



Human or machine?
The advantages and disadvantages of automation

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Introduction: position of warehouses

Logistics costs as percentage of sales:

- 1987: 12%
- 2003: 6%

Market share of The Netherlands (2004):

- 22% of the European road transportation
- 50% of all American and Asian EDCs

Top 5 locations of DCs in Europe:

1. Belgium
2. France
3. The Netherlands
4. Czeck Republic
5. Poland

(Cushman&Wakefield Healey&Baker, 2006)

Proportion of logistics costs for warehousing:

- 37% in 1995
- 25% in 2005

Introduction: trends and goals

- Trends
 - More product variety
 - Fewer products per order
 - Faster response
 - Higher accuracy
- What is the biggest piece of the operating expenses in a typical warehouse?

Key questions

- Human or machine?
 - How much do you invest in equipment?
 - And how much will you spend on wages?
- Human or computer?
 - What is the current functionality of your WMS?
 - Which decisions must be made by your warehouse workers?
 - Can you improve efficiency by expanding your WMS?

Human or machine?

Are you going to the product?



Human or machine?

Or is the product coming to you?



Human or machine?

Or a little bit of both?



Human or machine?

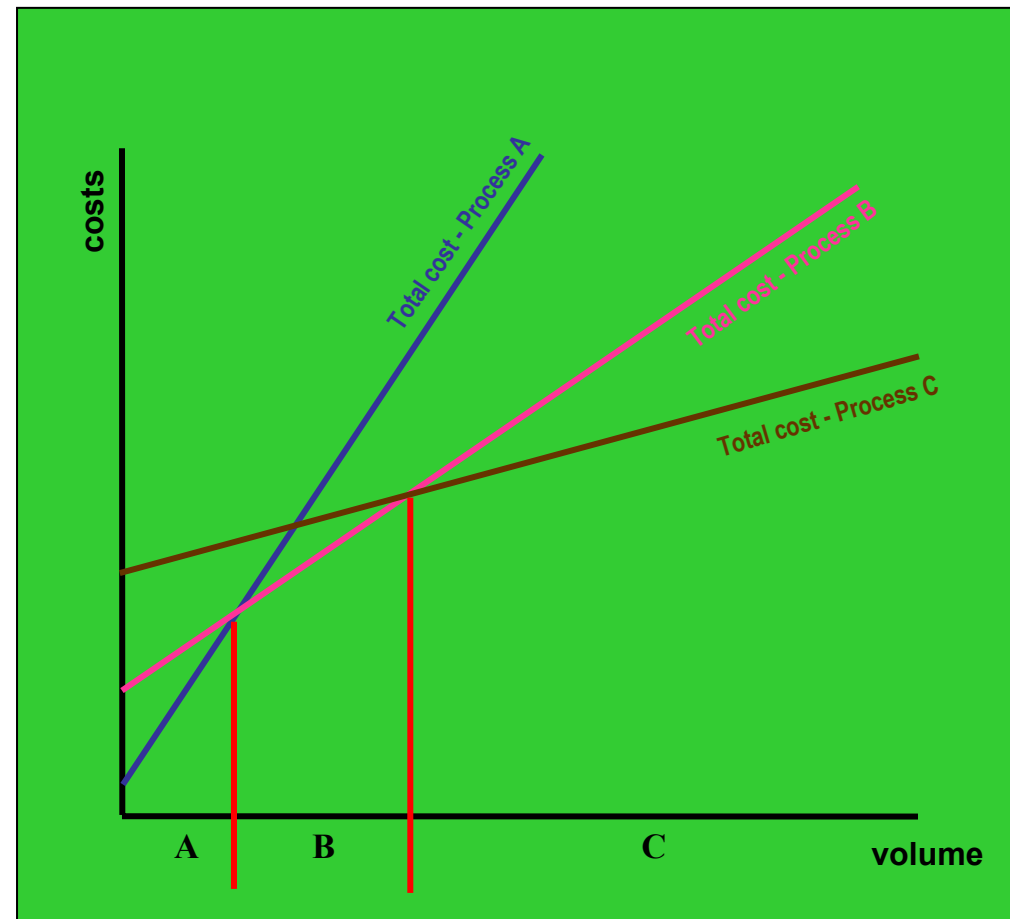
Financial considerations

- As for any investment you need to determine:
 - whether to make an investment
 - which investment option to take
 - expected (financial) outcomes
- Automation is **not a goal by itself**. It must support your corporate goals.

Human or machine?

Financial considerations

- Initial considerations
 - Costs
 - Savings
- Common financial tools
 - Payback period
 - Return on investment
 - Net present value
- Break-even analysis



Human or machine?

Other objectives

- Accuracy
- Throughput requirements
- Storage density
- **Employee welfare**
- Compatibility with the existing operation
-
- Although intangible benefits are difficult to quantify, there is no reason to value them at zero, . . . , zero is, after all, no less arbitrary than any other number."

Robert Kaplan

Human or machine?

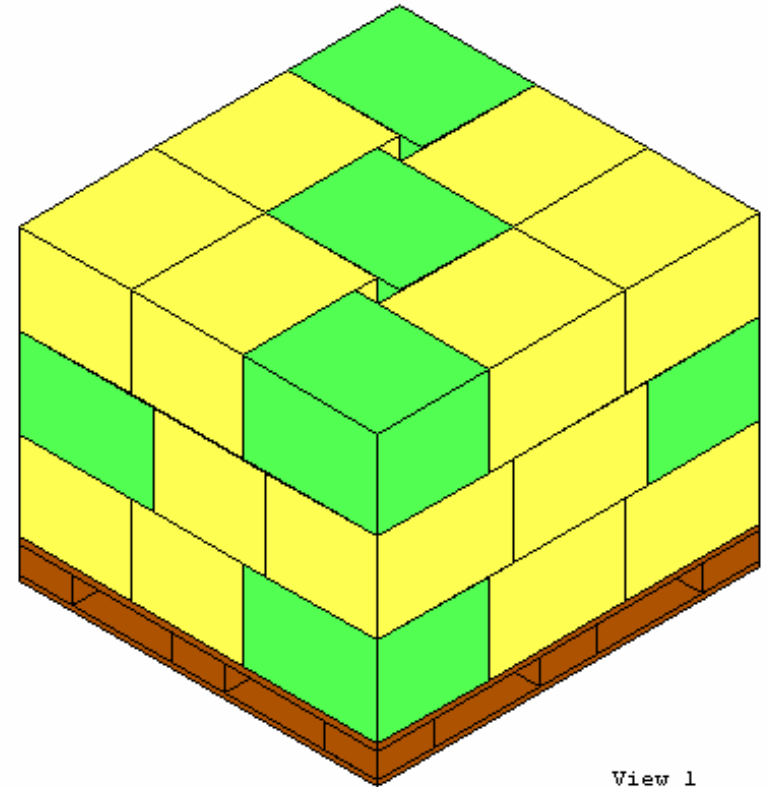
Important applications of automation

- Will technology eliminate the presence of people in the warehouse?
- Replace humans for
 - Heavy lifting,
 - Non-value-added movement of goods,
 - Repetitious jobs
 - Dangerous jobs,
 - Limited-access areas of the warehouse.

Human or machine?

Who can do this best?

- The flexibility and decision-making capabilities of a human are difficult to replace.
- For example pallet loading.
- Difficult:
 - Calculate a good positioning of boxes on pallet.
 - Handle boxes of different sizes.



View 1

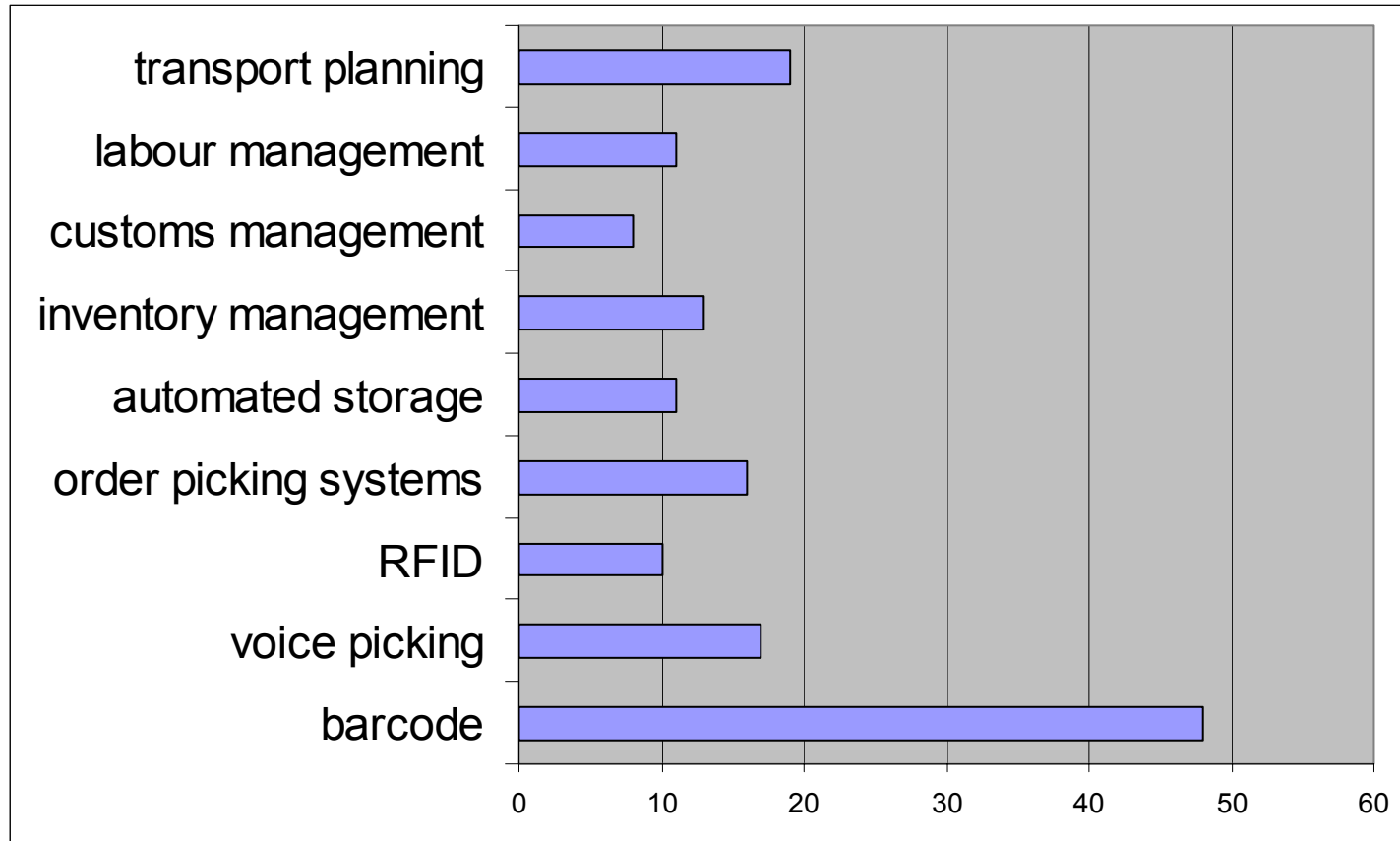
Human or machine?

Where can you save by automating?

1. Communication of locations to be visited (7% of time)
 - communication by RF terminal
 - Voice picking
2. Walking of order picker to collect items (50% of time)
 - Part-to-picker systems
3. Transportation of items to other areas (7%)
 - Automated transport systems (e.g. conveyors)
4. Orientation to find the right location (7%)
 - Pick-to-light systems
5. Avoiding errors (3%)
 - Scanning systems

Human or machine?

Future plans of companies



Source: logistiek.nl, 2008

Human or machine?

Consequences of the choices

- Do you need less-skilled workers after automating?
 - Computers can do the “thinking”.
 - Simple jobs remain such as picking orders or making boxes.
- **BUT....**
- The simple jobs will be minimized by the very technology that makes them simple.
- New jobs emerge.

Human or machine?

Consequences of the choices

- More technology means
 - A mixture of job skills is required.
 - Required level of expertise and technical skills will increase.
 - Especially computer skill requirements will grow.
 - Quality and education of the primary workforce must improve.
 - Temporary workers will no longer be as effective.

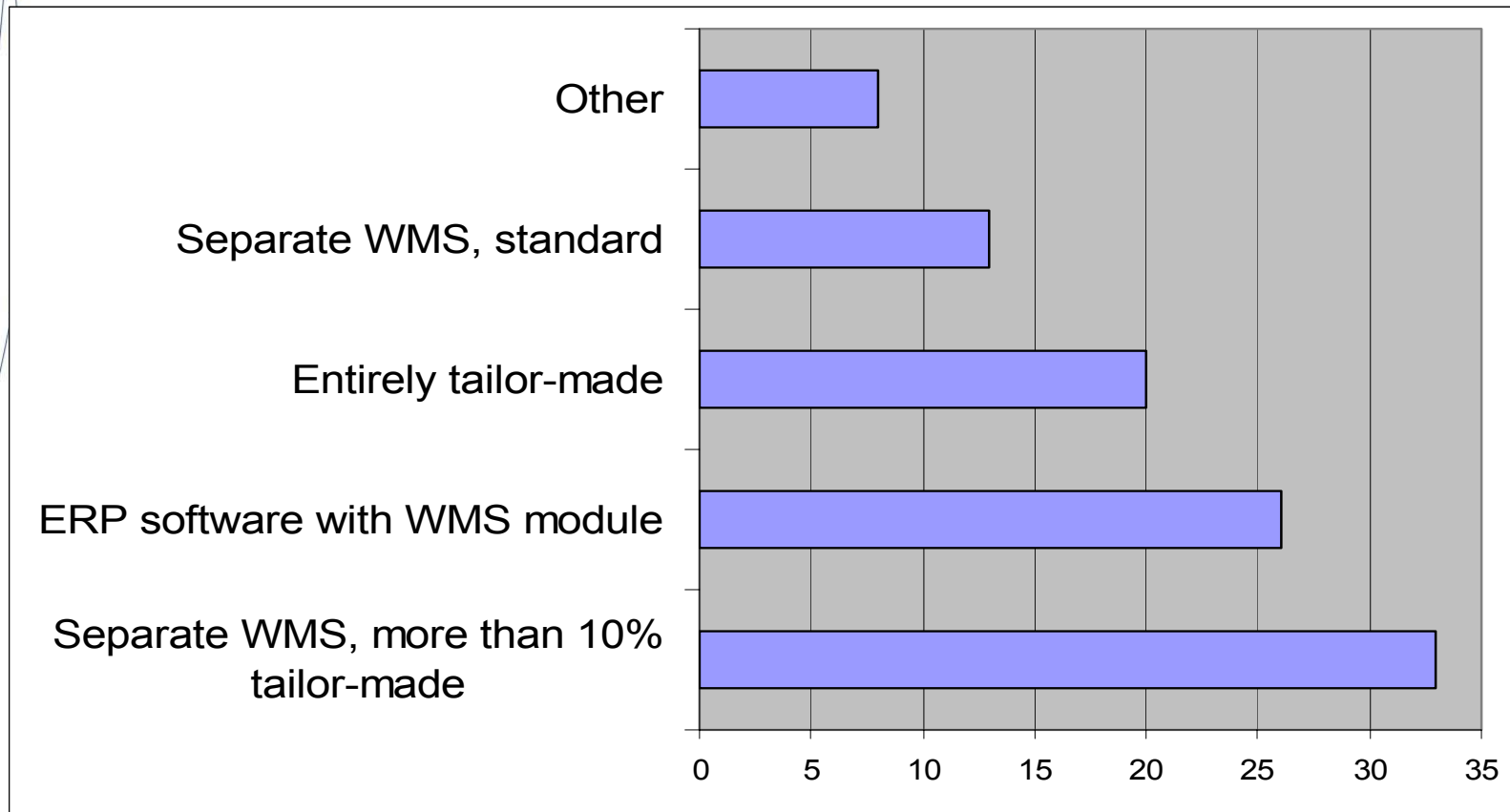
Human or machine?

Make a fair comparison

- It is difficult to compare automated and manual systems.
- Automation may sometimes seem to be more efficient, but what are you comparing it to?
- To consider automation properly, **you need a well-organized manual process as a benchmark**, not a badly organized one.
- Optimizing manual processes typically implies using **more advanced software**.
- What can your **WMS** do?

Human or computer?

- What is the current functionality of your WMS?



What companies are using.

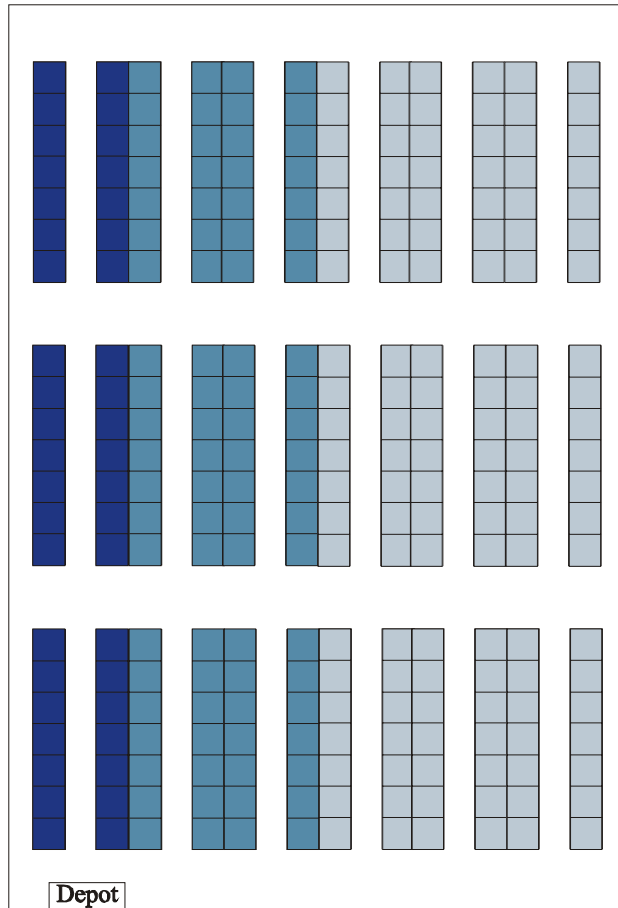
Source: logistiek.nl, 2008

Human or computer?

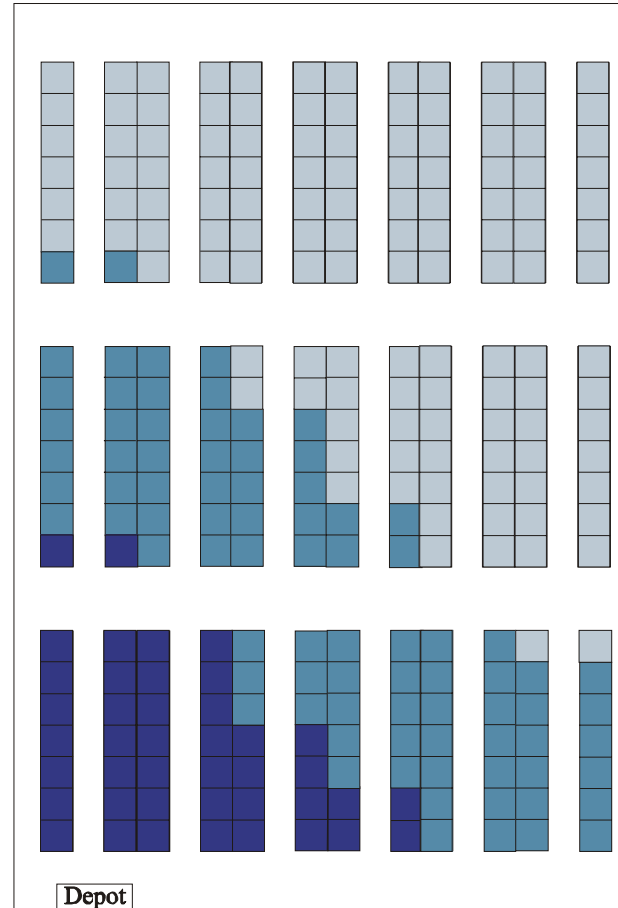
Improving control

- Storage assignment:
 - Assign incoming loads to storage locations.
 - ABC storage is often used.
- Zoning
 - The order picking area is divided into zones.
 - Each picker picks the part of the order that is in his zone.
- Batching
 - Combine several customer orders into one pick order
- Routing
 - Determine the sequence in which products are retrieved from storage

Human or computer? Improving storage



Within-aisle storage



Nearest-location storage

Is a machine efficient?

- AS/RS
 - Automated Storage and Retrieval System
 - Fully automated
- No humans interfering in the process.
- But ...



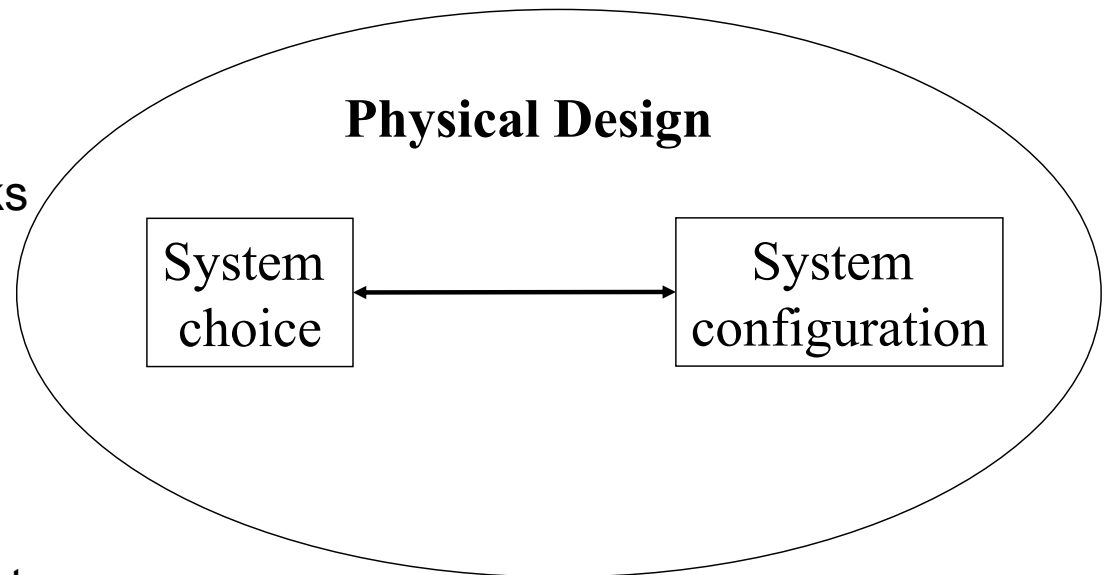
Is a machine efficient?

- If the WMS is not very smart, **your workers can partly compensate** for that.
- An automated system will **blindly** follow the instruction from the WMS.
- If the WMS is not very smart, then **your automated system will not perform well**.

Is a machine efficient?

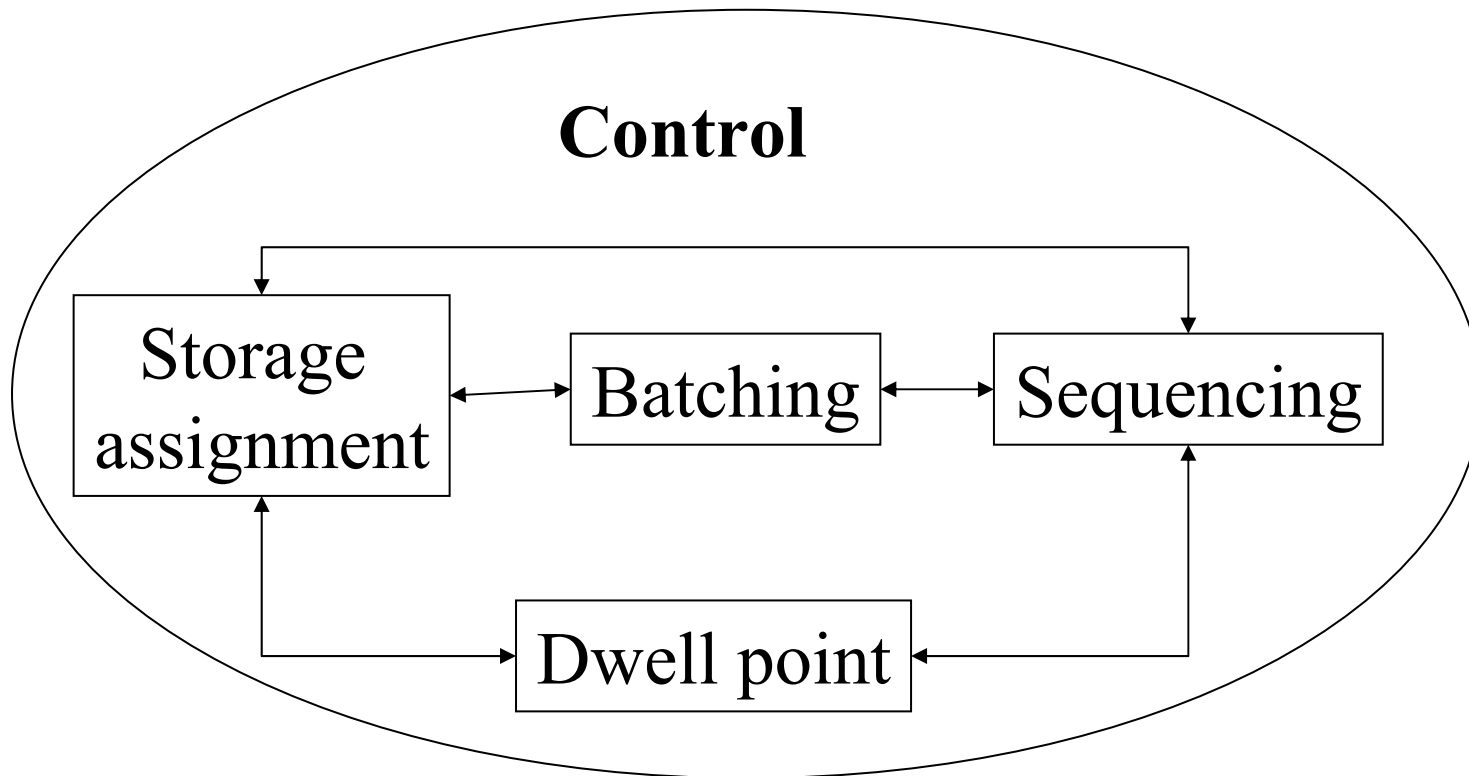
Physical design aspects

- Optimizing an AS/RS
 - Number of aisles
 - Height of the storage racks
 - Length of the aisles
 - Equally sized or modular storage locations
 - Number and location I/O-points
 - Buffer capacity at I/O-points
 - Number of cranes per aisle
 - Number of order pickers per aisle (if any)



Is a machine efficient?

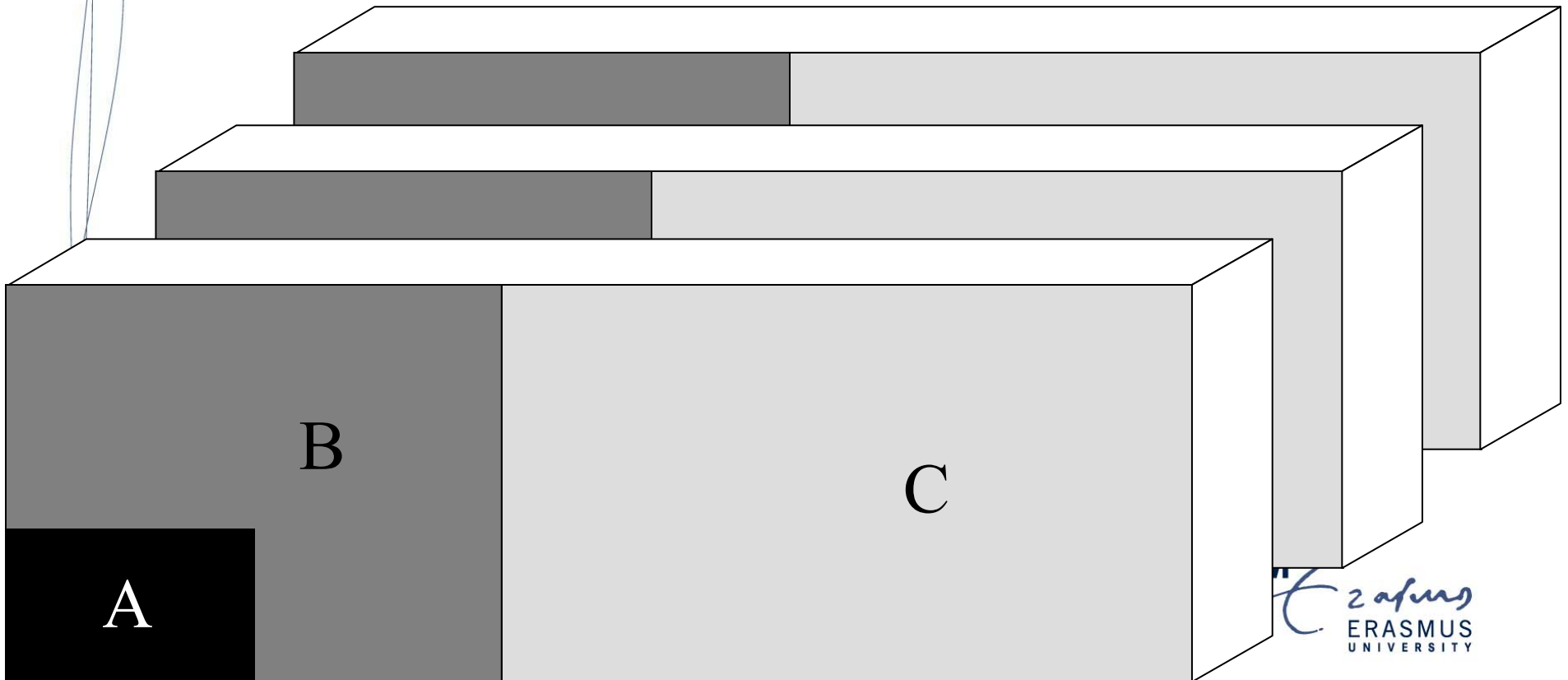
Improving AS/RS control



Is a machine efficient?

Improving storage

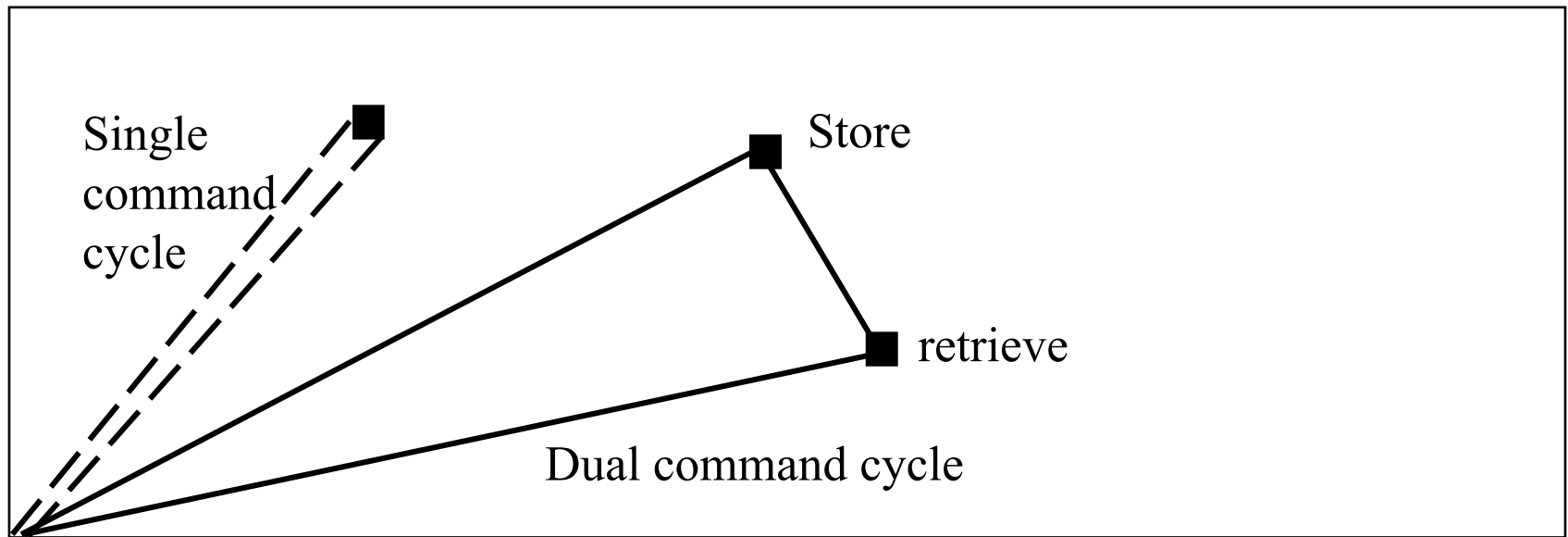
- Storage assignment method
- Number of storage classes
- Positioning of the storage classes



Is a machine efficient?

Improving job sequencing

- Sequencing restrictions (e.g., due dates)
- Type of operation (single or dual command)
- Scheduling approach (block or dynamic)
- Sequencing method



I/O point

Conclusions

- Check all criteria when deciding between manual work and automation. **Don't forget the intangible factors.**
- **Make a fair comparison.** Don't compare a perfectly tuned automated system to a badly organized manual system.
- Consider extensions to your WMS to achieve a really **efficient operation.**
- Web links:
 - www.roodbergen.com/warehouse
 - www.fbk.eur.nl/OZ/LOGISTICA