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# Integrated Information Application on Mobile Devices for Air Passengers

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*Abstract*—**Preparation requires the most time in case of air travel among all transport modes. In the travel chain, plenty of information management processes are related to the movement phases between the house and the aircraft. An integrated application aids the planning, the execution and the decision-making during travelling. A completely integrated application does not exist yet, although the demand for it has been also confirmed (among others) by our international passenger survey. In order to develop the application, transport informatics analysis and modelling has been performed, which establishes the integration. Model of the integrated information system has been developed and the functional model of the passenger-oriented application was inserted into. To prove the applicability of the model, a system design has been prepared and for demonstration purposes of the transfer aiding function, a mock-up application has been developed. The results serve as a good base for a possible development of such application.**

***Keywords—air travel; mobile application; integration; modeling***

## I. Introduction

The quick spread of airline and airport information mobile applications can be observed in recent years. The logical (functional) and physical integration of air transportation information systems and services is required by the increasing expectations of air passengers and it became possible by the development of infocommunication technology. Based on the literature review, the importance of passenger information is confirmed, however because of the novelty of the topic, scholarly analyses of mobile applications in academic papers are hardly found.

Based on the study of [1] the second most important factor (after the seamless security control) for transfer passengers at airports is the quality of the Flight Information Displays. The same conclusions can be drawn to the quality of guidance/navigation, which is regarded highly by transfer passengers who need to find their way from the arrival gate to the departure gate, often within a limited time period. According to the study of [2] the passengers' attitude towards mobile applications highly depends on the quantity and usefulness of the provided information.

Papers of [3] and [4] prove that airport operators use mobile technology to satisfy the information needs of travellers, which makes the processes more efficient. Based on the study of [5] during the planning of terminal buildings, the expectations of passengers regarding navigation placed in focus, especially the indoor navigation through mobile applications. According to the researches of [6] and [7], beside airport operators, the airlines also increase the level of service with mobile applications. In case of some airports the development of a mobile application has become prestige issue. Paper of [13] confirms that one of the future strategies for airlines and airports is to focus on information system.

Most of the papers are about the description of mobile applications developed by either airlines or airport operators and examine the attitude of passengers toward these solutions. Detailed, academic articles about system- and process-oriented modeling, descriptions of integrated solutions are hardly found.

Accordingly, the aim of this paper is to determine the demands and expectations of passengers about mobile applications, analyse the available information system background in order to lay down the basics of an integrated mobile application architecture.

## II. State of the Art

Mobile applications support the decision-making of passengers [8]. Characteristics of current available applications:

- unimodality ("covering" only air transport sector),
- miscellaneous temporal validity of information,
- traditional (without added-value) solutions,

which are unsatisfying for future travellers. Presently, there are no applications that "cover" all the processes of air travel chain. The directions of the development:

- multimodality,
- increasingly used real-time information.

Key features of the integrated application are the following:

- the air transportation journey chain is „covered" both in time and space (airline and airport functions are not separated), considering all door-to-door transportation modes,
- provision of personalized information,
- both the real and the perceived passenger „expenses" are reduced (time and costs, physical and mental effects, etc.).

These requirements can be mostly met by mobile infocommunication devices (smartphones, tablets, etc.). The fully integrated application that is characterized by all the mentioned properties is called by us as 'ideal' application. Such an application is still not in operation, and the partial integration is also hardly with precedent.

## III. Basics of Research

Focusing on the above mentioned deficiencies, the research aim was to establish the base of an integrated application development, by application of infocommunication technology for improvement of existing processes and services. The following questions have been answered:

- what the 'ideal' application should do (functions),
- how this application should work (operation).

The following research steps have been performed:

- analysis of the currently available applications; determination of their advantages and disadvantages,
- survey of passenger needs/expectations through online questionnaire.

In order to determine the operational background of the application the following were analyzed:

- available information system components,
- connections between the components.

The model of the integrated information system has been developed and the functional model of the passenger-oriented application was inserted into. A mock-up application has been also developed. The research process is summarized on Fig. 1

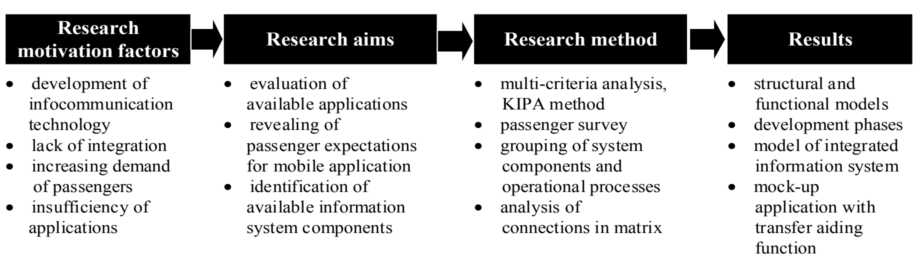


Fig.1. Research process

## IV. Multicriteria Analysis of the Characteristics of Air Transportation Mobile Applications

Best practises of mobile applications were examined [9] by the functions and the operation (general characteristics) as analysis aspects. The functions of airline and airport applications were analysed separately, whereas the general characteristics collectively. The KIPA weighting factor method was chosen for the multicriteria evaluation analysis [10]. The steps of the method are the following:

1) Each alternatives are evaluated by the aspects completed with weighting factors.

2) Preference indicator and disadvantage indicator are calculated, then a numerical value based on the aspects is assigned to each alternative. To determine the preference indicator, the weighting factors of the aspects were summarized, where either the test application was better or evaluated by the same rating value as the other application. To determine the disadvantage indicator, the maximum rating difference between the two applications (where the

test application was worse) was divided by the maximum possible difference.

3) The alternatives are compared in pairs based on the indicators, and then sorted. The preference sequence was derived by sorting the differences between the values of the indicators in an ascending order.

The method can be performed easily, but in case of large number of alternatives, the unequivocal solution is not guaranted. Table I. summarizes the function groups ($F_i$).

TABLE I. FUNCTION GROUPS

| Notation | Function groups |
|---|---|
| $F_1$ | Flights |
| $F_2$ | Bookings |
| $F_3$ | Airport |
| $F_4$ | Airline |
| $F_5$ | Getting there (transport) |
| $F_6$ | City |
| $F_7$ | Settings |
| $F_8$ | Evaluation (feedback) |

Table II. summarizes the general characteristics ($K_i$).

TABLE II. GENERAL CHARACTERISTICS

| Notation | General characteristics |
|---|---|
| $K_1$ | accessibility, user rights, fees (download, usage) |
| $K_2$ | design (user-friendly characteristic) |
| $K_3$ | actuality of information |

Table III. contains the rating values of functions and general characteristics. Importance of the aspects were rated with scores (between 1-7, the most important aspect received the 7) by the users. Then the mean values of the scores were transfered into 0-1 scale. The weighting factors calculated in this way are summarized in Table IV. and V.

TABLE III. RATING VALUES

| Rating values | Description |
|---|---|
| 5 | Easily usable |
| 4 | Usable |
| 3 | Hardly usable |
| 2 | Available, but unuseable |
| 1 | Not available |

TABLE IV. ANALYSIS ASPECTS OF AIRLINE APPLICATIONS

| Notation | Weighting factors |
|---|---|
| $F_2$ | 0,3 |
| $K_2$ | 0,25 |
| $K_1$ | 0,15 |
| $F_1$ | 0,1 |
| $K_3$ | 0,1 |
| $F_8$ | 0,05 |
| $F_7$ | 0,05 |

It is found that the most useful airline applications have been developed by the full service carriers and the best airport applications have been realized for the airports with significant traffic (over 40M passenger/year).

TABLE V. ANALYSIS ASPECTS OF AIPORT APPLICATIONS

| Notation | Weighting factors |
|---|---|
| $F_3$ | 0,25 |
| $F_2$ | 0,175 |
| $F_5$ | 0,175 |
| $K_3$ | 0,15 |
| $F_1$ | 0,1 |
| $K_2$ | 0,1 |
| $F_8$ | 0,05 |

Key findings were that the "intelligence" of existing mobile applications can be improved by value-added and location-based information services. The beneficial characteristics of the existing applications were built into the concept of our "ideal" application.

## V. Survey of Passenger Expectations

Passenger expectations were surveyed by online questionnaire regarding the information management. It was filled in by 242 people with different nationalities (American, English, Polish, Czech, Italian, French and Hungarian). Features of survey respondants are summarized in Table VI. The users were selected from among today's youth, who usually use mobiles, and among that old people, who tend to travel. The answers were recorded between 06/10/2014 and 19/10/2014. The questionnaire contained both open and closed questions, in this way the individual needs of persons were surveyed as well. Answers regarding general characteristics and travel habits of passengers have been also recorded. Based on the survey it has been found that the major expectations of passengers are the following:

- more actual (real-time) and personalized information,
- integrated mobile application managing all the sub-processes of air transport chain.

User expectations were analyzed by:

- age,
- travel motivation, and
- employment status.

TABLE VI. FEATURES OF SURVEY RESPONDANTS

| Features | Categories | Quantity | |
|---|---|---|---|
| | | *No. of persons* | *%* |
| Gender | Woman | 116 | 48 |
| | Man | 126 | 52 |
| Age | Under 18 | 14 | 6 |
| | 18 - 25 | 125 | 51 |
| | 26 - 45 | 92 | 38 |
| | Above 45 | 11 | 5 |
| Employment status | Student | 113 | 47 |
| | Employed | 129 | 53 |

Regarding the personalized information aspect, it has been found that the expectations do not differ by passenger categories; consequently there is no need for detailed personal settings. The conception of the "ideal" application was developed by the results and the evaluation of the questionnaire.

## VI. Model of Integrated Information System

The basic of the operation of the “ideal” application is the integrated information system in the background that provides the required data. This system was modelled through the identification of the following components:

- information management subsystems (human and machine elements),
- function groups and functions (information management processes),
- data groups,

then the relationships between them were determined and represented on Fig. 2. Instead of detailed analysis of the information management functions on the operator side, the research focused only on the data groups originating from there. The “core” element of the system is the integrated database that serves as data source of the operation of the application.

In the I. phase of the modeling (macro approach) the enhancement of the resolution regarding the component types was disregarded.

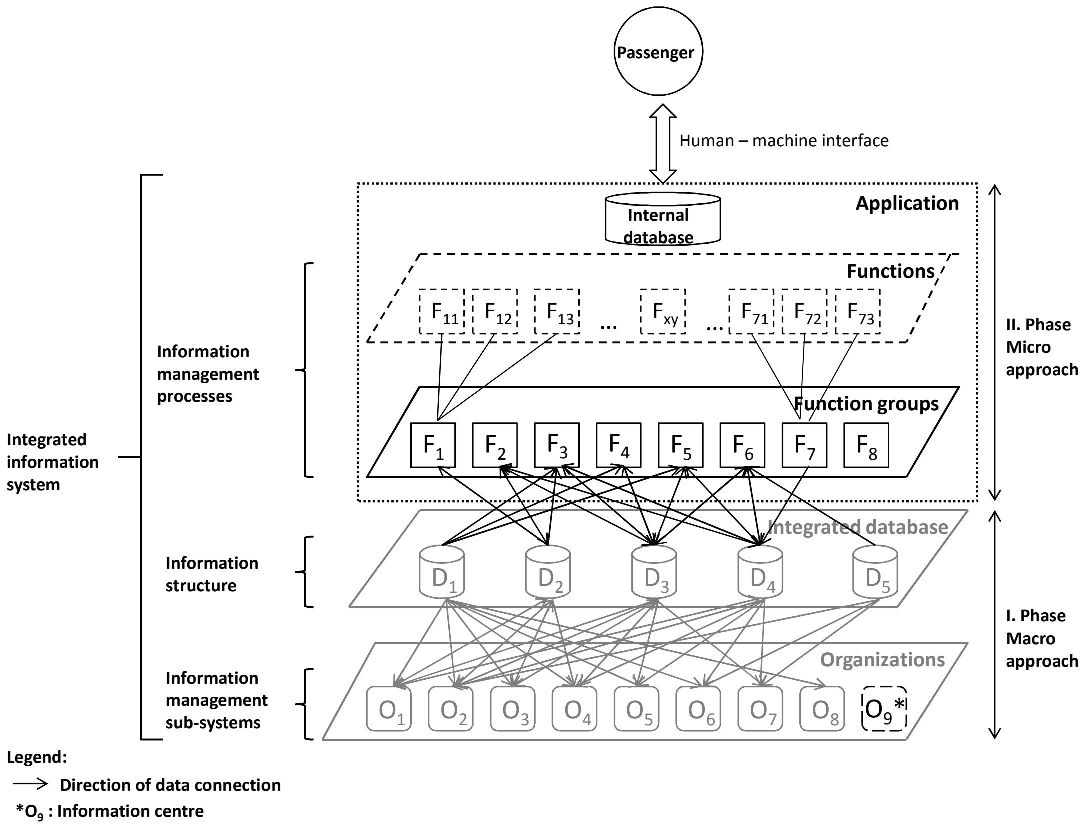


Fig.2. Model of the integrated information system

The operational side of the structural model represents the connections between the information management sub-systems and the data groups. After the identification of organization types of air transportation, the associated machine sub-systems were summarized in Table VII. The sub-systems provide the data for the operation of the application through the integrated information system as the organizations authorize access to their own databases. The collected data are stored either in centralized or decentralized way depending on whether they are stored either by the owner organization or in a central database.

Data groups handled in the machine sub-systems were identified. Depending on the temporal validity, static, semi-dynamic and dynamic data were distinguished. Categorization is shown in Table VIII.

Based on the machine sub-system – data group matrix it has been found that mostly the data is either input for the information system or the transmission is duplex. Time characteristic of the data transmission was determined as well (event-driven or time-cycle).

## VII. Functional Model of the “Ideal” Application

In the II. phase of the modeling (micro approach), the research focused on only one information managing element, the mobile device, its functions and operational properties. Functions are represented in Table X. The “sources” used for the identification:

a., comparative multicriteria analysis and evaluation,
b., closed questions of the survey,
c., opened questions of the survey.

TABLE VII. INFORMATION MANAGEMENT SUB-SYSTEMS

| Notation | Organization types | Notation | Machine sub-systems |
|---|---|---|---|
| $O_1$ | Airport operators | $M_{11}$ | Resource allocation system |
| | | $M_{12}$ | Airport operational database |
| | | $M_{13}$ | Flight information display system |
| | | $M_{14}$ | Security system |
| | | $M_{15}$ | Baggage handling and reconciliation system |
| $O_2$ | Airlines | $M_{21}$ | Reservation system, ticketing |
| | | $M_{22}$ | Global distribution system |
| | | $M_{23}$ | Route and network planning, scheduling és aircraft rotation planning system |
| | | $M_{24}$ | Crew planning system |
| | | $M_{25}$ | Navigation system (route and fuel planning) |
| | | $M_{26}$ | Operation management system |
| | | $M_{27}$ | Maintenance planning system |
| | | $M_{28}$ | Departure control system |
| $O_3$ | Air traffic control services | $M_{31}$ | Restriction monitoring system |
| | | $M_{32}$ | Navigation system |
| | | $M_{33}$ | Meteorological system |
| | | $M_{34}$ | Messaging system |
| $O_4$ | Ground handling companies | $M_{41}$ | Airport operational systems |
| | | $M_{42}$ | Lost baggage tracer system |
| $O_5$ | Authorities | $M_{51}$ | Registration systems |
| $O_6$ | Other related (transport) services | $M_{61}$ | Parking management systems |
| | | $M_{62}$ | Traffic control and passenger information systems |
| $O_7$ | Tourism services | $M_{71}$ | Accomodation reservation systems |
| | | $M_{72}$ | Car rental, reservation systems |
| | | $M_{73}$ | Other information systems |
| $O_8$ | Airport services | $M_{81}$ | Service registration systems |

TABLE VIII. DATA GROUPS

| Notation | Data group | Static data | Semi-dynamic data | Dynamic data |
|---|---|---|---|---|
| $D_1$ | Airport infrastructure data | basic infrastructure data, details of tools and equipment | planned ground handling data | traffic, weather, equipment occupancy data |
| $D_2$ | Operational data | management strategies,vehicle and crew data, historical traffic data, maintenance data | schedule, planned amendments, vehicle and crew planning, route permits, reservation/capacity data | traffic data, delay data, status of equipment and ground handling vehicles |
| $D_3$ | Collection of fees, reservation data | pricing strategies, historical reservation data | periodic prices, amendments, discounts, reservation data | actual prices, reservation data. |
| $D_4$ | Passenger data | registries of authoritites (passport, visa), entry regulations | reservation data, preferences, contacts, payment and billing information | actual reservation and check-in data |
| $D_5$ | Tourism data | service registration, tariff data | temporary service data (opening, contact) | current reservation, rental data |

The relationships between information management sub-systems and data groups are represented in Table IX.

TABLE IX. MACHINE SUBSYSTEM – DATA GROUP RELATIONSHIP MATRIX

| | $M_{11}$ | $M_{12}$ | $M_{13}$ | $M_{14}$ | $M_{15}$ | $M_{21}$ | $M_{22}$ | $M_{23}$ | $M_{24}$ | $M_{25}$ | $M_{26}$ | $M_{27}$ | $M_{28}$ | $M_{31}$ | $M_{32}$ | $M_{33}$ | $M_{34}$ | $M_{41}$ | $M_{42}$ | $M_{51}$ | $M_{61}$ | $M_{62}$ | $M_{71}$ | $M_{72}$ | $M_{73}$ | $M_{81}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **$D_1$** | ↗ | ↗ | ↗ | ↗ | ↗ | - | - | ↗ | ↗ | - | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | - | ↗ | ↗ | ↗ | - | - | - | ↗ |
| **$D_2$** | ↔ | ↔ | ↗ | - | ↔ | ↔ | ↔ | ↔ | ↔ | ↔ | ↔ | ↗ | ↗ | ↔ | ↔ | ↙ | ↔ | ↗ | - | - | - | - | - | - | - | - |
| **$D_3$** | - | ↔ | - | - | ↗ | ↔ | ↔ | ↔ | ↗ | ↗ | - | - | ↗ | - | - | - | ↔ | ↔ | ↗ | ↗ | - | - | ↗ | ↗ | ↗ | - |
| **$D_4$** | - | ↔ | - | ↗ | ↗ | ↗ | ↗ | - | - | - | - | - | ↗ | - | - | - | - | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | - |
| **$D_5$** | - | - | - | - | - | - | ↗ | - | - | - | - | - | - | - | - | - | - | - | - | - | ↗ | ↗ | ↗ | ↗ | ↗ | - |

Legend:

↗: data group is the input of the machine sub-system,
↙: data group is the output of the machine sub-system,
↔: data group is handled both as input and output,
-: no connection,
white background: event-driven transmission,
dark-grey background: time-cycle transmission,
light-grey background: event-driven and time-cycle transmission.

As a result of the passenger survey, the preference ranking of the functions is demonstrated on Fig. 3. As the research processes (analysis, survey) were executed parallel, at the time of the questionnaire not all the functions of the "ideal" application were identified or some of them were handled separately or merged. Consequently the ranking does not contain certain functions or some of them are considered separately or as part of a group. Notation of the part-functions that were handled separately in the survey but merged in the "ideal" application is the following:

- F32α: information about services,
- F32β: discounts and advertisements of services,
- F33α: information about queueing time,
- F33β: support transfer,
- F33γ: indoor navigation.

Since the implementation of the extensive function list is realized mostly in modular developments, development stages [11] were identified.

The functions among the stages were distributed based on the preference ranking.

1. stage: according to the passenger expectations, the most important, basic functions.
2. stage: further improvement of the basic functions, and the extension with additional preferred solutions.
3. stage: improving existing features, and the development of functions regarding the personalized expectations.

TABLE X. FUNCTIONS

| Function groups' notation | Functions' notation | Functions | Source | Development stage |
|---|---|---|---|---|
| $F_1$ | $F_{11}$ | Flight schedule information | a.,b. | 1. |
| | $F_{12}$ | Status of flight | a.,b. | 1. |
| | $F_{13}$ | Real-time information of "Favourite" flights | a.,b. | 1. |
| $F_2$ | $F_{21}$ | Booking | a.,b. | 1. |
| | $F_{22}$ | Manage my bookings | a. | 1. |
| | $F_{23}$ | Check-in | a.,b. | 1. |
| | $F_{24}$ | Boarding pass | a.,b. | 1. |
| | $F_{25}$ | Baggage tracking | a.,b. | 1. |
| $F_3$ | $F_{31}$ | Airport information | a.,b. | 1. |
| | $F_{32}$ | Airport services | a.,b. | 1. 2. |
| | $F_{33}$ | Aiding of passenger activities | a.,b. | 1. 2. |
| $F_4$ | $F_{41}$ | Airline information | a. | 1. |
| | $F_{42}$ | Actual travel offers | a. | 3. |
| | $F_{43}$ | Frequent flyer programs | c. | 3. |
| $F_5$ | $F_{51}$ | To and from the airport | a.,b. | 1. 2. |
| | $F_{52}$ | Parking management | a. | 1. 2. |
| | $F_{53}$ | Transport information in the city | c. | 3. |
| $F_6$ | $F_{61}$ | Tourist information | a.,c. | 3. |
| | $F_{62}$ | Accomodation booking | a.,b. | 2. |
| | $F_{63}$ | Car rental | a.,b. | 2. |
| $F_7$ | $F_{71}$ | Default settings | a. | 1. |
| | $F_{72}$ | Language | a. | 1. |
| | $F_{73}$ | Settings for disabled persons | a. | 2. |
| $F_8$ | $F_{81}$ | Passenger feedback | a. | 1. |

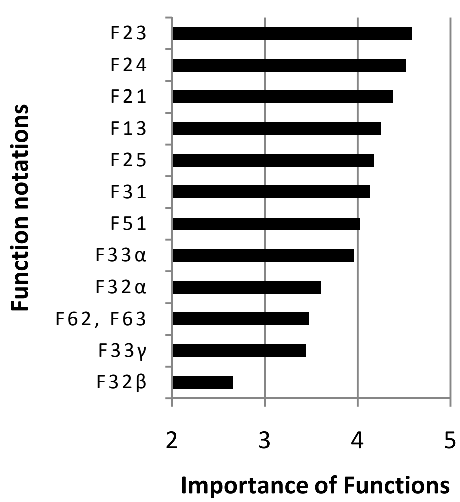


Fig.3. Preference of respondants about the functions of an application

The passenger-side functional model [12] represents the relationships among the function groups and data groups in Table XI. The planning was performed by determination of the data flows between the functions. Relationship matrix was developed in order to represent the data flows among the function groups. Results are summarized in Table XII. In both tables, the resolution depth was enhanced in order to indentify the relationships of the transfer aiding function, which was in focus of our research, because of its novelty. The information support of the related decisions and movements are highly important, even so this function is realized in mobile applications occasionally.

Full depth resolution was applied in case of the mobile device to design and develop the mock-up application, so the smallest units were attained to (data elements and procedures). According to our conception, plenty of information services are available through the "ideal" application that handles value-added information as well. The operation of the application is supported by the integrated database.

TABLE XI. FUCTION GROUP – DATA GROUP RELATIONSHIP MATRIX (TWO LEVEL RESOLUTION OF FUNCTION GROUPS)

| | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 |
|---|---|---|---|---|---|---|---|---|
| D1 | - | - | ↗ | ↗ | ↗ | - | - | - |
| D2 | ↗ | ↔ | ↗ | - | - | - | - | - |
| D3 | - | ↔ | ↗ | ↔ | ↔ | ↔ | - | - |
| D4 | - | ↔ | ↗ | - | ↗ | ↔ | ↙ | - |
| D5 | - | - | - | - | - | ↗ | - | - |

| | F31 | F32 | F33 |
|---|---|---|---|
| D1 | ↗ | ↗ | ↗ |
| D2 | ↗ | ↗ | ↗ |
| D3 | - | - | ↗ |
| D4 | - | - | ↗ |
| D5 | - | - | ↗ |

| | F33α | F33β | F33γ |
|---|---|---|---|
| D1 | - | ↗ | ↗ |
| D2 | - | ↗ | - |
| D3 | ↗ | - | - |
| D4 | ↗ | ↗ | - |
| D5 | - | ↗ | - |

Legend:

↗: data group is the input of the machine sub-system,
↙: data group is the output of the machine sub-system,
↔: data group is handled both as input and output,
-: no connection,
white background: event-driven transmission,
dark-grey background: time-cycle transmission,
light-grey background: event-driven and time-cycle transmission.

TABLE XII. FUNCTION GROUP - FUNCTION GROUP RELATIONSHIP MATRIX (TWO LEVEL RESOLUTION OF FUNCTION GROUPS)

| | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 |
|---|---|---|---|---|---|---|---|---|
| F1 | ⧅ | ↗ | ↗ | ↗ | - | - | - | - |
| F2 | - | ⧅ | ↗ | ↔ | - | ↗ | - | - |
| F3 | - | - | ⧅ | - | ↔ | ↗ | - | - |
| F4 | - | ↔ | - | ⧅ | ↔ | ↔ | - | - |
| F5 | - | - | ↔ | ↔ | - | ↔ | - | - |
| F6 | - | - | - | ↔ | ↔ | - | - | - |
| F7 | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | ⧅ | ↔ |
| F8 | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | ↔ | - |

| | F31 | F32 | F33 | F5 | F6 |
|---|---|---|---|---|---|
| F33 | - | ↙ | ⧅ | ↙ | - |

| | F32 | F33α | F33β | F33γ | F5 |
|---|---|---|---|---|---|
| F33β | ↙ | - | ↔ | ↔ | ↙ |

Legend:

↗: data group is the input of the machine sub-system,
↙: data group is the output of the machine sub-system,
↔: data group is handled both as input and output,
⧅:data group is handled in function group between the part-functions,
-: no connection,
white background: event-driven transmission,
dark-grey background: time-cycle transmission,
light-grey background: event-driven and time-cycle transmission.

## VIII. Properties of mock-up application

For the demonstration of the operation of the transfer aiding part-function (F33β) a database application in Microsoft Access has been elaborated. The database contains all the functions of the first development stage beside the detailed part-function. Fig. 4. represents the logical plan being consistent to the menu system of this part-function of the application. Relationships between the decision making situations and the data groups used for the information provision regarding decision support have been indicated. Decisions:

C1: transfer or leave the airport,
C2: in case of leaving, using airport service or not,
C3: in case of transfer, boarding gate is known or not
(not a passenger decision),
C4: approaching gate or using service (depending on remaining time),
C5: what type of service used.

All the processes are associated with navigation, regardless which option is chosen by the passenger during decision.

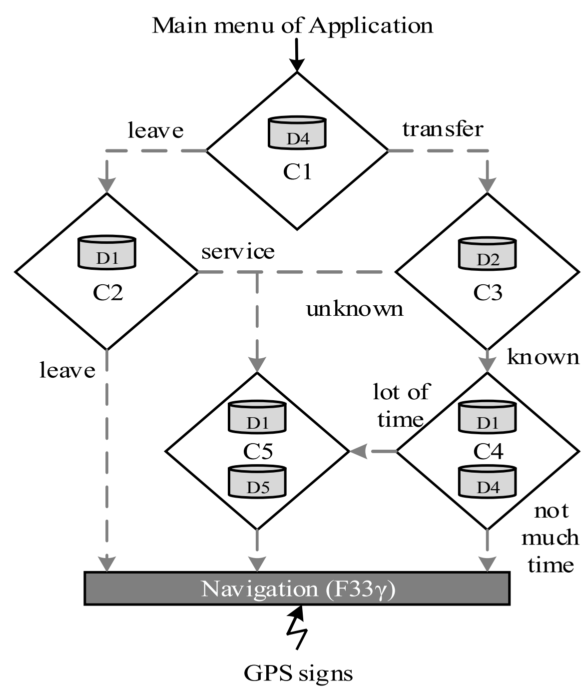


Fig.4. Model of the transfer aiding part-funtion (F33β)

Legend:
$C_x$: passenger decisions (separate form for each one),
$D_y$: data groups,
dashed arrows: transition between forms.

## IX. Conclusion

An application that covers the entire air transport travel chain regarding the information services does not exist of its own. The main contributions of the paper are:

- method for evaluating and comparing the capabilities of existing mobile application used in aviation,
- model of the 'ideal', integrated information application for air passengers on mobile devices, including also the entire 'background' integrated information system.

The applicability of the model has been proven by a part-function. As the complete, integrated application can be developed only in stages, a proposal for the stages has been made while taking into account several factors.

The key findings of the paper are:

- According to the KIPA analysis it has been found that applications of full service carriers are more complex and user-friendly than the applications of low-cost carriers. Information services on mobile device regarding airports with higher traffic are more developed.
- Based on the questionnaires it has been found that the expectations do not differ by passenger categories; consequently there is no need for detailed personal settings.

The lessons learnt:

- continuous monitoring of the research process is required,
- only few articles are related to the topic what made very hard the thorough, comprehensive literature review,
- examined alternatives, aspects, rating values and weighting factors have to be chosen thoughtfully regarding the application analysis,
- questions should be inserted into a questionnaire only after the methodology and the expected results are obvious,
- machine sub-systems can be used by different organizations, categorization approaches should be corresponding to the research aims,
- relationships between the model elements is not always definite, the dominance has to be taken into consideration

Further research directions:

- Enhancement of resolution depth of models in directions 'organization, function, and data' to attain to the elementary components.
- Further improvement of funtions, focusing on aiding of passenger activities (F33) function, regarding the personalized guidance and the decision support. For the elaboration of this function passenger time consumption at handling processes are examined that is the basic of waiting time predictions.
- Extension of the application with new functions. By intensification of multimodal character of the application the entire travel chain between the origin and destination points is aided. Extension of the evaluation function (collection of passenger feedback) provides the duplex communication between the operator and the passengers. Information from/about the passengers significantly facilitates the developments in operational side.

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