

Combining survey and database technologies in support of a safety climate improvement strategy

Gerard Fogarty, Ph.D.

Anthony Machin, Ph.D.

University of Southern Queensland

fogarty@usq.edu.au

Abstract

Safety climate is now a well-known construct within the safety literature. Many surveys exist that purport to measure safety climate but few of these surveys are based on a sound theoretical model. In this paper, we introduce the organisational health model as a framework for investigating the role of safety climate within military settings. We also describe our work in the public sector and show how to construct a climate survey using this model. The collection of data via safety climate surveys is a first step in the safety management strategy we advocate. A key component in our approach is the use of a database (Total-IDEAS) that stores survey data and has a graphical interface that allows managers with minimal statistical skills to conduct further analyses and prepare reports on the status of various psychological factors within the organisation. We have found this approach to be very effective in our work with other organisations and have shown how it can be used to monitor change within an organisation.

Introduction

The title of this paper includes the term “safety climate” and indeed this is an area of major interest to the authors. However, our treatment of the topic in this paper is somewhat oblique in that we have chosen to present a case study illustrating an approach that we believe has widespread applicability, including to the area of safety climate. We have taken the more general approach because of the maturity of the research programme that we are about to describe compared with our still relatively recent efforts to introduce the same methodologies and principles to managing safety climate. We return to safety climate towards the end of the paper.

We are all familiar with the practice of using surveys to collect data on various aspects of organisational functioning. The practice is currently so widespread that one may be forgiven for thinking of it as yet another management fad, something that appears on the scene, mushrooms, and then disappears. The purpose of this paper is to set out some principles that will help to lift the practice above the level of a “fad” and to place it among the tools that managers understand and can access on a regular and ongoing basis. We begin by outlining some of the pitfalls that have always plagued organisational surveys. We draw these examples from our own extensive experience conducting surveys in private and public organisations. We will then describe a research programme that seeks to “Apply the Science” of survey methodology in new and interesting ways.

In our experience, the main challenges facing organisational surveys are as follows:

- The request for a survey is not driven by a clear model of how the findings can improve organisational outcomes.
- The resulting questionnaire is too-often a one-off survey that lacks established psychometric properties, benchmarks, and an established pattern for communicating results to staff and making use of findings in organisational improvement initiatives and strategic planning.
- Interpretation of survey findings is the exclusive province of experts, without whose help, little can be done by the organisation itself.

These problems can be overcome. In this paper, we present a brief overview of a case study involving an organisational improvement initiative which my colleagues and I helped to promote and develop within a large Australian organisation. The case study illustrates many practices that are directly applicable in a military context. Indeed, it is clear from the other papers presented at this conference that we are not alone in our quest to optimise the benefits of survey methodology – but we are probably going further than others in our use of technology and benchmarking.

Case study

This case study will outline the organisational health research model that forms the basis for the organisational climate and management practices survey developed in collaboration with Queensland Health beginning in 1998. We will describe the programme from its very beginnings to enable the reader to understand why it evolved in the way that it has.

Beginnings

The programme began back in 1998 when we were requested to conduct an organisational climate survey of staff employed by a local health district. We were fortunate in that the survey was requested by the Organisational Improvement Unit of Queensland Health and the people involved had already paid for the development and validation of an organisational climate survey that they intended to use right across this very large organisation. Our clients also had some ideas about how the survey findings would be used. That almost took care of points (1) and (2) above, but we still had some work to do in terms of gaining the trust and confidence of staff prior to the voluntary data collection day.

Our first hint of a problem occurred after we had analysed the survey data using the Statistical Package for Social Scientists (SPSS) and had written a major report for the organisation. The report was so well-received that we were requested to prepare feedback reports for sub-districts. There were only six of these, but we could already see that there would be problems down the track if we were asked to work across the organisation and to prepare reports for the large number of sub-districts. The second concern for us was that as the managers read the contents of the reports, they kept coming back to us with further questions.

The Programme Matures

We were asked to conduct further surveys and we continue to do so, right up to the time of writing this report. Our client base has extended to include other public sector organisations. Along the way, we have encountered additional problems. Foremost among these has been the request to modify the organisational climate questionnaire. We knew that changes to the questionnaire would threaten our ability to carry out benchmarking exercises – something that our clients almost always wanted – so we accommodated these requests by stripping the original survey of redundant items/scales and then maintaining a solid core of 10 organisational climate scales. We add layers to the questionnaire if necessary, but we don't change the core.

A second problem we encountered was the rapid accumulation of a large pile of survey forms – scannable but bulky and not environmentally friendly. We were able to solve this problem to some extent by switching to Web-based surveys for some clients and a hybrid Web-based and paper-based survey administration system for others. A strategy for implementing the results was developed within each section of the various organisations. The strategy focused on ways to improve the quality of decision-making within organisational units and to evaluate the impact of decisions on morale and well-being.

Developing a Theoretical Model

As the client base broadened, however, and we came into contact with managers who were less familiar with the potential benefits of organisational climate research, we decided to embed our survey work within a broader model of organisational functioning. We began by identifying the goals of the programme, the focus of the programme, and the assumptions upon which the model is based.

- Goals of Programme:
 - Identify the key aspects of organisational climate requiring improvement.
 - Apply appropriate benchmark data to assess overall performance.
 - Plan an organisational improvement strategy using data collected from an employee survey.
 - Involve the senior leadership in strategic planning to facilitate change.
- Focus of Programme:
 - What are the critical factors that drive performance?
 - How do we measure them?
 - How can the organisation use this information to improve performance?
- Assumptions About Healthier Workplaces:
 - Healthier workplaces have a better organisational climate.
 - Healthier workplaces lead to increased productivity and fewer errors.
 - Healthier workplaces have a better work-life balance.
 - Healthier workplaces offer opportunities for growth and development.
 - Healthier workplaces value health and safety.
 - Healthier workplaces offer recognition.
 - Healthier workplaces encourage and support employee involvement.

This simple theoretical framework has proved to be very acceptable to managers and easily assimilated into their strategic planning. It is a framework that is also highly transportable across industries and sectors, including military settings, as we shall shortly see.

Developing a Standard Methodology

Our standard methodology has already been described. In brief, it consists of the following steps:

- Participation in the organisational planning and communication processes that precede survey administration.
- Use of surveys, administered via the Web wherever possible.
- Measuring the same set of core constructs across organisations and repeatedly within organisations.
- Preparing individualised reports and briefings for sections within organisations.
- Holding face-to-face meetings with all levels of management and including our own team leaders and technical staff in these meetings.
- Regular follow up and review.

Once the model and the methodology were refined, 10 years after the start of the programme we found ourselves in a situation where we had a strong client base committed to the use of organisational climate surveys and accepting of the constraints that benchmarking imposes. We were making progress on the technical front too, but here the gains were much more difficult to come by, as we now explain.

Development of a database for use by managers.

In order to improve the quality of benchmark-driven decision making within organisations and, equally importantly (see point 3 above), to relieve the need for all follow-up analyses to be conducted by the USQ team, we developed an interactive database that we called Total-Ideas. This database enables managers to produce graphical representations of the psychological outcomes well as the organisational climate variables for subgroups within the sample down to as few as 10 respondents (for confidentiality reasons, group size cannot be smaller than 10). This process allows managers to identify the areas that are reporting better (or poorer) psychological outcomes and to compare the organisational climate variables for those areas with other areas. If the organisation has completed surveys for us in the past, it is also possible to compare current and past results. The features of this database are as follows:

- The database sits on an SPSS or Excel file.
- It now contains responses from over 30,000 employees.
- It allows for many comparisons, limited only by demographic data collected.
- It protects confidentiality of respondents.
- It is updated regularly by our team.
- The database can be operated by organizations with just a small amount of training.
- The statistical experts are no longer the only source of follow-up analyses and reports.

Features of the interactive database

The demographics section is extremely important and the source of much discussion in the planning stages of all our projects. It is amazing how many managers want to have some say in the design of the demographics section. From our point of view, we would like this section to be as stable as possible because the information captured here forms the basis of between-group comparisons within the organisation and across organisations. The screen shown below is a reasonably typical representation of the demographic variables captured by a survey. The data are already stored in an SPSS or Excel file – we are still needed for that step – the rest is up to the manager. Group 1 is defined on this screen by checking various boxes. It could be something as simple as 2005 data versus 2007 data, or it may be 31-50 yr old male respondents who have a degree (as depicted in Figure 1) versus some other configuration that is specified in the “Define Group 2” screen.

The screenshot shows the 'Total Ideas - DEMO' application window. The title bar includes standard window controls. Below the title bar is a menu bar with 'Actions', 'Edit', 'Graph', 'Tools', and 'Help'. A toolbar contains icons for file operations (New, Open, Save, Print, Close) and a search icon. The main interface is divided into sections. At the top, there's a 'Define Groups' section with a dropdown menu set to '2005 Data', buttons for 'Clear Page', 'Expand Page', 'Save Selection', 'Default...', and 'Count', and a 'Number of groups' dropdown set to '2'. Below this are two tabs: 'Define Group 1' and 'Define Group 2'. The 'Define Group 1' tab is active, showing a list of demographic criteria with checkboxes. The criteria are: Gender (Male checked, Female unchecked), Age Group (Under 21, 21-30, 31-40 checked, 41-50 checked, 51-60, Over 60), Length of time in current role, Length of time in Organisation, Type of position, Supervisory or management responsibilities, Current classification, Work location, Highest level of vocational study (Certificate Courses, Associate Diploma, Diploma, Post Graduate Diploma, Degree checked, Graduate Diploma, Masters, Phd, Other, N/A), Study undertaken in last five years, Currently studying, Currently studying supported by SARAS, Member of an EEO group, and EEO group membership. At the bottom, there are two small text boxes: 'Click on Title Bar to display/hide options' and 'Min. Group Size : 10'.

Figure 1. Interactive database showing set-up for group comparisons.

Having defined the groups, it is a relatively simple matter to select the variables on which comparisons are to be made. Graphical representations of group differences, such as the one shown below, can be obtained and pasted into word processing documents.

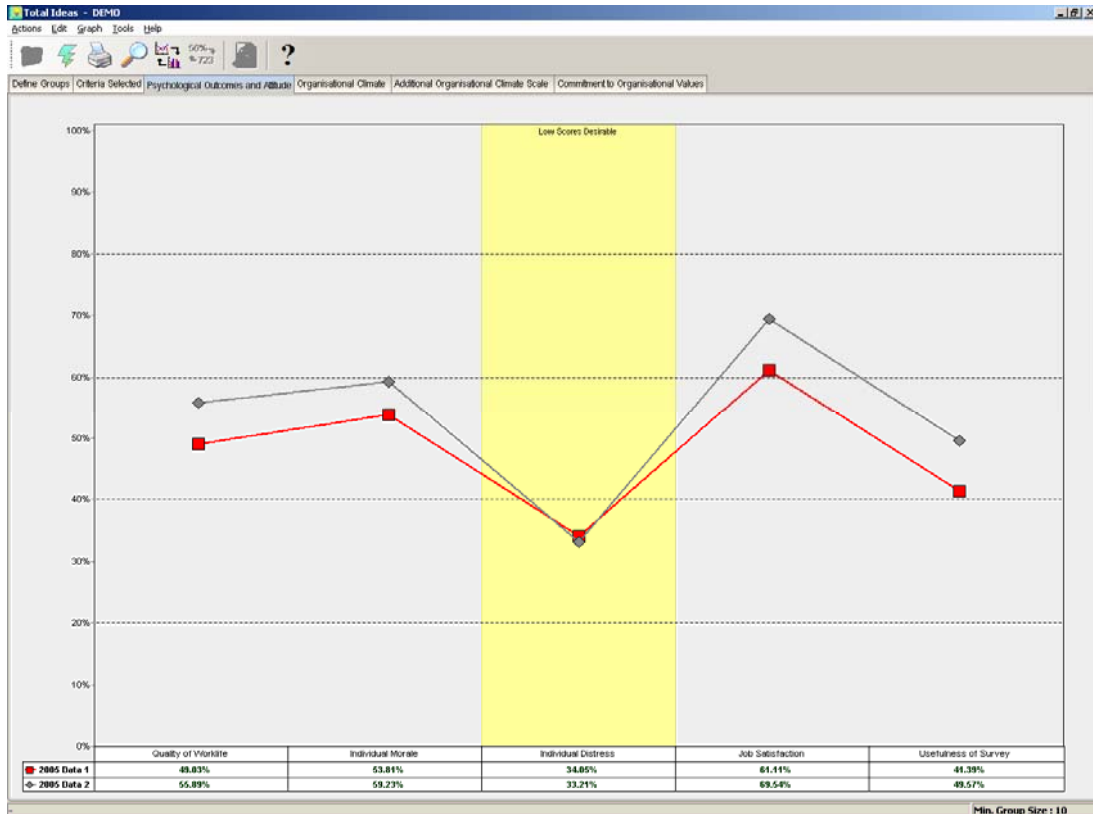


Figure 2. Interactive database showing group comparisons in graphic form.

A wide range of graphic formats can be requested, as Figure 2 illustrates. These figures can be copied to a word document, a powerpoint presentation, or any other medium, thus facilitating the preparation of written reports and face-to-face demonstrations. Whilst there is nothing new about software that allows you to do this sort of thing, the innovative aspect of this database is that there is no third party software involved.

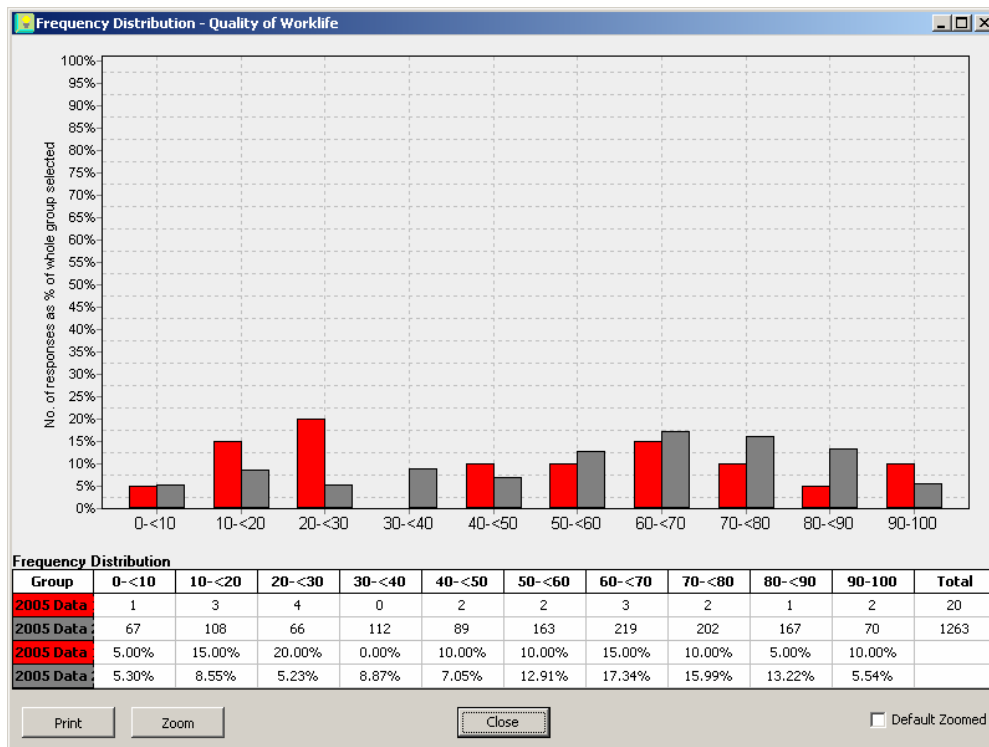


Figure 3. A different view from the interactive database.

Figure 3 shows some of the versatile features of the database. We have avoided the common trap of making too many features available to keep training requirements to a minimum, but it is still a reasonably versatile package.

Improvements to Interactive Database

The interactive database has been popular with our clients who appreciate the opportunity to compare their own statistics with benchmarks and the opportunity to explore the database without coming back to us all the time. We have also continued to improve the database. Our latest improvement involves switching from comparisons based on raw scores to Rasch-based analyses. Because many readers will not be familiar with the Rasch model, a brief history is in order. For a more detailed non-technical technical explanation, see Tenenbaum and Fogarty (1997).

As early as 1928, Thurstone stated that scales are not sufficient if they do not satisfy the requirement of having an “origin” or a defined “zero-point” with units of measurement that extend from the origin in a linear fashion. The requirement for a zero origin poses some difficulties for the classical measurement model. A score of zero tells us little because it does not indicate that the individual has zero ability, it simply indicates that the individual did not get any of the items in the test correct or, in the case of an attitude scale, did not select any option with a value above zero. Nor can we easily make interpretations about the intervals between different total scores. Classical measurement processes do not satisfy the requirement for a zero origin and equal units of measurement in the way stipulated by Thurstone.

The essential prerequisites for constructing such a measure comprise (a) a consistent definition of the domain of investigation (Thurstone, 1928), (b) selection of items which best

represent the domain and share a common content classified under a single heading (Guttman, 1944), and (c) administration of the resulting scale to a sample of the relevant population in order to examine the response patterns. Andrich (1981) argued that the requirements outlined by Thurstone (1928) and Guttman (1944) which define the concept of psychological scaling are solved by the Rasch model. In Andrich's (1981) words:

The most important distinguishing feature of Rasch's models is that, when they hold within some specified frame of reference, they provide explicit comparisons of person parameters which are independent of other persons to be compared and also independent of the parameters of the questions or items used to obtain the required responses. In achievement testing these parameters are the abilities of persons and the difficulty of items, while in attitude measurement they may be termed respectively attitudes and, following Thurstone, affective values. The explicit separation distinguishes these models from other psychometric models, generally called latent trait models, within which framework the Rasch models are often placed. (p.2)

The Rasch method yields person measures and item values that are independent of each other. Both represent points on linear continuums and both rely on measurement units called logits that have a true zero point with equal units of measurement extending in either direction. The benefit of incorporating Rasch measurement into our interactive database is that we can track change more reliably. Thus, a change of two logits from one year to the next has the same meaning, wherever on the scale they appear. We have introduced this change in measurement units with a selected range of clients.

Another recent development includes the extension of Total-Ideas to accommodate written comments in surveys. We call this version Total-Comments and it was added to cater for ongoing client demands to allow written comments in surveys and to speed up the process of analysing these comments, which can fill many, many pages in a large organisational survey.

Applying this approach in a military context

The combination of survey methodology and database reporting technology has worked well for us in the public sector where there is a strong demand for measures of organisational climate. Our approach has worked because we formulated a set of underlying principles and stuck to them over a period of 10 years. It has also worked because of the willingness of managers to embrace surveys when they form part of an organisational improvement plan that fits within their strategic planning framework.

It is clear from the many papers at this conference on the use of survey methodology that military organisations are also turning to this methodology to gather information that can assist in managing human resources. The Australian Defence Force (ADF) is no exception. In fact, the widespread demand for surveys and associated reports is now presenting the same kinds of problems that we experienced in our public sector work. It is difficult for personnel with expertise in survey methodology to keep up with the demand. As a case in point, the ADF's Profile of Unit Leadership, Satisfaction and Effectiveness Survey (PULSE) is designed to provide commanders with a measure of the organisational climate within their unit and sub-units. Safety Culture/Climate is one of the scales in an updated version of PULSE that will shortly be implemented. The situation is not exactly the same as that described in the Case Study above, where we were dealing with large organisations that

required tailored reports for sub-sections of the organisation, but there are obvious parallels in terms of the need to introduce technology solutions to assist with data analysis and report preparation. If the datasets have to go to a central point for analysis and interpretation, that central point will quickly become a bottleneck and impetus will be lost.

We are currently trialling the introduction of the Total-Ideas database to support the administration of PULSE surveys. The initial thrust will be to refine the reporting system so that it is not simply an easy-to-use interactive database but a reporting tool that will automatically generate the tables and figures required for a report to a commander. It is too early to comment on the progress of this project but it is not too early to say that we believe this is the way of the future. The role of psychometricians is to communicate with managers to help build the strategic frameworks for organisational surveys. We need to make better use of technology to help with the more mundane tasks of data analysis and reporting. That's what Applying the Science is all about.

References

- Andrich, D. (1981). *Rasch's models and Guttman's principles for scaling attitudes*. Paper presented at the International Conference on Objective Measurement. Chicago: The University of Chicago, Department of Education.
- Guttman, L. (1944). A basis for scaling quantitative ideas. *American Sociological Review*, 9, 139-150.
- Tenenbaum, G., & Fogarty, G. (1997). Applications of the Rasch Analysis to sport and exercise psychology measurement. In J. Duda (Ed.), *Advancements in sport and exercise psychology measurement*. Morgentown, M.V.: Fitness Information Technologies.
- Thurstone, L.L. (1928). The measurement of opinion. *Journal of Abnormal and Social Psychology*, 22, 415-430.

Acknowledgements

Dr Machin and I are the authors of this paper but the work we have described includes significant contributions from Dr Majella Albion, Dr Jeff Patrick, Dr Hong Eng Goh, and computer technicians Mr Ross Bool, Mrs Susie Gibson, Mr Simon Fawell, and Mr Ken Askin.