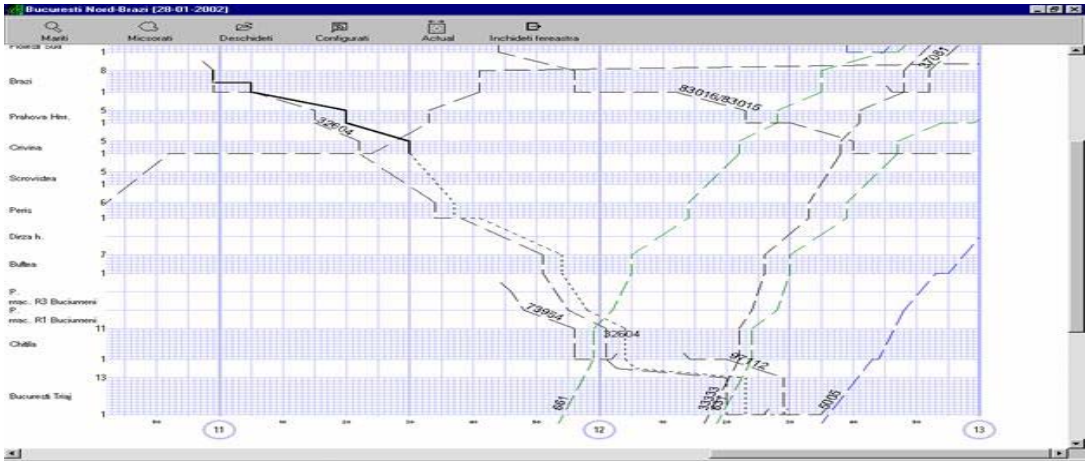

Fig. 4 Print screen FOCUS module

The application number four of this CBI architecture is called – ARGOS – and refers to the automatic monitoring of operational activities in technical stations and marshalling yards and is aimed at Freight and Passenger transportation companies. This application shows the schematic map on the monitor screen of the station as it is represented in the technical plan of station, this being figurative with different types of symbols and locomotives, carriages and trains in the station.

In a similar vein is the fifth module of the CBI architecture and it is called – MERCURY - which is intended for the management of load-unloading activities with the commercial component. Here, the user must enter all orders of railcars, which generates in the computer system of electronic waybills, which, as the meeting controls, is filled with real data, and when the wagons are loaded and delivered to the station and customer representative comes to the cashier, pricing and billing can be done automatically. Thus the chances of double records exist of this financial operations are almost zero.

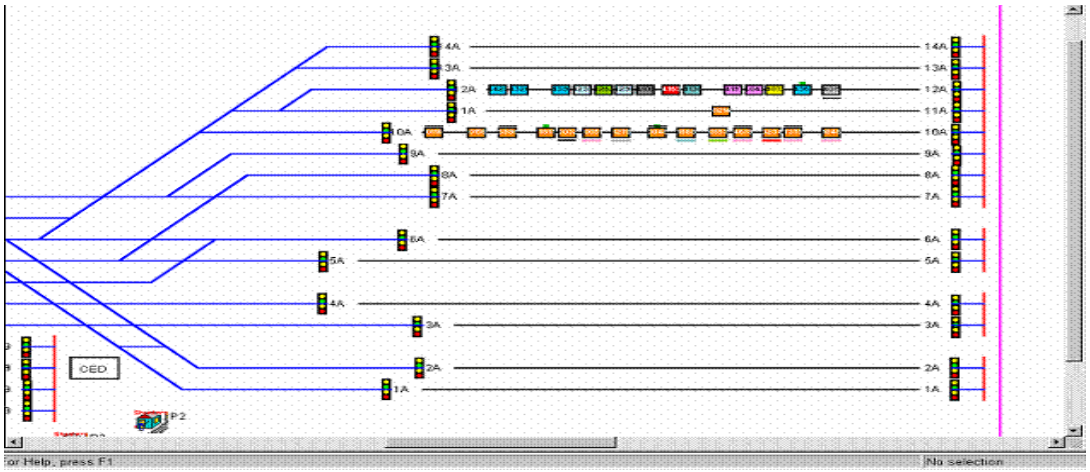

Fig. 5. Print scren for ARGOS and MERCURY modules

Among the main advantages of this CBI architecture we can call:

- IRIS CBI is money well spent, offering real-time information;
- the calculation of transport charges and transferring them correctly and on time;
- control of train movements in order to reduce delays;
- information to customers of real time positioning of their goods;

Before the creation the CBI architecture named IRIS, the database of the railway system consisted of huge archives of folders, registers. After you deploy the entire IRIS network will remain a dynamic information architecture. Among the main advantages of this system include that the IRIS will ease its users by providing them with information that today cannot be obtained through manual work technologies. Automatic calculation of taxes thus will benefit from hundreds of millions of dollars through the correct and timely receipt of the consideration of the benefits made, control the movement

of trains with the help of this architecture that will lead to the reduction of delays and the precise and quick calculation of revenue obtained through receipt of the RNRC use of the railway infrastructure, customers will be better informed about the status and location of their consignments within and will know in advance the most precise time of the arrival of goods at destination.

5. Conclusions

There is great business value in building a modern CBI architecture to provide an analytics ecosystem where complex and varied data sets can be mined for gold: actionable insights to make better decisions.

Exploring the data involves three key steps:

- Identifying the data sources that can contribute to an organization's data repository
- Building a strong, scalable data management foundation
- Layering new analytic tools on top of the data to provide new insights.

Transforming the National Railway Company into a data-driven organization - turning information into actionable insights is a 3 part strategy - only one of which is IT - a modern CBI architecture:

- Technology – build a modern BI architecture & analytics ecosystem with the right tools
- Processes – streamline and standardize CBI processes, measurements, and reports wherever possible
- People – train staff to use CBI tools, become data-driven decision makers to meet the needs of the organization.

The goal of a modern CBI architecture is to allow the organization to:

- Make confident, data-based decisions based on evidence
- Access timely, relevant information you need, to meet the requirements of all types of users
- Link strategy to execution, leveraging data from all data sources
- Get answers when and where you need them on any device, at any time
- Transform data into actionable insight for everyone
- Uncover new or hidden opportunities to increase competitiveness
- Explore data in an intuitive way, for immediate answers to questions

The full potential of integrating these sensing technologies and intelligently using the vast amounts of data they generate has yet to be realized, but it is without doubt one of the greatest opportunities open to the twenty first century rail carrier.

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