

# Using a simplified version of Theory of Constraints to achieve **MORE WITH LESS IN LESS TIME** within the Public Sector: A Case Study from Africa

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## **ABSTRACT**

Over the past 25 years, Theory of Constraints (TOC) has helped thousands of ‘for-profit organisations’ to achieve profitable growth. However, despite TOC’s universality to identify and unlock inherent potential within any goal orientated system, few ‘not-for-profit organisations’ (NFP) have attempted to apply TOC due to a perception that it is probably too complex or sophisticated for their organisation and / or that since many of these NFP organisations do not have clear goal statements such as ‘Make more money now as well as in the future’, TOC will probably not work for them. This case study, presented by the Author Alan Barnard, showed that a new simplified TOC analysis, consensus building and implementation approach (developed as part of the Author’s PhD) can help achieve the very ambitious target of ‘Doing MORE with LESS in LESS TIME’ even in non-profit organisations. In this presentation, the Author will share his new, simplified win-win approach based on Theory of Constraints Five Focusing Steps and Thinking Processes that have been proven to help identify and unlock inherent potential not only in NFP organisations but also “for-profit” (FP) organisations as well as individuals.

## **BACKGROUND**

In January 2007, a partnership was formed between Goldratt Research Labs and InWENT (Capacity Building International, Germany) with an objective to test whether a simplified and collaborative 5 day TOC analysis & planning process, developed by the author as part of his PhD thesis, can be used to help cities close the growing gap between demand and supply of services. The initial pilot sites involved improving “Solid Waste Management” (SWM) systems in selected cities from Zambia (Lusaka & Kitwe) and Nigeria ((Ibadan & Kano) that applied for assistance from InWENT’s “Sustainable Cities Programme”. Rather than following a traditional SWM capacity building process, InWent decided to test with these cities the new five day “Constraint Analysis Strategy workshop” with representatives of all the SWM system stakeholders such as national and local government, public and private service providers, the community and academic institutions.

The objective of these 5 day workshops was to enable all participants to work together to firstly develop a common understanding around the cause-effect relationships between the various challenges faced by each of the stakeholders in dealing with the causes and consequences of the large and growing gap between the amount of waste created and collected on a daily basis. And secondly, to agree on which necessary and sufficient changes will be required to overcome capacity and policy constraints to focus their limited resources on those areas that will have the biggest impact on closing this GAP now and in the future.

Prior to the start of this initiative, the Author and his co-facilitator, Professor Antoine van Gelder (Head of Internal Medicine at University of Pretoria and a pioneer in applying TOC in the public sector) were warned that normally there is quite a high level of distrust among the groups that will be represented. Additionally, similar “capacity building workshops” have traditionally struggled to get active participation, frequently suffering from quite high drop-out rates within the first few days. They were also warned that such a goal setting and constraint analysis process would never work because:

- The Public Sector organizations do not have clear goals, have many constraints (not just one) and many stakeholders with conflicting objectives and generally have low management competency.
- Apathy, Finger Pointing and internal “politics” is endemic

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- There is a low tolerance for the application of “Business Methods” to the Public Sector...especially for something that is called “THEORY of CONSTRAINTS”

**THE BASIS FOR A NEW APPROACH TO CLOSING DEMAND VS. SUPPLY GAPS**

Traditionally, capacity (lack of budget) and or capability constraints are blamed for the growing gap between demand for services and current service levels in developing countries. However, the main hypothesis in the Author’s PhD research is that a significant part of the gap is caused not by lack of capacity or capability – but rather from erroneous assumptions of key stakeholders that block these cities from better exploiting the limited capacity, cash or capability they have or as Peter Drucker said “*The bottleneck is always at the TOP of the bottle.*” This hypothesis claims that it is our own beliefs and assumptions that either limit or enable us to see and unlock inherent potential within ourselves, our organisations or even our cities. These beliefs and assumptions are called “paradigms”; and paradigms are the “filters” through which we view reality or the “rules” we use to make decisions every day. The Author also claims that there are five challenges organisations and individuals face which can “lock-in” potential if you try to deal with them in the traditional way. The systems approach as propounded by TOC deals with these challenges very differently. Different in a way that helps us to SEE and UNLOCK the inherent potential which in turn enables organisations and individuals to achieve more.

**Table 1: Limiting vs. Enabling Paradigms**

Challenges	Limiting Paradigms	Enabling TOC Paradigm
1. Constraints	Most “constraints” are “Out-of-my Control” – blame them for GAPS and focus on “in-my-control” stuff	Most “constraints” are “In-my-Control or Influence” – find ways to EXPLOIT or ELEVATE
2. Complexity	Complexity is inherent - Simplify it by breaking up into simpler parts and optimize each part	Assume Inherent Simplicity. Find it and focus all efforts on finding and capitalizing on it
3. Conflicts	For me to WIN, you must LOSE. Find compromises or even win-lose solutions	Win-win is ALWAYS possible, just look for it
4. Uncertainty	Assume inherent Certainty - Look for “Formulas” to calculate Optima	Find “Good Enough” and use Feedback to Improve and Sustain
5. Bad Behaviour	Some people are just inherently BAD – get rid of bad people	People are inherently GOOD – get rid of Bad Assumptions

The Author’s research looked at how to capitalize on these insights by developing a simplified process which combines the power of TOC’s five focusing steps with the power of the TOC Thinking Processes to enable an individual or group to discover how to do more with less, in less time...whatever their goal units might be. The pilot workshops used a new simplified TOC process the Author developed which follows five questions related to any change, each answered on a different day during the analysis.

Day 1 is focused on firstly sharing the limiting vs. enabling paradigms with stakeholders and allowing them to internalize these through sharing stories related to these from their own experiences. Then TOC’s 5 focusing steps is introduced to help stakeholders differentiate between the many parts of any system that can be improved, from the few that must be improved (the system constraints or weakest links) to achieve more goal units for the system.

TOC’s five focusing steps involve identifying the system constraint(s), defining how better to exploit (rather than waste) the system constraint, subordinating everything to this decision (i.e. change any policy, measurement or behaviour that is in conflict with the exploitation requirements), then (if the capacity is still less than demand) to elevate the system constraint and finally (since through elevation the constraint has probably moved) to go back to step 1 to achieve a process of ongoing improvement.. The new analysis process is then introduced with examples to participants (see Figure 1) and then the rest of

the 5 days is spent on following the process to answer each of the 5 change questions: Why Change, What to Change, What to Change to, How to cause the change and how to measure change and continuously improve the system.

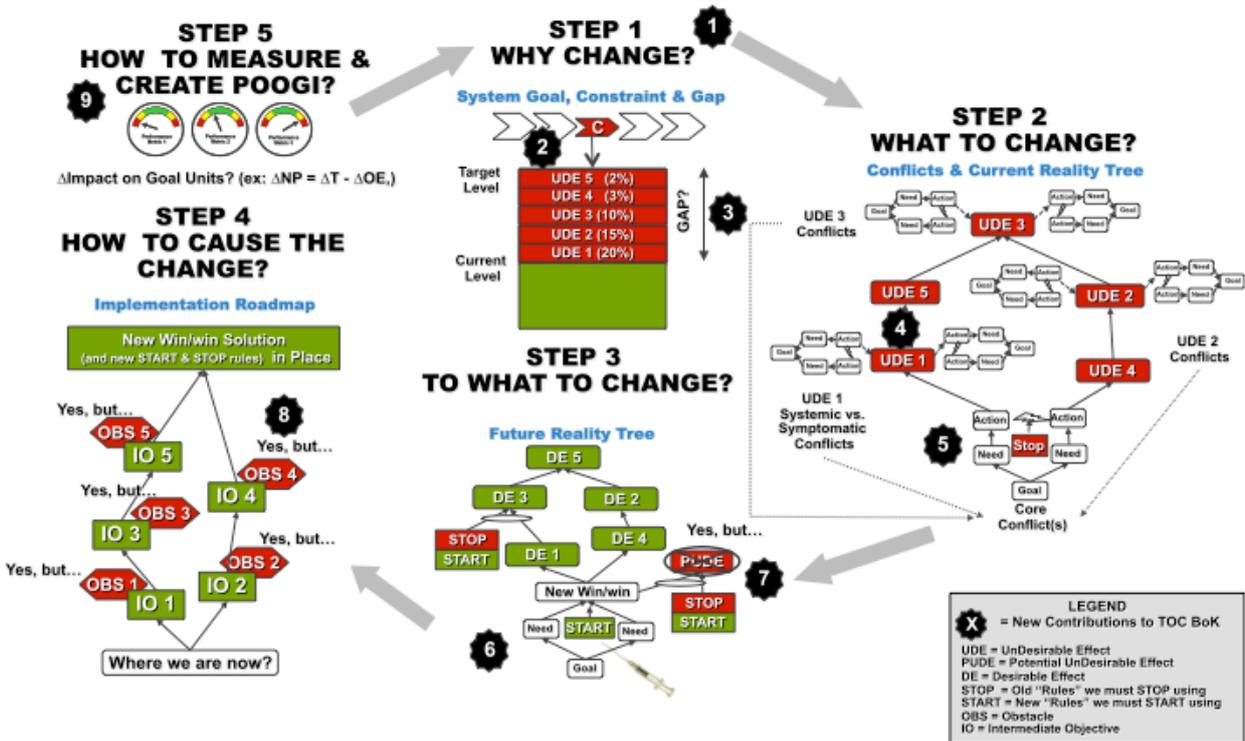


Figure 1: The new Five Step Constraint Analysis Process

The rest of this paper provides details of how the new process helped stakeholders in the first pilot in Lusaka, Zambia, answer each of the 5 questions related to improving their City’s Solid Waste Management System.

**STEP 1 - AGREEMENT ON WHY CHANGE?**

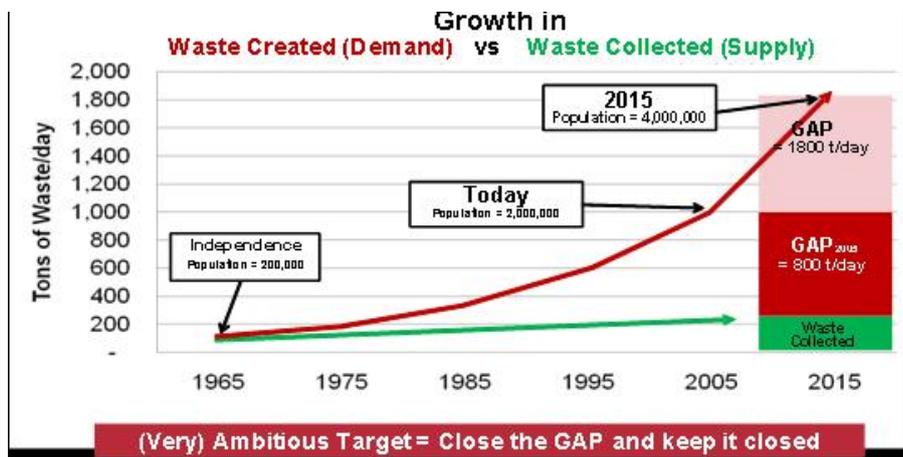


Figure 2: Growing Gap between Wasted created and Waste Collected

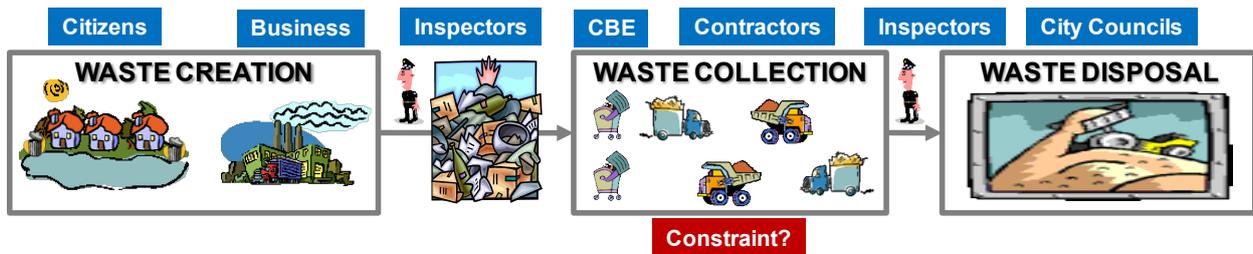
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The agreement on why change was brought about on looking at the current gap. The GAP between DEMAND and SUPPLY in city infrastructure is not only very large but growing at an alarming rate.

To directly reach the core problem, the Author argues rather than looking at all the Undesirable Effects (UDEs), it is important to understand the UDEs relating to the constraint. There are two kinds of UDEs related to the performance of any system:

1. A statement of a GAP in system performance in a primary measurement (Type 1) and
2. A statement of the difficulties to close the GAP (Type 2)

The analysis process therefore starts with mapping the “system” and getting agreement on the “system constraint” – the place where typically all the queues are building up. Since everyone knew that the “queues of waste” was building up just before “waste collection”, it was agreed that “waste collection” would be identified as the system constraint.



**Figure 3: The Solid Waste Management System in Lusaka**

The next step was therefore to identify what the gap was in fully exploiting the constraint capacity (type 1 UDE) and what makes it so difficult to close this gap (type 2 UDE).

Figure 2 showed that typically only 200 to 300 tons of the 1000 tons of waste created everyday was collected. Initial estimates showed that “waste collection” probably had at least 600 tons per day capacity if the trucks were properly scheduled and maintained. The current gap can be closed in two ways. Either by increasing the waste collected or by reducing the waste created. So what reasons (type 2 UDEs) did participants give that made it so difficult to better exploit the limited capacity of collection or to reduce the amount of waste created?

Table 2 shows a listing of the UDEs shared by stakeholders in the Lusaka workshop as well as the perceived “root causes” and the traditional solution that unfortunately have not resulted in any major improvement in the growing gap of waste created vs. waste collected.

**Table 2: The UDEs that make reducing Waste Created or Increasing Waste collected so difficult**

Problems (UDEs)	Root Cause	Traditional Solution
Government Departments lack budget	Lack of Awareness	Awareness Campaigns
Residents do not want to pay		
Service is too expensive		
People dump / burn illegally	Poor / No enforcement	Stricter enforcement of by-laws
No waste bins available		
Frequent equipment break down	No Equipments or Old Equipments	Get external funding to buy / build necessary infrastructure
Can not access all areas		
No service in some areas	Low / No Subscription Rate	More awareness campaigns
Actual Collection = 200 to 300 Tons per day		

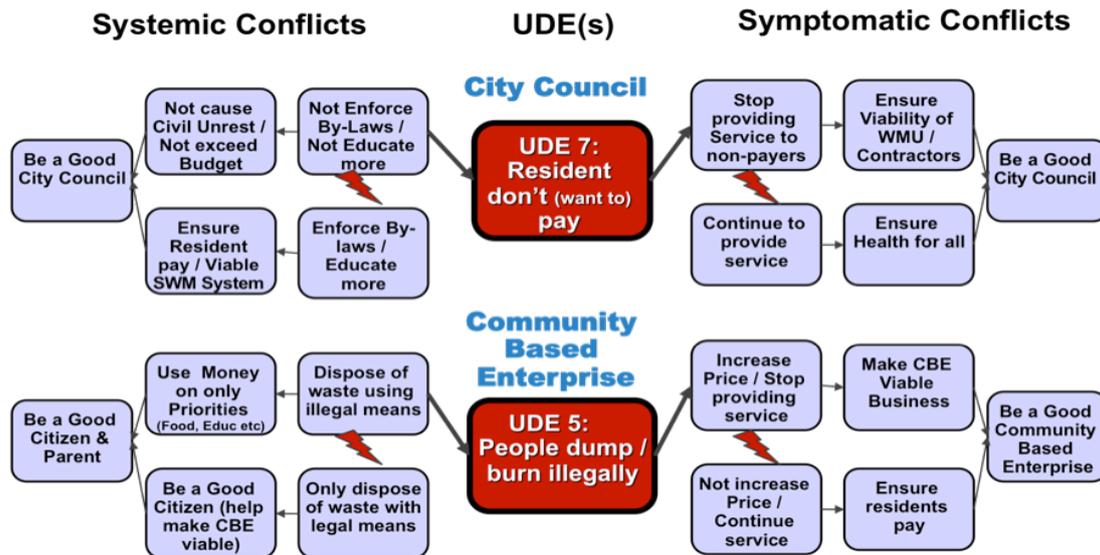
**STEP 2 – AGREEMENT ON WHAT TO CHANGE?**

A “problem” exists whenever there is a GAP or difficulty to close the GAP. The Author argues that the fact that the problem still exists means that:

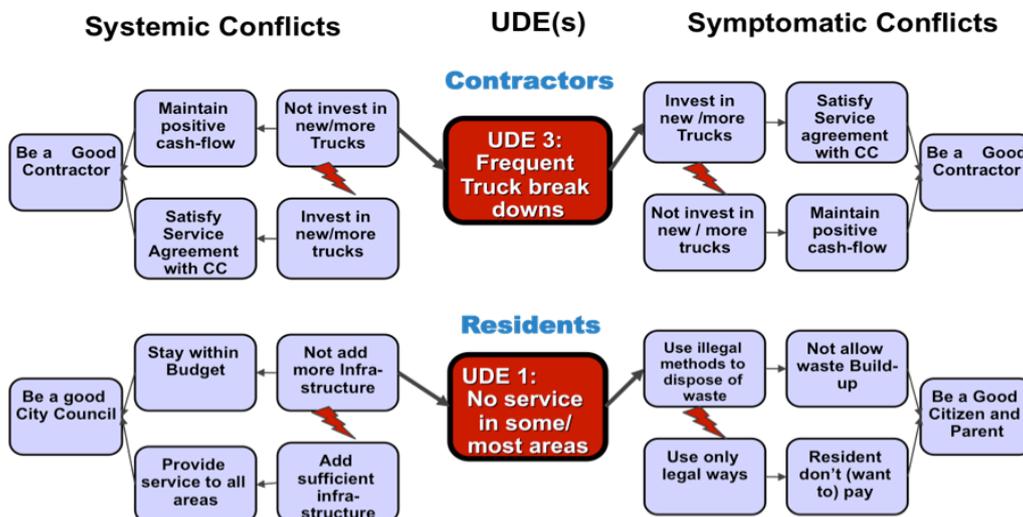
- The Action causing the problem DID happen – that is, it is part of an unresolved conflict
- The Action needed to deal with the problem DID NOT yet happen – that is, it is part of unresolved conflict

Therefore, in the Author’s view, defining a problem precisely must start with understanding both the conflict that blocks us from “Solving / Preventing” the problem (SYSTEMIC or PLANNING Conflict) and the conflict that blocks us from “Dealing better with” the problem (SYMPTOMATIC or EXECUTION Conflict).

Figure 4a and 4b shows the systemic and symptomatic conflicts identified for the major stakeholder UDEs



**Figure 4a: Unresolved Systemic & Symptomatic Conflicts for City Council and Community**



**Figure 4b: Unresolved Systemic & Symptomatic Conflicts for Contractors and Residents**

These conflicts provide insights on the second question of change - What to change:

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1. Enforcement conflict: Enforce or Do not Enforce ➔ The conflict and related UDEs will exist as long as Enforcement Agencies do not have fair and enforceable by-laws.
2. Service Provider Conflict: Invest or Not invest in facilities ➔ The conflict and related UDEs will exist as long as service providers don't know when and where to invest (to ensure the service provide a positive ROI).
3. Pricing Conflict: Price on Provider Value or Price on Customer Value ➔ The conflict and related UDEs will exist as long as the Regulatory authorities price based on the supplier's perception of value (cost + fair margin) rather than on customer's perception of value and affordability.
4. Payment Conflict: To pay or not to pay ➔ The conflict and related UDEs will exist as long as those citizens who can pay do, don't and as long as those who cannot, is pressured to pay in cash rather than in kind (e.g. helping to separate waste etc).

**STEP 3 – AGREEMENT ON WHAT TO CHANGE TO?**

In the third step in the analysis, the groups work on the conflicts and invalidated assumptions to arrive at a breakthrough and win-win solution.

**Table 3: Illustrative example to break Enforcement Conflict by challenging limiting assumptions**

Arrow	Assumption	Injection	How to...	Benefit
M1 – D'B	Current Capacity insufficient to meet current demand	Current capacity sufficient to meet demand	Ensure we do not commit to supply more than our capacity to deliver Know Demand and compare against total capacity in region (before investing)	Meet demand at minimum cost and risk
M2 - DC	If you spend more you increase cost and risk of business	We have a way to Invest more and not increase cost & risk	We approach Business man to help prepare business plan to get low interest loan from bank	Meet demand at minimum cost and risk
M3 - DD'	Both cannot be done at the same time	We agree when to invest and when not to and also where to invest	Use backlog as early warning indicator. If backlog starts growing, we know when to invest and invest only in "Bottleneck" resources	Meet demand at minimum cost and risk
M4 - E	Only way to increase capacity is through investment	Find way to increase capacity without increase cost	Use TOC to help better utilize capacity we have before getting more (exploit before elevate)	Meet demand at minimum cost and risk

**STEP 4 – AGREEMENT ON HOW TO CAUSE THE CHANGE?**

The next task is to construct a roadmap showing the sequence in which each of the new breakthrough "solutions" contributed by the various stakeholders had to be implemented. The Future Reality Tree logically shows that once the injections are implemented, desired outcome will be accomplished easily. However, implementing the injections is not a trivial task, as it is a departure from current practice. Thus, it was necessary to break the implementation of the injections into smaller increments (answering "how to") and also then to encourage all participants to contribute possible negative consequences (predicted undesirable effects) of the planned changes and how these can be prevented (to ensure new solutions are really win: win) as well as to contribute potential implementation obstacles and how to overcome these. All these inputs are then sequenced into a Roadmap (Pre-requisite Tree) showing the necessary and sufficient milestones to achieving success (closing the GAP and keeping it closed).

**STEP 5 – AGREEMENT ON HOW TO MEASURE THE CHANGE AND ACHIEVE POOGI?**

The last day is typically spent on agreeing exactly how each of the stakeholders can contribute to making the changes happen, how the impact of these contributions can be measured and what additional capacity building support each stakeholder will require to achieve a Process of Ongoing Improvement (POOGI) within their organisation or community.

To date, the overwhelmingly positive response from the participants and early results have been very encouraging.

It seems from the early results and comments from people like Dr Eli Goldratt that this initiative and the related new innovations by the Author with the Public Sector probably marks a new breakthrough in the TOC knowledge of consensus building.

## CONCLUSION

In summary, this initiative has shown it is possible to “Do MORE with LESS in LESS TIME” using TOC’s five focusing steps within the Public Sector with active participation and contribution from all stakeholders, by finding ways to close the SUPPLY-DEMAND GAP from both sides quickly (reducing waste, create and increase waste collection capacity by focusing on the few critical constraints).

The team also learned there are two important steps in the analysis which should not be skipped:

1. Recognizing past achievements (but then to show the large current and future GAP)
2. Validating the impact of current / planned Strategies (that is can they help break core conflicts / constraints or will they be in conflict).

Thomas Edison said “Vision without Execution is a Hallucination.” This implies that Capacity Building (without follow-up and follow-through) will not deliver any significant and sustainable results (to close the GAP and keep it closed). This will be the next step of this initiative – finding practical methods for NGOs to ensure the Capacity Building efforts deliver real results through assisting stakeholders with the challenge of execution of “follow-up” and “follow-through”

*This paper is part of the Author Alan Barnard’s PhD thesis on “How to IDENTIFY and UNLOCK inherent potential within organizations and individuals?”*

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**ABOUT THE AUTHOR**



Dr Alan Barnard is one of the world's leading TOC experts based out of South Africa. He is CEO of Goldratt Research Labs, Director of the Goldratt Group SA, Chairman of Realization Africa and has been the longest standing Chairman of TOCICO. Alan served on the SAPICS board from 1996 to 2004 and was SAPICS President from 2000 to 2002. Alan has also served as a judge in the South African National Logistics Achiever Awards since 2001. Alan graduated BsC Industrial Eng. (Cum Laude) from Wits in 1991 and with a PhD (Cum Laude) from Da Vinci Institute of Technology in 2009. The title of his research was "How to identify and unlock inherent potential within organizations and individuals using a Systems Approach".

Alan is TOCICO (Theory of Constraints International Certification Organization) certified in all the TOC Applications. He has extensive international experience in the development and implementation of "Constraint Breaking" solutions, first as a practitioner working in management positions in companies such as SABMiller and currently as a TOC Expert, Advisor and Educator to companies such as African Explosives, Afrox, SABMiller, Premier Foods, ABB, UN WFP, BC Rail, Random House Publishing, Athena Health, Ditch Witch, Tata Steel, Adidas, Seagate. Cisco and SAP.

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