It’s just common sense, right? 
So why is it so uncommon?

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The theory of constraints (TOC)
- Originator: Dr. Eliyahu Goldratt (1947-2011)
- Origins in the hard sciences (physics)
- Aims to continually achieve more of the goal of a system

Five Focusing Steps (5FS)
1. IDENTIFY the system’s constraint(s)
2. Decide how to EXPLOIT the system’s constraint(s)
3. SUBORDINATE everything else to the above decisions.
4. ELEVATE the system’s constraints.
5. If the constraint has been broken, GO BACK to step 1
   A Process of Ongoing Improvement

Manufacturing
Step 1. **Identify** the system’s constraint

Step 2: **Decide** how to **Exploit** the Constraint

- Use constraint effectively
  - make the right products
  - most efficiently
So...
- Avoid wasting time on the constraint
- Make only what’s needed

Step 3: **Subordinate** everything else to those decisions

- Borrow workers from elsewhere
- Set up ‘off line’
- Make sure Cutting cuts only to customer demand
Step 4: **Elevate** the constraint

- No big investment – just some custom made racks!

Step 5: **Go back** to Step 1

- Do not let inertia become the system constraint!

**Second constraint**: sewing

And then ...

After
1. printing
2. sewing
   tackled the next constraints in turn:
3. inventory
4. marketing
5. cut planning
6. quality

**After applying 5FS at Expozay**

- Sales up 80% in 3 years
- Inventory down 13% in 8 mths
  - WIP down from 30k to 4k
- Operating expenses steady
- Quality, flexibility, responsiveness, and due date performance all improved
- Faster quotes for delivery dates

“Chaos was replaced by order”

Tony Alvos, Managing Director, Expozay International.
Key lessons from The Goal

A chain is only as strong as its weakest link!

Gould’s Fine Foods

• Situation:
  • Two product lines: Sausages and Hams
  • Shared production resources
  • Couldn’t meet demand
  • High unplanned overtime

Process Flowchart

1. Raw Materials
2. Mixing Ham
3. Filling
4. Cooking
5. Chilling
6. Pack and Despatch

Demands:
- Ham (1000 kg batch): 8
- Sausage (350 kg batch): 20
  (batches/wk)
How to set priorities?

- TOC Product Mix Heuristic

<table>
<thead>
<tr>
<th></th>
<th>Hams</th>
<th>Sausages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Profit</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Time on Constraint (Filler hrs/batch)</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Gross Profit per Constraint Hour</td>
<td>6/8 = 0.75</td>
<td>1</td>
</tr>
</tbody>
</table>

Goulds Fine Foods - Results

**Results**
- Improved productivity:
  - Throughput improved by 70%
  - Unplanned overtime slashed
- Allowed Goulds to supply the market demand and increase profits without extra staff or capital

**Research spinoffs**
Synergies between Linear Programming and TOC’s 5 Focusing Steps

Impacts of applying The Goal and 5FS
Evidence from the international literature

- Published papers and books up to late 1990’s
- 100 case studies, no failures reported
- Large measurable improvements from TOC
  - (better than from other methods)
  - eg 75% reduction in Lead time, 50% in Inventory!

Improvements using TOC (Medians)

- Revenue Increase: 39%
- Due Date Performance Improvement: 50%
- Throughput Increase: 65%
- Profitability Increase: 100%
- Lead Time Reduction: 75%
- Cycle Time Reduction: 66%
- Inventory Reduction: 50%
Impacts of applying The Goal and 5FS
Evidence from the international literature

• Observations:
  • Some BIG companies achieved BIG results
  • Having already used other methods
  • Worth sharing?!
  • Most applications used only part of TOC

TOC Thinking Processes
It’s Not Luck

• How to develop solutions
  • Via a change process ...

Key Questions to Guide Change ...
... and TOC Thinking Tools

1. Why change?
   - Goal Tree
   - Lists of Undesirable Effects

2. What to change?
   - Current Reality Tree
   - Evaporating Cloud

3. What to change to?
   - Evaporating Cloud
   - Future Reality Tree
   - Negative Branch Reservation

4. How to cause the change?
   - Prerequisite Tree/ IO Map
   - Transition Tree
   - Strategy & Tactics Tree

5. How to sustain the change?
   - Using the right measures;
     Repeat?

Simplicity in complexity

"The whole is greater than the sum of its parts"
**Some Local Applications of the Thinking Processes**

- Banking
  - "TOC provided framework and tool kit to help manage and lead a major bank merger, harnessing resistance to change" Steve Forgeson, Area Manager, Westpac
- Manufacturing:
  - "Led to fundamental shift in the way we think, unlocked potential we never realised we had." Lawrie Evans, Managing Director, Astra Print
- Milk products (Fonterra)
- Regulatory issues: electricity, telecoms, education
- Resource management: water, biofuels
- Health: Hospitals, elder care, smoking, ...
- Distribution networks
- Projects

**Water**

- the case of Kāpiti district

  - Finding a solution using TOC’s Evaporating Cloud

**Healthcare**

- hospital

  **Individual Evaporating Clouds**

**Combined Evaporating Cloud**

- The hospital must provide best treatment outcomes for patients.
- The hospital must operate within its resources.
- Management must achieve results.

**What to change?**

- core conflict

  - The hospital must provide best treatment outcomes for patients.
  - The hospital must operate within its resources.
  - Doctors must decide how resources are allocated.
  - MANAGEMENT must allocate all resources.
Back in the hospital pharmacy

Problem symptoms:
• Long **waiting times** for patients in cancer centre
• Fluctuating workload
  • Idle time and **overtime**
• Increasing **stress levels** for staff

Dr writes prescription
If OK – Dr confirms prescription
Pharmacy makes drugs
Deliver to Patient

Problematic situation

What to change to? **Pilot solution**

Dr writes prescription
Pharmacy makes drugs immediately
Check blood test results
Deliver to Patient

Nurse workload↓
Minimal wait times
Short queue

Impact on Waiting Times

Average Overall Patient Waiting Times Pre and Post Project

129 mins

20 mins

Pre Project (n = 62)
Post Project (n = 14)
Impact on Staff Overtime

![Staff Overtime Chart]

Impact on Wastage Cost (% Total Expenditure)

![Wastage Cost Chart]

What to change to? Win-win solution

![Flowchart Diagram]

Education

- TOC for Education – worldwide movement
- At Victoria:
  - Setting up ‘Assurance of Learning’ processes
  - Designing and implementing new policies/operations
  - Regulatory issues: tuition fees/institutional funding
  - Strategic issues: inter-school organisational structure
  - Improving student research thesis completion
  - Improving teaching and learning experiences
**An Academic’s Dilemma?**

- Publish good articles
- Spend more time on research
- Spend more time on teaching
- Have a satisfying teaching experience

**Key Questions:**
- How can we spend more time on teaching AND publish good articles?
- How can we spend more time on research AND have a satisfying teaching experience?

**Goldratt’s tenets**

"I smile and start to count on my fingers:

1. people are good
2. every conflict can be removed
3. every situation, no matter how complex it initially looks, is exceedingly simple
4. every situation can be substantially improved; even the sky is not the limit
5. every person can reach a full life
6. there is always a win-win solution

Shall I continue to count?"


**Further Reading**

- Dettmer, The Logical Thinking Process
- Scheinkopf, Thinking for a change
- Khaw Choon Ean, Thinking Smart
- Ronen, Focused operations management for ... health services organizations, Jossey Bass (2006)
- Papers on cases referred to in this talk available on request.