Innovation Adoption and Adaptation in Air Traffic Control: Interaction of Organizations

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ABSTRACT
With the increased demand for the air travel the air traffic control (ATC) systems have been improving over the years. Today, the advances in the technology can enable even more capacity and better performance for the air travel. With those goals in mind, two distinct, but similar programmes are striving to develop new ATC systems: Next Gen in the USA and SESAR programme in Europe. Both programmes aim at developing new systems for the implementation around the year 2020. The innovation adoption and adaptation is illustrated by the story of User Request Evaluation Tool development and implementation, followed by the discussion of main lessons. First, the lessons learned from the innovation process of the tool itself are discussed, to be followed by the discussion of the interaction of various organizations that were involved.

Keywords: Adaptation, Adoption, Air Traffic Control (ATC), Automation, Innovation, User Request Evaluation Tool (URET)

INTRODUCTION
With the increased demand for the air travel the air traffic control (ATC) systems have been improving over the years. Today, the advances in the technology can enable even more capacity and better performance of the air travel. With those goals in mind, two distinct, but similar programmes are striving to develop new ATC systems: Next Gen in the USA and SESAR programme in Europe. Both programmes aim at developing new systems for the implementation around the year 2020.

ATC and related air travel are safety critical and thus heavily regulated, in turn resulting in rather long times needed for development, certification, regulation and implementation of new technologies and/or procedures. Usually, various organizations are involved, and the specific objectives can change during the periods needed for development, if for nothing else, for the fact that the world does not stand still.

As mentioned, ATC systems have been improving over the years, and some valuable lessons were learned and taken on board from previous efforts. Some other lessons got less publicity, but should be re-stated, and thought about. The goal of this article is to offer the analysis of the development, implementation and initial use of User Request Evaluation Tool (URET), focusing on how various organizations and different units within some organizations influenced this process (Bolic, 2006). Valuable
lessons stem from this case and can be applied to both SESAR and NextGen programmes.

Next section, URET Innovation Process tells a story of the decades long process of development, implementation and initial use of URET, depicting the main steps and main actors involved. The story is a result of literature review and conversations and interviews with the Subject Matter Experts (SMEs) (Bolic, 2006). Final section discusses the lessons learned, the application of some within SESAR programme and the overview of what should still be taken into account in the future ATC systems development.

URET INNOVATION PROCESS

URET, a tool designed to help the assistant controller, has four main functionalities. The core functionality (by design) is an automated Conflict Probe (Kirk, 2002) that detects and displays potential conflicts (up to 20 minutes in the future) in the Aircraft List and Plan display, which automates flight strip management function. The Aircraft List and Plan display is text based and contains the list of active and incoming flight plans, conflict probe alerts in dedicated boxes next to the affected flight plans, and trial planning results. Essentially, this functionality is electronic flight strip replacement. By clicking on a conflict notification controller switches to the graphical display of flight routes of conflicting aircraft where the time to potential conflict is displayed. Another function, Trial Planning, allows a controller to check a desired flight plan amendment that could be change of heading, or altitude or speed or any combination of the three, for potential conflicts. If the trial plan is conflict-free, this clearance can be issued to the pilot and at the same time sent, by the click of a mouse, or by pressing an enter button, to the Host Computer System as a flight plan amendment. Finally, the Route Amendment function offers point-and-click entry of aircraft route amendment. A controller can just click on the list of fixes or enter its name in order to change the route directly in the Host Computer System.

URET is an innovation – a new technology at the time of its implementation (Bolic, 2006) - introduced into the Air Route Traffic Control Centers (ARTCCs) in the USA. These centers are a part of the Federal Aviation Authority (FAA), which is responsible for providing all Air Traffic Control services in the United States. The decision to implement URET - first on a limited, pilot-testing basis and later in all the centers in the USA - came from FAA management in the course of its ongoing efforts for improvement of the National Airspace System (NAS).

It has been noted that the innovation process in an organization can be decomposed into five stages. The five stages of innovation process (Rogers, 2003) will be utilized here to present URET history in an organized manner. Figure 1 depicts these stages applied to URET innovation process.

Initiation Phase

The initiation phase of the innovation process serves to identify a problem and find a solution for it. This phase usually comprises of the Agenda-setting and Matching stages. In Air Traffic Control, these two stages are often intertwined and it is hard to draw the line between them. The initiation phase in ATC usually spans years, or decades for some innovations. Change and innovation in aviation in general are slow because of safety concerns. These dictate that the safety of tools and procedures be conclusively demonstrated before they are implemented. Safety critical systems often have a high inertia and are reluctant to accept changes. Often, changes in ATC happen in response to an accident or severe congestion. For example, with the growth of air traffic the paper flight strips replaced the blackboard for flight information recording (in the early 40’s (Air Traffic Control, 2003)). Radar was introduced into civilian ATC when the traffic grew even more and the controllers were not able to cope with the workload using procedural control. Defining a problem in the ATC and then finding
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