

DIAGNOSING PROBLEMS ON-FARM – PROCESSES USED BY AN EXPERT FARM MANAGEMENT CONSULTANT

Sub-theme: Knowledge and information

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Abstract

A major constraint facing the New Zealand consultancy sector is the time and cost of training novice farm management consultants. An industry funded training programme has been developed to improve the proficiency of novice consultants. However, although this programme provides good training in benchmarking and information collection, it provides limited theory about other processes that are required for the effective diagnosis of on-farm problems. To this end, a pilot study was initiated with an expert consultant to investigate their diagnostic processes. This paper reports on some of the processes identified during this study that were important for the diagnosis of on-farm problems during a first visit to a client. The study found that constraining information gathering, triangulation, classification and diagnosis through the use of diagnostic trees were all important processes for the effective diagnosis. This research has demonstrated that the investigation of the consultancy processes of an expert consultant could provide useful theory for training novices.

Key words: *problem solving, diagnosis, consultancy, key performance indicators, classification, triangulation*

Introduction

An aging consultant population and the lack of succession planning is a concern in New Zealand. A key factor constraining the employment of new consultants is the time and cost required to train them. Often it can take three years before a trainee is proficient. To overcome this problem, DairyNZ, an industry funded extension organisation, has developed a training programme for new consultants based on the Whole Farm

Assessment and Planning (WFAP) process they use with their Consulting Officers (Kenny and Nettle, 2013). It aims to improve the capability of novice consultants such that they become proficient more quickly, which in turn reduces the high training cost. Although the WFAP programme provides trainees with a thorough grounding in benchmarking and the information they need to collect to assess a farm business, the programme provides limited theory about how this information can be processed to diagnose on-farm problems. Such theory could be sourced from experienced consultants. If this pool of expertise could be captured, it could then be passed on to novices to enhance their capability. However, limited research has been undertaken on this topic. This paper reports on a study that investigated the techniques used by an “expert” farm management consultant to diagnose problems for a client during a first visit.

Methods

The objective of the study was to describe the diagnostic processes used by an “expert” farm management consultant. A single-case study approach was adopted because it was considered the most appropriate method for collecting in-depth information about processes (O’Leary, 2005). The consultant was selected on the following criteria: at least twenty years consultancy experience, recognition as an expert in their field, and willingness to participate in the study. A semi-structured interview protocol (Ritchie and Lewis, 2003; O’Leary, 2005) was designed based on the literature. The consultant was interviewed about the consultancy process he used during a first visit to a new client. Four, one and a half hour interviews were conducted and each interview was taped and transcribed. The data was analysed using the qualitative data analysis technique (Dey, 2003). The results were sent to the consultant for verification and then compared to the literature.

Results

Several processes that could be useful in training novice consultants to diagnose problems on-farm were identified from the study. These included the methods to: 1) limit the amount of information gathered on a first visit, 2) triangulate information provided by the client, 3) classify the client, farm family and farm business, and finally

4) identify and diagnose the client's problems. These will be described in the following sections.

Information gathering

Because of the large amount of data that can be gathered on a first visit, the consultant uses a process to constrain this. First, during the drive to the farm, he retrieves knowledge about both district (e.g. wet soils) and seasonal problems (e.g. inadequate feed at calving) that might be important to the client. He uses this to determine what information must be gathered to identify potential problems in these areas. Second, once at the farm, a priority is to assess which problems the client is most interested in. This information is then used to further constrain information gathering. Finally, key benchmarks are then used to identify other important problems facing the client and this further focuses information gathering. As the consultant gathers information, he is processing it in different ways for different purposes (Figure 1). It is used to build a picture of the farm business, diagnose the problems facing the client, and then tailor solutions to the client's problems. Picture building and diagnosis occur in tandem and a range of techniques are used to do this. These include triangulation, benchmarking and comparative analysis and classification. These will be discussed in the following sections.

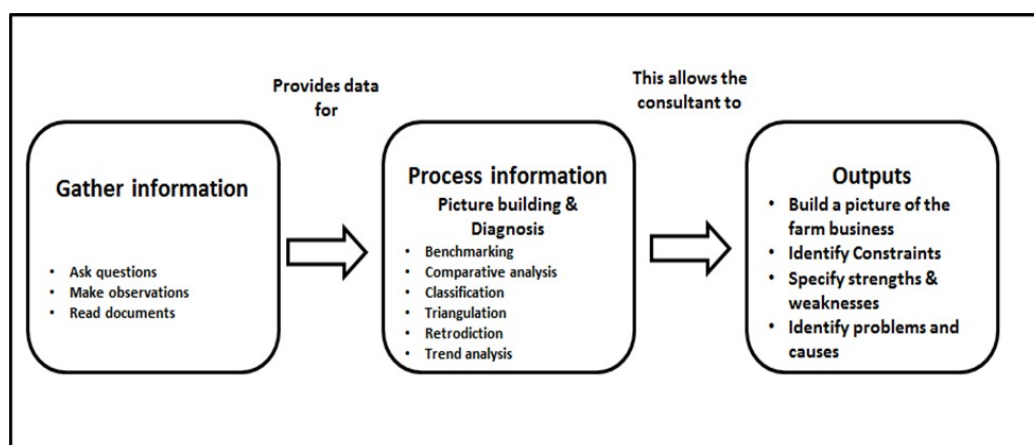


Figure 1. Information processing by the consultant.

Triangulation

Because he is not the problem owner, the consultant has to use triangulation procedures to assess the reliability of the information he obtains from a client. However, he must do this without the client being aware of it as this can result in distrust. Several forms of triangulation were identified. Verbal information provided by the client was triangulated with the consultant's observations. This might include the client's perceptions of: 1) the state of his resources (e.g. cow condition) and 2) the practices he uses (e.g. grazing round and residuals). The client's assessment of the performance of his business (e.g. MS/ha, cost of milk production) is triangulated with documents (e.g. accounts) or figures calculated from raw data. Areas the client says he is interested in are triangulated with visual and verbal cues. The consistency of the information is also determined within, and across visits, a form of temporal triangulation. Drawing on this information, the consultant classifies the client as either a provider of accurate or inaccurate information.

Classification

The consultant uses comparative analysis and benchmarking to compare elements of the farm business to industry standard data and his own benchmarks. He then classifies these to build a mental picture of the farm business and locate it relative to other clients. The farm business is classified into four key areas: 1) the clients and farm family, 2) the farm resources, 3) the production system and its physical performance, and 4) its financial performance (Table 1).

Table 1. Examples of the classification schema used by the consultant.

Classification Area	Sub-categories
Clients and farm family	
	Power in decision making Interest in the business Roles in the business Age group Personality type Degree of openness

	<p>What motivates them</p> <p>Strategic and/or tactical focus</p> <p>Accuracy and reliability of information provision</p> <p>Management capability by area</p> <ul style="list-style-type: none"> • Pasture management • Herd nutrition • Mating management • Etc. <p>Attitudes to key areas of management</p>
Farm resources	
<i>Quality of Infra-structure</i>	<p>Herd</p> <p>Replacements</p> <p>Pastures</p> <p>Soils</p> <p>Etc.</p> <p>Milking shed</p> <p>Subdivision</p> <p>Races</p> <p>Water supply</p> <p>Effluent system</p> <p>Drainage</p> <p>Irrigation</p> <p>Feed pad</p> <p>Etc.</p>
Production system and physical performance	
	<p>Farm size</p> <p>Herd size</p> <p>Farm system type (DairyNZ 1-5 Classification)</p> <p>Milksolids/ha</p> <p>Stocking rate</p>

	Milksolids/cow Farm state on the day of the visit Etc.
Financial performance	
	Liquidity <ul style="list-style-type: none"> • Net cash income • Farm working expenses Profitability <ul style="list-style-type: none"> • Return on assets • EFS/ha • Operating profit margin • Cost of milk production/kg MS Solvency <ul style="list-style-type: none"> • Debt to asset ratio • Debt/kg MS Etc.

Of particular interest is the classification process that the consultant used to assess the management capability of the client across different domains (e.g. grazing and financial management). Seven techniques were used to do this and some of these also use a triangulation process. For each knowledge domain the consultant first compares the client's decision making processes to best practice. Second, he compares the client's assessment of the state of the farm's resources (e.g. post-grazing residuals) with his own observations. Third, he determines if there are discrepancies between stated and actual practice. Fourth, he compares the client's performance against appropriate benchmarks (e.g. MS/cow, MS/ha). Fifth, he evaluates the client's understanding of the principles within that particular domain. Sixth, he determines the degree of monitoring the client uses, often a good indicator of capability. Finally, he assesses the discourse that the client uses. Clients with good capability in a domain tend to use a more "technical" discourse. The consultant uses this information to determine the client's management capability (poor, average, good) across key domains. Areas where the client's capability is classified as poor, often identifies a problem.

The consultant also classifies the client's resources in terms of quantity (e.g. is the farm small, medium or large?) and quality (e.g. is the soil fertility low, medium or high?) using a set of industry standards and benchmarks. From this, he can identify constraints, strengths and weaknesses and potential problems. He also distinguishes between generic resources that all dairy farms are likely to have and specialised infra-structure that is found on farms because of specific resource constraints (e.g. irrigation in dry areas). On farms that have such resource constraints that can be overcome by specialised infra-structure, the consultant will assess if firstly, they have this type of infra-structure, and secondly, its scale and quality.

An important output from the classification process is the identification of the strengths and weaknesses of the farm business (Figure 2). Various factors within a range of broad categories (client, farm family, resources, production system, physical and financial performance) are classified using benchmarking or comparative analysis into those that 1) negatively deviate from the average, 2) are average, and 3) positively deviate from the average. Factors that are classified as negatively deviating from the average would be inferred as a weakness and those that are classified as positively deviating from the average are inferred as a strength. The terms negative and positive deviations from the average are used because some factors such as debt levels may be classified as above average, but this has negative connotations, and as such, it is classified as a negative deviation from the average. Generally, weaknesses tend to highlight potential problem areas that the consultant then investigates using his diagnostic process.

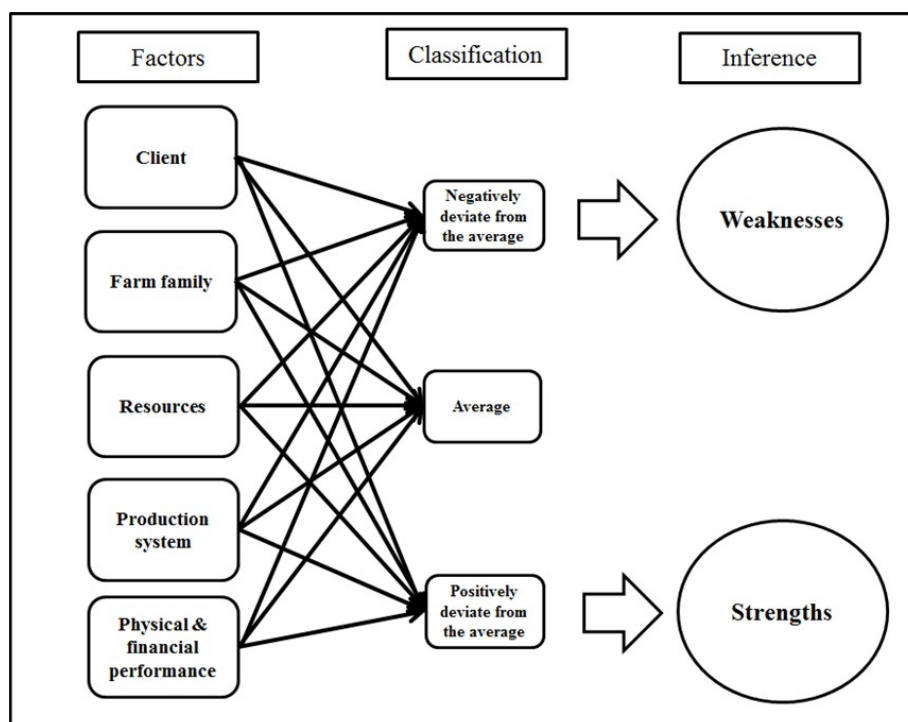


Figure 2. The role of classification in identifying strengths and weaknesses.

Diagnosis

Most clients have a wide range of problems, but given a consultancy visit is a half day, the diagnostic process must be time-efficient. To ensure this, the consultant focuses on 1) seasonal or district problems, 2) those raised by the client, and 3) those he has identified from his own benchmarking process. Problem importance is based on impact on the business and relevance to the client. Slightly different processes are used to diagnose problems in each area. For seasonal or district problems, the consultant classifies the season or district in which the visit occurs. He then draws on his mental schema that he has developed over time which sets out the problems he is likely to find. In the schema, each problem has a set of symptoms. He then collects information to test which symptoms are exhibited to identify which problems exist. For the problems raised by the client, the consultant will draw on his mental schema for these problem types and their associated symptoms. Again he will collect information to test if any of these are in fact a problem for the client.

To identify issues important to the farm business, but not mentioned by the client, the consultant uses a small range of key performance indicators (e.g. production per cow and

production per hectare, supplement fed per cow, pasture dry matter harvested per hectare, cost of milk production, EFS/ha) to benchmark the farm. He first calculates a key performance indicator, compares this to a benchmark and classifies the farm as below average, average or above average for their resource bundle and system type (Figure 3). If performance is above average (e.g. top 20%), this suggests that there is limited scope for improvement in this area. In contrast, if it is below average, this suggests there is considerable opportunity to improve performance and that this is a priority area. Similarly, if the client's performance is average, there is scope to move it into the top 20% of farms.

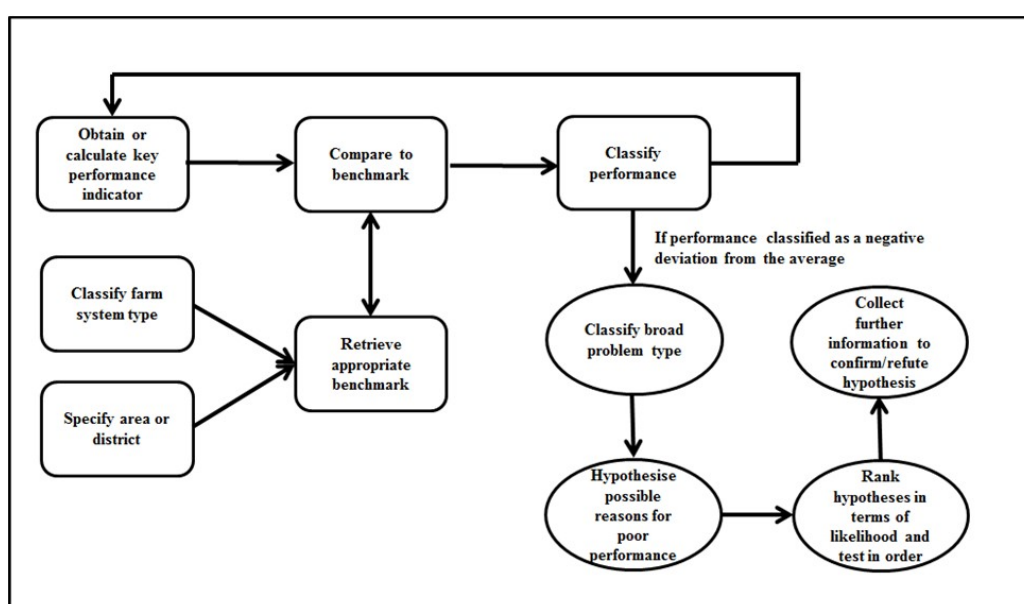


Figure 3. The diagnostic process.

Once a problem is identified, a problem type classification schema or diagnostic tree is used. This mental schema sets out problems and sub-problems by type and as one moves down the tree, there is a set of symptoms associated with each problem type at each level. The consultant uses this schema to hypothesise the symptoms associated with possible causes of the problem and rank the most likely causes (Figure 3). Information is then collected during the farm visit to confirm or refute these hypotheses. For example, the farm's return on assets might indicate a profitability problem (Figures 4).

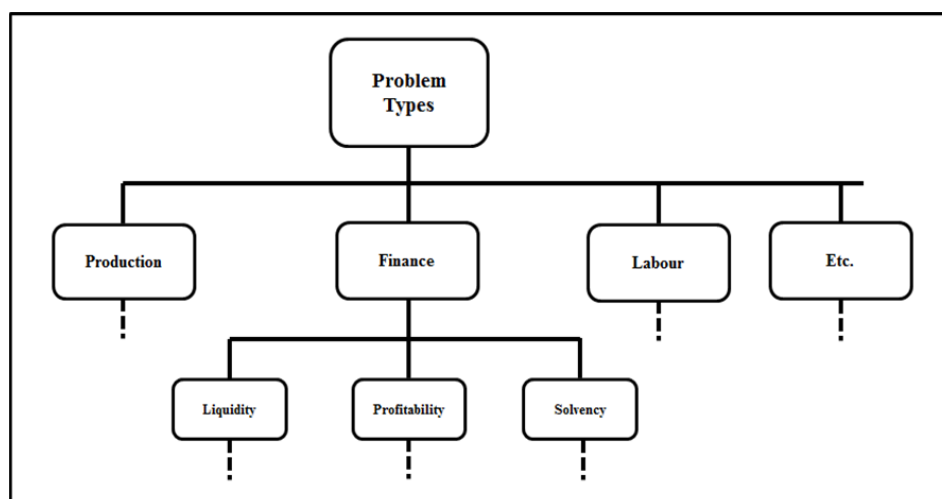


Figure 4. A partial problem type hierarchy or diagnostic tree.

More in-depth analysis of the profitability problem (Figure 5) might indicate that it is driven by a low level of milksolids production per hectare and that this in turn is due to a low level of pasture dry matter harvested per hectare. Using this component of his diagnostic tree (Figure 6), the consultant might determine that pasture production is not limited by strategic elements such as infra-structure or technology use, but rather, the client's operational grazing management is the problem with inappropriate round lengths and grazing residuals. The diagnostic tree structure allows the consultant to quickly diagnose key problems facing the client.

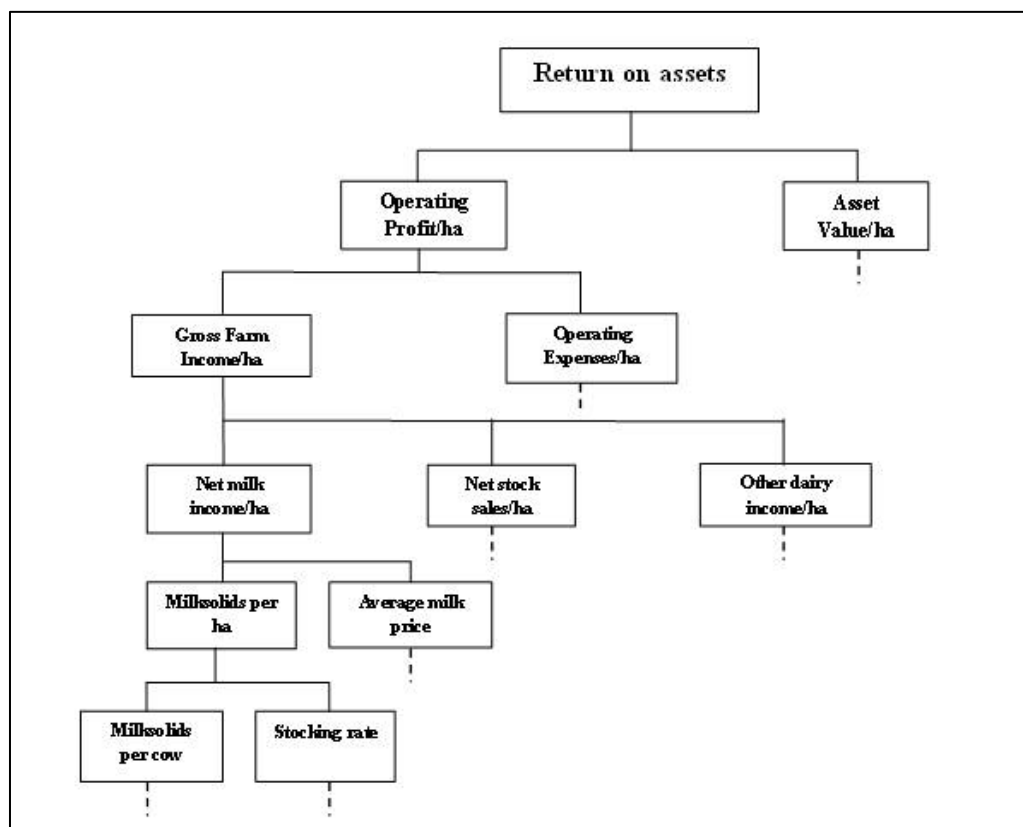


Figure 5. A partial diagnostic tree used to assess profitability problems.

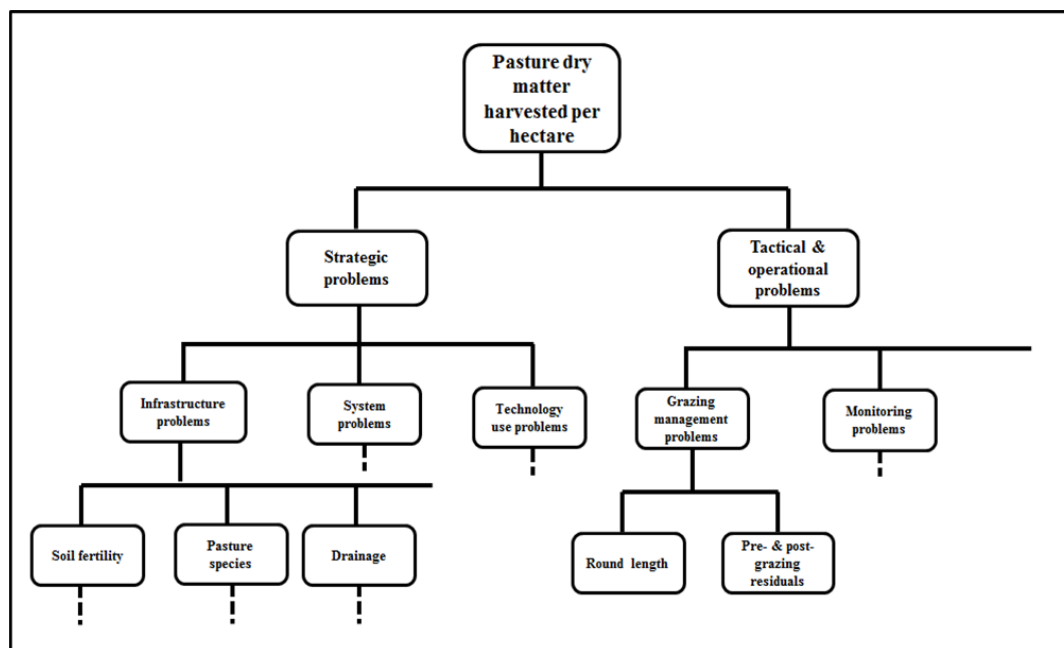


Figure 6. A partial diagnostic tree for low pasture dry matter harvested per hectare.

Discussion

A problem identified by Kenny and Nettle (2013) for training novice consultants was the amount of information they needed to collect during a visit. The consultant in this study provided some insights into how he used his mental schema (Endsley, 2000) to reduce this. He focuses on four problem sets: 1) seasonal problems, 2) district problems, 3) the problems the client identified as important and 4) “other” problems he identified. The consultant’s mental schema (Endsley, 2000) has a set of symptoms associated with each problem within the four problem sets. These dictate the information that needs to be collected to confirm or refute the existence of these problems. Little has been written about how consultants constrain information gathering to make it more efficient. Lipshitz and Shaul (1997) reported that experts are more efficient at collecting information than novices, but they did not provide any insights into how they did this. The techniques identified here could help novice consultants improve the efficiency of their information gathering.

Triangulation processes were used to verify the accuracy of the information obtained from the client. This was important because the consultant is not the problem owner (Gray *et al.*, 1999) and as such, he does not have full and accurate information for problem solving. Because of this, he must cross-check the information provided by the client. The consultant used four types of triangulation: 1) temporal triangulation, 2) triangulation by information source, 3) triangulation of the client’s perceptions of the state of farm resources with the observed state, and 4) triangulation of client perceptions of his behaviour with observed behaviour. One other study (Gray *et al.*, 2000) did identify the role of triangulation in the information gathering process, but they did not specify different types of triangulation. In a review of the Whole Farm Assessment and Planning program, Kelly and Nettle (2013) reported that the approach stressed the importance of asking “cross-checking” questions, however, this made the process unduly lengthy and farmers often felt the questions were judgemental. Better use of triangulation techniques that limited the number of cross-checking questions would reduce these problems. The focus would shift to observational skills (Klein *et al.*’s (2006) perceptual discrimination) and the use of cross-checking calculations.

The bulk of the information processing that the consultant undertakes requires the use of benchmarking, and comparative analysis to classify the farm business. This process was used to build a mental picture of the farm business and allowed the consultant to locate the client relative to his other clients. Other studies have stressed the importance of benchmarking, comparative analysis, and classification in helping consultants build a picture of the farming business (Gray *et al.*, 1999, 2000). The process used by the consultant for classification is similar to those reported in other studies (Rogers *et al.*, 1996a, b; Gray *et al.*, 1999, 2000). First the consultant gathers information on some factor of interest. He then compared the factor to benchmarks or standards that he has in memory. On this basis, he then classifies (Schreiber *et al.*, 2000) the farm business across a broad range of categories including the client, farm family, resources, the production system and its physical and financial performance. Similar results have been reported by other studies (Gray *et al.*, 1999, 2000). Understanding the farm business context is critical for problem solving. Techniques such as those reported in this paper would help novice consultants better describe the farm context and make them more effective problem solvers.

The consultant uses a classification process to assess the management capability of his clients across different domains. Seven techniques are to do this including assessments of: 1) their practice relative to best practice, 2) the efficacy of their perceptions of the state of farm resources, 3) the accuracy of their perceptions of their own practices, 4) their performance, 5) their understanding of principles, 6) their monitoring systems and 7) their use of discourse. Some studies (Rogers *et al.* 1996a; Gray *et al.* 1999; Reid *et al.*, 2013) have either inferred or mentioned that consultants assess the capabilities of their clients, but do not make the process explicit. This process would be useful for a novice consultant and it would help them identify areas for future capability building.

The consultant used a classification process to build a picture of the client's resources including important infra-structure. Resources were separated into generic and context specific resources. Generic resources were classified in terms of both quantity and quality. To classify a resource, a number of indicators were used for benchmarking purposes. For context specific resources, the consultant first assessed if the resource was present or absent (e.g. he would expect a farm in an area with heavy wet soils to have intensive drainage), and then its scale and quality. Other studies have mentioned that

consultants assess a client's resources (e.g. Gray *et al.* 1999, 2000), but they have not reported the process in any detail. This technique would help novice consultants assess the nature of a client's resource base and identify potential problems.

The consultant also uses his classification process to identify the strengths and weaknesses of the farm business. A wide range of factors, within a set of broad categories (client, farm family, resources, production system, physical and financial performance), are classified using benchmarking or comparative analysis into three categories. Those that: 1) negatively deviate from the average, 2) are average, and 3) positively deviate from the average. This information is then used to infer the strengths and weaknesses of the farm business. Other studies (Rogers *et al.*, 1996b; Gray *et al.*, 1999) have reported that consultants identify their clients' strengths and weaknesses, but not the process they go through to do this. Generally, weaknesses tend to highlight potential problem areas for the consultant to investigate further. A template could be set up to help a novice consultant identify the strengths and weaknesses of his clients. This would be a useful tool.

The diagnostic process reported in this study is similar to that described by other studies (Rogers *et al.*, 1996a, b; Gray *et al.*, 1999, 2000) where consultants have used benchmarking and comparative analysis to identify if indicators have deviated significantly from industry averages or standards which in turn identifies a potential problem. As with this study, the consultants in Gray *et al.*'s (2000) study used causal chains where once a problem is identified, it is classified (e.g. low profitability), then a mental schema (Lipshitz and Shaul, 1997) is used to infer a range of possible causes that might help diagnose the exact nature of the problem. Each possible cause has an associated set of symptoms or relevant cues. Information is then collected through questioning and observation to confirm or refute the existence of a possible cause. Gray *et al.* (1999, 2000) compared this to the feature matching process (Klein, 1997) in the naturalistic decision making literature. During feature matching, each problem type has a set of "features" or symptoms (Klein, 1997). By gathering information and matching this to the features of a specific problem type, its existence could be confirmed or refuted (Klein, 1997). The consultant in Gray *et al.*'s (2000) study compared this to working down a diagnostic tree, a point also made by the consultant in this study. The mental schema or diagnostic trees identified in this study are powerful conceptual tools for

diagnosing problems because they represent important causal relationships. Making such schema explicit for novice consultants would improve the effectiveness of their problem solving.

Conclusions

Current training for novice consultants in New Zealand focuses on subject matter knowledge, and specific techniques such as benchmarking and information checklists, but lacks theory about other processes that are important for problem diagnosis. This research has identified methods that provide useful conceptual tools for training novice consultants by drawing on a largely untapped resource, namely the expertise of our top consultants. Learning about such processes could enhance the diagnostic skills of novices, helping them to develop their own mental schema. Workshops will play an important role as will the provision of a conceptual framework against which novices could reflect on their existing practice. Consultancy firms could develop resources based on this research to help novices. For example, the provision of : 1) local district and seasonal problems and associated indicators, and 2) locally-based templates for quickly identifying strengths and weaknesses.

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