Taking Business Decision-Making to the Next Level, using a Compact Data Analysis & Visualisation Model

André Human
Operations-Insight
www.operations-insight.com
Problem Statement: Decision-making cycle

- Profit-Centre
- Data Generated
- Information
- Business Decision-making
- OPERATIONS - Insight
- Higher Profits!
Problem Statement

• Conversion of Data into Information into Decision-making critical to business management

• Some organisations have a combination of data not feeding into decision-making (T. Napier-Munn, AusIMM M2M, 2010)

• This is despite...
  • A myriad of technical products available
  • An overload of data and even big data
  • Existing management systems already in place
  • Obvious business benefits that this may have

• Increased Data available does not always equate to increased Clarity
Problem Statement: Case Study

• A national organisation looking for a solution to their growing challenge
  • Partaking in projects (plant maintenance)
  • With various resources (various different trades)
  • Based across the country at various centers
  • Servicing various sites and companies from these centers

• Planning of the various activities and resources becoming more complex

• Back-tracking of planning-changes close to impossible with previous system
  • How did the planned task change, and why?
Problem Statement: Case Study

- Some of these resource-interactions are invisible to all decision-makers
  - Total numbers and weekly averages across all attributes do not tell the whole story...

- Detailed data of individual projects don’t tell the whole story either...
  - Note: new solution used to illustrate
Problem Statement: Case Study

- Increased activity through growth have made illustration and management of interactions more difficult (more data across more dimensions)

- Note: new solution used to illustrate
Problem Statement: Case Study

- Business decision-making is not well-supported by the data available across various dimensions (time, region, customer)

- Note: new solution used to illustrate
Problem Statement: Technical Challenges

• Various business decision-makers have different requirements:
  • Key account managers wishes to investigate and compare projects for a specific client
  • Operations-managers needs to understand requirements for each business area
  • Recruiters are interested in demand over time for each of the various trades

• Continuous Timescale for activities, rather than Daily Bins
  • Some activities will start or end halfway through the day
  • Some companies will break down one project into various projects transitioning in the middle of the day

• Initially using GUI Developer (GUIDE)
  • Multiple file system (.fig and corresponding m-files)
  • Had one instance of corrupted files
The approach was underpinned by the immediate business needs, time-constraints, geographical distribution and budget.

A single SQL-database was set up to store all official data centrally.

Remote GUI clients implemented to:
- Enter data into database
- View data as raw data
- View data graphically from various viewpoints, and with data filters
- Review scenarios locally, and save to database when approved

GUI clients were developed programmatically in MATLAB, and compiled via Compiler into standalone applications.
Approach used to Solve the Problem

Operations Insight Workforce Calendar

Overview of Maintenance Timeframes and Manning Requirements

Insert YOUR COMPANY NAME here

OPERATIONS - Insight
Approach used to Solve the Problem
Approach used to Solve the Problem: Business

“...illustration and management of interactions more difficult...”

• Differentiating Views (trend by...)
• Filter Tables (incl. or excl. data)
• Highlighter Utility
Approach used to Solve the Problem: Business

“Back-tracking of planning-changes close to impossible...”

• Facilitating data changes through client application
  • Do not modify/delete old records, but add new/edited records
  • Client application identifies and use only most recent entries for a project
  • Client application has functionality to review changes for a project
Approach used to Solve the Problem: Technical

“...not well-supported by the data available across various dimensions”

• Main Data is managed in one large table; but intermediate tables are created in real-time:
  • There are various tables created as data is filtered
  • Different graphical views are presented from these various tables
  • Scenarios also use these intermediate tables; and these intermediate tables are thus managed from the client (and not the central Database)

“Continuous Timescale for activities, rather than Daily Bins”

• Move from tables to timelines with table entries indicating points of change on the timelines
• Timelines are split up according to differentiating attributes
Approach used to Solve the Problem: Technical

“Initially using GUI Developer (GUIDE)”

• Moved from GUI Developer (GUIDE) to Programmatic GUI
  • More work upfront; but great reward in the long run
  • Only a single m-file, with supporting m-files referenced (external functions created); rather than a fig & m-file combination
  • Majority of independent functions however within nested- and sub-functions
  • Great scalability and stability
Tools Used

- MATLAB for programmatic development of GUI
- Database Toolbox for database interaction
- GUIDE for initial GUI development and proof-of-concept
- MATLAB Compiler for converting GUI into standalone executable
- MS SQL for database hosting
- MS Excel spreadsheet for proof-of-concept and testing
How MATLAB Products helped in Solving the Problem

• Ease of technical calculation and development in MATLAB
  • Powerful functions
  • Comprehensive documentation
  • Analytical tools (Code Analyzer, Debugger)

• Computational strength, as manifested in aspects such as vectorization
  • No unnecessary loops in tables

• Ease of importing and exporting data to and from the MATLAB GUI with spreadsheets and databases
How MATLAB Products helped in Solving the Problem

• Tidy integration through compiled components
  • Creates a simple installer

• License management through compiled components
  • This creates a new business model to interface with the client

• Ongoing support by Mathworks
  • User forums
  • Training
  • Direct support by Mathworks

• Ongoing technical development by Mathworks
Results Achieved: Technical

• Greater data integrity:
  • A single source of the truth on a backed up and secure database
  • Data cannot be deleted, just added
  • Controlled management of data via client applications

• Increased visibility of planned activities by all

• Scenarios can easily be tested; and suitability can be verified

• Risks are better illustrated, highlighted and quantified
Results Achieved: Business Impact

• Great vehicle for Continuous Improvement, as business decision-making is evolving. Comments such as
  • “can we also look at this aspect?”
  • “given this view, do we still want to manage our customer interaction like this?”

• This implementation has already played an active role in facilitating risk identification and subsequent action!
  • Moving shutdown projects where high-peak-loads have been identified
  • High workloads would have led to increased difficulty in recruiting sufficient and high-quality personnel, and risks of project overruns
  • Project overruns would have led to Penalties Paid and damage to Brand
Further Learnings: Opportunities & Challenges

• Continuous Improvement: do not let the promise of delayed perfection (tomorrow) lure you into doing nothing today

• Business Impact is the measured outcome; not so much the degree of sophistication of the solution

• Technology Transfer Delay is Real:
  • There are plenty of situations begging for improvements today; if you can be part of a 80% improvement here today, you are part of a wave of success
  • Many organisations are several steps away from Internet-of-Things and Big Data

• Solid Foundations go a long way: using a platform with computational capability is not trivial
Beyond Software

• Mathworks, and not only MATLAB or Simulink

• Mathworks Development and Strategic Intent goes into your organisation and project as well (Compiler developments for instance)

• Training is always a good investment

• Formal Support is necessary, and key to any platform

• Informal Support (user groups, etc.) will always surprise you with ideas
The Challenge to all of You

• Are you making the most of your data today; and getting it into your organisation’s decision-making?

• Irrespective of the technology you use; you still need to utilize the data to improve your business decision-making

• Most of You in this audience are capable of making more of your organisation’s data