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Intelligent Transport Systems (ITS), postal technology, integration, modelling

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POSTAL TECHNOLOGY MODEL BASED ON INTELLIGENT TRANSPORT SYSTEMS CONCEPT

Paper sets up a view on the postal technology that starts from the basic model of Intelligent Transportation System (ITS). Assumption is that it is possible, on higher levels of observation, to establish the analogy between these two systems. Benefits are multiple: from the numerous possibilities of reciprocal interoperability on different levels and modes of traffic system to simplification of traffic cognitions exchange and to establishing generalized traffic methodology.

MODEL TECHNOLOGII POCZTOWEJ BAZUJĄCY NA KONCEPCJI INTELIGENTNYCH SYSTEMÓW TRANSPORTOWYCH

Referat ustala pogląd na technologię pocztową, która bierze swój początek z podstawowego modelu Inteligentnego Systemu Transportu (ITS). Założeniem jest to, iż na wyższych poziomach obserwacji istnieje możliwość ustanowienia analogii pomiędzy tymi dwoma systemami. Korzyści są wielorakie: od licznych możliwości wzajemnej wykonalności na różnych poziomach i trybach systemów ruchu drogowego do uproszczenia wymiany informacji o stanie ruchu oraz ustanowienia uogólnionej metodologii ruchu.

1. INTRODUCTION

Posts have been delivering mail for a few centuries and it is their core business. While a postal communication system is sometimes considered less efficient than other modern communication systems such as e-mail or fax, it remains the only universal system of physical message delivery. Moreover, the postal system offers broad bandwidth at a very reasonable cost and all security and legal advantages of paper-based communication that still forms the backbone of the industrial world commercial system.

The challenge facing postal administrations from the beginning is to offer a higher-quality service (to introduce new services) to more and more demanding customers, while

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simultaneously minimizing processing costs in an increasingly competitive market. The basic processes of collecting mail, sorting and transporting it, and delivering it to the destination point are well understood, and a lot of money has been spent on automating parts of this process.

But now there are "islands of automation" which reduces the effectiveness of the whole system. This lack of integration means that existing resources, such as plant and vehicle fleets, sorting machines etc., are not used as effectively as they might be. The development of digital technology resulted in dramatic changes in the methods of mail generation, processing and delivery. Integration of telematic equipment and applications systematically provide possibility for postal system dynamic management. New services (such as Track & Trace or Radio-frequency identification etc.) can be deployed and integrated within traffic system by applying concept of Intelligent Transportation System in early stages of its development.

2. SYSTEM ARCHITECTURE FRAMEWORK

The complexity of the integration of postal automation and *intelligent* equipment in effective postal system can be solved using proper systems architecture. Postal automation and intelligent equipment improved productivity or working conditions in parts of postal processes. Most of the existing sorting equipment, counters automation etc. was designed without proper systems architecture. Systems analysis of the existing automated sorting equipment provides valuable information to recognise the associated problems (on different levels of scope).

Postal automation programme has to evolve from classical orientation to implementation of mechanised and automated equipment to more intelligent and integrated systems harmonised with core postal business processes. In this new context, postal services are no longer regarded as simply physical transport services from mailbox to mailbox or from counter to the doorstep. The suggested conceptual framework introduces multi-level model depicted in Figure 1 [1].

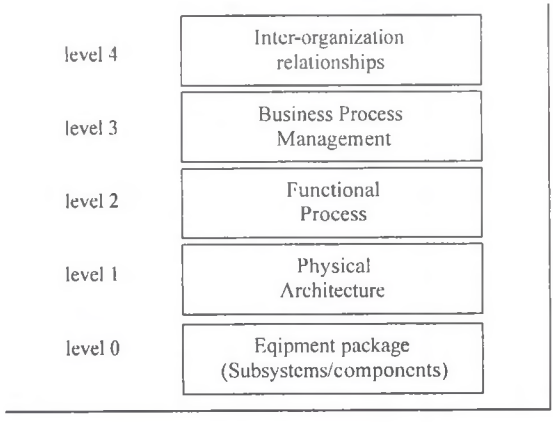

Fig.1. Multilevel model for postal systems architecure ([1])

The first step in establishing the systems architecture that covers technological and beyond-technological levels is the proper identification and prioritisation of end-user services. All end-users and other stakeholders (employees, local community, government, suppliers, etc.) should be involved in this process that is very important for postal organisations and its environment. The negotiation and consensus can lead to effective determination of functional requirements and proper design of technology processes in postal organisation. The complexity of the postal operator's value-added chains and inter-organisational relationships in dynamic and liberalised environment limits the possibilities of structures (hard systems) approach at this level.

Physical architecture provides physical representation (not technical design) of how the system should provide the required functionality. Functional processes designed in the functional architecture are associated with *equipment package* (subsystems/components) that are enabler of process or subprocesses. Holistic development of a physical architecture will discover the interactions, interfaces and information flows between different organisations and actors included in the process [1].

3. PROPOSED POSTAL TECHNOLOGY MODEL

In our research we assume that it is possible to build postal technology model based on Intelligent Transport Systems architecture concept. For that purpose, at conceptual level, it is necessary and enough to recognise and integrate main ITS subsystems within postal system. Those main subsystems are:

- headquarter(s) – for network monitoring, enterprise resource planning, transport management, consultancy, decision support, security and safety monitoring, etc.
- information subsystem – data warehouse, Geographical Information System (GIS), etc.)
- communication subsystem – wireless (GSM, GPRS, etc.), wired, networked, etc.
- sensor and indication subsystem – automated address identification, dimensioning, weighing, etc.

Primitives of those subsystems exists already in postal system for a years, but theirs inadequacy is about: completely network monitoring impracticability, slowness, growing bureaucracy, mistakes (unsafe, uncertain, low-quality of services), imprecision, costliness etc. But, with technological development, customer demands and liberalization of global market emerge necessity for redesigning of present and future postal processes by modern telematic technologies implementation.

Figure 2 represent overview of postal system model (with included ITS subsystems) from the technological point of view, with denoted key points of collecting data through postal shipments transfer process phases, about collected data exchange methods, systems which works out with those data and in case of necessity sends directions back in the postal process for taking adequate actions.

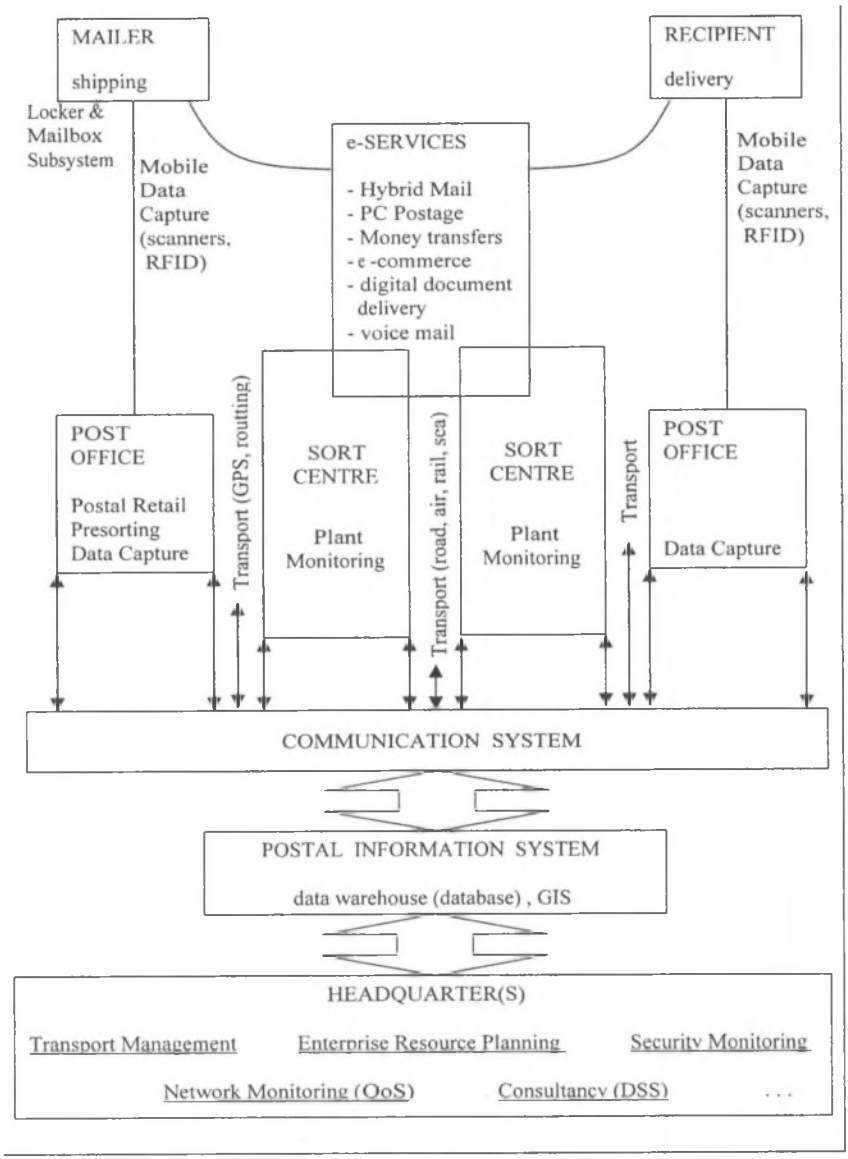

Fig.2. Postal system from technology point of view with integrated ITS subsystems [4]

In this paper we do not work out in details architecture and some certain cases evaluation of applicable techniques and technologies for each earlier mentioned subsystems but we give list of some major applications which can indicate importance and reciprocally interactions between ITS development and their employment. That further suggests use of systems approach for making properly strategic decisions about ITS development.

4. ITS APPLICATIONS IN POSTAL TECHNOLOGY

As ITS development and deployment today mostly cover applications in road traffic, it is logical that and within postal traffic it would firstly be used in a postal shipments transport process for possibility of dynamical (adaptive) vehicle routings over a network of roads. Dynamic routing (contrary to classical statically transport plans) mean faster adaptation to changing traffic situations as a result of traffic jams, user demands, reception and delivering shipments purposes, shipments concentration etc. Technical-technological prerequisites for use dynamical routing over roads network basically includes: GIS (Geographical Information Systems) with road network digitalized maps and related information according to specific territory, and GPS (Global Positioning Systems) which enable spatial vehicle location in real-time. [2] Besides that, it is necessary to have real-time traffic conditions data (meteorological conditions, traffic jams, user demands, etc.).

5. CONCLUSION

By collecting data from mail processing over the sensor and indication system we are now able to go beyond the traditional efficiency improvements in the physical handling of mail. It is now possible to capture data from core business processes and over the communications system to support the information network that will further provide relevantly prepared information to particular management subsystems.

One of the primary benefits of implementing more and better technology is that it will enable the Postal Operators to do more advance planning, by providing better information regarding the volumes of mail entering the system. When based on actual rather than historical information, the planning process will lead to improved resource allocation and machine utilization. Pre-sorting by mailer will permit cross docking to keep the mail moving, thereby facilitating a shift from batch to continuous processing, consistent with current best commercial business practices.

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Reviewer: Prof. Barbara Kos