

Consultancy Companies

Banxia Software Ltd

www.banxia.com

Banxia Software Ltd is a small software company, based in Kendal, in the UK. Matthew Jones, who founded Banxia Software Ltd in 1994, was part of an academic team, initially based in the School of Management at the University of Bath and then based in the Department of Management Science, at the University of Strathclyde. Matthew left the University of Strathclyde, set up Banxia Software and became a full-time software developer, working on a variety of decision support and operational research tools, including Decision Explorer[®] and Frontier Analyst[®]. In 1995 the University of Strathclyde licensed Decision Explorer[®] to Banxia, to continue its development and make it available to a wider audience. For the first seven years of its existence, Banxia was based in the Lord Hope Building, on the University of Strathclyde campus, where the university runs an "incubator" facility (serviced offices) for start-up companies. The core staff at Banxia all worked in the Department of Management Science at the University of Strathclyde and so have a good understanding of the theoretical as well as practical uses of Decision Explorer and Frontier Analyst. From its founding 15 years ago, Banxia has extended both its range of products and its international reach, with Banxia products now in use in over 60 countries worldwide.

Banxia's focus has always been on decision support and operational research tools, with the foundation of the business being built around Frontier Analyst[®] (a data envelopment analysis tool) and Decision Explorer[®] (an ideas mapping package). Banxia offers support, training and, through a network of consultants, consultancy using Frontier Analyst[®] and Decision Explorer[®].

Frontier Analyst[®], Decision Explorer[®] and MCDA. Frontier Analyst[®] and Decision Explorer[®] complement those tools already in the Multiple Criteria Decision Aiding (MCDA) practitioner's toolbox. In particular, Banxia's tools can assist with two of the most challenging aspects of MCDA – the selection of weights and the construction of criteria hierarchies and determining alternatives.

Banxia's products draw on a range of decision support research, and as such are designed to "play nicely" in multi-methodology engagements – which are becoming more prevalent with today's complex problems. Data can be imported to, or exported from, Banxia's tools using a variety of standard formats. The extensive use of visualization tools assists users in interpreting results in a (relatively) methodologically neutral manner.

Frontier Analyst[®]

Frontier Analyst[®] is based on an operations research technique known as Data Envelopment Analysis (DEA). DEA is, at heart, an option comparison tool. Indeed, DEA and MCDA can be seen, in one way, as limiting cases of each other. DEA is suitable for situations where you have many more options than criteria, while MCDA approaches tend to focus on a small number of options that need to be compared across numerous criteria. Of course, both DEA and MCDA tools exist that can be used more widely, but this basic focus remains.

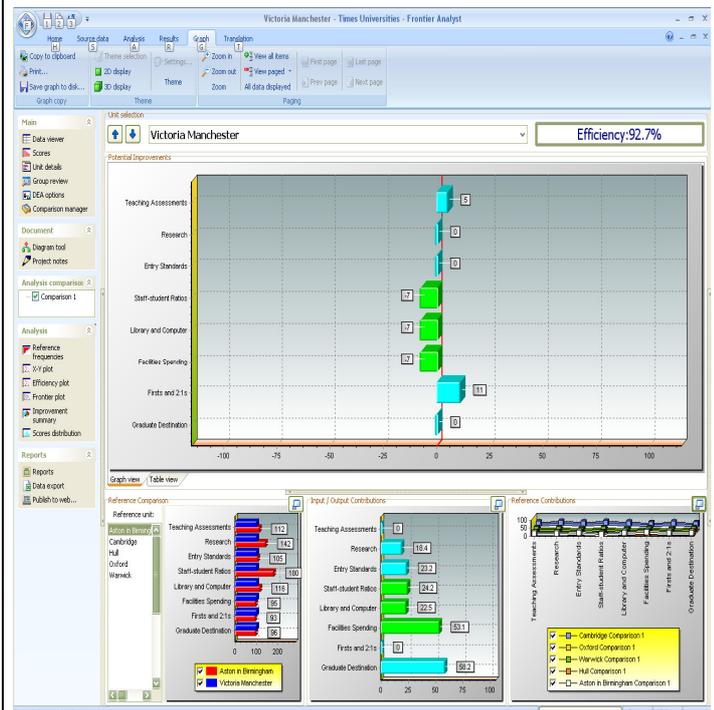


Figure 1: general screen shot showing some of the Frontier Analyst results charts. Gives an overview of an inefficient unit. Each results chart can be maximized in turn, while the others can be visible (or not) as desired.

In a Frontier Analyst[®] model, the weights are endogenous – i.e. they are derived from within the model, as opposed to being defined externally (e.g. by decision makers)². Weights are chosen to optimize the score assigned to an option – with the score being conceived of as an efficiency rating – i.e. how effectively the option (or unit, in DEA terminology) translates its inputs into outputs.

There is a crucial constraint placed on these scores – no option can have a score in excess of 100. As the same weights must be applied to *all* the options, this means that some options will score less than 100 – e.g. if they are dominated by other options.

Frontier Analyst[®] has been used by many different types of organization, to analyse many different processes,

² As is the case with most decision support approaches, Frontier Analyst[®] supports externally derived weights, but we'll focus on the "classic DEA" approach in this article.

across all of which is the common feature that a process is performed by a number of discrete, autonomous business units, all of which are using a common set of resources to produce a common set of products.

An example of the application of Frontier Analyst® is its use by the Arizona and New York State Education Departments to study school performance. Andrew Tait (formerly at the University of Strathclyde and now with Banxia and Idea Sciences in the USA: Andrew.tait@ideasciences.com) was one of the consultants involved in this project. A web-based benchmarking service, schoolbenchmarking.com, was built on top of a Frontier Analyst® model to allow comparisons between "underperforming" schools and their higher performing peers. Schools were evaluated on how effectively they produced results (e.g. graduation rates) given their resource utilization (e.g. expenditure per pupil) and constraints (e.g. local poverty). This particular application is mentioned because in this instance further analysis was carried out on the weights applied to the inputs and outputs. The weights assigned to the evaluation criteria were studied to identify areas of generally high/low performance within the systems, with an eye to aiding strategic planning.

Decision Explorer®

Decision Explorer® is an ideas mapping package, designed to support the cognitive mapping approach as developed by Colin Eden, Fran Ackermann and colleagues. Matthew Jones, Banxia's founder, worked on the original MS-DOS version of Decision Explorer®, which was, at the time, known as "COPE". With the advent of MS Windows® COPE was developed further and became "Graphics COPE". When it was licensed to Banxia, further development took place and the product was renamed "Decision Explorer", to reflect the role that the tool plays in supporting decision making. The link between Decision Explorer® and MCDA comes in the way that Decision Explorer® can be used for problem structuring, as a means of eliciting and structuring the criteria which will then be modeled in the value tree to determine alternatives.

Decision Explorer® is essentially a "neutral" tool, in that it is the text in the ideas and the links that are made between them, which "bend" the tool to a particular purpose. Although designed to support cognitive mapping (which is a causal mapping method), Decision Explorer can be used to support other mapping methods (such as "concept mapping" – based on Joseph Novak's work, and "mind mapping" – based on Tony Buzan's work).

Prof Fran Ackermann (fran@mansci.strath.ac.uk) has been involved in a number of interventions where the use of Decision Explorer® has been linked with MCDA. One of these interventions is reported in: Belton, V., Ackermann, F., Shepherd, I (1997), "Integrated Support from Problem Structuring through to Alternative Evaluation using COPE and VISA". *Journal of Multi-Criteria Decision Analysis*, Vol. 6, pp115-130 (Which won the Wiley Prize for Best Application Paper). This paper acknowledges the fact that many real-world

problems are often ill-defined and a "front-end" process is needed to help manage the problem and ensure that the inputs for the MCDA model tie up with the "actual" rather than the "perceived" problem. The mapping process facilitates group negotiation and recognizes that it is a cyclical process between opening up the decision space before applying more precision through weights and scores which in turn generate more qualitative issues and insights.

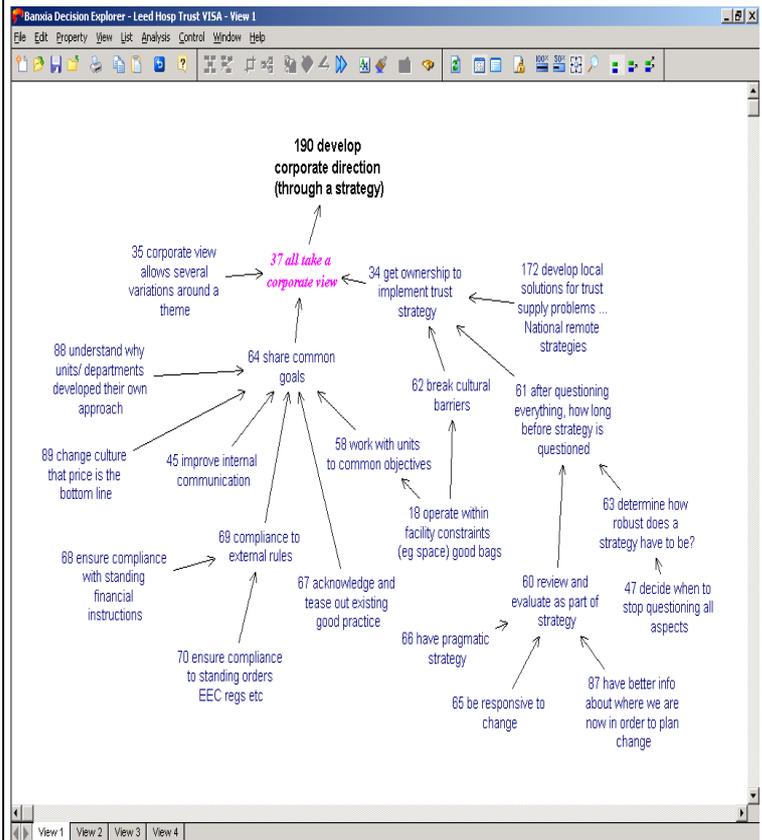


Figure 2: concepts taken from the "front end" of the Decision Explorer® (COPE)/MCDA intervention.

For those who want to read more about Frontier Analyst® and Decision Explorer® and the methods that they support, bibliographies can be found on the web site at www.banxia.com, along with working demonstrations. You can email enquiries to Banxia at info@banxia.com, and Prof. Fran Ackermann (fran@mansci.strath.ac.uk) and Andrew Tait (Andrew.tait@ideasciences.com) are happy to talk to anyone about their work and their use of Banxia's tools.