C10
- Management Logistic

- Studii de caz. Exemple de modalitati de abordare.

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Exemple de studii de caz

- 1. Procesul de deservire a unei comenzi client intr-un depozit (warehouse order picking process)

Referinta bibliografica:

http://www.fing.edu.uy/inco/eventos/icil05/03-wed/F1-Dukic.pdf

- 2. Managementul resurselor intr-un spital
- 3. Operatii logistice intr-un aeroport

Referinte bibliografice:

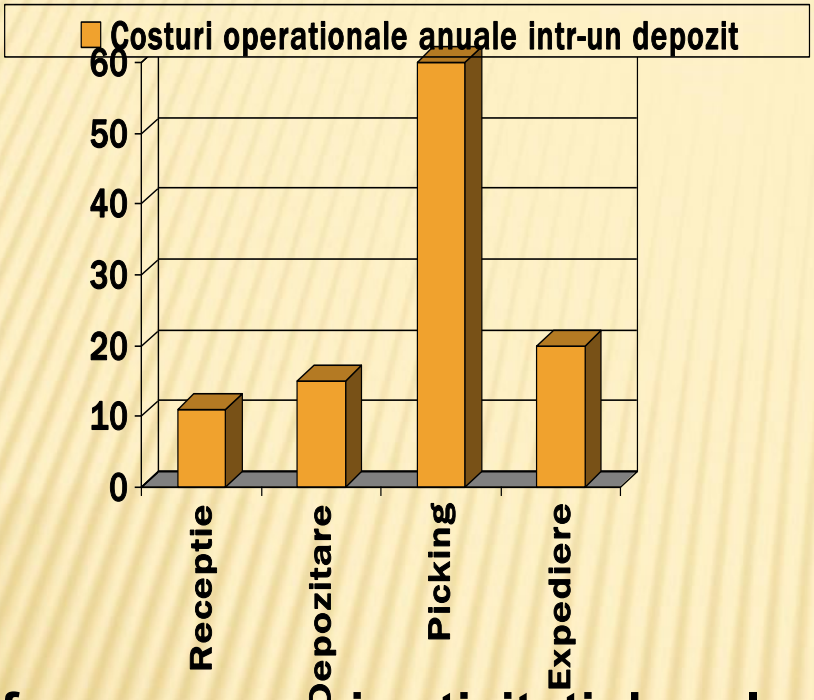
http://www.eurocontrol.int/articles/atm-procedures

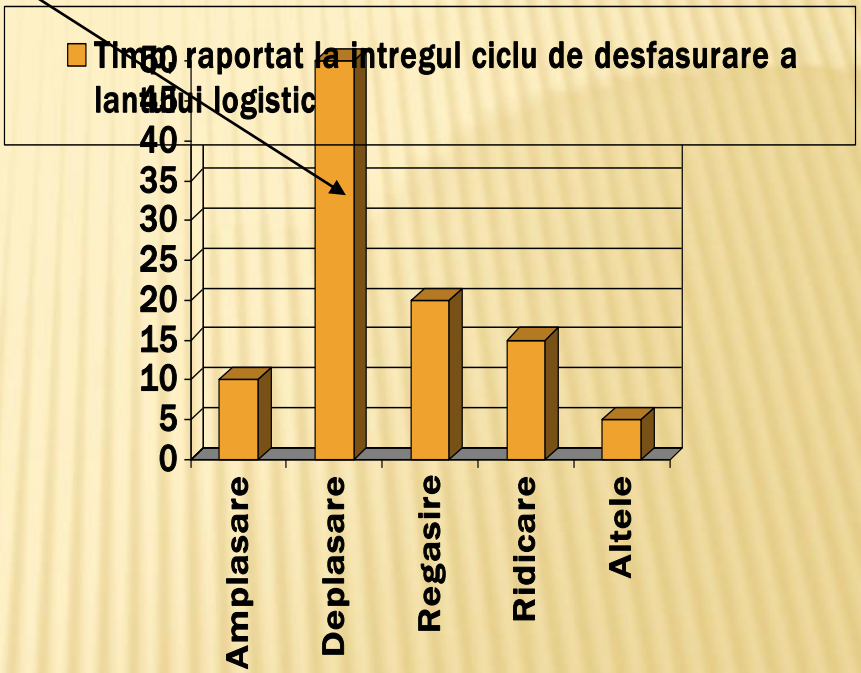
http://www.eurocontrol.int/sites/default/files/content/documents/official-documents/skyway/2012-spring-skyway56-atm-guide.pdf

Studiul de caz 1 - warehouse order picking process

- Intrebare: cum se poate imbunatati **productivitatea** si **eficienta** operationala a procesului de ridicare comanda intr-un depozit?
- Ce este “order picking”? – regasirea produsului intr-o locatie specifica de depozitare, pe baza unei comenzi-client.
- Link: software - http://www.youtube.com/watch?v=28lh-WVIeqQ
- Caracteristici:
  - - este cel mai laborios proces dintr-un depozit
  - - consuma aproape 60% din activitatile ce se desfasoara intr-un depozit
  - Influenteaza direct acuratetea si timpul de livrare a produsului comandat de client
    - Exemple: http://www.youtube.com/watch?v=z-Ey-or8-r4
    - http://www.youtube.com/watch?v=yU6OwsqETzI
    - http://article.wn.com/view/2013/03/05/Siemens_Completes_Baggage_Handling_System_Contract_at_Miami_/

Reducerea timpului de cautare – proportional cu ruta de cautare (distante)





Desfasurarea unei activitati de selectare (regasire si culegere) manuala a unui produs:

-Pe calculator, se primeste lista produselor care trebuie gasite si livrate

-Deplasare la locatia/locatiile de culegere a produsului/-elor in conformitate cu lista primita

-Livrarea lor la un punct de colectare (drop-off point), de unde se vor trimite mai departe pe canalul logistic ales

-Reintoarcerea la calculator si confirmarea ordinului de livrare si a cantitatilor de produse livrate

Combinatii de metode de optimizare

- Metode de rutare – determina secventele si caile de regasire/ridicare (picking) a produselor comandate de client
- Metode de depozitare – atribuirea unei locatii de memorare, a unui produs pe baza unor reguli
- Metode de prioretizare a comenzilor – gruparea unei comenzi sa a mai multor comezi de acelasi fel, intr-o singura activitate de ‘picking’

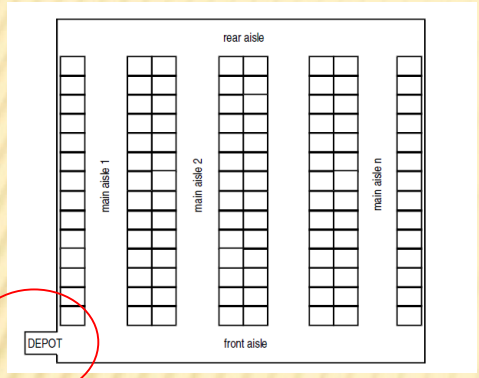
- Performantele inregistrate depind de:

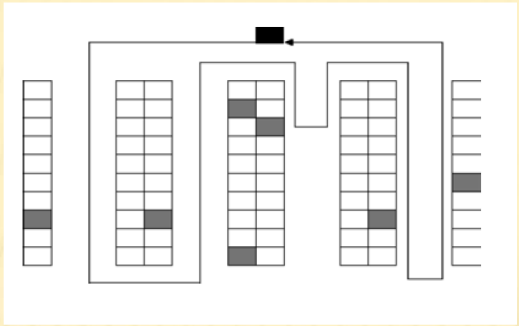
1. Dimensiunea si forma (layout) depozitului
2. Dimensiunea si caracteristicile comenzii
3. Capacitatea de livrare (picker’s capacity)

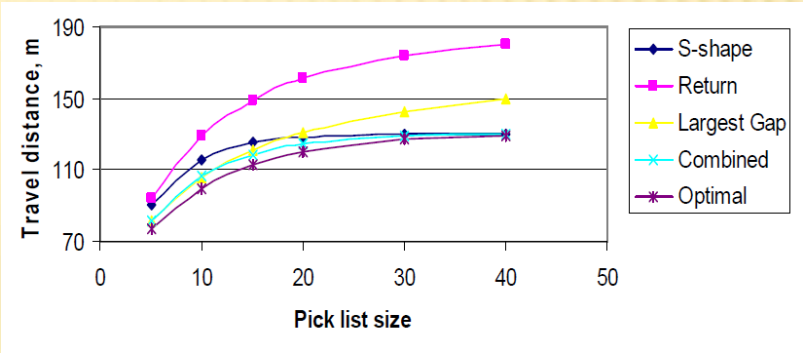
Descrierea procesului

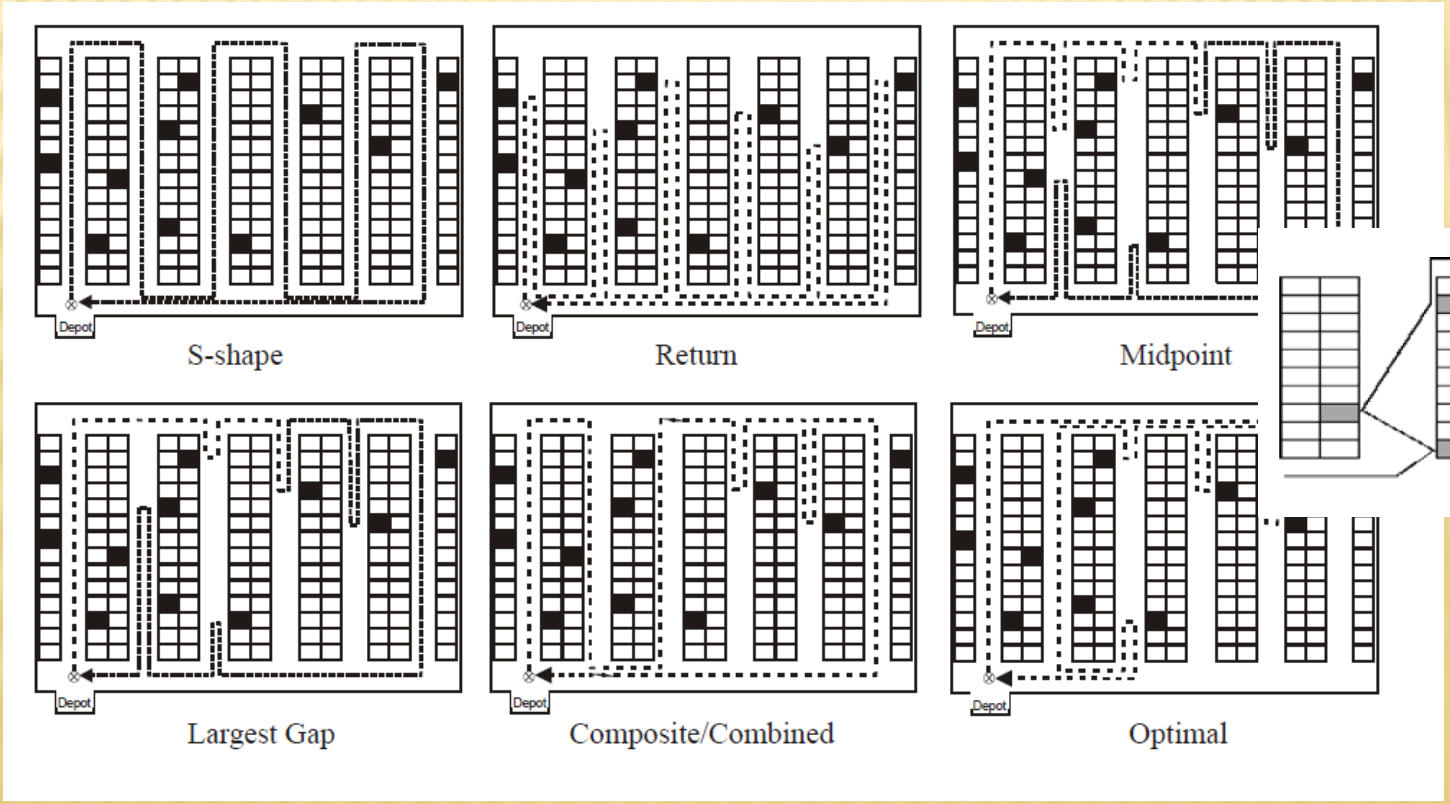
- Intotdeauna incepe la depou (loc in care sunt depozitate utilajele folosite – ex. Motostivuitor)
- Se alege drumul cel mai scurt (de regula) pana la culoarul unde se gasesc rafturile cu produsele depozitate
- Deplasarea de-a lungul culoarului pana la locul destinatie (front sau back crossing path)
- Eficienta procesului de picking depinde de:
  - Planul depozitului (layout)
  - Strategiile de depozitare
  - Tipul de comanda client
  - Metode de rutare
  - Minimizarea distantei de parcurgere (distanta medie pe comanda sau distanta toatala pentru un set de comenzi)

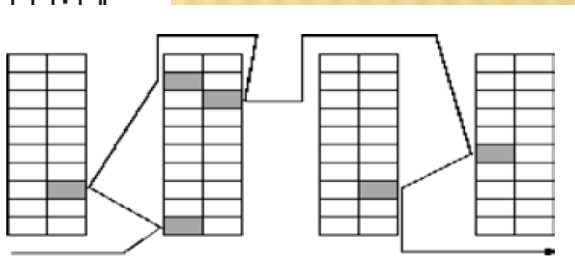
Exemplu de layout-uri si analiza rutelor











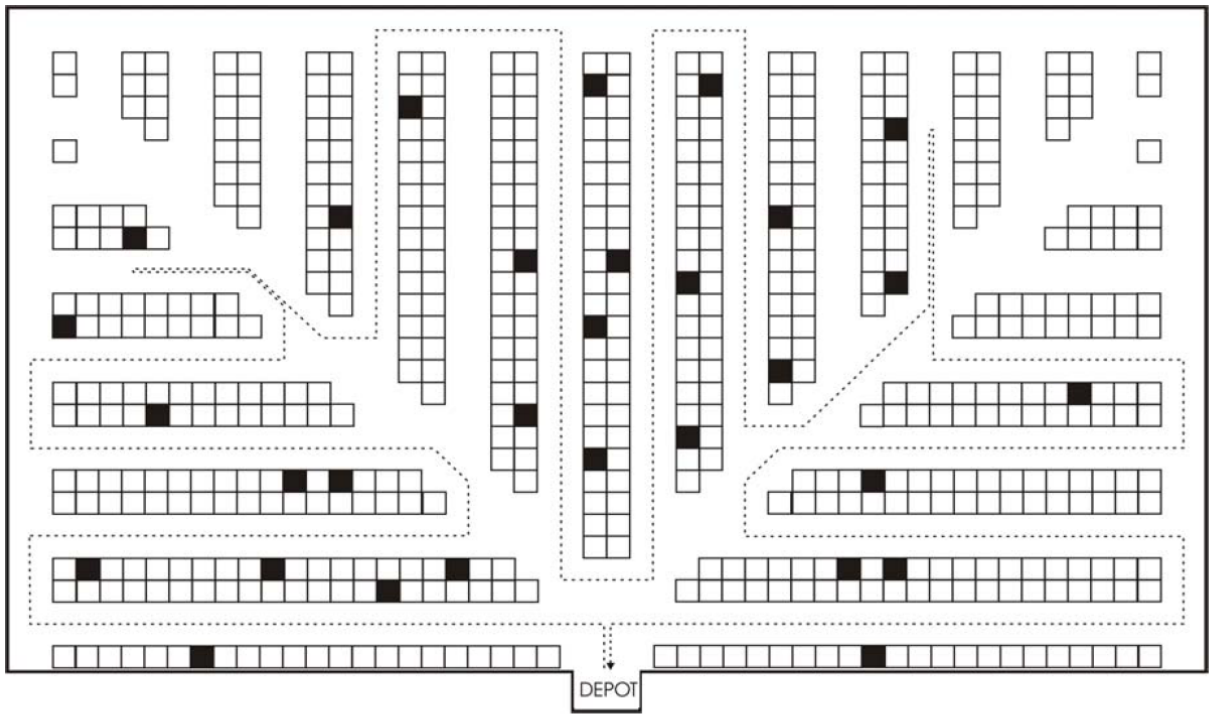
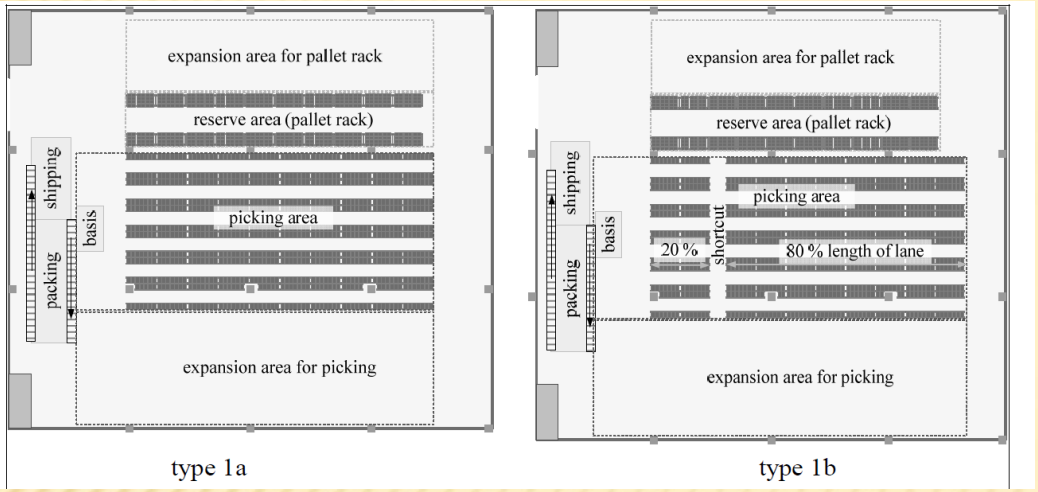
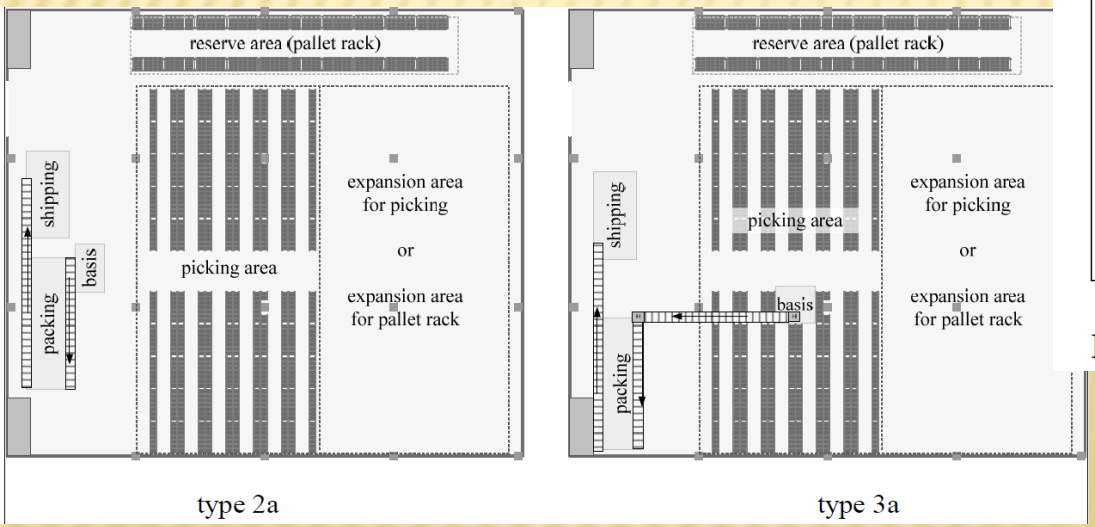


Fig. 2: Example of picking route in examined fishbone layout

Table 1: Results of analysis

Order size	10			30		
Traveling distance (m) Layout	Within aisle	Across aisle	Total average	Within aisle	Across aisle	Total average
Traditional (basic)	181.3	77.4	258.7	289.1	86.7	375.8
Traditional with middle cross	116.5	77.4	193.9	242.3	86.7	329.0
Fishbone	155.6	71.9	227.5	268.7	83.2	351.9





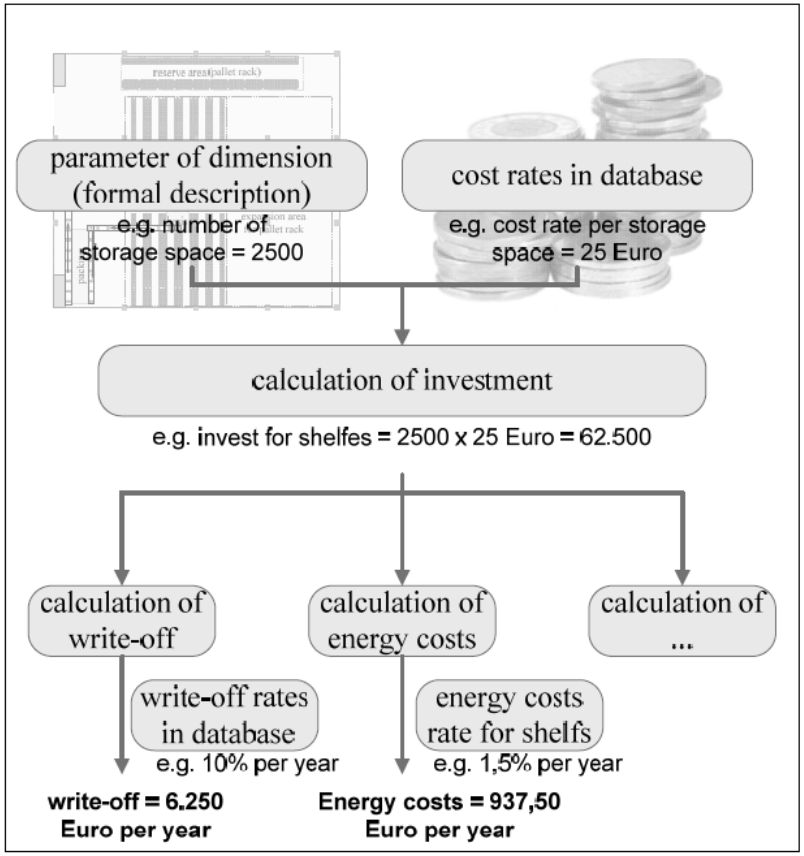
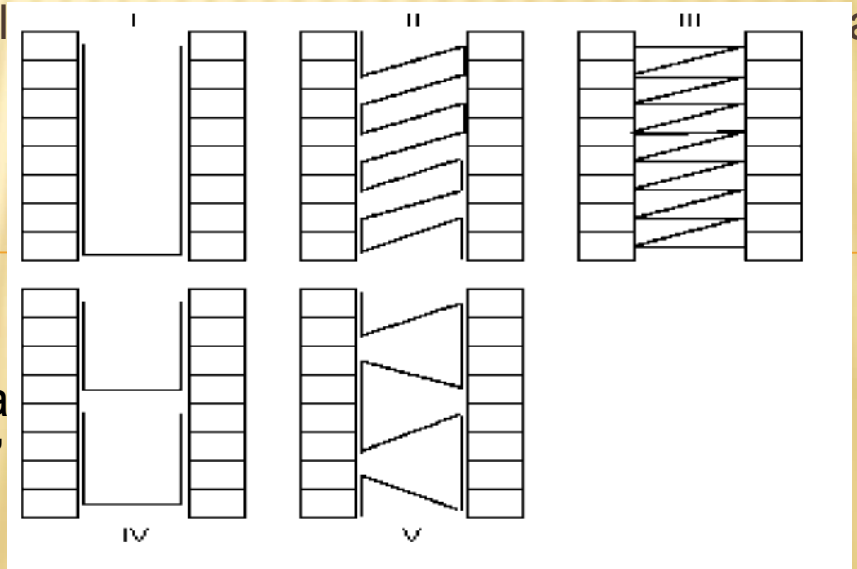


Figure 6: approach to calculate the investment and costs

Strategii de depozitare

- Clasificare
  - Randomizata – locatiile libere au probabilitate egala de a fi umplute
  - Locatie cat mai apropiata de depou
  - Locatie dedicata – locatie rezervata pentru anumite produse, chiar daca produsul este out-of-stock.
  - Depozitare bazata pe volum (turnover-based storage sau volume-based storage) – produsele cele mai vandute sunt stocate in locatii cat mai aporpiate de depou
  - Depozitare pe clase de produs (family-products-based storage) – clase atribuite unor zone dedicate din depozit (combinatie de random si volum)
  - Depozitare in functie de cl ate)

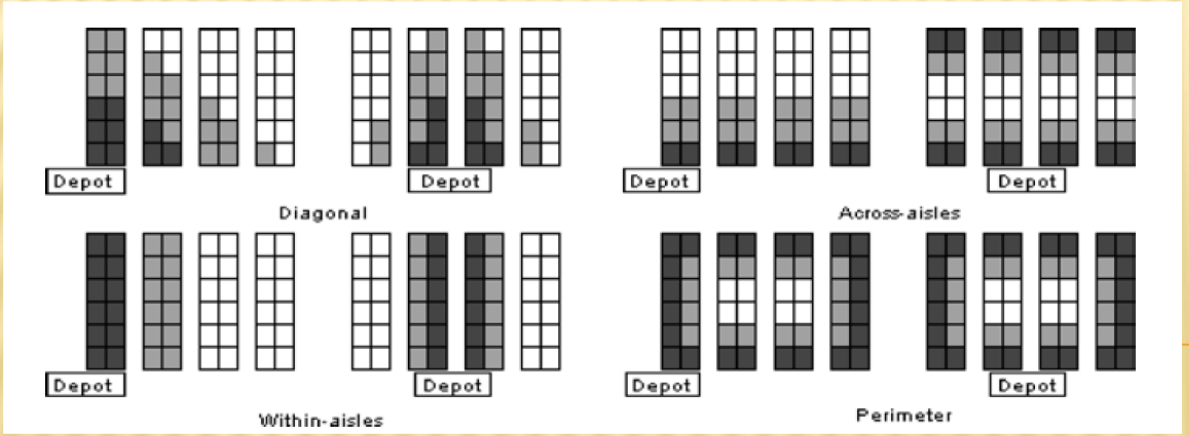


Strategii de rutare

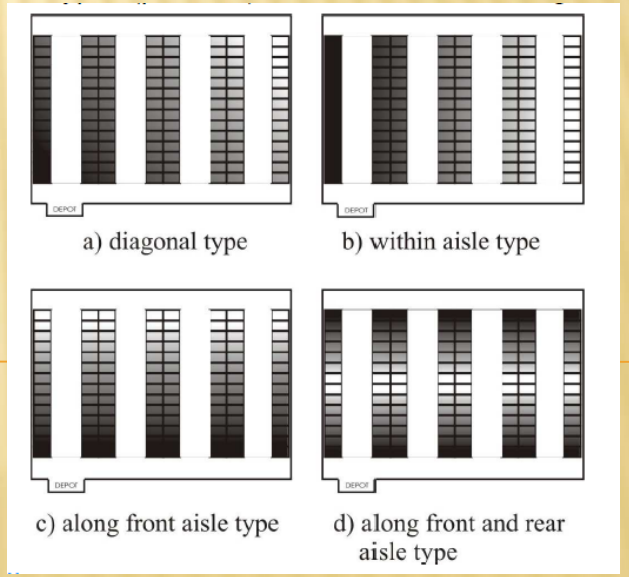
-Fiecare locatie are o codificare (nume de locatie), stocata in Baza de date, care poate fi accesa In vederea satisfacerii “picking list”

Detaliere strategii “volum-based”

- Metode diagonale – volumele mari sunt stocate in locatii apropiate de depou iar cele mici in locatii mai indepartate
- Din cadrul aceluiasi culoar (within ailes) – volumele mari sunt localizate pe culoarele aporpiate de depou
- De-a lungul culoarelor (cross-ailes) – volumele mari in fata culoarului iar celelalte in spate
- Metode de tip perimetru – volumele mari sunt depozitate spre exterior iar cele mici spre interiorul spatiului de depozitare a depozitului



Presupune sortarea produselor si eliminarea congestiei



Exemplu de pick list

Table 9.1 Location visit identification numbers for the fourth routing method

Location number	Identification number	Location number	Identification number
I-1	1	I-2	8
I-3	2	I-4	7
I-5	3	I-6	6
I-7	4	I-8	5
I-9	16	I-10	9
I-11	15	I-12	10
I-13	14	I-14	11
I-15	13	I-16	12
I-17	ID no. (I-1) + 16	I-18	ID no. (I-2) + 16
. . .	. . .	. . .	. . .
I-97	97	I-98	100
I-99	98	I-100	99

Pasi:

Utilizatorul alege clientul si locatia, fixeaza data de livrare si deschide atasat acestei inregistrari o lista

Se selecteaza metoda de rutare

Se specifica numarul de operatii de picking din lista

Fiecarei operatii de picking I se ataseaza o inregistrare, astfel incat la sfarsit se poate consulta secve

Operatiilor de picking alocate clientului (pentru a nu depasi numarul maxim alocat)

Se aloca numarul locatiilor necesare pentru a fi vizitate

Lista este sortata pe baza – locatiei vizitate si a numarului de identificare a produsului, astfel incat in

Rutarea sa fie optimizata (calea si timpul minim de picking)

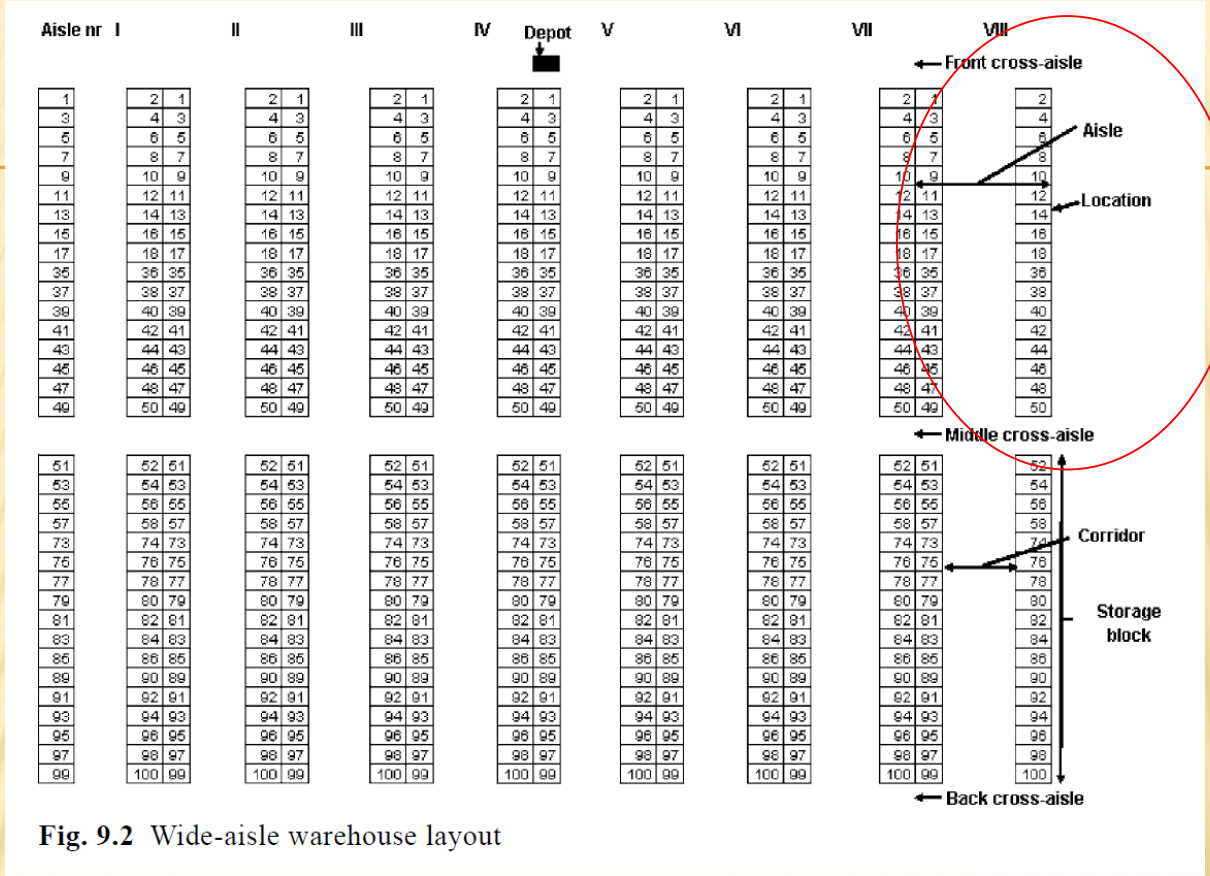


Fig. 9.2 Wide-aisle warehouse layout

Aisle (pasaj intre randuri) – de regula 2.3m-3.5m
Produsele sunt pastrate pe rafturi , sortate pe clase de produs
Exemplul de mai sus contine 8 randuri, a cate 100 locatii
Modalitati de acces si comutare a cailor – din fata, din spate si din mijloc
Modalitati de depozitare – de jos in sus (ground to up location)
Locatiile sunt de dimensiuni – 1.2 latime si 0.8 adancime
Punctul de start – e important in algoritmii de optimizare si e considerat depou-ul unde se regasesc calculatorul, punctul de colectare (drop-off point) si echipamentele (ex. Stivuitor).
Punctul de start poate fi localizat in fata, spate sau la mijloc (vezi cazuri abordate in desene)

METODE ORDER-PICKING

Order Picking Methods Include:

Discrete Order Picking - This is the most common type of order picking because it is basic and simple to understand. When employing a discrete order picking methodology, one order-picker picks one order, one line at a time. Additionally, there is only one order scheduling window during a shift. Therefore, orders are not scheduled and may be picked at any time on a particular day. The advantage of using this method of order picking is that it is simple, ideal for paper based picking, provides fast response time for order fulfillment and can easily track order picker accuracy. On the downside, this is the least efficient methodology as it requires a significant amount of travel time compared to other methods.

Zone Picking - As the name implies, order pickers are assigned a specific and physically defined zone in the pick area. The picker assigned to each zone is responsible for picking all of the SKUs that are located in the zone for each order. In the event that an order requires SKUs that are located in multiple zones, then the order is filled after it passes through each zone. This is typically referred to as "pick and pass" methodology. Additionally, in zone picking there is only one scheduling period per shift. Therefore, there is a cutoff point for orders to be queued into the order picking process and any order received after that cutoff point will get fulfilled during the next shift.

Batch Picking - Batch picking is when one picker picks a group, or batch, of orders at the same time, one SKU at a time. This is advantageous when there are multiple orders with the same SKU. When that occurs, the order picker only needs to travel to the pick location for that specific SKU once, in order to fill the multiple orders. Therefore, the main advantage to choosing this method is reduced travel time, which increases productivity. Batch picking is often used when the typical order profile has only a few SKUs (under four) and the SKUs physical dimensions are relatively small. Just as in zone picking, batch picking requires only one order scheduling window per picking shift.

Wave Picking - Wave picking is very similar to discrete picking in that one picker picks one order, one SKU at a time. The main difference is the scheduling window. In discrete picking, there is not a scheduling window whereas in wave picking there is. Therefore, orders may be scheduled to be picked at specific times of the day, which is usually done to coordinate and maximize the picking and shipping operations.

Zone-Batch Picking - This is a combination of methods in that pickers are assigned a zone, just like traditional zone picking, however they are also directed to batch pick within their zone. Since both zone picking and batch picking have a scheduling window, then zone-batch picking does too.

Zone-Wave Picking - This is a combination of methods in that pickers are assigned a zone and each picker within their zone picks all of the SKUs for all orders that are stocked in their zone, one order at a time with one scheduling window per shift.

Zone-Batch-Wave Picking - This is the most complex combination of all of the order picking methodologies. In this method, each picker is assigned a zone and picks all SKUs for orders stocked in the assigned zone. Additionally, the picker picks more than one SKU at a time and there are multiple scheduling windows per shift.

stock keeping unit (SKU)

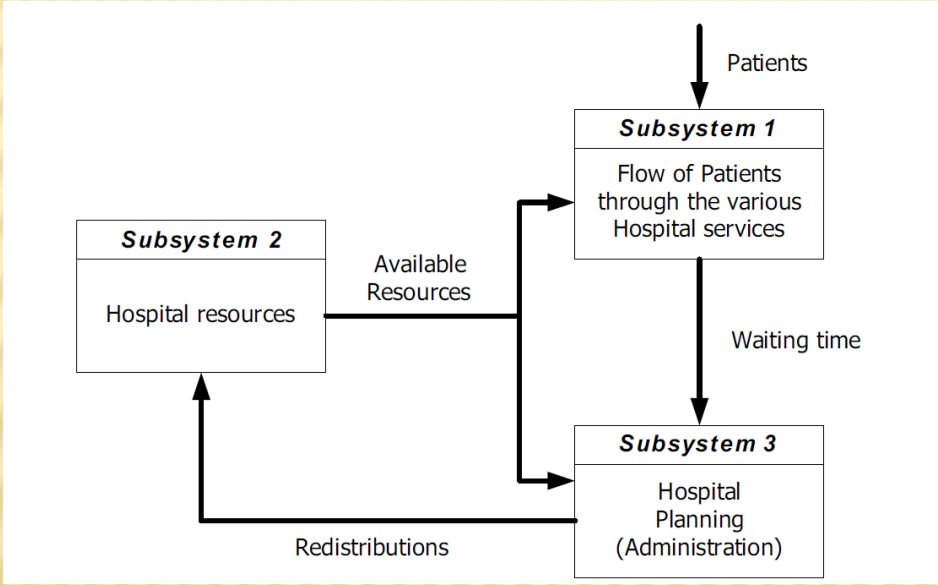
DefinitionAdd to FlashcardsSave to FavoritesSee Examples
Warehousing item that is unique because of some characteristic (such as brand, size, color, model) and must be stored and accounted for separate from other items. Every SKU is assigned a unique identification number (inventory or stock number) which is often the same as (or is tied to) the item's EAN or UPC.

Read more:
http://www.businessdictionary.com/definition/stock-keeping-unit-SKU.html#ixzz
http://www.youtube.com/watch?v=VyeBIYjTqtk
http://www.scdigest.com/assets/Experts/Tedford_09-01-08.php
http://de.cipherlab.com/default.asp?pageid=66
http://vanderlande.com/en/Warehouse-Automation/Products-and-Solutions/Orc
http://www.go4sight.com/industries/warehousing.html
http://www.inventoryops.com/order_picking.htm
http://en.wikipedia.org/wiki/Warehouse_management_system
http://help.sap.com/saphelp_470/helpdata/en/c6/f8386f4afa11d182b90000e829

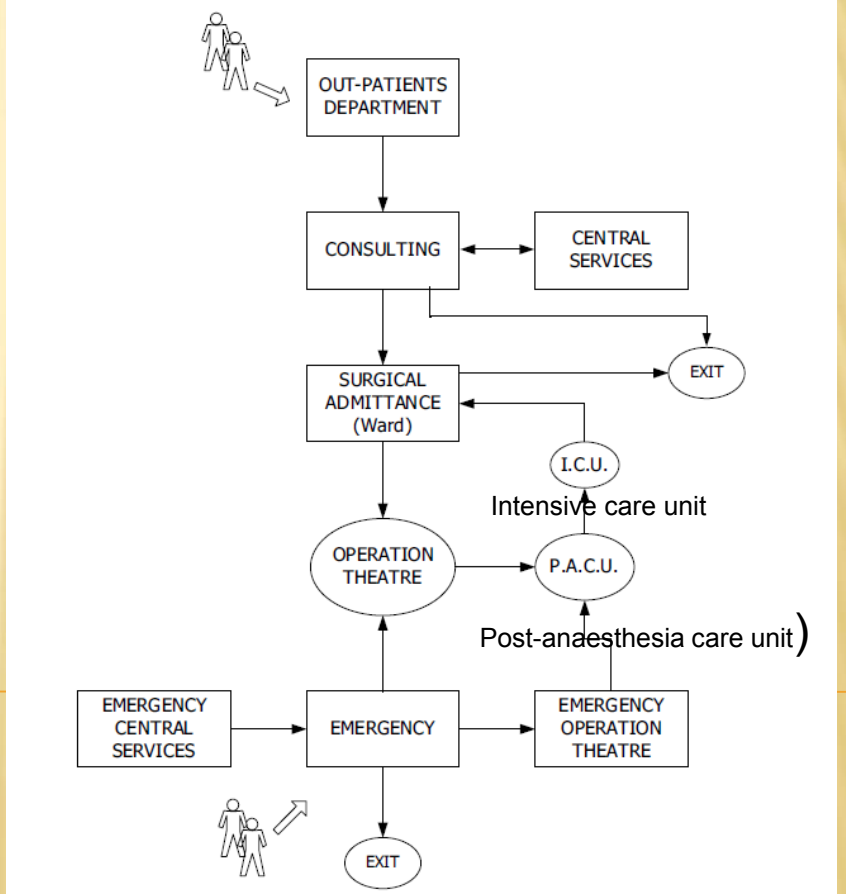
Link: http://www.trifactor.com/Material-Handling-Engineering-and-System-Design/Order-P

Studiu de caz 2. Managementul resurselor intr-un spital

Modelul conceptual- diagrama bloc a spitalului



Traseul pacientilor in spital



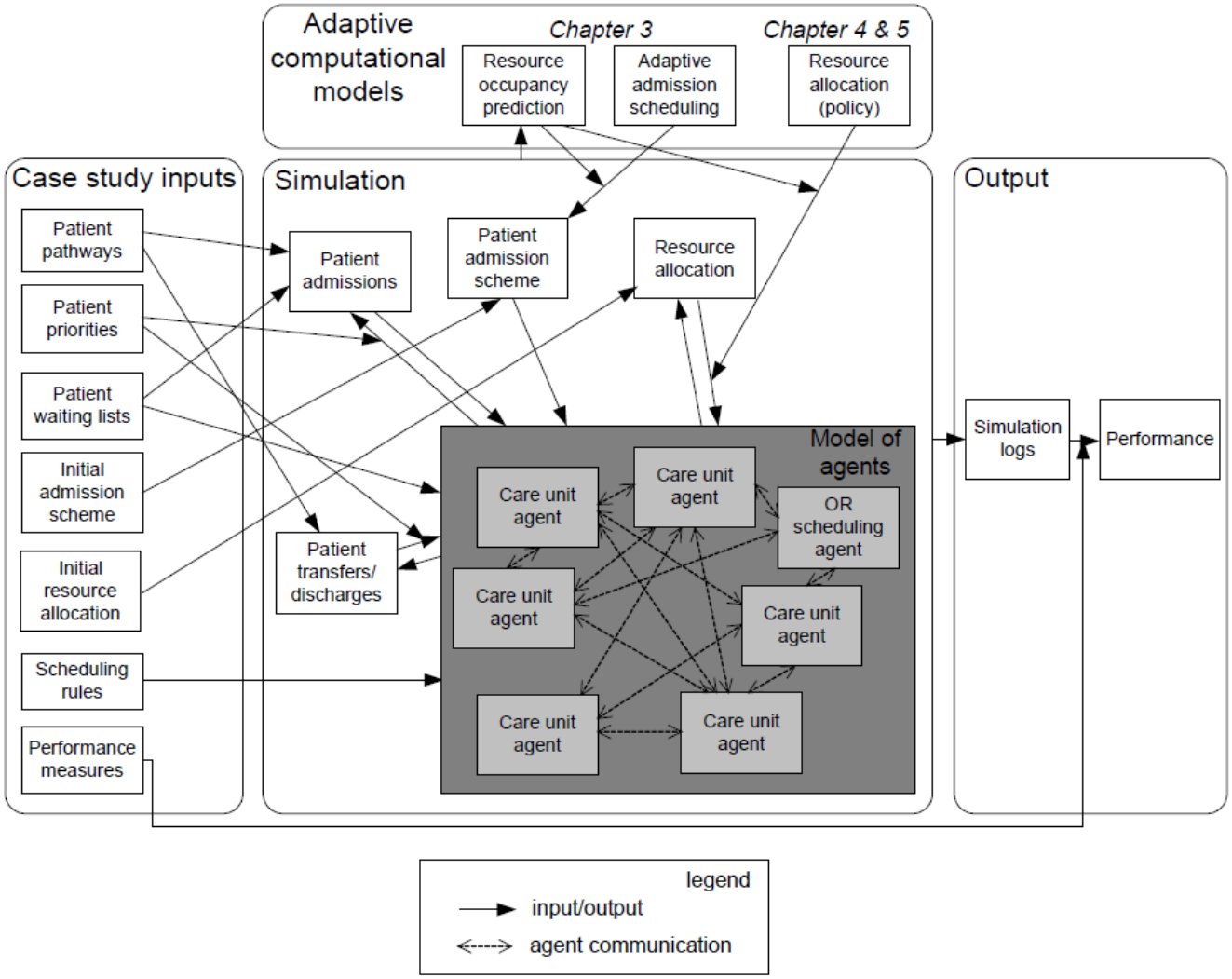
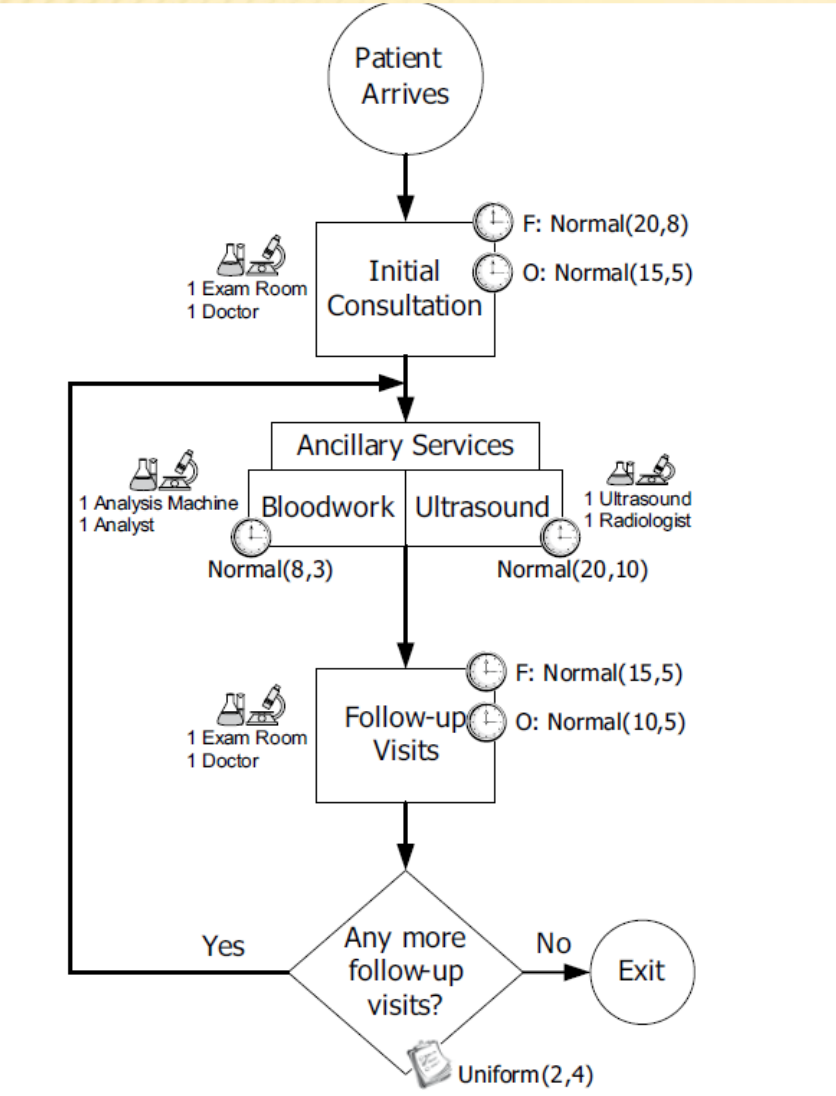


Figure 2.1: Overview of the agent-based simulation

Vizita la un departament de specialitate



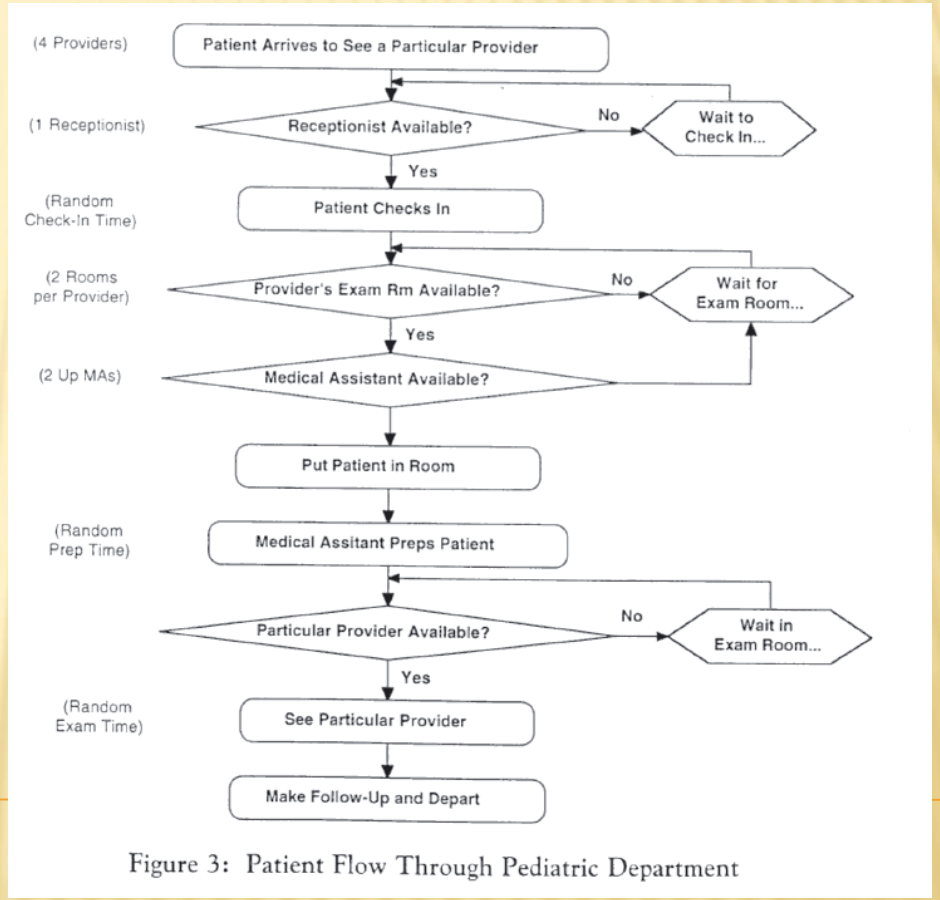


Figure 3: Patient Flow Through Pediatric Department

Exemple de studii de caz

- 3. Operatii logistice intr-un aeroport

Referinte bibliografice:

http://www.eurocontrol.int/articles/atm-procedures

http://www.eurocontrol.int/sites/default/files/content/documents/official-documents/skyway/2012-spring-skyway56-atm-guide.pdf

Studiul de caz 3 - OPERATII LOGISTICE INTR-UN AEROPORT

- Context: traficul aerian a crescut, in timp ce capacitatea multor aeroporturi a ramas aceeasi -> aceasta duce la congestii si la ridicarea costurilor in ce priveste controlul traficului

- In ciuda dezvoltarii tehnologiei de control aerian, procedurile de la sol si-au pastrat in mare parte caracteristica manuala (se realizeaza dupa procedee invechite), lucru care poate cauza intarzieri cand nu exista reguli concrete de coordonare si optimizare a operatiilor (astfel incat sa se previna operatiile redundante)
- Aeroportul este considerat un sistem cu o dinamica mare (de regula factori ca starea vremii influenteaza foarte mult orarul zborurilor)
- Orice intarziere se propaga, producand intarzieri cumulate pe lantul logistic.

ATM si TMA

- In contextul managementului de control al traficului (ATM), aria de gestiune a operatiilor la terminale (TMA- terminal movements area) este considerata un subsistem ce prezinta complexitatea cea mai mare de optimizare a task-urilor datorita:
- - dinamicii traiectoriilor libere din aer (airside conflict-free trajectories) si a
- -programarilor operatiilor raportate la infrastructura aeroportului (inchirierea pistelor de catre companiile de zbor, piste de utilitati(numite si 'taxi'-uri, figura slide 11), parcari, gate-uri) impreuna cu serviciile aferente de la sol (ground handling segment) – spatii inchiriate pentru magazine, cafenele, spatii de asteptare calatori, parcari taxi-uri, parcari autobuse sau alte servicii (ex. descarcarea bagajelor si transportul lor)

Concluzie – TMA este o sursa de "bottleneck" (gatuiri ale traficului) in ce priveste capacitatea de 'fluidificarea' traficului (airside si landside) si necesita imbunatatirea eficientei operationale in ce priveste controlul aerian si managementul operatiilor de la sol (ex. Pista e inchiriata pentru o perioada determinata de timp si e bine sa nu se produca intarzieri, pentru ca datorita lor cresc costurile prin prelungirea sederii la sol, astfel incat avionul trebuie rentabilizat sa 'stea cat mai mult in aer si cat mai putin la sol")

STRATEGII

- O prima strategie – imbunatatirea infrastructurii aeroportului (piste, locuri de parcare utilitati, noi terminale)
- Alte solutii stand-alone: radare aditionale, extinderi ale turnului de control. Dupa o evaluare s-a constatat ca redimensionand infrastructura si actualizand tehnologia nu s-a realizat o eficientizare reala: taxele au crescut dar propagarea intarzierilor pe lantul logistic s-a pastrat astfel incat *SQF (service quality factor)* nu s-a imbunatatit proportional cu cresterea acestor taxe pe aeroport.

Probleme:

- Problemele de congestie la sol raman aceleasi: cand creste traficul aerian, resursele la sol a aeroportului sunt supra-solicitate (ex. timp de lucru la limita in acord cu specificatiile tehnice ale utilitatilor).
- O alta problema este lipsa de colaborare intre diversi operatori de zbor, datorita competiei pe 'piata' traficului aerian -> http://www.euro-cdm.org/.
- Apar situatii de modificare a orei de plecare (prevazuta conform unui orar initial) -> influenteaza dinamica (si asa mare) in planificarea operatiilor aeroportului.

Aeroportul – sistem evolutionist

- Activitatile operationale ale aeroportului sunt integrate intr-un system evolutionist, dinamic care presupune mai degraba un management al schimbarilor periodice de strategie si nu doar unul de reactie la factorii care produc schimbarile.
- Capacitatea tehnologica ATM de la sol (groundside or landside) a ramas in urma celei din aer (airside), bazata pe practici invechite
- Pentru a defini proceduri operationale noi incepand de la nivelul de baza al activitatilor operationale, pentru a creste eficienta si rentabilitatea in contextul systemului studiat, este necesar sa fie inteles rolul entitatilor operationale, metodelor (politicilor) aeroportului si influenta propagarii unor decizii, de-a lungul lantului operational. Impartirea in subsisteme pentru a intelege rolul lor si infleunta lor in contextul sistemului analizat este esentiala.

Descriere subsisteme

- Secventa principala: descrierea variabilelor de decizie implicate in manevreme la sol din momentul aterizarii pana in momentul decolarii unui avion (activitati de tip TMA). Aceasta implica: - informatii de background despre mediul operational al aeroportului, parteneri principali si serviciile pe care le asigura, facilitatile de care dispune aeroportul si interactiunea tuturor acestor factori in contextul optimizarii globale de management operational a aeroportului.
- Operatorii principali, responsabili de deciziile primare sunt:
  - 1. companiile aeriene,
  - 2. segmentul de manipulare terestra,
  - 3. operatii in aeroport si
  - 4. operatorii de controlul al traficului (ATC – air traffic controllers).

  Primii doi operatori, in unele situatii sunt considerati ca un singur subsistem.
- Optimizarea capacitatii aeroportului = capacitatea utila raportata la maximizarea resurselor utilizate.
- Variabile: orarul zborurilor, tipul avionului, tara destinatie, informatii despre pasageri, capacitate terminal etc.

1. Companiile de zbor

- operatori de zbor – sunt responsabili de managementul si alocarea resurselor aeroportului, pentru zona inchiriata: standuri, porti (gates), check-in, birou revendicari bagaje pierdute, zona de securitate (verificare pasapoarte).
- Alocarea cu exactitate a portilor se realizeaza cu aproximativ 15 min inaintea sosirii la sol a aeronavei, cand se iau decizii cu privire la succesiunea operatiilor de aterizare (landing)

Obs: in aeroporturile mari, bine organizate, se cunoaste de regula aria unde se aloca poarta, dar nu si numarul portii-> cunoasterea cu exactitate se realizeaza de regula la operatorii mari)

Uneori pentru a compensa diferentele intre timpul de check-in si timpul de a pozitiona aeronava la gate, sau pentru sosiri, timpii de atragere a aeronavei la gate si disponibilitatea personalului/resurselor aeroportului – e necesar sa fie introdusi anumiti timpi de intarziere pe parcurs. Din aceasta cauza sistemul prezinta o dinamica mare (flexibilitate in timpi alocati pe operatii).

- Daca timpii de intarziere sunt mai mari de 15 minute, se considera o intarziere semnificativa care produce efecte nedorite. Astfel de regula aeronava este redirectionata spre puncte speciale de asteptare (remote points, contact points).

4. Controlorii de trafic (ATC – air trafic controllers) si 2. TMA

- Turnurile de control sunt pozitionate in zona segmentul de manipulare terestra (TMA- terminal movements area) in zona apropiata traiectoriei de zbor.
- Se iau deciziile cu privire la secventele de operatii logistice la sol
- Orice intarziere (ex. Starea vremii) poate sa influenteze drastic orarul zborurilor, sau se propaga pe lantul logistic, provocand intarzieri uneori cumulate.

3. Operatiile la sol si operatorii de zbor

- Servicii pasageri
  - Lounges and VIP services
  - Passenger assistance
  - Check-in, gate and transit
  - Ticketing
- Servicii aeronava
  - Baggage transportation
  - Aircraft loading and unloading
  - Ramp support
  - Pushback
  - De-icing
  - Operation control
  - Load planning
  - Supervision
  - Ground equipment maintenance

- Operatiile de optimizare vizeaza in special acest sector (de regula indica obtinerea unor scoruri KPI mici)

Airport Collaborative Decision Making

- Se lucreaza in prezent la optimizarea operatiilor pe baza conceptului de decizii colaborationale (CDAB) intre cele 4 categorii de operatori mentionate anterior.
- http://www.euro-cdm.org/
- Ca rezultat se obtin beneficii conform tabelului urmator:

Some benefits provided to ground handling operators are:

- Improved pushback productivity thanks to better use of staff and reduced inactive time due to inefficiencies (e.g. less time wasted by ground vehicles)
- Reduction of (indirect) operating costs as a result of a reduction in delays
- Knowledge of the precise status of arriving aircraft well in advance that will optimise the handling of flights

Some benefits provided to airline operators are:

- Pre-departure sequence can be optimised, better ground movement and more efficient take-off order, less idling on the ground.
- More capacity maintained during adverse conditions and the return to normal conditions can be faster. Both can result in major cost savings.
- Optimisation of gate utilisation and other ground resources. The effects of late incoming or departing flights and missed connections can be reduced.
- Greater predictability leads to greater use of staff resources since rosters can be organised to meet demand. As a result, crew management costs can be reduced.

Some benefits provided to the ATCs are:

- A collaborative pre-departure sequence enables ATCs to take user preferences into account.
- Accurate taxi times increase the accuracy of the calculations in which taxi times are used, improving predictability (benefit to all partners).
- Constant work load, preventing controllers from becoming fatigued due to work overload.

Some benefits provided to airport operations are:

- Reduced delays and hence greater predictability leads to a greater use of staff resources since rosters can be organised to meet demand. As a result, staff employment costs can be reduced.
- Better information related to the departure and arrival sequence can result in a significant improvement in the planning capability for further operations and also allows better quality information to be dispatched to relevant partners (e.g. passengers and handling agents).
- Having knowledge about the departure sequence should improve the allocation of stands and gates.

Modelul de turn-around

- Subiectul a fost abordat la unul din proiectele de logistica, prezentat

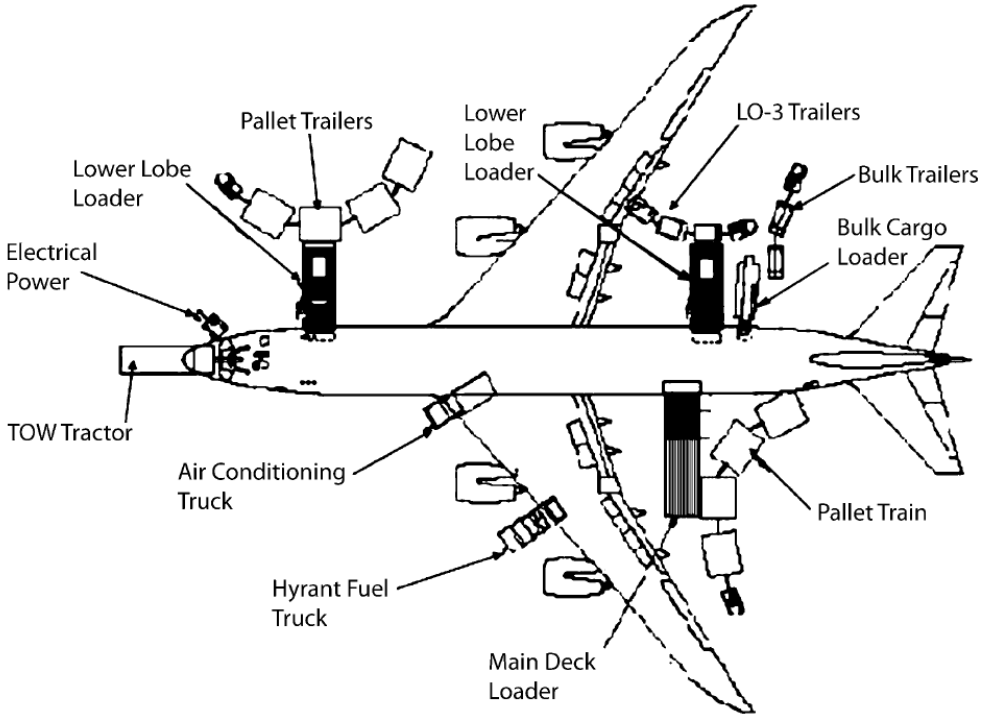
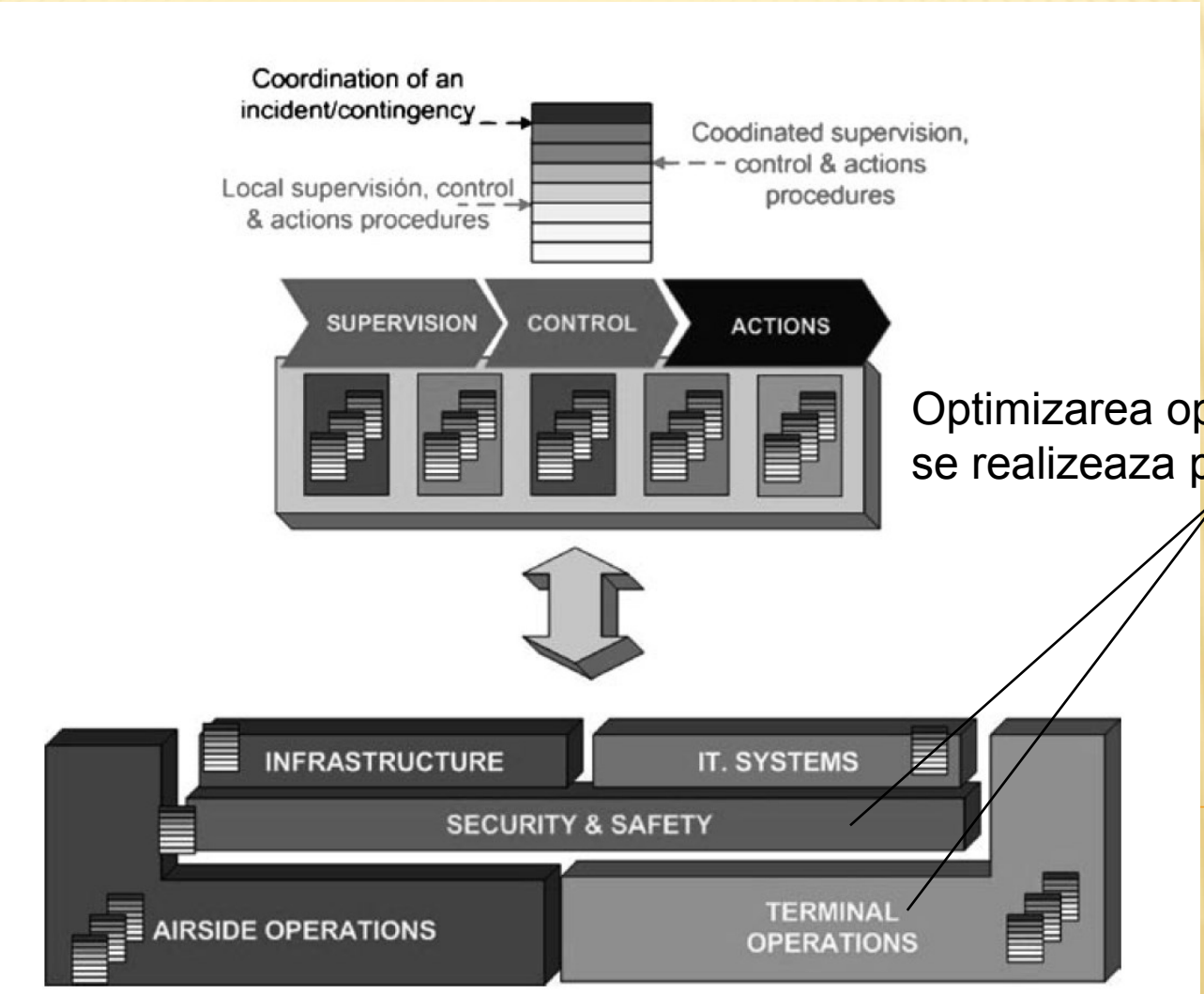


Fig. 12.3 Turn-around aircraft locations for ground handling

Model de management subsisteme in aeroport



Optimizarea operatiilor se realizeaza pe subsisteme

Subsistemele colaboreaza; unele taskuri se realizeaza/sunt planificate in paralel.

Exemplu de model de layout pentru un aeroport

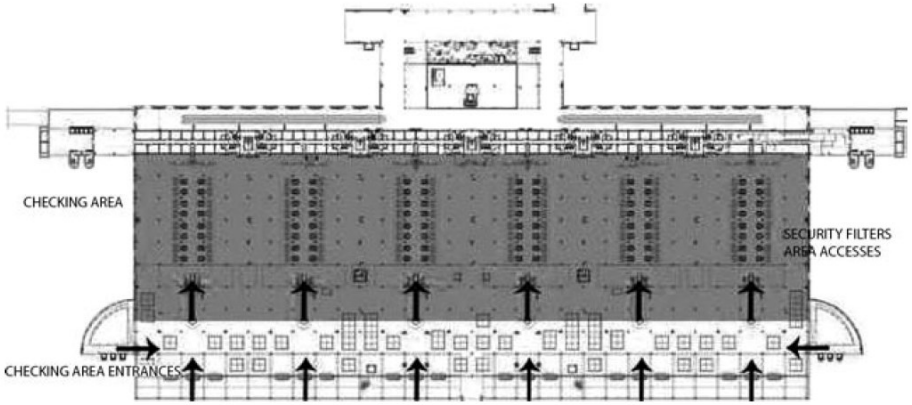


Fig. 12.6 Layout distribution of the check-in counters at Palma de Mallorca Airport

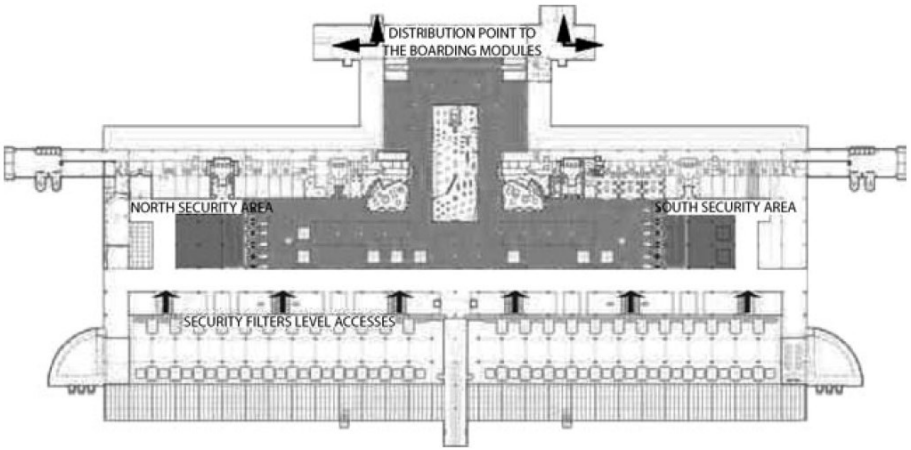


Fig. 12.7 Layout distribution of the security area at Palma de Mallorca Airport

Modelul de layout este optimizat
In conformitate cu spatiul si
Capacitatea aeroportului (a se vede
Video-clipul
Airport; Flexsim Simulation Model.mp