



BIG DATA

Delivering REAL value from Supply Network
Optimization requires real data

“Multicommodity Distribution System Design by Benders Decomposition”
Geoffrion and Graves

Presented by: Keith B. Carter

INTRODUCTION

About Keith B. Carter
<http://www.keithbcarter.com>

Corporate Measurement

Family

Unique Blend

Student Exchange to Russia

New York

Change Management

Mandarin

KPMG

Practitioner

Poetry Copyrighted

NUS

Chess

Church

Electrical and Computer Systems Engineering

Director, Purchasing

Blue-sky Thinker

Entrepreneur

Business Process Re-engineering

Academic/Data Scientist

Script Writing

Speaker

Speaker

Spring Fong

Kris Leader

Playwriting

Institute

Goldman Sachs

Replaced Fax with eCommerce

Actionable Intelligence

Accenture

Play Saxophone

Board member

Taught Poetry Club

Website Design

Singapore

Snowboarding

Delivered \$89 million in savings

Corporate Compliance

Spanish

象棋

Love To Shop

Love To Travel

Cornell MBA

Love To Eat

Supply Chain Strategy

Supply Chain Excellence

Certified Counter Terrorism Practitioner

Play Bass Guitar

Доверяй, но проверяй

Know

Facts To Remember:

Hong Kong GDP: \$274Bil USD 2013

Singapore GDP: \$297Bil USD 2013



Know

Facts To Remember About Nigeria:

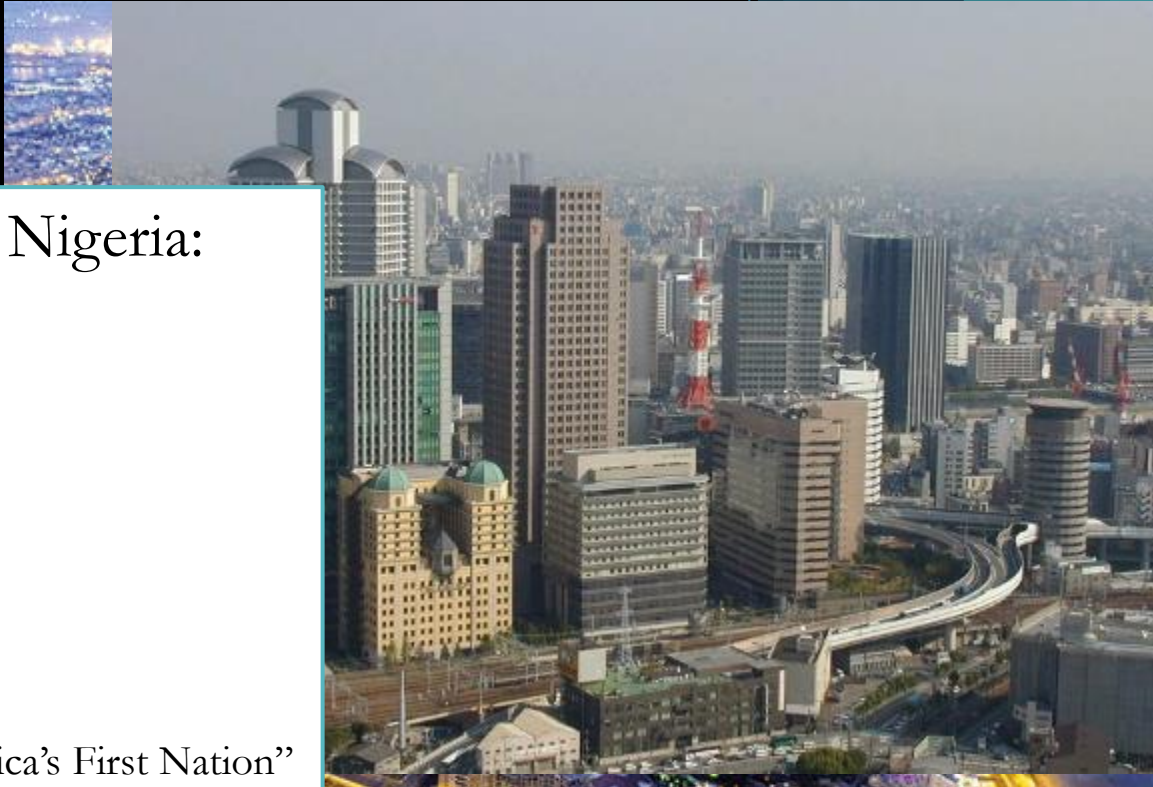
GDP: \$522 Bil USD 2013*

Millionaires: 15,000**

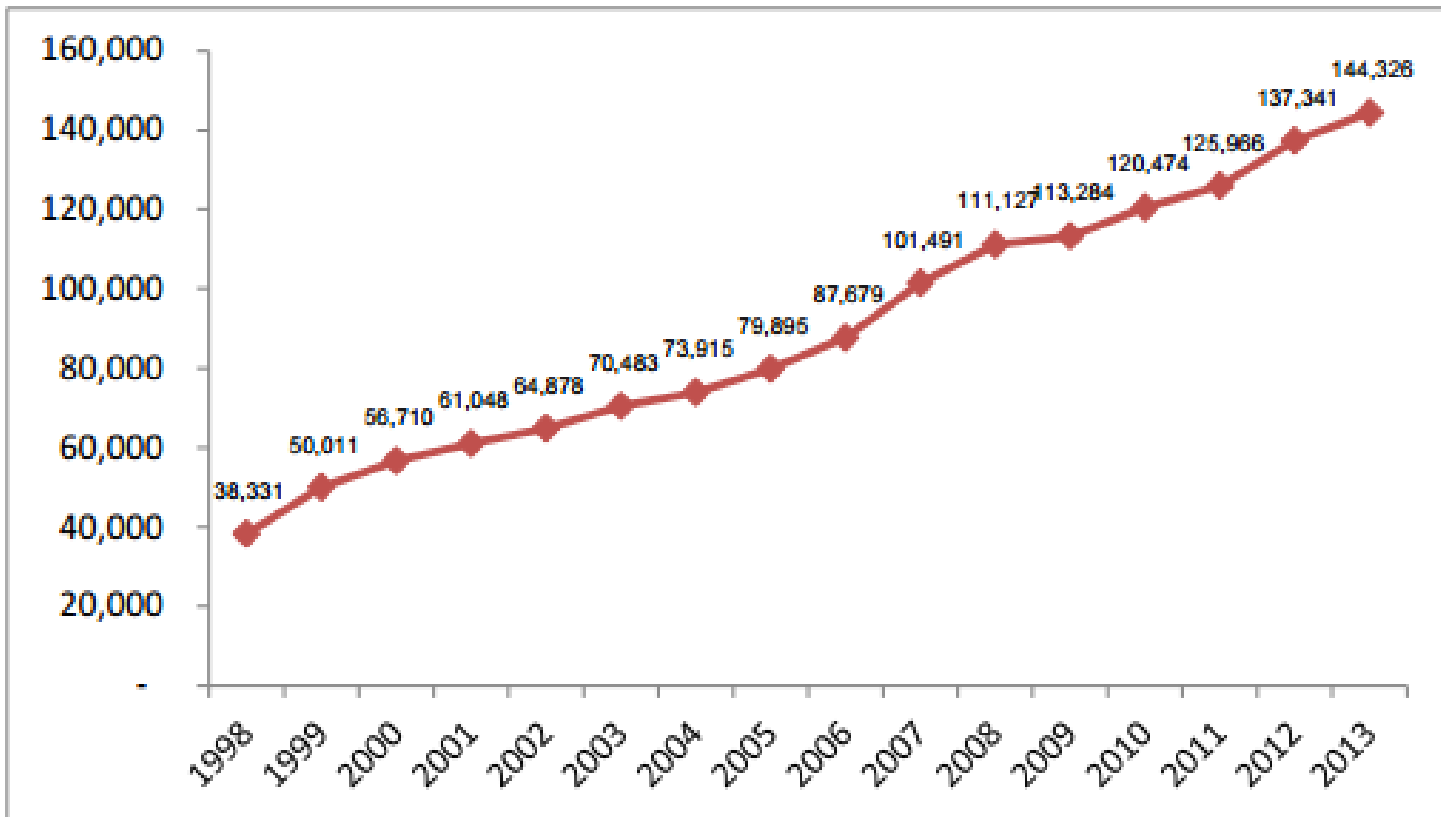
Billionaires: A handful

*Worldbank **National Geographic “Africa’s First Nation”
Jan 2015.

To Make Singapore the world’s first Smart Nation there needs to be an
entrepreneurial culture
- Prime Minister Lee Hsien Loong



4X Increase In Ambulance Calls



Graph B1: Year-to-Year Comparison of Emergency Ambulance Calls (1998 - 2013)

2030

900 000

are aged 65 yrs old and above

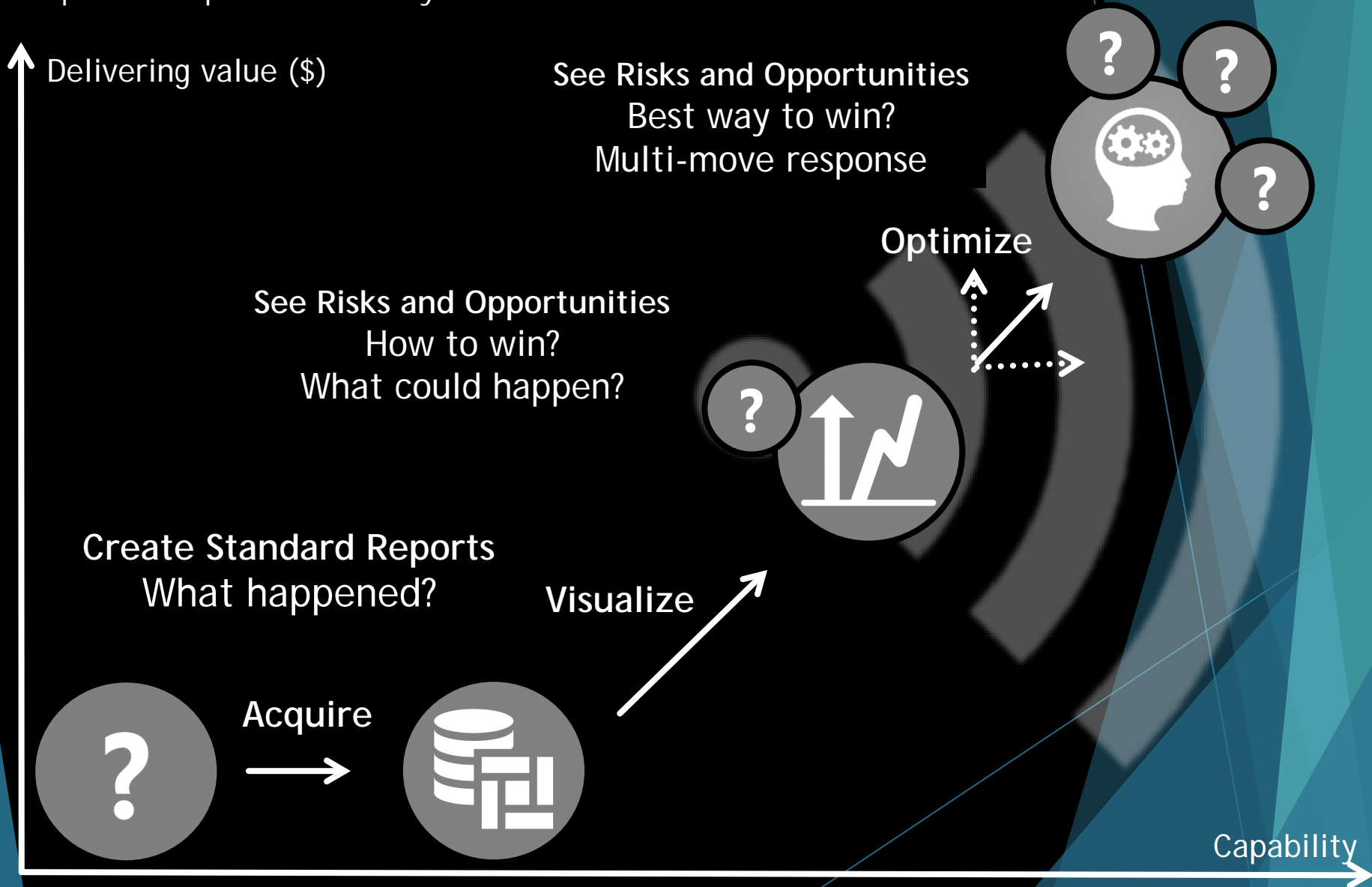
*singstat.gov.sg



AGING POPLN.

Actionable Intelligence

Steps to Competitive Visibility



Behind the Scenes

- ▶ Problem statement:

A commonly occurring problem in distribution system design is the optimal location of intermediate distribution centers between production plants and customer zones.

These intermediate facilities (temporarily) store a large variety of commodities that are later shipped to designated customer zones.

Multi-commodity Distribution Systems Design

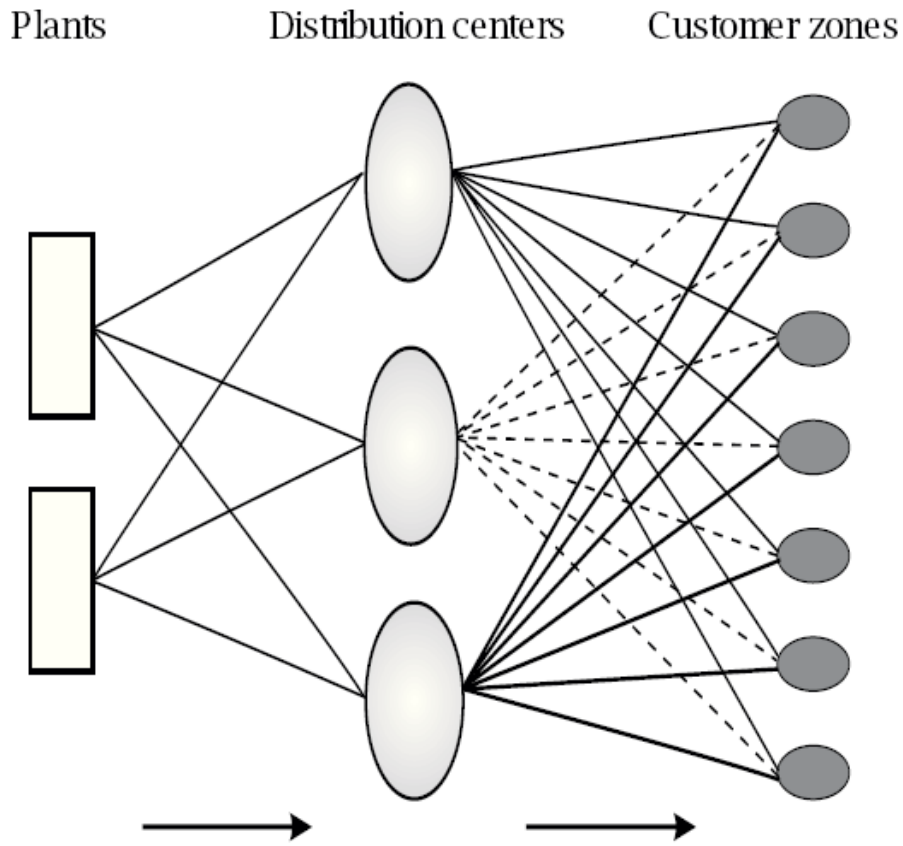


Figure 22.1: Commodity distribution scheme

Let's Look At Objectives

- ▶ Basic: meet the given demands at minimum total distribution and production cost, subject to plant capacities and distribution center throughput requirements.
- ▶ Complexities:
 - ▶ Variable throughput capacity (seasonality)
 - ▶ Preferences for certain routes (tax efficiency, road issues)
 - ▶ Shared resources requiring joint capacity constraints
 - ▶ ...bad master data

$\varepsilon > 0$	<i>relative convergence tolerance</i>
$B := \emptyset$	<i>set with generated constraints</i>
$UB := \inf$	<i>upper bound for $P(x, y)$</i>
Solve $M(y, m = 0)$	
$LB := f(y)$	<i>lower bound for $P(x, y)$</i>

The objective function that is to be minimized is essentially the addition of production and transportation costs augmented with the fixed and variable charges for distribution centers and the throughput of commodities through these centers.

Objective function

$$\text{Minimize: } \sum_{cpdz} K_{cpdz} x_{cpdz} + \sum_d [F_d v_d + R_d \sum_{cz} D_{cz} y_{dz}]$$

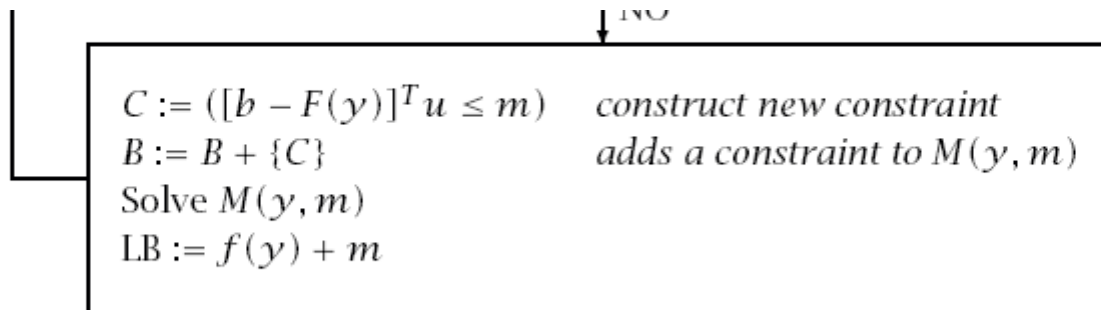


Figure 22.2: Benders' decomposition algorithm flowchart

Optimize



What About Reality?

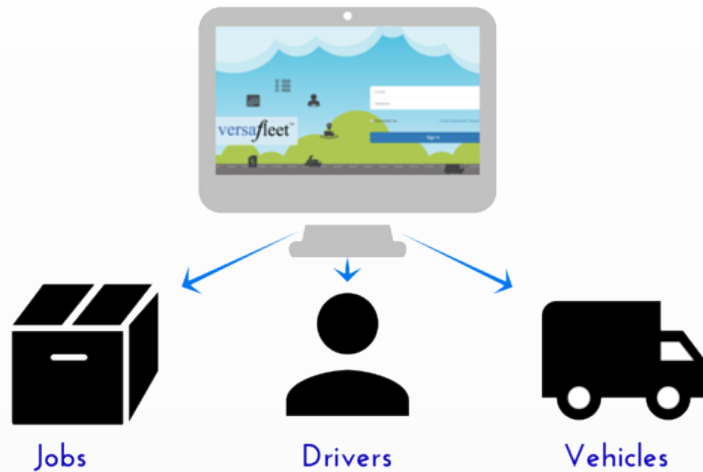
So... intelligence, but not actioned?
... the weakest link, in field execution



Validate with Telematics (Internet of Things) VersaFleet

The screenshot displays the VersaFleet telematics software interface. On the left is a blue sidebar menu with the following items: Dashboard, Map, Operations, Planning, Runsheet Calendar, Jobs, Vehicles, Vehicle Maintenance, Drivers, Accounts, Billing Accounts, and Customers. The main area features a map of Singapore and the surrounding region, including Johor Strait, Jurong Island, and Bukom Island. The map is overlaid with a network of orange lines representing roads and highways. At the top of the map area, there is a 'Filter:' section with a 'Select Vehicle' dropdown menu, a 'From' field with a calendar icon, and a 'To' field with a clock icon. The map includes various navigation controls such as a compass, a person icon, and zoom in/out buttons. The map shows several locations and landmarks, including Pekan Nanas, Skudai, Bukit Indah, Gelang Patah, Nusajaya, Jurong West, Jurong East, Tuas, Jurong Island, Bukom Island, Sentosa, Singapore, and various industrial and residential areas like Woodlands, Yishun, and SLE.

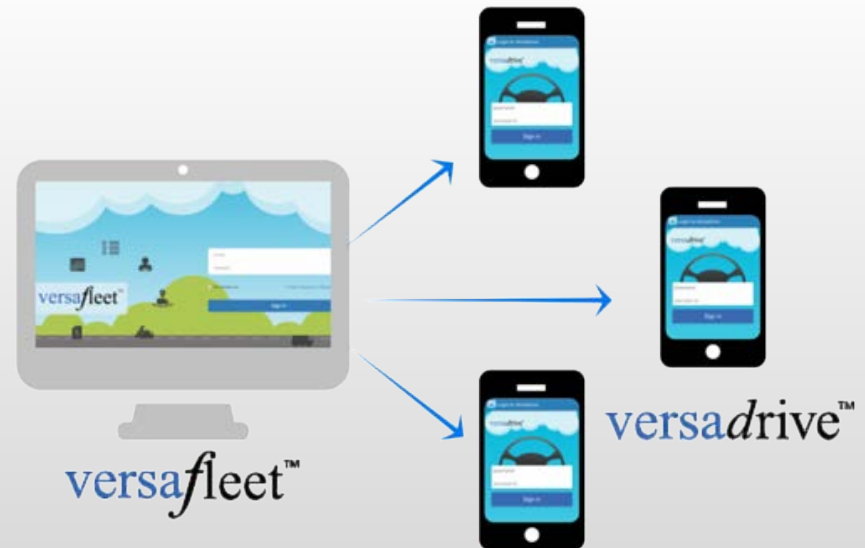
<https://www.youtube.com/watch?v=MJxFGOHYPj8>



- Manage & assign jobs in real time, in sync
- Instantly know job delivery statuses

Dispatch

- Dispatch jobs quickly with *Route Optimisation*
- VersaDrive™ companion app – empower your drivers!



VersaFleet™ Features - Benefits



Browser-based

No installation required.
You only need a web browser.



Real-time Notifications

No more waiting till the day's end
for status updates. Be notified
instantly, all the time!



Route Optimisation

Schedule, assign and
dispatch hundreds of jobs
within *seconds*!



Awesome Updates at NO Cost

We are constantly upgrading our
software. There are no extra
installations. It's automatic.

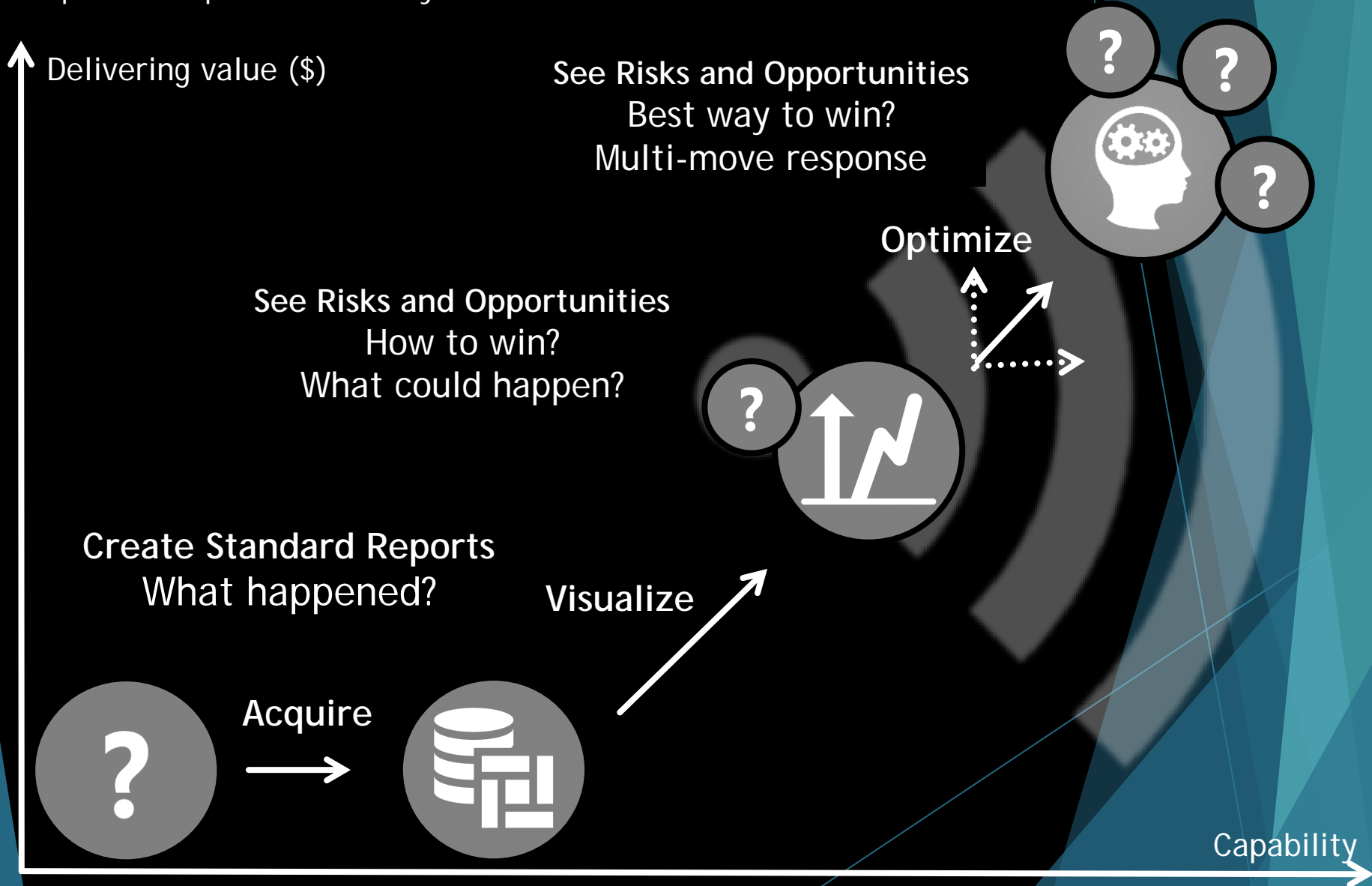


Bring Your Own GPS (BYOG)

We integrate with GPS so you can track
vehicle locations too. If you already have
GPS, introduce us!

Actionable Intelligence

Steps to Competitive Visibility



For a Total Solution Depend On: Actionable Intelligence

- ▶ Buy the book: Actionable Intelligence
- ▶ Start With :
 - ▶ National University of Singapore Business School:
 - ▶ Executive Education For You and Your Team
 - ▶ Masters of Business Analytics!
- ▶ Get Consulted by Keith Carter (Practitioner/Professor)
 - ▶ And team of professors
- ▶ Upgrade People, Processes, and Technology
With Actionable Intelligence



NUS
BUSINESS
SCHOOL

ACTIONABLE INTELLIGENCE

A GUIDE TO
DELIVERING BUSINESS RESULTS WITH
BIG DATA
FAST!

KEITH B. CARTER

with Contributions from
DONALD FARMER and CLIFFORD SIEGEL

WILEY



@

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+65-8482-3625

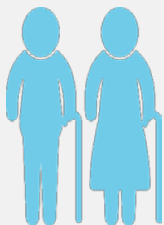
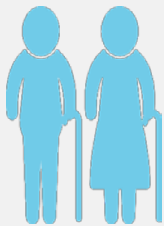
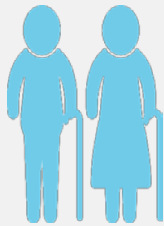
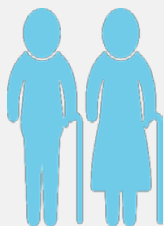
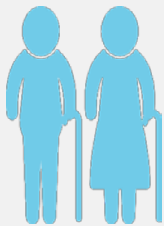
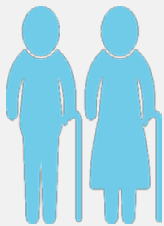


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*singstat.g
ov.sg



AGING POPLN.

69.1%
desire to 'move
on' at
HOME

*Agency for
integrated care
SINGAPORE

PROBLEM

ILTC PROVIDERS NEED TO

MANAGE

THEIR

RESOURCES

BETTER

.

EXPERIENCE

FOR YEARS, LOGISTICS COMPANIES HAVE

MANAGED THEIR

RESOURCES VERY
WELL.

SOLUTIONS

PLATFORM ADAPTED FROM LOGISTICS INDUSTRY

ALLOWS ILTC TO

MANAGED

THEIR

RESOURCES

BETTER.



Plan



Track



Notify

+New Patient

Delete Selected

Clear Selected

Show: Central Region

All

Assigned

Unassigned

On-going

Completed

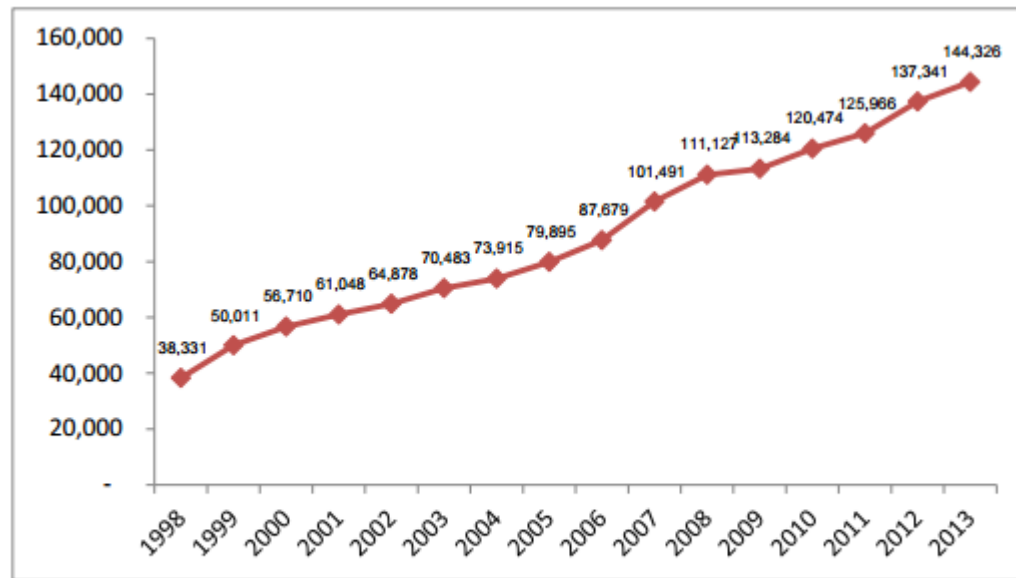
<u>Job ID</u>	<u>Date/Time of Visit</u>	<u>Patient Name</u>	<u>Condition</u>	<u>Address 1</u>	<u>Recurring? (Y/N)</u>	<u>Status</u>	
4	15/03/14 09:00	John Tan	Diabetes	12 Thompson Road	Y	Completed	Save ▾
3	15/03/14 09:00	Mary Lim	Palliative	Ang Mo Kio 843, #07-21	Y	On-going	Save ▾
2	14/03/14 09:00	Muhammed Shaiful b. Asslam	Palliative	Woodgrove lane	Y	Unassigned	Save ▾
1	14/03/14 09:00	Goh CY	Recovery	Bishan St. 22, #03-91	N	Assigned	Save ▾
+	DD/MM/YY HH:MM	Name	Condition	Current Location	Weight(T)	Status	Save

NURSE Mary (#124) has reached Job #4 at 15:30 today.

□ x

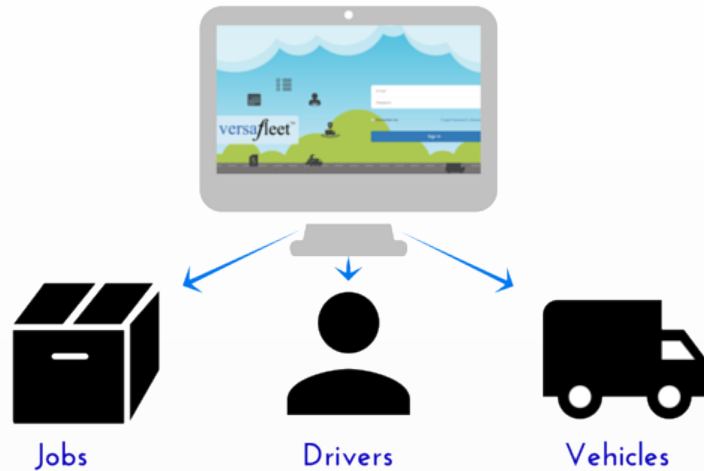


Growing numbers of Emergency Ambulance Calls



Graph B1: Year-to-Year Comparison of Emergency Ambulance Calls (1998 - 2013)

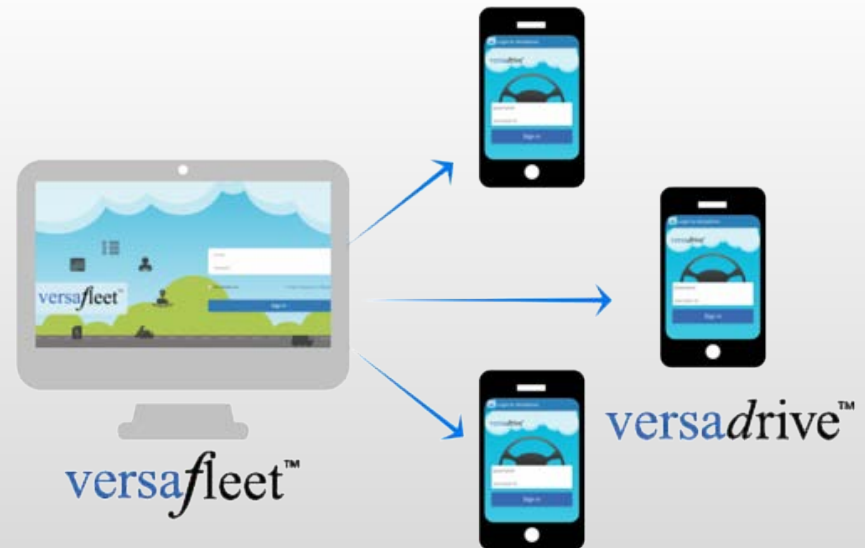
Steady Increase in the number of number of emergency Calls over the past 15 years, requiring SCDF to increase the size of its fleets



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vehicle locations too. If you already have
GPS, introduce us!

VersaFleet™ Features - Benefits



Multiple Operators

All your staff can work on operations at the same time seamlessly, just like with Google Docs.



Photo Taking & E-Signature Capabilities

Take photos as proof (POD) and e-sign on smartphones!



Customisable Items & Quantities

Create your own item list based on your business needs



Easy-to-Use Mobile Application

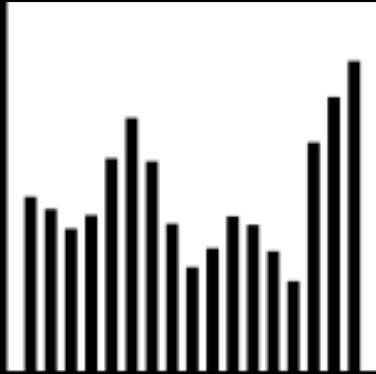
Language is no barrier - we use universal icons, easy for everyone!

Check us out at versafleet.co for more information!

Existing Issue At Polyclinics



Proposed Solution



- Real time queue and travel information coupled with historic data



- Color coded drop-pins for quick recommendations



- One stop application with all information needed



- Available on iOS/Android and desktop

Everyday Singaporean



Informed choices and less travelling and waiting time

Polyclinics



Improved customer experience and balanced load