A Training Needs Analysis for the New Zealand Forestry Industry

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Abstract

Forestry work is inherently dangerous, and logging workers are injured and killed at work at a rate considerably higher than other occupations. A training needs analysis was conducted for the New Zealand Forestry Industry to: identify if there were any deficiencies in the currently available training for logging workers; assess the perceived effectiveness of current training methods regarding safety messages; assess the perceived utility of the currently available pre-employment training; and to determine if there are factors other than training that may be contributing to the poor occupational health and safety record of logging workers. Logging workers, logging contractors and forestry trainers from three geographical regions were invited to complete specially developed questionnaires. In total, 396 crew members, 48 contractors and 23 trainers participated. The results found a number of deficiencies in the current training - particularly the lack of training available for machine operators. Safety training was not especially effective in delivering safety messages, indicating that miscommunication between contractors and logging workers occurs regarding safety. Pre-employment training was viewed positively by logging workers, but contractors had problems with the amount of practical experience given and the level of safety awareness of the graduates. The results also indicated that the logging industry has a highly mobile, transient workforce, which may be contributing to the poor occupational health and safety record.

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Chapter One: Introduction

Training is often used by organisations to improve performance or rectify skill and/or knowledge deficiencies. In order for training to achieve these goals it needs to be effectively targeted and delivered. One technique to assist those making decisions about training is the training needs analysis.

1.1 Chapter Overview

This chapter first discusses what a training needs analysis is and discusses why training needs analyses are useful tools for organisations. How training needs analyses are performed within organisations, and their development across time are detailed next. The use of training needs analysis methods outside their traditional sphere of intra-organisation is then described. Finally, the use of training needs analysis in an industry setting (the harvesting sector of the forestry industry) is discussed and the aims of this research are stated.

1.2 What is a Training Needs Analysis (TNA)

What is training needs analysis? It is generally seen as the first stage, first phase or first step in a systematic training process, regardless of which model of training is being used. Sleezer (1993) summarising a review of training models states that "training models detail a process for developing training...[these] models differ slightly but in general they contain five major phases: assess the needs, design the training; develop the materials and instruction; implement the training and evaluate the training" (p. 248). Thus assessing needs is accepted in the literature as the start of the training process and the generally

recommended method for assessing needs is the TNA. Rummler (1987) argues that training need analyses are crucial to the success of any training programme because if the TNA is not done correctly the ramifications of inappropriate or unneeded training affect the whole organisation not just the trainees themselves. Rummler's position is supported by Ford and Noe's (1987, cited in Tannenbaum & Yukl, 1992) research of self-assessed training needs. Ford and Noe found that inadequacies in conducting the person analysis phase of a training needs analysis resulted in training that was targeted at an inappropriate level or targeted to the wrong people. They stated "in addition to determining who needs training, person analysis can be used to assess whether employees have the prerequisite attitude, knowledge and motivation to benefit from training. Individuals who lack basic skills or motivation prior to training are less likely to succeed and may require remedial preparation prior to entering a specific training program" (p. 403). More recently Rossett (1997) notes when unnecessary training is conducted it not only results in cynicism but also fails to improve performance. Without the benefit of the information collected during a TNA such as the current skill/knowledge level, organisational support and attitude towards training it may by difficult to separate the effect of any given training programme on trainees performance and organisational productivity from other possible influencing factors. It is for these reasons that Rummler argues "There is no more critical task in the training process" (p. 217) than a TNA.

The TNA concept is not recent. The concept was probably developed from the work of Mahler and Monroe, who investigated the determination of training needs in American industry in the early 1950s (cited in Moore & Dutton, 1978). Mahler and Monroe found that less than ten percent of the industrial companies that they sampled used any form of systematic approach to identify the training needs of their employees. Employee training needs were most commonly determined by intuitive approaches such as observation, discussion with supervisors and requests by management for training. They noted an emerging trend of combining some of the above methods in an attempt to gain accuracy in identifying training needs. At that time, there had not been research to determine if

systematic approaches to training were more successful than intuitive approaches, a fact that remains true today. However, it was generally accepted that a systematic approach to determining training need was more likely to provide appropriate training than an intuitive one because a systematic approach would require evidence that training was needed. While it is probably true that an experienced manager maybe able to accurately identify training needs based on knowledge gained over time working both with the people and in the organisation, they may also fail to identify areas where training can assist. Thus relying only on a manager's opinion on what training is required may lead to inappropriate training decisions being made.

One of the first documented systematic approaches to the determination of employee training needs was the three-fold investigation method of McGehee and Thayer 1961 (cited Moore & Dutton, 1978). This method called for integration of analyses of the organisation, organisational operations and manpower to ensure that any training undertaken would be beneficial to the company. They did not intend that three separate investigations were undertaken, rather that any investigation of training needs should consider the interrelationship between the organisation, the job and the person performing the job so that each training decision was 'custom fitted' for the situation. According to McGehee and Thayer, the organisation analysis "focuses on the entire business enterprise and consists of organizational objectives, human resource analysis, analysis of efficiency indices, and analysis of organizational climate" (p. 533, cited Moore and Dutton). It is used to determine where and when training should be used to benefit the organisation. The operations analysis (job/task analysis as referred to today) was used to "determine what an employee should be taught to perform the job at the desired level...includes standards of performance, how the tasks are to be performed to meet the standards, and the skills, knowledge, and attitudes necessary" (p. 533). The manpower analysis was used to determine if an employee was meeting the required performance standard for their job. McGehee and Thayer recommended using objective records (performance data and performance appraisal information such as productivity,

absenteeism, accident, grievance, waste, repairs), situational and observational methods.

McGehee and Thayer's original methodology has undergone only minor modifications to become the organisation, task and person analysis that is recommended today. Goldstein (1991) noted where McGehee and Thayer utilised an organisational analysis to determine where and when training could be useful, the modern equivalent also uses the organisational analysis to determine if there are organisational barriers that prevent training producing the desired results. In this, Goldstein counters one of the deficiencies of the TNA framework raised by Moore and Dutton, that of failing to account for the organisational environment and organisational structure when attempting to determine employee needs.

Moore and Dutton noted in their 1978 review of the TNA concept that while research in specific techniques for determining training needs had flourished in the seventeen years since McGehee and Thayer had put forward their methodology for TNA, there had been little progress in the theoretical development of the concept. A comprehensive search of the TNA literature (including PsychLit; ABI inform; ERIC; Wilson Social Science Index; electronic and print media databases) suggests that this comment would still hold true in 1999. The majority of the current TNA or needs assessment literature is to be found in practitioner-orientated journals and magazines, which tend to be utilisation focused, rather than research based. This leads to a second deficiency of the TNA literature, that of failing to determine which techniques are best suited to particular situations, and whether any particular technique is more accurate in determining training needs than others.

An interesting change in the reported TNA literature is it now tends to focus on management training programmes, whereas the initial focus was improving training outcomes at the worker/employee level.

While there appears to be considerable agreement that a TNA is the fundamental first step in the training process, research by O'Driscoll and Taylor (1992) found the majority of training decisions made by New Zealand organisations were not based on the results of a TNA. In this, New Zealand organisations are not different from their overseas counterparts as there are many articles that note that while training needs analyses are theoretically viewed as essential, in practice they are not generally performed (e.g. Kaufman, 1996; Rossett, 1997; Saari et al., 1988 - cited in O'Driscoll & Taylor). O'Driscoll and Taylor interviewed 99 Human Resources Directors in large or medium sized New Zealand organisations to discover if a) a gap existed between the methods for TNA advocated by the literature and those actually employed by organisations and b) how training decisions are made in New Zealand organisations. They found training personnel or employees were not usually responsible for suggesting that training is needed, rather high level management (i.e. CEO or General/Senior Managers) requested training. High level management was also responsible for determining the content of the training that was subsequently provided. Requests for training were generally based on "informal observations of productivity, turnover rates and customer complaints or, in a small number of cases, seeing opportunities for development" (p. 600). This list of 'reasons' for training is almost identical to that found by Mahler and Monroe over forty years ago. O'Driscoll and Taylor conclude that systematic training needs analyses are not commonly used to assist training decisions, so a gap does indeed exist between TNA praxis and practice. They suggest the reason for this gap is due to a lack of attention to "the organizational context in which training decisions are formulated" (p. 601). This lack of attention is an error in practice rather than an error in TNA theory as McGehee and Thayer, and Goldstein, both intended the organisational analysis to take account of the current organisational situation when determining training needs. O'Driscoll and Taylor further conclude "greater utilization of more systematic TNA techniques would assist decisions about management training and serve to link them more closely with strategic organizational objectives" (p. 602) a rather fancy way of suggesting that actually using TNA techniques should improve the quality of training decisions made,

especially if the organisation's objectives are considered during the process.

Defining TNA is not easy. In part this probably stems from a belief that everyone knows what one is. Latham in his 1988 review of training discusses TNA without defining what a TNA is, as do Tannenbaum and Yukl in their 1992 review of training. In part the difficulty with defining the concept may be because needs assessment and needs analysis are used interchangeably in the literature. The difficulty in defining the concept may also be partly due to the flexibility of the TNA concept. This flexibility allows the definition of what a TNA is to be influenced by both the element of the TNA process the author wishes to emphasise and the purpose for which the TNA is being conducted.

The distinction between needs assessment and needs analysis, in relation to training, is deserving of further comment as it has the potential to impact not only on a universal definition of TNA but also on the TNA process. Kaufman in collaboration with others (Kaufman, 1996; Kaufman & Valentine, 1989; Watkins & Kaufman, 1996) argues that a needs assessment "identifies gaps in results, places them in order of priority and selects the most important for closure or reduction" (p. 13, Watkins & Kaufman), while needs analysis "identifies the causes of the gaps in results so that appropriate methods, means, tactics, tools, and approaches may be rationally identified and then selected for meeting the need" (p. 13, Watkins & Kaufman). On the surface the definitions of the two concepts appear not only similar, but also overlapping. Despite this, Kaufman and collaborators clearly intend them to define two processes. The first, needs assessment, is strictly limited to identifying organisational performance deficiencies and indicating their relative importance to organisational efficiency, and thus the relative urgency in remedying the deficiency. The second process, needs analysis, is a more complex undertaking. It attempts to discover why the deficiency is occurring and determine which of many of possible solutions is best suited to rectify the deficiency within the organisation. As each organisation has a unique culture and climate, solutions to performance deficiencies must be individually tailored. It is possible the reason for

splitting TNA into two processes is related to a frequently stated and probably accurate belief that a comprehensive TNA is an expensive undertaking both in time and money. By offering a two-stage process, organisations maybe persuaded to at least start to systematically investigate their training requirements, and then at a later date be convinced that finishing the TNA process is a worthwhile investment for improving the organisation's operational efficiency and effectiveness. This would be a particularly useful strategy for consultants and training directors where organisational management is distrustful of the value or usefulness of training for remedying performance problems.

Kaufman's and others attempts to split TNA into needs assessment and needs analysis has been accepted to some extent as evidenced including the trend of "Needs Assessment and Analysis" in a book discussing world-wide human resources trends (Phillips, 1999). Phillips discusses the trend as "Needs assessment and analysis" (a combined process) rather than two separate processes, as the idea of only doing one of the two is not generally accepted. This is probably a reflection of the lack of utility and return-on-investment of only doing a needs assessment, as the majority of value in undertaking a TNA lies in the needs analysis portion. On a positive note, Phillips reports that organizations appear to be more willing to participate in TNA and are "committing more resources, in the forms of both time and money, toward needs assessment and analysis to ensure that training and development programs are necessary and are linked to business improvement" (p. 33). This suggests that the TNA technique maybe gaining credibility within management circles. Alternatively it could also suggest that there is more reporting of current levels of TNA.

Returning to defining TNA, the majority of authors accept that a TNA covers both needs assessment and needs analysis processes as described above. Hirumi (1994), defines TNA as a "systematic procedure for identifying problems, setting priorities and making informed decisions about how to reduce and/or eliminate performance discrepancies" (p. 23). A shorter definition of TNA is offered by Braimoh (1994) "to collect and evaluate

information in order to find out a) what is currently being done, and b) what should be done (either now or in the future)" (p. 271). Neither of these definitions is particularly clear about what a TNA actually is.

There is currently no universal definition for TNA. From the descriptions of the TNA process used by Basarab and Root (1992); Bucalo (1984); Drummond (1993); Moore and Dutton (1978); Peterson (1992); Smith, Delahaye, and Gates (1986); Thomas and Kellerman (1995); and Williamson (1993) the following definition is suggested. Training needs analysis is a process by which organisational performance deficiencies are identified and examined to determine if a) the deficiency is sufficiently important to warrant further attention and expense, and b) if the deficiency is best resolved with a training or non-training solution.

In summary, TNA are used to gather information about organisational efficiency and performance needs, the skill level of the people working in the organisation and the culture and/or climate of the organisation, in order that informed decisions about training (such as 'to do or not to do', what to do if necessary, and the 'best' way to do it) can be made. When used in this manner, any resultant training has an improved chance of success over training, which is being used as a reward, or punishment, or just to use up the training budget so 'we don't lose it next year when we might actually need it'. Rossett (1997), a specialist in needs assessment and instructional design, has found "organisations that fail to support needs assessment make mostly mistakes. They use training when another intervention would be more effective. They use too much training or too little. They use training but fail to support it with other interventions. They select the wrong objectives or attach the wrong emphases to them. They send trained employees back to supervisors who ignore or counter the new skills and knowledge" (p. 31). These mistakes can be extremely costly. Allen (cited in Maglitta, 1997) argues "$80 out of every $100 spent on IS [computer] training is wasted" (p. 80). Thus the use of a properly conducted TNA could potentially save an organisation both money and

employee goodwill while increasing organisational efficiency and effectiveness.

1.3 Why TNA can be a useful tool for organisations

Training needs analyses are traditionally and most commonly reported as a technique for improving the design and content of training courses (Abel, 1986; Bader & Bloom, 1994; Bloom & Levin, 1987, Braimoh, 1994; Christian-Carter, 1992; Goldstein, 1991, 1980; Landy, 1985; McGurk, Platton & Gibson, 1994; Sheperd, 1994; Tannenbaum & Yukl, 1992; Watson & Tanner, 1992; Wright & Geroy, 1992). Training needs analyses are conducted in order to improve training results by targeting either areas that are not currently being covered or areas that need greater coverage. This results in training that only deals with current problems (reactive training). Bramley (1989) noted when used in this manner, TNA and training courses are inextricably linked, a TNA leads only to a training course and non-training alternatives are not considered [i.e. only solution to a problem is training].

One of the problems with the literature on TNA stems from the fact that much of it is devoted to either telling one how to conduct a TNA or providing arguments for why training needs analyses are necessary. There are few actual training needs analyses reported. This is maybe a reflection of the commercially sensitive nature of the results from a TNA, as some brief case studies are sometimes included.

Christian-Carter (1992) describes the approach Barclays' Bank PLC took when the training department was reorganised in 1989. The reorganised training department adopted a systematic approach to employee training to ensure the bank's business needs were met. While the reorganisation necessitated the undertaking of a TNA it was made clear that this did not imply that only training solutions would be considered.

Performance competencies (written in terms of behavioural requirements) for each job were developed from consultations with staff in the position, their immediate manager(s), subordinates (if any) and subject matter experts (in effect a job analysis for each position was done). These competencies were then checked for accuracy with different staff members who held the particular position.

The performance of all staff members against the relevant competencies was subsequently undertaken. Where staff members failed to meet the competency standard a performance gap was deemed to have occurred. These performance gaps were further investigated to determine if training would remedy the deficiency. If a training solution was deemed suitable the information about the gap(s) between actual performance and required performance formed the basis of the training programme content.

Bloom and Levin (1987) describe how the American Institute of Nuclear Power Operations (INPO) use TNA methodology to continually aid the design of training programmes for nuclear facility personnel. Information is collected from three main sources. The first data source, Personnel Information Questionnaires, collects information from companies working within the industry. The information collected includes position/job descriptions, performance standards, job-specific knowledge and skills which is then collated to form industry wide requirements for each position.

Next, Task Inventory Questionnaires are created from the information collected from the Personnel Information Questionnaires. A Task Inventory Questionnaire is developed for each position within the industry. The Task Inventory Questionnaires are given to randomly selected workers in the relevant position to the questionnaire to complete. The workers' responses are used to "validate and supplement [the] job-specific data" (p. 239) collected via the Personnel Information Questionnaires.

Finally, Interviews are held with those who have completed the task inventory to ensure

the inventory accurately describes their position; no tasks have been omitted; and standards for the position are accurately described.

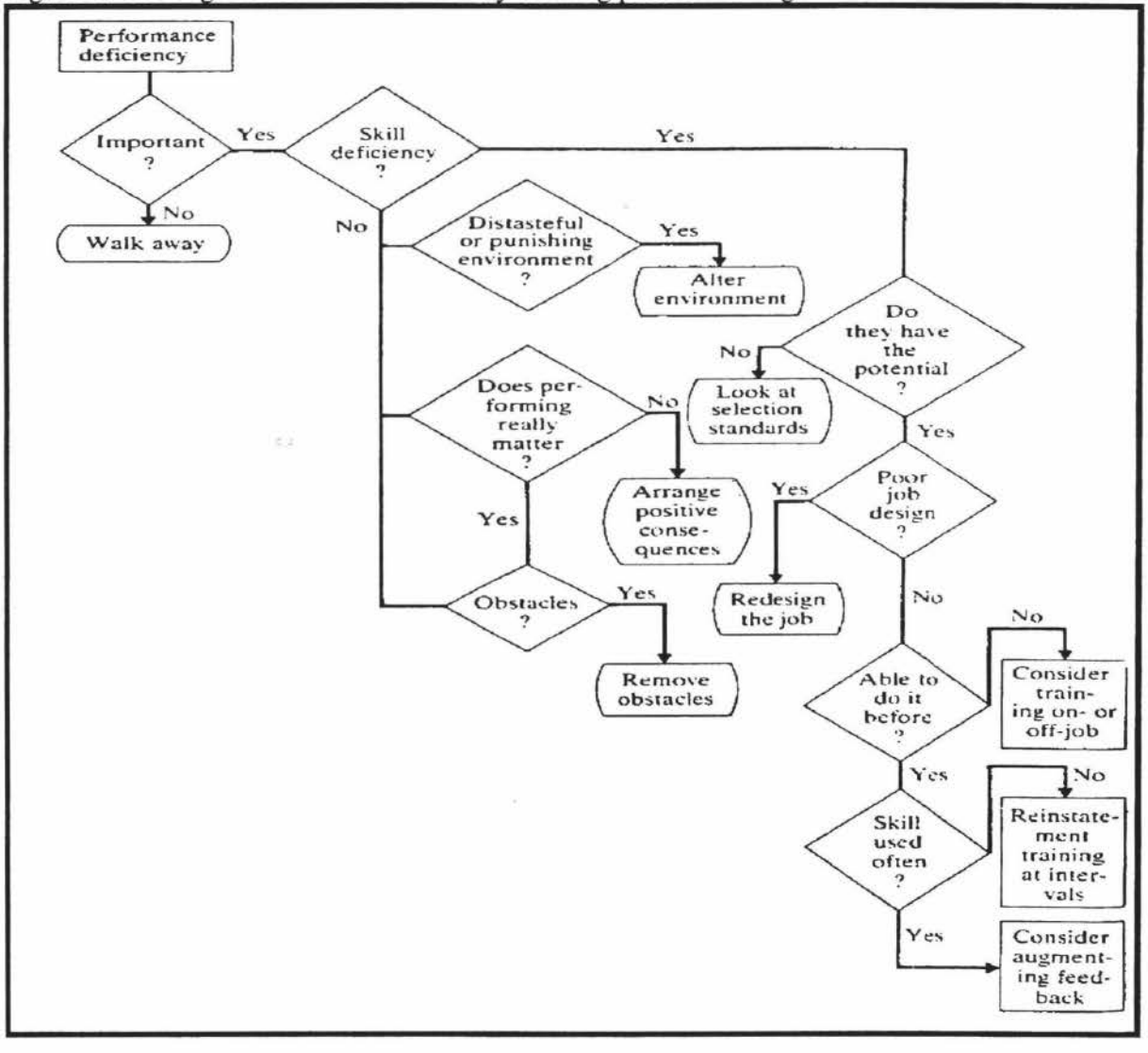
Information from all these data sources was analysed to determine the relative importance of each aspect of a position and produce a job performance standard. The job performance standard is then used as the basis for determining the curriculum of training programmes for nuclear facility operators.

More recently, TNAs are being advocated not only to identify training solutions, but also to identify where non-training solutions are more appropriate (Bramley, 1991; Landy, 1985; McCelland, 1993; Sleezer, 1993; Wills, 1994). Mager and Pipe (cited in Moore & Dutton, 1978) suggest using the following question to determine if training is an appropriate solution to a performance problem. 'Could they do the job/task if their life depended on it?' If the answer to this question is no, then training is an appropriate solution as the person lacks the skills, knowledge or ability required to perform the job/task. If the answer to the question is yes, then training is an inappropriate solution as the person already knows how to perform the job/task, there is some form of motivational or organisational barrier that prevents them from performing in the desired manner. Thus it becomes important to find out the reason why the person is not performing. Mager and Pipe suggest considering "lack of opportunity to practice, job design, lack of performance feedback, punishment for performing well" (p. 541) as possible barriers that prevent the person performing in the desired manner. Where lack of skill or knowledge is not the issue, Mager and Pipe suggest changing: duties; supervisors/managers; communication patterns; or adding incentives rather than instigating training.

Like Mager and Pipe, Bramley (1991) acknowledges that training is not always the answer to performance deficiencies. Bramley developed an algorithm to assist in determining the appropriate solution to an identified performance deficiency. Bramley

unlike Mager and Pipe, starts by asking whether the deficiency is important. If it is not, then Bramley recommends leaving it be. If it is important, Bramley then asks whether it is caused by a skill deficiency. Here the question of whether it could be done if life depended on it would help to arrive at an answer. If skill deficiency is not the cause, Bramley recommends first considering the working environment, then whether performing really matters before considering other obstacles. Of the eight 'solution' type boxes in the algorithm, only two suggest training. The full algorithm is presented as Figure 1 below.

Figure 1: Solving 'Performance deficiency training problems?' algorithm.



(Source: Bramley 1991, p14 [adapted by Bramley from Mager, R.F. and Pipe, P., 1970])

Agreeing with the premise that training is not always the appropriate solution and attempting to highlight alternatives to training as a solution to performance deficiencies Rossett (1997) found the causes of performance deficiencies generally fall into four areas. Rossett identifies these areas as skill and knowledge discrepancies, flawed incentives, flawed environment or lack of motivation. Her experience is that the solutions to the causes of performance problems do not generally vary across organisations. Rossett's causes and linked solutions are shown in figure 2 on the below.

Figure 2: Linking causes and solutions for performance deficiencies.

Causes		**Solutions**
Skill and knowledge discrepancies	→	Training
	→	Coaching
	→	Job Aids
Flawed incentives	→	New policies
	→	New contracts
	→	Training for supervisors
Flawed environment	→	Work redesign
	→	New and better tools
	→	Better match between person and job
Lack of motivation	→	Training so workers can see benefits
	→	Better processes or tools if there are benefits to cite
	→	Training that provides early, tangible successes to build confidence

(Source: Rossett 1997, p 333)

For example, if a TNA identifies delimbing trees in forestry work (a frequent cause of

injuries to legs, backs and feet[1]) a performance problem, Rossett's table suggests causes for the problem and 'links' them to appropriate types of solutions. There are two identified methods of delimbing trees. The first (and most common) is called the conventional method and consists of walking along the top of the felled tree and removing the branches (limbs) with a chainsaw by bending over to cut them off. The inherent problems with this method include back strain from bending over, falling off the log either onto previously cut material or onto the chainsaw, and cutting into protective clothing on the legs or feet when moving the chainsaw from one side of the tree to another. The second method is called the alternative method and consists of walking on the ground alongside the felled tree removing the branches. This method reduces or eliminates most of the problems associated with the conventional method but has the drawback of being occasionally difficult to manage in areas with heavy undergrowth.

Rossett's table can be used to discover why the alternative method is not used more frequently (disregarding the unfortunate naming of the methods which is a possible cause) and assists in identifying appropriate solutions. If the alternative method is not used because of a skill and/or knowledge discrepancy then training in the method and coaching to use the method would be suitable solutions. If it is not used due to flawed incentives (such as the conventional method being considered quicker) then introducing new policies that require the alternative method to be used wherever possible and/or getting supervisors or contractors to encourage the use of this method would be a suitable solution. If the method is not used due to a flawed environment such as the undergrowth being too dense then considering moving the felled trees to a cleared area (redesigning the work) or clearing the undergrowth prior to felling the trees would be a suitable solution. If the alternative method is not used because loggers see no value or benefit to themselves in using the method then ensuring that the training in the alternative method highlights the benefits of the alternative method and highlights the disadvantages

[1] Identified from actual accident reports provided by Fletcher Challenge Forests for the years 1995-1997).

of the conventional method would be a suitable solution.

A number of authors also advocate the use of training needs analyses proactively, to identify potential problems and determine if training - or other non-training alternatives - can prevent these problems from occurring (Anderson, 1994; Bramley, 1991; Tannenbaum & Yukl, 1992). Tannenbaum and Yukl note a recurring theme of linking training to organisational strategy in their review of training. This promotes the proactive identification of possible problems by hypothesising from predicted changes. For example if an organisation knows they will be changing computer systems they could proactively troubleshoot by asking such questions as 'will introducing a new computer system create problems', if yes, 'what are the likely problems?', 'can we do anything to prevent these problems occurring?', 'if we can't prevent them, can anything be done to ameliorate the problems?'. Anderson (1994) also recommends a process of anticipating trends and future changes and attempting to prepare people to meet the challenges that they bring. This use of TNA techniques remains speculative as currently there are no reported studies where TNA techniques have been used in this way.

In summary, the most common (and the traditional) use for TNA is to provide information that can assist with improving the design and content of training courses. This is accomplished by discovering gaps in the training or areas where the training is insufficient. When used traditionally, TNA results in training solutions to problems. More recently, TNA are being advocated to also identify areas where non-training solutions (such as redesigning jobs or aligning rewards with correct performance of tasks) may be more appropriate. The proactive use of TNA, i.e. hypothesising from predicted changes, has been suggested to identify possible problems and prevent these problems from impacting on organisational performance.

1.4 How to conduct a TNA

The process of a TNA is not universally agreed upon. Drummond (1993) argues the process begins with a meeting of senior management to discuss performance concerns identified from sources such as: performance records (e.g. production deadlines and quality control records); accident records, performance analysis interviews; turnover; and absenteeism. In contrast, Williamson (1993) suggests TNA has it beginnings during the establishment of the organisation's aims and objectives to ensure training will assist in the attainment of those aims and objectives. Basarab and Root (1992) recommend starting the needs analysis with an assessment of employees' knowledge, skills, and attitudes. The differences between the starting points for the above needs analysis processes most probably relate to the differences in definitions of TNA used by the authors and the level at which the training needs analyses are being conducted. Williamson's method reflects a proactive stance in that an attempt is made to avoid performance problems before they emerge, an option that is rarely available in the real world, whereas Drummond and Basarab and Root reflect the more common reactive response to coping with performance problems as they occur. Regardless of the ongoing discussions over the appropriate initiation of the process, the following steps appear in most descriptions (Basarab & Root, 1992; Bucalo, 1984; Drummond, 1993; Goldstein, 1991; Korotkin, 1992; Peterson, 1992; Williamson, 1993): alertness for performance problems; identification of performance concerns or performance deficiencies; identification of training and other needs; analysis of identified needs; setting of training objectives and the development of a training plan

While most authors agree the TNA process is completed when both the training needs and the possible solutions have been identified, Peterson (1992) recommends following up and evaluating the success of the training plan, and turning the process into a cycle, so the results of the training can then feed into the identification of further training needs. In this, Peterson is really advocating the adoption of a training model of the systems

persuasion, which is beyond the scope of TNA, which is only the first step in such a training model.

The literature on TNA does not clearly indicate which of the three analyses should be undertaken first. However, one could assume from the descriptions of the process that the **organisational analysis** is conducted first as the object of this analysis is to determine where and when training could and should be used (Bramley,1989; 1991). Moore and Dutton (1978) in their review of TNA detailed all the data sources suggested prior to their review. These sources include but are not limited to: organisational goals and objectives; organisational climate indices such as turnover, productivity, accidents, attitude surveys, and customer complaints; analysis of efficiency indices such as costs of labour/materials, equipment utilisation, waste, downtime, and repairs; changes in systems or subsystems; exit interviews; and management requests for training. Analysis of these data sources will highlight areas of concern or performance deficiencies. Thus the organisational analysis provides the starting point for the job/task and person analyses. Analysis of the organisations goals and objectives also assists with assigning priorities to rectifying the performance problems.

The **task analysis** is probably performed next, some of the information collected in this analysis is used as reference points or benchmarks in the person analysis. Moore and Dutton identified the following sources of data as appropriate for the job/task analysis: job descriptions; job specifications; performance standards; observation of work; reviewing relevant literature; asking questions about the job from the job holder, their supervisor and higher management; and analysis of operating problems such as downtime reports, waste, repairs, quality control. The information collected in this analysis allows comparisons between desired and actual performance against specific task performance criteria.

The **person analysis** is probably performed last as it relies to some extent on the

availability of the job description and job specification data collected in the job/task analysis. Moore and Dutton identified the following data sources: data from performance or appraisals such as productivity, accidents, grievances, waste, product quality, down time, repairs, and customer complaints; observation of work; interviews, questionnaires; attitude surveys; rating scales; critical incidents; devised situations such as role plays, case studies, business games, and in-baskets; and assessment centres. The results of the person analysis allow a decision of whether the person is meeting the desired performance criteria to be made. If the person is not, then reviewing the person data may indicate whether a training solution is appropriate.

While McGehee and Thayer intended the results of these analyses to be integrated, the literature in not clear on how this is achieved. It is likely that they intended that the results of any one of the analyses be considered in context of the other two, so that information collected from the three levels is considered as a whole rather than separately.

One of Moore and Dutton criticisms of the this area was that there had been no apparent effort to establish which data sources provided the best information for a particular situation i.e. that the area was lacking experimental research. This criticism is still true today to a large extent. There are no reported instances where comparisons have been made between success of training programmes based on TNA results and those not based on TNA results. Nor are there any reported instances where different data sources or methods of conducting TNAs are compared to indicate which data sources are best for a particular type of TNA.

While Moore and Dutton's review provided a list of suitable data sources/methods for collecting information relating to the three analyses, it failed to give specific direction as to what data in particular should be collected. For example, interviews are recommended as data sources for both the job/task analysis and the person analysis but

no further direction is given about the sorts of questions that would provide useful data. This lack of direction about the specific types of data required to perform a high quality training needs analysis contributes to the confusion that appears to surround this area, and is a probable reason why training needs analyses are infrequently performed.

However, some effort has been made to identify the advantages and disadvantages of the most commonly used methods of collecting data. Newstrom and Lilyquist (1979) identified the twelve most commonly used methods for collecting TNA data. These were: Advisory Committees; Assessment Centres; Attitude Surveys; Group Discussions; Employee Interviews; Exit Interviews; Management Requests; Observations of Behaviour; Performance Appraisals; Performance Documents; Questionnaires and Skills Tests. They then suggested five criteria as a means of differentiating between these methods. These criteria were: Employee Involvement; Management Involvement; Time Required; Cost; and Relevance and Quantifiability of the collected data. Based on the results of a review of the literature they assigned a ranking of low, moderate or high against each method for each criteria. Their results are presented below in Figure 3 on the following page. Newstrom and Lilyquist note according to their model an ideal method would have a high rating for employee involvement, management involvement, and relevant quantifiable data, and a low rating for cost and time requirement.

Figure 3. Contingency model of needs assessment methods

Methods	Employee Involvement	Management Involvement	Time Requirement	Cost	Relevant Quantifiable data
Advisory Committees	Low	Moderate	Moderate	Low	Low
Assessment Centres	High	Low	High	High	High
Attitude Surveys	Moderate	Low	Moderate	Moderate	Low
Group Discussions	High	Moderate	Moderate	Moderate	Moderate
Employee Interviews	High	Low	High	High	Moderate
Exit Interviews	Low	Low	Low	Low	Low
Management Requests	Low	High	Low	Low	Low
Observations of Behaviour	Moderate	Low	High	High	Moderate
Performance Appraisals	Moderate	High	Moderate	Low	High
Performance Documents	Low	Moderate	Low	Low	High
Questionnaires / Surveys	High	High	Moderate	Moderate	High
Skills tests	High	Low	High	High	High

(Source: Newstrom & Lilyquist, 1979, p 56)

According to their criteria none of the commonly used methods was ideal. They all had strengths and weaknesses. They suggested that the strongest overall methods were questionnaires/surveys and performance appraisals, with the weakest methods being attitude surveys, exit interviews, and observations of employee behaviour. They suggested that their model could identify the most appropriate method for needs analysis when the relative importance the organisation placed on the five criteria was factored in. For example if cost was not important but time was, then methods that scored low on time requirement and high on all the other criteria (excluding cost) would be best. No single method meets all the criteria but the choice is refined to exit interviews, management requests and performance documents. Of these performance documents methods stacks up best with high relevant data, moderate management involvement and low employee involvement.

Smith, Delahaye and Gates (1986) further refine Newstrom and Lilyquist's model by factoring in a utility analysis. This means that each of the five criteria is assigned a value from one to three (low, moderate or high) depending on the value the organisation places on the criteria. The same numbering system is applied to Newstrom and Lilyquist's rankings. The criteria value is then multiplied by the ranking value to give a numerical value for each criteria. These are then summed for each method, and the highest value methods are easily identified for use.

In summary, the 'how-to' of TNA remains fairly vague - the starting and ending points, as well as what to do, rely heavily on the definition of TNA used and the purpose for which the TNA is being undertaken. What is clear, is the 3-fold method of investigation - organisational analysis, job/task analysis, and person analysis - is generally recommended. The literature, while suggesting a number of data sources and collection methods for each analysis, is yet to link methods and data sources with evidence of greater benefit than another combination.

1.5 Beyond Organisations: TNA applied to a Profession or Industry

While training needs analyses are still most commonly used within an organisational setting, they have been adapted/modified so the training needs of a profession (for example nurse practitioners [Sheperd 1994; 1994; 1995]) or an industry (for example seafood industry [Watson & Tanner 1992]) can be determined. Instead of focusing primarily on the needs of the organisation and the individuals within, these investigations look across organisations to determine the needs of the industry or profession, which may differ or be contrary to the needs of any particular organisation or individual within the industry or profession.

A search of the literature reveals there are few reported training needs analyses undertaken from a 'profession' perspective, with only five articles found, three of which are by the same author. There has been even less reported work done on TNA from an 'industry' perspective, with only two occurrences reported. This suggests a few possibilities. The first possibility is few people have considered using the methodology outside of its traditional usage. The second possibility is a lack of reporting of the use of the methodology outside of its traditional usage. A third possibility is the current state of training needs analysis methodology is too vague and undefined to be applied in such a broad manner. Given that the literature tends to frequently suggests that training needs analyses are not commonly undertaken, it is probably safe to assume that the methodology has not frequently been applied in new areas.

1.5.1 TNA applied to a profession.

There are only two professions that have reported training needs analyses in the literature, nursing and police detectives. The nursing profession training needs analyses

have focused on developing post-graduate and/or continuing education courses. Whereas the lone police detective TNA focused on ensuring the current job training met all needs that could be fulfilled by training.

McGurk, Platton and Gibson (1994) report the results of a combined job and TNA for police detectives in England and Wales. The job and TNA were undertaken as a preliminary to an evaluation of the then current ten-week regionally based, locally orientated training course. The aim was "to determine the skills and abilities required to successfully carry out the role of a detective" (p. 24), with the results feeding into improving recruitment methods (including creating job relevant advertisements), designing staff appraisal systems, identifying accurate and fair promotion criteria and developing relevant training courses (p. 25). Four police forces (including both rural and urban based forces) were selected to provide a representative sample of English and Welsh police detectives.

McGurk et al. used four complementary techniques to analyse job and training needs, which provided three independent measures of the skills needed by detectives and a separate measure of the major tasks where those skills are utilised. The techniques involved: the Position Analysis Questionnaire (PAQ), the Repertory Grid; Critical Incident Technique and a task analysis. The PAQ is a structured questionnaire designed to produce an objective description of a job. The end result is to produce a job description and specification that describe both the job and the abilities that the person performing the job needs (Kline, 1993). The Repertory Grid is a method of collecting data about the way a person sees and interacts in specified situations (Kline, 1993). The critical incident technique is a method of collecting behavioural data about performance of specific tasks. Task analysis is a way of identifying the important aspects of a job through a multi-stepped process focusing on the actual tasks and duties performed by jobholders (Berry & Houston, 1993).

Fifteen detectives completed the PAQ, a further fifteen used the repertory grid (in an interview setting) to distinguish between good and poor detectives based on their experiences of working with other detectives. Two hundred detectives were asked to provide a written example of good and bad detective practice, including "a description of what led up to the incidence [sic], identification of what was thought to be particularly good or bad, and what the consequences were of the behaviour of the detective involved in each incident" (p. 25). Eighty-nine detectives returned critical incidents, a response rate of 44.5%. The task analysis had two stages, the first involved three groups of detectives (total n = 30) identifying the tasks they carried out in daily work. All of the above information was used to develop the task analysis questionnaire used in the second stage of the process. In the second stage, two hundred detectives were asked to answer a posted questionnaire which required them "to rate how frequently each task was completed, how difficult the task was to carry out, and how important successful completion of the task was to overall job effectiveness" (p. 26). One hundred and twenty-six questionnaires were returned (63%). McGurk et al. note the task analysis (frequency, importance and difficulty questions) was of most interest to the designers of training for detectives, as the "assumption is made if a task is difficult and important, the cross-product reflects a genuine training need" (p. 29). As the aim of the TNA was to provide information to the designers of the training courses about the required skills, knowledge, and abilities, the results of the task analysis was compared with the current course offerings. The most interesting feature of the results in terms of designing training courses for detectives was the relatively low importance of 'legal knowledge' as a category that discriminates between 'good' and 'poor' detectives. Instead, communication skills (e.g. communicating effectively, being personable/approachable) were viewed as better discriminators. This result highlights the need to enter a TNA without preconceived results.

There are two authors that have written about TNA in relation to the nursing profession, Braimoh and Sheperd. Braimoh (1994) puts forward an argument for undertaking TNA

for African 'para-medical' personnel (i.e. nurses), with a view to distance education as the favoured delivery system. Para-medical staff were singled out because those who work in this area in developing countries of Africa have a reputation for "hostile, inhuman, apathetic and impolite" (p. 268) behaviour towards patients as reported in the patient 'satisfaction' surveys used in hospitals. Braimoh advocates "constant training needs analysis to evaluate areas of need where some of them [nursing staff] could be given regular exposure for behavioural modification and efficient job performance" (p. 276).

Braimoh acknowledges the changes in technology and large distances separating training institutes and care providers make the task of staying current with the latest medical technology difficult, but without continuing education African nurses will have problems with career development.

Braimoh's proposal relies on customer complaints as the main data source for the needs analysis, it is to be used as both indicator of training need and to measure the success of training. Braimoh proposal does not attempt to investigate if there are other possible causes (environmental issues, staffing issues, and unrealistic expectations of patients) for the customer complaints.

Sheperd (1992, 1994, 1995) on the other hand, has actually conducted a TNA for 'qualified nurse practitioners' in England, where a qualified nurse practitioner would be a graduate of a nursing school. All three publications refer to the same piece of research. The TNA reported in 1992 was undertaken to "a) assess and examine nurse practitioners' perceptions of their learning needs relevant to their current and future development, and b) provide vital feedback to the college of nurse education so that a meaningful framework is designed to meet those needs identified by the project" (p. 310).

Sheperd, using a descriptive survey approach, collected data from both nurse practitioners (across differing specialities) and their managers. Prior to developing a semi-structured questionnaire, focus groups were used to identify the major barriers for nurse practitioners in accessing post-graduate education. Two questionnaires were designed, one each for the nurse practitioner subjects and the nurse manager subjects. Both questionnaires were designed a) to collect both qualitative and quantitative data and b) be used in both interview and self-completion modes.

The questionnaire for the nurse practitioners had three sections with a total of 65 questions. The first section collected demographic-type information, the second section asked about personal development and knowledge of continuing education with the aim of identifying both positive and negative factors that impact on attendance and availability of resources. The final section asked about training needs and suggestions as to how these could be met. The final section also asked about preferred modes of delivery (e.g. on-the-job, seminars, distance learning, computer based, off-job training).

The questionnaire for the nurse managers had four sections with 30 questions. The first section collected demographic-type data; the second collected information about factors that affect nurse practitioners attendance at continuing education event, the resources available to nurse practitioners and their attitude towards continuing education for nurse practitioners. The third section collected information about how successful previous continuing education events had been in changing attitudes and improving clinical knowledge/practice. The final section collected information about the where continuing education could assist with the organization's priorities as well as the individual's priorities and also asked which of these areas would be best supported by management.

Sheperd collected information from 621 nurse practitioners and 52 nurse managers. At the time of publication, only limited analysis of the results had been done so only general recommendations were made. These consisted of ensuring that the continuing education

is clinically driven, management and course designers need to communicate with each other to ensure that the continuing education results in improved quality of care and continuing education should be available to all nurse practitioners 'as and when required' (p. 312). These results are fairly self-evident and could probably have been arrived at without conducting a training needs analysis. One would have expected this research to have come up with specific areas that would benefit from continuing education input (i.e. areas where experience needs to be balanced by further education), or to identify areas where nursing college graduates find it difficult to assimilate new information. Publication of these types of results would support the belief that TNA's "do not tell us anything that we don't already know", suggesting that they are a waste of time and effort.

Sheperd 1994 provides a more detailed background to the 1992 article, and argues for a five-stage model for TNA for nurse practitioners. The first stage of Sheperd's proposed model called "Statutory requirements" consists of a comprehensive literature review of TNA with special attention paid to determining both the legal requirements for post-registration nursing training and any other training requirements made by relevant professional nursing bodies. Stage 2 called Organizational needs is the much the same as the organisational analysis in a traditional TNA. The major point of deviation appears to be the consideration of resourcing issues for nursing training. The third stage – Individual nurse practitioner needs – is a combination of the job/task analysis and person analysis of the traditional TNA. The first three stages are mostly a reworking of McGehee and Thayer's training needs analysis model focused on the nursing profession. Stage 4 – Nurse educationalist needs – requires consideration of what the trainers (i.e. nurse educationalists) need to know to meet the training needs identified in the first three stages and could easily have been called 'recruiting and developing nurse educationalists'. Stage 5 - Programme planning, implementation and evaluation" – consists of designing, developing, implementing and evaluating the training courses offered to meet the training needs identified in the first three stages. With the inclusion

of Stages 4 and 5 Sheperd is no longer actually suggesting a model for undertaking TNA but a complete training process.

Sheperd (1994) concludes by arguing that collaboration between nursing colleges and hospitals/healthcare providers is beneficial to both. He states "if training needs analyses are carried out in joint collaboration with both the providers and purchasers of education, the resultant programme development, by virtue of its agreed content and delivery, can only be seen as enhancing the delivery of practice, whilst meeting the changing health care needs of the client population and the organization in which that care is provided" (p. 185).

Despite the fact that Sheperd was undertaking the TNA to determine the continuing educational needs (a legal requirement for nurse practitioners in the United Kingdom), it is somewhat disappointing that no reference was made to non-education alternatives for improving the quality of care received by patients (such as staffing levels, shift work arrangements, organisational climate/culture), as this type of reporting reinforces the misconception that training needs analyses lead only to training solutions. Sheperd's training model would be useful for professions that have legal requirements for post-registration continuing education. However, the model is less useful for professions where statutory continuing education is not required.

Sheperd's 1995 article offers nothing new about TNA and is more like an argument advocating the use of TNA supported by a small selected literature review.

Both McGurk et al. and Sheperd have used the TNA methodology to provide information about a selected population across organisations so that training course developers can, at least theoretically, improve the utility of subsequent training courses. They have expanded the use of training needs analysis from a tool that is only applicable within an organisation to one that can be applied in a wider arena when the overall goal

of the organisations involved is similar and the organisations are not in direct competition.

1.5.2 Training needs analysis applied to industry

There are only two reported industry training needs analyses, the first is for the American Institute of Nuclear Power Operations (Bloom & Levin, 1987) which was described earlier, the second is for the New Zealand Seafood Industry (Watson & Tanner, 1992).

The Seafood Industry TNA was the first step in a large-scale review of the relevant available training. The impetus for the review of the industry's training stemmed from 1991 government Industry Skills Training Strategy which gave industry training boards greater control of the training process and the changes to the organisation of the industry (e.g. introduction of a quota management system, Sealord deal[2]).

The aim of the TNA was to "identify future training requirements" (p. 8). The TNA also had the following objectives: "Establish the current skill level of industry; Establish the industry's requirements; Identify the gaps between supply and demand [of training]; Identify the gaps causing problems in quality and service standards; and Identify future requirements to pre-empt the technological changes in systems, products and services" (p. 9).

Watson and Tanner used a consultative approach to collecting data from a wide range of people working in the fishing industry across the country. The data collection methods included personal visits with relevant people, meetings with groups of people as well as telephone interviews with fishing industry workers and management and a postal survey of fishing workers. The range of data collection methods reflected the range of cultural

[2] The Sealord Deal - a treaty of Waitangi settlement - involving the New Zealand Government handing over money and fishing resources to Maori.

perspectives and geographical areas required to be consulted. Effort was made not only to involve people employed in all sectors within the industry but also to ensure those located in isolated communities were included.

The reported results are almost exclusively qualitative in nature because "what were major issues at one stage are no longer valid and what are now issues were not so earlier.....accordingly, statistical data from this TNA would be of questionable relevance" (p. 11). In this, Watson and Tanner have articulated one of the disadvantages of undertaking a comprehensive large scale industry-wide TNA – by the time quality data have been gathered, significant change within the industry is likely to have already occurred. However, despite changes the information collected may still have some use. Watson and Tanner found considerable variation across the industry in the skill level of managers and those involved in administration, with the more isolated areas generally having less skilled people occupying these positions than the more populated and easily accessed areas. They concluded the "overall need [is] to focus urgently on the development of administration and management skills of many involved in the industry" (p. 11).

Watson and Tanner in reporting their work made the same mistake many of the articles published about TNA make, namely while stating a comprehensive TNA was undertaken, they do not describe in sufficient detail what was actually done. For example, although a postal survey was used, there was no description of the type of questions used, or a copy of the survey provided. This makes it difficult to determine what kinds of questions are useful (and well responded to) and does little to further the understanding of the TNA process.

Bloom and Levin (described in Section 1.3 p10), describe a sound, quantifiable and verifiable use of TNA methodology. Their results suggest that it is possible to successfully expand TNA from its traditional intra-organisational sphere to have an inter-

organisational perspective. They have shown that it is possible to gather information from a range of competing organisations and compile general training recommendations that assist all organisations within that industry by ensuring that current training programmes remain both current and relevant. However, Watson and Tanner have not. They report their methodology in insufficient detail to allow replication and rely on unverifiable qualitative data to reach their conclusions, making evaluation of their work difficult. One of the main differences between these two studies is the frequency with which TNA is undertaken. Bloom and Levin describe an ongoing TNA process whereas Waston and Tanner describe a 'one shot' affair.

1.6 Why a TNA could be useful for the forestry industry

Forestry - and the harvesting sector in particular - is a hazardous profession. Harvesting workers (more commonly known as 'loggers') have serious accidents and die at work at a rate that is considerably higher than most industries. Loggers are continuously surrounded by hazards such as those related to climate (e.g. extremes of temperature, wind, rain), terrain (e.g. steep slopes, uneven ground, variable soil/rock stability) and flora (e.g. dense undergrowth, poisonous plants). In addition to these natural hazards, there are hazards associated with using the equipment and machinery required in logging operations (Barker, 1992; Cryer & Ehrman, 1988; Ewing, 1992; MacDonald, 1991; Poschen, 1994; Reisinger, Sluss & Shaffer, 1994). Logging is an industry where there is frequently little or no room for error. A safety consultant to the forestry industry notes "You can make mistakes in a lot of jobs, but the forest is one of the most unforgiving places to make an error. That failure could easily be one's last" (p. 30; Ewing, 1992)

Forestry is consistently ranked world-wide as one of the five occupations with the

highest fatality rates (Driscoll, Ansari, Harrison, Frommer & Ruck, 1995; MacDonald, 1991; Poschen, 1993) and New Zealand is no exception (Kawachi, Marshall & Cryer, 1995; Marshall et al., 1994a, 1994b). The fatality rate for New Zealand loggers as reported in the New Zealand Forest Industries magazine (1997) was 3.75 deaths per thousand workers per annum. That rate was seventy-one times greater than the national average of 0.05 deaths per thousand workers.

While there have been enormous technological changes in the forestry industry in the last twenty years, these changes have had little effect on the numbers of forestry workers dying on the job. The average number of fatalities recorded by the Accident Rehabilitation and Compensation Insurance Corporation (ACC) database - eleven per year - had not changed from 1969 to 1996 (New Zealand Forest Industries, 1997). The Logging Industry Research Association (Lira) database, the Accident Reporting Scheme (ARS), disagrees with the ACC average fatality number and argues that for professional loggers the average number of fatalities over the period 1969 to 1996 is seven per year (Parker, personal communication).

Regardless of which average is correct, the fact remains that logging **is** an occupation where the risk of death is not only very high, but very real. A 1950 report into forestry accidents noted "if they (forestry workers) all worked in a single factory and a man were killed every six or seven weeks, it is doubtful if the factory could continue to operate with such a fatality rate" (Garland 1950, cited in Marshall et al., 1994b). The fatality rate in question was 2.5 per thousand workers per year. Marshall et al. noted the 1994 fatality rate for forestry workers was 2.03 per thousand workers per year, which has not significantly decreased. And similar to the 1950's report, today training is still the most frequently called for solution- in fact it appears that training is viewed somewhat as a magic potion that will guard against accidents and injuries, if only enough of it can be had.

A human resources conference in 1984 recommended training as a solution to the poor occupational safety record - yet recent work by Kawachi et al. (1995) indicates that the fatality rate in forestry has not changed significantly in the last thirty years. A recent article in The Dominion (Wednesday, 21 July 1999), noted "Forestry workers are 70 times more likely to be killed on the job than the average NZ worker" (p. 14) and that there had been 10 deaths in the forestry industry during that year alone.

Despite the development and implementation of an industry training programme in the 80's, and the requirement that all workers be trained for their jobs in the mid 90's, the occupational safety record of forestry with regard to fatalities has not greatly improved.

It is reasonable to conclude from the above information that the current training is somehow failing to fulfil the industries expectations for improving safety. It would be useful to determine if there are other factors that are preventing the training from meeting the expectations or if the training itself is deficient.

Despite the lack of improvement in the forestry fatality rate, there has been some improvement in the number and severity of injuries, particularly chainsaw injuries. This improvement can, in part, be attributed to the introduction of personal protective equipment and developments in the design and safety features of chainsaws (Gaskin, 1989, 1990; Parker, 1998, 1999, Wallace, 1991).

As forestry has a poor occupational health and safety record there has been a lot of research into ways to improve it. A comprehensive review of the literature of the factors affecting injury rates among forestry workers was undertaken by Slappendel and Laird (1991), as part of the "Epidemiology of Injury" project. The review covered the period from 1975 to 1990, and the factors affecting injury were grouped into the following

areas: Personnel characteristics (sensory capacities, perception, decision-making, motor skills and technique, education and training, physiological work capacity and ageing); Machinery, tools and equipment (design inadequacies and maintenance); Work methods and organisation (task demands, task variety, rest breaks, hours of work, supervision, mechanisation, payment method, contracting and safety organisation); and Physical environment (climate, terrain, light conditions and flora).

Slappendel and Laird noted although substantial forestry literature existed in the areas of perception, age, design inadequacies, task demands and climate, little or no literature was discovered in the other areas. In particular, they were able to identify only one or two studies relating to education and training in forestry.

Slappendel and Laird then considered available preventive intervention strategies. They identified the following types of intervention strategy: Legislation and standards; Machinery and equipment design; Education and training; Work methods and organisation; Health and safety programmes; Information systems; and Personal protective equipment.

Slappendel and Laird concluded there is no single solution to improving the safety of forestry work (a fairly self-evident conclusion). They explain further that accidents occur as a result of complicated interactions and circumstances, and multiple interacting interventions are required to improve the current situation. Training was only one of a number of options available to the industry as a means of improving their occupational health and safety record.

1.7 Aims of this research

Given that there has been little change to the forestry fatality rate, and the injury rate is still significant, it is probably time to question whether the current training meets the

current needs of the industry, and determine/identify if there are non-training solutions that may assist this industry.

The following aims are proposed:

1. To identify if there are any deficiencies in the currently available training for logging workers (i.e. crew members). This is one of the traditional uses of TNA methodology and was employed by both McGurk et al. and Bloom and Levin in industry-type settings. The outcome of this aim is to provide information that has the potential to improve industry training for loggers

2. To assess the perceived effectiveness of current training methods in delivering safety messages to logging workers. Effectiveness will be determined by a) the extent to which crew members recognise twelve basic safety issues that should be covered in training compared against the safety issues that contractors and trainers indicate crew members received, and b) how crew members and contractors rate the safety training given to crew members. This is a new slant on the traditional use of TNA to improve training. It recognises that skills based training and safety training may be perceived differently by loggers. It is similar to Sheperd's asking about the impact of nurse training on clinical knowledge.

3. To assess the perceived utility of the currently available pre-employment training programmes by both contractors (employers) and crew members (training graduates). Utility will be determined by the extent to which crew members and contractors a) indicate pre-employment training provides new entrants to the logging industry with adequate skills to work productively in a logging crew and b) indicate pre-employment training provides new entrants to the logging industry with sufficient

knowledge to work safely in a logging crew. Targeting new entrants to the industry is important as Poschen, in studying the American logging industry found "a disproportionate number of accident victims are poorly trained new entrants, particularly those employed by contractors" (p. 9, 1993). The results have the potential to improve (if necessary) the design, delivery, and content of pre-employment training programmes for loggers.

4. To determine if there are factors other than training that may be contributing to the ongoing poor occupational health and safety record of harvesting workers. This aim is applying the suggestions of Bramley, Sleezer and Wills to extending TNA methodology as consideration of non-training solutions will be used. In particular, organisational climate and tenure and turnover of crew members will be looked at as Reisinger, Sluss and Shaffer's (1994) investigation of 'safety successful' logging contractors found management attitudes and crew stability to distinguish between contractors whose crew members had low and high accidents rates.

Chapter Two: Methodology

2.1 Chapter Overview

The development and pilot testing of the questionnaires used in the training needs analysis are discussed. This is followed by a description of the sampling design, sampling procedure and sample results. Next the content of the questionnaires is described. Finally, the data collection methods are detailed.

2.2 Questionnaire Development and Testing

Three questionnaires were developed (one for each of the participant groups i.e. crew members, contractors and trainers) which focused on the issues to be explored in the training needs analysis.

These issues were developed in association with both ACC[3] , New Zealand Forest Owners Association (NZFOA) and industry representatives. Ethical approval to conduct this research was sought from both Massey University's Human Ethics Committee and the Logging Industry Research Organisation's (LIRO) ethics committee.

A pilot study was carried out in September 1997 in Hawkes Bay, an area selected for the purpose because it would not be one of the regions used in the main study. The aims of the pilot study were to check the readability and understanding of the questions, to discover any areas where misunderstandings could arise due to terminology, and to determine the time taken to complete the questionnaires.

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[3] ACC and NZFOA co-funded this research, and required industry input to ensure the research would meet industry needs.

Based on the results of the pilot study, significant changes were made to the design of questions relating to skills (rating of importance, frequency and difficulty to learn). As the time available for completing questionnaires was strictly limited, a measure of psychological climate was removed from the crew members questionnaire to ensure that the questionnaire could be completed within the available fifteen to twenty minutes. Minor modifications to the language used in the questionnaires was made to improve clarity and incorporate commonly used expressions.

2.3 Sampling Design

The data were collected from three target groups - crew members, contractors, and trainers. As information provided by LIRO and the Logging and Forestry Industry Training Board (Rob Prebble, personal communication) indicated that logging training and practice was not regionally homogeneous, three geographical regions, Northland, Central North Island and the South Island (predominantly Nelson/Marlborough and the West Coast) were selected as strata. It was assumed that such a stratified sample would be representative of the different aspects of forestry harvesting, such as terrain, climate, types of harvesting operation (motor manual, mechanised and hauler based) as well as the type, and availability, of training.

2.4 Sampling Procedure

The sampling procedure was purposive (non-random) and designed to provide as representative a coverage of harvesting worker training needs as possible within the constraints of available funding and availability to participate.

The sampling units were contractors who were contacted, invited to participate, and permission sought for the data collection of their crew members. Each member of a participating contractor was contacted and invited to participate. Names of contractors were sought from forestry companies and attempts were made to include both 'company crews' i.e. contractors who contracted solely with a forestry company and have an

ongoing business relationship with that company, and 'woodlot crews' i.e. contractors who contract with farmers and small land owners as well as forestry companies. Unfortunately, all the woodlot contractors that we were given names for were either unable or unwilling to participate.

The third group were those responsible for providing training to harvesting workers. The invitation to participate was extended to trainers who were based: within the crew; at polytechnics; private training enterprises; Iwi/Marae based or acting as independent trainers. All those listed in The National Training Establishment Register who offered logging related courses were invited to participate.

2.5 Sampling Results

Approximately 500 crew member questionnaires[4], 75 contractor questionnaires and 200 trainer questionnaires were given out to potential participants.

Three hundred and ninety-six crew members from 62 crews completed the crew member questionnaire. Forty-eight (75.0% of potential) contractors completed the contractor questionnaire and 23 (11.5% of potential) trainers completed the trainer questionnaire.

26 Measures

Three questionnaires were developed, one for each of the target groups: Crew, Contractor, Trainer. The questionnaires used both open and closed question types. The qualitative data were obtained to assist in explaining and adding to the quantitative results. These questionnaires are reproduced in full in Appendices 1 - 3 (p. 98 - 148).

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[4] Actual numbers of questionnaires given out are unable to be determined as questionnaires were photocopied when the 400 prepared questionnaires ran out and unfortunately a count of those 'extra' questionnaires was not made.

The first section of each of the questionnaires collected the following demographic information: age; gender; ethnicity; and regional location.

The second section of the questionnaire collected information relating to the first aim of the TNA. Crew members were asked the following: to identify all the jobs they were doing the day the questionnaires were administered and to nominate their main job; to rate the importance, frequency and difficulty to learn of the skills they were using on the day of questionnaire administration; if they thought that they had sufficient training when they first started these jobs, and what other training (if any) they felt they needed; who provided their training and to nominate their main trainer; if the FIRS modules cover all the skills required in their job, and to identify any additional skills to be added to the FIRS modules.

Contractors were asked the following: to identify the jobs that their crew members were working on the day of questionnaire administration, to rate the importance, frequency and difficulty to learn of the skills their crew members use; if they think crew members receive sufficient training when they first start working in the industry, and what other training (if any) they believe crew members need; to identify who provides training to their crew members and to nominate the main training provider; if the FIRS modules cover all the skills required in crew members jobs, and to identify any additional skills that should be added to the FIRS modules; the number and size of crews that the contractor managed, and the percentage of time that the contractor spent working solely on contractor tasks, working as a trainer and working as a crew member.

Trainers were asked the following: to identify the jobs that they train crew members in and list the topics that they cover; indicate if they think crew members received sufficient training when they first start working in the industry; and what other (if any) training they believe crew members need; if the FIRS modules cover all the required skills for the related job, and to identify any additional skills that should be added to the FIRS modules; whether they were qualified to assess FIRS modules, what type of trainer they were (within a crew, at a polytechnic, independent etc.), and the average time spent per week training people in logging skills.

The third section of the questionnaire collected information relating to the second aim of the TNA. All groups were asked to identify safety issues covered in training; to rate how well these issues were covered; indicate other safety issues that are covered; identify safety issues that should be covered in safety training.

The fourth section of the questionnaires collected information relating to the third aim of the TNA. Crew members were asked if they had undertaken pre-employment training. Those that responded positively were asked the following: to identify the type of pre-employment training; to name the provider of that training; to assess the utility of the training, and make suggestions to improve the utility; and if the training covered all the safety issues they needed, and what issues, if any, should be added to the training.

Contractors were asked if any of their crew members had undertaken pre-employment training. Those that responded positively were also asked the following: to identify the type of pre-employment training; to name the provider of that training; to assess the utility of the training, and make suggestions to improve the utility; and if the training covered all the safety issues their workers needed, and what issues, if any, should be added to the training.

The trainers were asked if they were involved in pre-employment training, and if so, what type of pre-employment training. Those that responded positively were asked the following: to identify the type of pre-employment training; to name the training institution; to assess the utility of pre-employment training, and make suggestions to improve the utility; and if pre-employment training covered all the safety issues workers needed, and what issues, if any, should be added to the training.

The fifth section of the questionnaires collected information about the fourth aim. All groups were asked to indicate the length of time they had spent working: in the industry; in their current job; and in their current crew. The contractors and trainers were asked to complete an industry climate measure, which was adapted from Litwin and Stringer's 1968 Organisational Climate Questionnaire.

2.7 Data Collection Methods

Data collection occurred between mid November 1997 and March 1998. Multiple methods of data collection were used to enhance the crew member and contractor response rate. Trainers (other than those based in a crew) were mailed questionnaires with reply-paid envelopes.

Crew member and contractor data collection methods included:

- Administration of questionnaires during a break in the work day (e.g. smoko, lunch) while the researchers were present.
- Administration of questionnaires during a break in the work day in which the researchers were not present but collected the questionnaires later that day.
- Questionnaires were given to the contractor as the start of the day to hand out to crew members to complete during a break in the work day in which the researchers were not present. The researchers collected the completed questionnaires the following day.
- Administration of questionnaires during a break in the work day in which the researchers were not present and the completed questionnaires were posted back to the researchers in a reply paid envelope.
- Questionnaires mailed with a reply paid envelope for return after administration.
- Administration of questionnaires after a Liro Limited seminar by the Liro Limited researchers, while the researchers were present.

Contractors and crew members in the Northland and South Island regions were more willing to participate than those in the central North Island region. This is probably because of the novelty of the event as due to the cost of travel and accommodation, most research on forestry workers tends to concentrate in the central North Island region as this has the largest commercial forest areas.

Chapter 3: Results

3.1 Chapter Overview

First, the demographic characteristics of the sample are reported. Then the results of the analysis of the items relating to currently available training (Aim 1) are reported. This is followed by the results of the analysis of items relating to perceived effectiveness of current training methods for delivering safety messages (Aim 2). Results of the analysis of items relating to perceived utility of pre-employment training (Aim 3) are next. Finally the results of the tenure items and the organisational climate (Aim 4) are described.

3.2 Analysis of Demographic Characteristics

3.2.1 Gender and Ethnicity

There were only 10 (2.5%) female crew members out 396 crew member responses. Eight of those 10 were in the Central North Island region. There was one female in each of Northland and South Island regions. Approximately one third of the crew members were Maori, two thirds New Zealand European. There were five Pacific Islanders, one English and one Dutch respondents. There were no Asian respondents. There was considerable regional variation in the distribution of the different ethnic groups. While one third of the total sample identified themselves as Maori, in the Central North Island region Maori made up over half the sample. In the South Island Maori had only a small presence (6%). Pacific Islanders has a small but consistent presence in all regions. Table 1 shows the ethnic distribution of crew members within each region.

Table 1. Crew Ethnicity by Region.

Region	Maori	NZ European	Pacific Islander	Other
Northland	31%	67%	2%	-
Central Nth Is	55%	42%	1.5%	1.5%
South Is	6%	90%	2%	2%
All Regions	31%	66%	1%	1%

All the contractors that responded (n = 48) were male. They were predominantly New Zealand Europeans (85%). Three contractors identified themselves as Maori, one Pacific Islander and one Australian. There were two contractors that declined to answer this question. All the contractors in the Northland region were of New Zealand European origin. Two South Island contractors were Maori, the rest New Zealand Europeans.

Of the twenty-three trainers who responded, one was female. Nine trainers identified themselves as Maori (39%), thirteen as New Zealand Europeans (56%) and one British (4%).

3.2.2 Age

The age of crew members ranged from 16 to 62 years, with a mean of 30.8 years. Almost 70% of crew members are aged less than 35 years of age, and 93% were less than 45 years old. The age distribution of the crew members is strongly skewed to the left of a normal curve with the number of crew members decreasing rapidly after 38 years of age.

The median age of crew members was about 25 years. The median age differed slightly for the various ethnic groups within the regions, with that of Maori crew members being 31 years, New Zealand European being 29 years. Pacific Island crew members tended to be slightly older (median age of 35 years), but the numbers in this group are very small. There were regional differences in the age distribution of crew members. The median age for Northland region crew members was 27.5 years, those in the Central North Island region had a median age of 31.5 years and South Island crew members had a median age of 31 years. Table 2, on the following page, shows the age distribution of crews by region.

Contractors had an age range of 31 to 56 years, with a mean (and median) age of 43 years. Over half the contractors were aged between 38 and 48 years of age. A quarter were aged less than 38 years, with the remainder aged over 50 years (16%). One contractor declined to answer this question. Geographical differences were again

evident. Age of contractors tends to increase from north to south. Contractors tended to be younger in the Northland region (50% were less than 40 years of age, none aged 50 years or greater) and older in the South Island (24% aged 50 years or greater). The mean age of contractors was 40 years for Northland contractors, 43 years for Central North Island contractors and 44 years for South Island contractors. Table 2 shows the age distribution of contractors by region.

Table 2. Age distribution of crew members (n=396) and contractors (n=48) by region.

	< 19	20 - 29	30 - 39		40 - 49		≥ 50	
Region	Crew	Crew	Crew	Cont.	Crew	Cont.	Crew	Cont.
Northland	8%	56%	25%	50%	11%	50%	-	-
Cent. Nth Is	10%	36%	40%	32%	12%	52%	2%	16%
South Is	6%	40%	37%	19%	13%	57%	4%	24%
All regions	8%	40%	36%	28%	12%	54%	3%	18%

Trainers had an age range of 31 to 61 years, with a mean age of 43.6 years and a median age of 42.5 years. Three trainers declined to answer this question. Trainers' ages were fairly evenly spread over 30s, 40s and 50s. All of the older trainers (aged greater than 40 years) are qualified to assess the FIRS modules, but only half of those aged between 30 - 39 years are so qualified.

3.3 Analysis of items relating to currently available training.

The first aim of this research was to identify if there are any deficiencies in the currently available training for crew members.

The first two sub-sections of this analysis report on the jobs that crew members were doing on the day of questionnaire administration. These questions were asked in order to determine the main areas that current training should be aimed at.

3.3.1 Job types crew members were involved with

Crew members were asked to identify all the jobs that they were doing on the day of questionnaire administration. The most frequently cited jobs were those of skid worker,

faller and log maker. A skid worker works in a cleared flat work area (the skid) and is usually involved in removing branches from felled trees that have been brought there by machine, and cutting these trees into logs. A faller is someone who cuts down the trees. A log maker, also works on the skid, determines how the tree is to be cut into logs. Given that there were 62 crews in the sample, there were approximately three skid workers, two fallers and two log makers per crew.

The results indicate as jobs get increasingly specialised and more mechanical, the number of crew members performing the job decreases. The exception to this is the faller position, which is a specialised position. Table 3 shows the number of crew members who indicated they were involved in each of the listed jobs.

Table 3: Jobs crew members were involved with.

Job#	Job Name	Number	Percent	# per crew
4	Skid Worker	171	43.4	2.8
1	Faller (motor manual)	111	28.1	1.8
5	Log Maker	101	25.6	1.6
3	Breaker Out	88	22.3	1.4
8	Loader Operator	59	15.0	0.95
10	Skidder Operator	47	11.9	0.76
11	Bell Operator	44	11.1	0.71
12	Other	44	11.1	0.71
7	Hauler Operator	30	7.6	0.48
9	Processor Operator	19	4.8	0.31
6	Tractor Operator	16	4.1	0.26
2	Faller (Mechanised)	14	3.6	0.22

The Other category of job included the following jobs: Quality control, relating to log specifications/log making (nine responses); other machine operator (seven responses); trimmer (five responses); foreman (four responses). The following jobs listed in the Other category had only single response: processing on the landing; trainer/assessor; relief worker; part time mechanic; and hooky under hauler.

The results from Table 3 indicate that crew members are frequently involved in more than one job during their working day as the sum of the count of all jobs (744) exceeds the number of crew members who participated (396). The skid worker and breaker out were the jobs most commonly linked with other jobs. Table 4 on the following page

shows the job combinations and number of crew members involved in each job combination.

Table 4: Job combinations indicated by crew members*.

Job Title	Number solely in job	Number with one other job and job title	Number with two other jobs and job titles
Faller (motor manual)	49	-	-
Faller (Mechanised)	4	-	-
Breaker Out	15	7 Faller†	-
Skid Worker	47	6 Faller 5 Breaker out	6 Faller & Breaker Out
Log Maker	18	30 Skid Worker	4 Faller & Skid worker
Tractor Operator	-	-	-
Hauler Operator	14	-	-
Loader Operator	28	2 Skid Worker	3 Skid Worker & Log Maker
Processor Operator	2	2 Faller (mech.)	-
Skidder Operator	18	2 Breaker Out 2 Log Maker	-
Bell Operator	16	5 Skid Worker	
Other	-	6 Breaker Out	

* Where more than three responses were given, these were omitted.
†Faller indicates motor manual unless specified as mechanised.

3.3.2 Main job crew members involved in today

Crew members were also asked to indicate the main job they were doing in on the day of questionnaire administration. The most frequently cited main job was skid worker, followed by faller and log maker. Table 5 shows the percentage of crew members who listed each job as their main job. Excluded from this analysis were the seventeen crew members who circled more than one job as their main job, and the twenty-eight that declined to respond to this question.

Table 5: Crew members main job (n=351).

Job Name	Count	Percentage
Faller (motor manual)	69	19.66
Faller (mechanised)	4	1.14
Breaker Out	31	8.83
Skid Worker	73	20.80
Log Maker	47	13.39
Tractor Operator	2	0.57
Hauler Operator	18	5.13
Loader Operator	35	9.97
Processor Operator	5	1.42
Skidder Operator	26	7.41
Bell Operator	23	6.55
Other	18	5.13

Contractors were also asked to identify which of the listed jobs their crew members would be involved in. The main difference between the contractor and crew reporting lies in the Faller (mechanised) position, where contractors reported this position more frequently. Table 6 shows the number and percentage of crews for each job title by region as reported by contractors.

Table 6: Number and percentage of crews for each job by region as reported by contractors (n = 45).

	Northland		Central Nth Is		South Is		All	
Job Title	#	% crews with this job	#	% crews with this job	#	% crews with this job	#	% crews with this job
Faller	6	100	14	74	16	80	36	80
Faller (mech.)	-	-	7	36	-	-	7	15
Breaker Out	4	67	7	36	17	85	28	62
Skid Worker	6	100	18	95	17	85	41	91
Log Maker	6	100	17	89	17	85	40	89
Tractor Operator	3	50	3	16	6	30	12	27
Hauler Operator	2	33	2	11	14	70	18	40
Loader Operator	5	83	18	95	18	90	41	91
Processor Operator	-	-	3	16	3	15	6	13
Skidder Operator	5	83	16	84	7	35	28	62
Bell Operator	-	-	8	42	16	80	24	53
Other	1	17	5	26	4	20	10	22

Crew members report some regional differences when indicating their main job. The jobs Tractor Operator, Processor Operator, Skidder Operator and Bell Operator were combined due to small numbers and are referred to as Other Machine Operator. While most of the jobs show little variation between regions, when the number of crews in each region is taken into consideration, there are some jobs that seem to have a regional bias. Breaker Out and Hauler Operator positions occur more frequently in the South Island region than the other two regions. The Skid Worker position appears 1.5 times per crew in the Central North Island region whereas there is less than one per crew in the South Island region. However as 45 crew members did not respond to this question, and not all crew members from each crew completed questionnaires, care should be taken in interpreting these results. There were 9 crews in Northland, 28 crews in the Central North Island and 25 Crews in the South Island regions. Forty-five crew members declined to answer this question. Table 7 on the following page show crew members main job by region.

Table 7: Crew members main job by region (n = 351).

Job title	Northland Count	Northland # per crew	Central Nth Is Count	Central Nth Is # per crew	South Is Count	South Is # per crew	All Count
Faller	15	1.67	24	0.86	30	1.20	69
Faller (mech.)	0	0	4	0.14	0	0	4
Breaker Out	6	0.67	2	0.07	23	0.92	31
Skid Worker	11	1.22	41	1.50	21	0.84	73
Log Maker	8	0.89	21	0.75	21	0.84	47
Hauler Operator	2	0.22	2	0.07	14	0.56	18
Loader Operator	10	1.11	14	0.50	11	0.44	35
Other Machine Operator	6	0.67	29	1.04	21	0.84	56
Other	2	0.22	9	0.32	7	0.28	18
All	60	-	146	-	145	-	351

3.3.3 Tasks crew members involved in today

Crew members were asked to rate the importance, frequency and difficulty of the tasks that they were doing on the day the questionnaire was administered as Bramley (1989) and McGurk et al. (1994) suggest where a task is both important and difficult to learn it generally indicates a training need. Unfortunately many of the participants did not take notice of the instruction, "Only complete the skills that **you** are using today." as evidenced by the results shown in Table 8 (on the following page) as far more crew members answered these questions than responses to earlier questions would support. Table 8 summarises the crew members' responses and gives some indication of the importance, frequency and difficulty to learn, of the tasks involved. In the table, percent relates to percentage of respondents who rated the skill as being very important or important, used all the time or most of the time, and a bit hard or very hard to learn. The number of crew members who responded to each skill is also given as this varies greatly between the skills.

As all the skills were rated as important, the rating of the difficulty of skills to learn is used to determine the job areas that, according to Bramley and McGurk et al. should have training.

The skills involved in a cable hauling logging operation (setting up hauler, operating hauler, maintaining hauler, preparing and doing line shifts, and wire rope splicing) are generally considered to be the most difficult to learn. These are followed by the skills used by a loader operator i.e. operating loaders, loading logs, and organising logging

trucks. The skills involved in falling (felling techniques, cutting techniques and tree assessment) are also generally considered difficult to learn.

Table 8: Crew members rating of importance, difficulty to learn and frequency of logging skills.

Job Skills	Importance of skill		Difficulty to learn		Frequency of skill use	
	Percent	Number	Percent	Number	Percent	Number
Operating a chainsaw	98.4	308	38.6	285	80.6	294
Maintaining a chainsaw	96.4	303	23.2	280	74.3	292
Felling techniques	94.4	213	57.1	184	68.9	177
Cutting techniques	98.2	271	50.2	241	85.7	231
Tree Assessment	96.9	229	51.3	187	78.2	193
Operating machines	94.8	234	52.7	186	76.0	208
Maintaining machines	93.0	227	29.3	181	73.1	197
Area Assessment	97.8	276	35.1	211	83.6	244
Hazard identification	99.7	343	33.0	285	93.1	307
Hazard control or removal	98.5	322	37.1	264	88	283
Grading logs	93.7	239	58.3	187	73.3	202
Measuring logs to length	91.7	218	35.8	179	67.0	179
Operating loader	86.3	161	53.9	117	49.2	126
Maintaining loader	82.7	162	26.4	110	50.4	117
Sorting logs	91.5	188	40.0	125	61.7	141
Loading logs	84.7	157	54.0	113	51.7	118
Wire rope splicing	76.6	154	65.2	112	34.8	118
Wire rope maintenance	79.5	161	41.4	111	44.3	113
Signalling	92.4	237	16.2	179	73.0	200
Organising logging trucks	78.5	144	53.5	310	40.0	95
Setting up hauler	84.9	132	69.6	92	49.5	105
Operating hauler	78.2	119	68.4	76	43.7	87
Maintaining hauler	76.5	115	48.6	72	40.2	82
Planning drags	88.6	193	27.8	143	71.1	152
Selecting drags	88.6	193	28.7	143	70.0	150
Hooking up logs	88.2	195	18.9	143	67.1	155
Preparing and doing line shifts	86.5	148	51.9	104	58.0	112

Contractors and trainers responses to the importance, difficulty to learn and frequency of skills are given in Table 9 (p. 50-51).

Crew members tended to agree with contractors and trainers about the importance of skills, but differed from contractor and trainers in the frequency and difficulty to learn ratings. Crew members tended to rate the skills as being performed less frequently than contractors and trainers, and as less difficult to learn. Crew members appear to be more optimistic than contractors or trainers about how difficult skills are to learn. This may due to the relative inexperience of crew members compared to contractors and trainers.

Table 9: Contractor and trainer ratings of importance, frequency and difficulty to learn of logging skills.

Job Skills	Contractor						Trainer					
	Importance of skill		Frequency of skill use		Difficulty of skill to learn		Importance of skill		Frequency of skill use		Difficulty of skill to learn	
	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count
Hazard identification	100	47	95	43	55	42	100	22	95	20	37	19
Hazard control or removal	100	47	91	43	74	42	100	22	100	20	68	19
Faller (motor manual)												
Operating chainsaw	100	44	100	42	43	42	100	23	95	21	59	22
Maintaining chainsaw	100	44	90	42	29	42	96	23	95	21	55	22
Felling techniques	100	44	95	42	76	42	100	23	95	21	82	22
Tree Assessment	100	43	95	42	63	42	100	23	95	21	73	22
Faller (mechanised)												
Operating machine	100	11	100	11	70	10	100	6	100	5	100	5
Maintaining machine	100	11	100	11	50	10	100	6	100	5	60	5
Felling techniques	100	11	91	11	90	10	100	6	100	5	100	5
Tree Assessment	91	11	82	11	80	10	100	6	100	5	60	5
Skidder Operator												
Operating machine	100	35	97	31	66	32	100	11	90	10	80	10
Maintaining machine	100	35	94	31	53	32	100	11	100	10	50	10
Area assessment	100	34	97	31	69	32	91	11	100	10	50	10
Splicing wire rope	64	33	57	28	69	29	67	9	70	10	70	10
Planing drags	100	34	97	31	57	30	91	11	100	10	40	10
Hooking up logs	100	33	90	30	37	27	91	11	100	10	20	10
Breaker out												
Signalling	97	33	96	28	31	29	100	17	100	14	36	14
Hooking up logs	97	33	89	28	34	29	100	17	100	14	50	14
Selecting drags	100	33	93	28	34	29	94	17	100	14	50	14
Preparing and doing line shifts	97	33	83	23	77	22	100	16	92	13	75	12
Wire rope splicing and maintenance	97	33	50	26	58	26	75	16	71	14	71	14
Skid worker												
Operating chainsaw	100	46	100	44	45	44	100	20	100	17	50	18
Maintaining chainsaw	100	46	93	44	30	44	100	20	100	17	39	18
Cutting techniques	100	46	100	44	73	44	100	20	100	17	72	18

Table 9: Contractor and trainer ratings of importance, frequency and difficulty to learn of logging skills (continued)

Job Skills	Contractor						Trainer					
	Importance of skill		Frequency of skill use		Difficulty of skill to learn		Importance of skill		Frequency of skill use		Difficulty of skill to learn	
	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count
Log Maker												
Grading logs	100	47	100	44	86	44	100	15	400	13	86	14
Measuring logs to length	100	47	100	45	55	44	100	15	100	13	50	14
Tractor operator												
Operating machine	100	19	94	16	76	17	100	9	88	8	100	7
Maintaining machine	100	19	88	16	41	17	100	10	75	8	44	9
Area assessment	100	19	94	16	65	17	100	9	88	8	56	9
Hauler operator												
Setting up hauler	100	19	95	19	86	21	100	9	88	8	100	7
Operating hauler	100	23	95	19	75	20	100	9	88	8	100	7
Maintaining machine	100	23	89	19	35	20	100	9	75	8	86	7
Signalling	100	22	89	19	30	20	100	9	100	8	71	7
Wire rope splicing and maintenance	96	24	72	18	60	20	100	9	63	8	86	7
Loader operator												
Operating loader	100	47	100	45	75	44	100	10	89	9	80	10
Maintaining loader	100	47	93	45	41	44	100	10	89	9	50	10
Sorting logs	100	47	96	45	80	44	100	10	89	9	60	10
Loading logs	100	47	98	45	77	44	100	10	100	9	70	10
Organising logging trucks	94	47	89	44	71	42	100	9	100	9	70	10
Processor operator												
Operating machine	100	11	100	7	98	8	100	6	100	6	100	4
Maintaining machine	100	11	100	7	63	8	100	6	100	6	75	4
Bell operator												
Operating machine	100	31	96	28	70	27	100	9	100	8	71	7
Maintaining machine	100	31	96	28	41	27	100	9	100	8	29	7

3.3.4 Type of trainer

The majority of trainers that responded to the questionnaire (36%, 8) work at a polytechnic, followed by working as an independent contract trainer (18%, 4), then working in a crew (14%, 3). One trainer did not respond.

The average amount of time spent working as a trainer per week varied markedly. Twenty-five percent of the trainers spent less than five hours a week training, 25% spent between 21 and 30 hours a week training and a further 25% spent over 30 hours per week. Three trainers declined to answer this question.

3.3.5 What jobs do trainers provide training for?

Trainers were asked to identify the jobs that they trained crew members for. Almost all trainers (91%) trained people for the faller position. The next most frequently trained position was skid worker at approximately 73%. This is unusual given that there are more people employed in the skid worker position than the faller position, and the skid worker position is frequently used as an entry level position. While the number of trainers that participated is small, given that most work within polytechnics which provide mainly pre-employment training, these results suggest that the pre-employment training is not being targeted at an appropriate level. Table 10 shows the number and percentage of trainers that train crew members for that job.

Table 10: Number and percentage of trainers that train crew members for that job (n = 22)

Job Title	Number of trainers	Percentage of Trainers
Faller (motor manual)	20	90.9
Faller (mechanised)	0	0
Breaker Out	12	54.6
Skid Worker	16	72.7
Log Maker	10	45.5
Tractor Operator	5	22.7
Hauler Operator	2	9.1
Loader Operator	7	31.8
Processor Operator	0	0
Skidder Operator	7	31.8
Bell Operator	3	13.6
Other	6	27.3

3.3.6 Contractor activities

The majority of contractors manage one crew (43 contractors, 89%). Four contractors manage two crews (8%). One contractor declined to answer this question. No contractors in our sample managed more than two crews. The number of people in a crew ranged from 5 to 25 people, with a median of 10 people per crew.

Most contractors work as both crew members and trainers in addition to their contractor tasks. Contractors were asked to identify the amount of time (as a percentage) they spent working: on contractor tasks: as a trainer; and as a crew member. There was considerable variation in the percentage of time contractors spent in the different tasks. The median percentage of time contractors spent solely on contractor tasks was 30%, with 50% of contractors spending between 17 - 53% of their time solely on contractor tasks. The median time contractors spent working as a trainer was 10%, with 50% of the contractors spending between 1 - 14% of their time training crew members. The median time contractors spent working as a crew member was 50%, with 50% of the contractors spending between 39 - 80% of their time as crew members. Some contractors spent 90% of their time solely on contractor tasks, while other contractors spent 90% of their time working as a crew member. The maximum time spent by a contractor working as a trainer, was 57%. A number of contractors noted that they spent considerable time in the evenings completing contractor tasks in order to spend more daylight hours working as a member of the crew.

3.3.7 Who trains crew members?

Crew members were asked to identify all those who provided training from the following list: workmates; foreman/supervisor; contractor; trainer; and other. Over 50% of crew members listed workmates, contractor and trainer as training providers. Twenty-nine crew members (7.3%) indicated that they had received training from another source. The Other trainers consisted of: self trained (22 responses); some sort of training scheme, including polytechnics (17 responses); a relation (9 responses); and machine manufacturers (5 responses). Contractors were also asked to identify all those who provide training to their crew members. Contractors' responses differed from the crew members, in that they identified trainers and contractors much more frequently than did

crew members. Contractors also identified foreman/supervisors more frequently than the crew members, while the Other trainer category was identified less often. Contractors named training schemes and consultants as Other trainers. Table 11 shows the distribution of type of trainer identified by crew member and contractor.

Table 11. Type of trainer identified by crew members (n=396) and contractors (n=48)

	Workmates	Foreman	Contractor	Trainer	Other
Crew Members	63.9%	20.6%	59.4%	67.3%	16.2
Contractors	62.5%	45.8%	79.2%	91.7%	8.3%

The majority of crew members identified more than one trainer. The most frequent combinations were: workmates and trainer (44); contractor and trainer (36); workmates and contractor (32); trainer (32); and workmates, contractor, trainer and foreman/supervisor (31).

Table 12 shows the various combinations of trainers identified by crew members, for example, the first row accounts for 146 respondents as 22 crew members identified workmates as their sole trainer. In addition, three crew members identified workmates and foreman as their trainers; 32 crew members identified workmates and contractor as their trainers; 44 crew members identified workmates and trainer as their trainers. A further 5 indicated workmates, foreman and contractor as providing their training, another 9 indicated workmates, foreman and trainer as providing their training. Another 31 crew members indicated that they received training from all four sources, i.e. workmates, foreman, contractor and trainer.

Table 12: Combination of trainers identified by crew members.

Trainer	**Sole trainer identified**	**Two trainers identified**	**Three trainers identified**	**Four trainers identified**
Workmates	22	3 foreman 32 contractor 44 trainer	5 foreman + contractor 9 foreman + trainer	31 foreman + contractor + trainer
Foreman	6	6 contractor 8 trainer	4 contractor + trainer	-
Contractor	21	36 trainer	-	-
Trainer	32	-	-	-
Other	10	-	-	-

Note: Other trainer with two, three or four responses was omitted due to the range of trainers in the other category

Contractors gave slightly different training provider combinations than crew members. The training provider combinations given by contractors were: workmates, contractor, trainer and foreman/supervisor (13 responses); workmates, contractor and trainer (11 responses); contractor and trainer (6 responses); trainer (5 responses); and contractor, trainer and foreman/supervisor (3 responses).

3.3.8 Who is the main trainer for crew members?

Crew members were also asked to identify the type of trainer who had provided the majority of their training. Workmates (31.5%) and trainers (30.4%) were the most frequently cited main trainers for crew members. In contrast, only 9.8% of contractors cited crew members' workmates as their main trainer. Contractors most frequently cited trainers as the crew members main trainer (63.4%). No contractors identified the "Other" category of trainer as their crew members main trainer. Table 13 shows the type of training provider identified as the main trainer by crew members and contractors.

Table 13. Main trainer as identified by crew members (n=339) and contractors (n=41)

	Workmates	Foreman	Contractor	Trainer	Other
Crew Member	31.5%	7.1%	22.7%	30.4%	8.3%
Contractor	9.8%	7.3%	19.5%	63.4%	-

Table 13 indicates that contractors tend to underestimate the amount of training given to crew members by their workmates, and the amount of training that they provide to their crew members. Contractors tend to overestimate the amount of training provided by trainers. Given that workmates are likely to be viewed as giving training that has high face validity, it would be important for contractors to ensure that this training is actually passing on skills and knowledge that is correct and promotes safe work behaviour as opposed to skills and knowledge that could lead to accidents and injury.

3.3.9 Did crew members receive sufficient training when they first started in logging?

Most crew members (89.3%) felt that they received sufficient training to do the work in a safe, productive manner when they first started work in the logging industry. Of those that did not feel that they received sufficient training, 3% stated that there was no

training, or that they had to train themselves. A further 7% had received some training, but felt that the training needed to be more practical, with greater individual attention, more supervision and less pressure to maintain productivity levels when learning new skills. Only 1.5% felt that there were insufficient trainers available to undertake the training. Comments such as the following were given to explain what needed to be added to the training:

- "...not enough 1 to 1 training in the beginning stages of training..."
- "...more hands on..."
- "...more practical training on job..."
- "...I feel that there is no follow up..." and
- "...more supervision on the job...".

Over 50% of contractors thought that crew members received sufficient training. Thirty-five percent of contractors thought that crew members did not receive sufficient training to work in a safe and productive manner when they first started in logging, and 2% of contractors did not know whether crew members had received sufficient training or not. Practical experience, time in the job and safe behaviour/safety awareness were identified as areas that needed to be improved. Comments such as the following were given to explain what needed to be added to the training:

- '...mainly younger workers - need more work-related experience i.e. learning and observing the bosses for a longer period of time...';
- '...safe behaviour training, basic logging skills, chainsaw operation and maintenance...';
- '...experience to meet and cope with ever changing conditions and environment...'; and
- '...practical experience, time on the job...'.

When crew member responses to the question of sufficient training are matched with who they identified as their main trainer, crew members who identified contractors as their main trainer were most likely to indicate they had received sufficient training (93.5%). Those who identified trainers as their main trainer followed closely (91%), followed by those who named foreman and workmates (87.5 and 86.9% respectively).

Those who identified Other trainer as their main trainer, had an 82% positive response to the sufficient training question.

3.3.10 Does the FIRS module cover all the required skills?

The majority of crew members (336, 87%) indicated they believed the FIRS modules covered all the skills required to perform their job in a safe and productive manner. Six percent (25) of crew members felt that the FIRS modules did not cover all the required skills, and a similar number indicated that they did not know if the FIRS modules covered all the skills. Almost half of the crew members who felt the FIRS did not cover the skills required, indicated the standard at which the FIRS were being assessed was at fault rather than the content of the modules. This sentiment was also expressed by those who felt that the modules covered all the required skills. Comments such as the following were common:

- '...need to include measures of experience and competence...';
- '...just because you have the module does not mean you can do the job well, experience helps you to do the job well, it isn't that hard really to gain the modules...'
- '...some people have module but can't do the job...'; and
- '...the modules you receive are of a minimum required standard...'.

A number of crew members noted that there were no FIRS modules available for their jobs.

The majority of contractors (60%, 29) felt that the FIRS modules covered all the required job skills. Those contractors who felt the FIRS modules did not cover all the skills made similar comments to the crew members. Comments such as the following:

- '...time and experience need to be taken into account. A person can get a module but still not "have it all together" when sent to do the job by himself...';
- '...skills in FIRS not asking for a high enough standard...';
- '...often when they obtain the module, they think that there is no more to learn...'; and
- '...most modules that pertain to our operation are still waiting to be instigated...'

were common complaints about the current situation.

Contractors also noted that while the FIRS modules were assessing the attainment of a minimum skill standard, crew members often believed that the modules assessed mastery of the skill. For example, the following comment (or similar) was made by both contractors and more experienced crew members:

- "...FIRS modules are a guideline for a minimum standard. Once you get the minimum standard you can perfect the job [skills] further as you progress...'.

The majority of trainers (70%, 16) felt that the FIRS modules cover all the skills required. The trainers comments about the FIRS modules were similar to both the crew members and the contractors comments. While over three quarters of the trainers were qualified to assess FIRS modules, none of the trainers under the age of 40 were qualified to do so.

3.4 Analysis of items relating to perceived effectiveness of safety training.

The second aim of this research was to assess the perceived effectiveness of current training methods in delivering safety messages to crew members.

3.4.1 Safety issues covered in training

Crew members were asked to identify which of the 12 common safety issues listed had been covered in their training. It was expected at least 10 of the items would be identified by each participant as the Health and Safety in Employment Act (1992) requires employers and their employees ensure that their work activities do not harm either themselves or other people.

While all of the safety issues scored over 50% the following safety issues scored a response of over 90%: 'Personal safety around machines', 'Working safely with other people', 'Hazard identification and control', 'Personal safety on the skid site', and 'Bush

code'. Table 14 (on the following page) shows the number of crew members who indicated they had that particular safety issue covered in their training. The reduced response for the safety issue 'Working safely in a hauler based operation' is to be expected as it accurately reflects the smaller number of crew members that work in a hauler based operation.

Contractors had a higher response to the safety issues than their crew members. Over 95% of contractors thought that the following safety issues were covered in their crew members training: 'Personal safety around chainsaws', 'Personal safety around machines', 'Personal safety on skid site', 'Working safely with other people', 'Hazard identification and control', 'Health and Safety in Employment Act', 'Bush code' and 'Company safety code'. A further 85% of contractors believe that the following safety issues were covered in their crew members training: 'Contractors safety code' and 'Tree and area assessment'. The smaller response to the issues of safety in either ground based or hauler based operations will be a reflection of the actual numbers of contractors involved in each type.

Table 14: Crew members identification of safety issues covered in their training (n = 338).

Safety Issue	Issue covered in crew members training	
	Number	Percent
Personal safety around chainsaws	297	88
Personal safety around machines	321	95
Personal safety on skid site	306	91
Working safely with other people	313	93
Hazard identification and control	311	92
Working safely in ground based operation	264	78
Working safely in hauler based operation	183	54
Health and Safety in Employment Act	272	80
Bush code	305	90
Contractors safety code	242	72
Company safety code	243	72
Tree and area assessment	213	63

Trainers had a higher response to some of the safety issues than either the contractors or the crew members. All the trainers (n = 22) believed that they covered the following safety issues when training crew members: 'Personal safety around chainsaws'; 'Hazard identification and control'; 'Health and Safety in Employment Act'; and 'Bush code'. A further 90% of trainers believed that they covered 'Personal safety on skid site', 'Tree

and area assessment', Working safely with other people' and 'Working safely in a ground-based operation' in crew members training. A further 80% of trainers covered the following safety issues in crew members training: 'Personal safety around machines'; Contractors safety code'; and 'Company safety code'. The smaller response to working safely in hauler-based operations will be a reflection of the smaller number of logging operations using haulers.

3.4.2 Rating of safety issue coverage in training

Crew members were asked how well the safety issues were covered in their training. Their responses were very positive with 57.1% (224) rating the coverage as 'really well', 41.8% (164) rating the coverage as 'OK' and only 1% rating safety issue coverage as 'not good enough'.

When the rating of safety issues is compared with main trainer, crew members who had a trainer as their main trainer, were most satisfied with the safety training with 20% of crew members rating the coverage as 'really well' and a further 10% rating the training as 'OK'. Crew members who identified workmates as their main trainer were also generally satisfied with the safety training they received. However, in a small number of cases where crew members were identified as the main trainer, the rating of the safety issue training was 'not good enough' (0.9%). Contractors as the main trainer were the only other group to be rated as 'not good enough' (0.3%). Table 15 below shows crew member rating of safety issue training by main trainer.

Table 15: Crew member rating of safety issue training by main trainer.

Type of main trainer	'Really well' Count	'Really well' Percent	'OK' Count	'OK' Percent	'Not good enough' Count	'Not good enough' Percent
Workmates	53	16	51	16	3	0.9
Foreman	14	4	10	3	-	-
Contractor	45	13	30	9	1	0.3
Trainer	68	20	35	10	-	-
Other	14	4	13	4	-	-
All	194	58	139	41	4	1

Contractors were not as positive as crew members in rating of safety issue coverage in training. 21 contractors (44%) thought that safety issues were covered 'really well', 22

(46%) thought that safety issues were covered 'OK', and one contractor (2%) thought that the safety issue training was 'not good enough'.

3.4.3 Other safety issues covered in training

Crew members, contractors and trainers were asked to identify any other safety issues covered in their training. Fifty crew members (12.6%), 12 contractors (25%) and nine trainers (37.5%) identified other issues that were covered in their training. Most frequently mentioned were: fire training; advanced/first aid and crew bus driving. Table 16 (on the following page) shows the other safety issues identified by crew members and contractors.

Table 16: Other safety issues identified by crew members and contractors.

Other Safety issues identified	Identified by crew member	Identified by contractor	Identified by trainer
Fire training	✓	✓	✓
First aid/Advanced first aid	✓	✓	
Man Machine interactions	✓	✓	
Crew bus driving	✓	✓	
Vehicle safety travelling to and from work	✓		✓
Communication by radio	✓		
Communication at worksite	✓	✓	
Emergency procedures	✓	✓	✓
Safety for public	✓		
Safe behaviours		✓	✓
Nutrition and hydration	✓	✓	✓
Hygiene/Personal health		✓	✓
Drug and alcohol abuse		✓	
Accident and near miss reporting		✓	
Rope splicing			✓
Chemical handling safety			✓

3.4.4 Safety issues which need to be added to the training

Contractors and crew members were also asked to identify any training which should be added to crew members training. Three hundred and forty crew members (85.5%) and 35 contractors (72.9%) indicated they believed nothing needed to be added to the training. The majority of responses, from crew members who felt current safety training was lacking in some area, would fall into some sort of management activity such as receiving a copy of the monthly safety meeting minutes or having ongoing testing/assessment of safety issues. Additional training was requested for: nutrition,

hydration, fatigue effects on workers; coping with wind and wet conditions; felling on steep slopes; team safety and coping with production versus safety pressures. One crew member suggested that a standard set of signals be adopted for cable haulers, rather than the current situation where signals change from one cable hauler crew to another.

Contractors identified the following issues as ones that should be added to crew members' safety training:

- dangers of drug and alcohol use at work;
- safe behaviours at work;
- first aid;
- hygiene;
- nutrition, hydration and fatigue effects;
- communication;
- defensive driving; and
- attitude to safety.

3.5 Analysis of items relating to perceived utility of pre-employment training

The third aim of this research was to assess the perceived utility of the currently available pre-employment training programmes by both contractors (employers) and crew members (employees).

3.5.1 How common is pre-employment training and what forms does it take?

Approximately one third of the crew members had undergone some form of pre-employment training, the most common being polytechnic training. Table 17 shows the distribution of pre-employment training sources. The 'other' category of pre-employment training provider identified by crew members were mainly "Woodsman/NZ forestry service training" (12%) and apprenticeship-type positions (12%). A further 10% of those that indicated they had other pre-employment training described situations that were not actually pre-employment such as "*worked in native logging for 20 years, X got a trainer in when I started work* and *on job modules*". 71% of contractors indicated that

at least one of their crew members had done some form of pre-employment training. Again, the majority of this pre-employment training consisted of attending a polytechnic course. Contractors 'other' category of pre-employment training consisted mainly of working with other gangs or other contractors - which is not actual pre-employment training.

Table 17. Crew members (n=386) and Contractors (n=48) identification of pre-employment training providers.

Pre-employment training provider	Crew members	Contractors
Polytechnic	42%	71%
Mare-based / Iwi-based	4%	12%
Other	44%	17%

Fourteen of the 23 trainers (61%) who participated in the training needs analysis indicated that they were involved in pre-employment training, with the majority working in a polytechnic (57%), followed by those working for a private training enterprise (36%). The remainder worked for a Marae or Iwi based training provider (21%). The percentages total more than 100 as trainers sometimes worked for more than one kind of training provider.

3.5.2 Rating of 'usefulness' of pre-employment training

Almost 75% of the crew members that undertook pre-employment training, found that training to be 'really useful'. A further 20% found the pre-employment training 'OK', while the remaining 5% found the training to be 'not much use' or 'useless'. Contractors are not as positive as crew members about pre-employment training, as 11% of contractors rated pre-employment training as 'not much use'. Table 18 shows the rating of pre-employment training by crew members and contractors.

Table 18. Rating of pre-employment training according to group.

How useful was the pre-employment training?	Crew Member (n=127)	Contractor (n=36)	Trainer (n=23)
Really useful	74.8%	72.2%	82.6%
OK	19.7%	16.7%	17.4%
Not much use	3.1%	11.1%	-
Useless	2.4%	-	-

3.5.3 Suggestions for improving pre-employment training

Crew members suggested that adding more practical experience, having more time to gain experience and learning in a more realistic working environment would improve the quality and utility of pre-employment training. Four crew members commented that the pre-employment training had improved since they had undertaken it. Crew members who had graduated from pre-employment training noted that the training provided could not supersede the practical experience gained by time spent doing the job.

Contractors who rated pre-employment training as less than 'really useful' were usually concerned with either the selection of trainees into pre-employment training courses or the lack of realistic practical work experience available during pre-employment training courses. Only one trainer offered a comment on the rating of pre-employment training courses noting that they need to *"focus on [the] contractors requirements, too many courses [have a] laid back attitude toward the training"*.

3.5.4 How well does pre-employment training cover safety issues?

Crew members were generally positive about how well pre-employment training covered the safety issues that they needed to know to work safely. Approximately 84% of crew members who had undertaken pre-employment training said that the training had covered all the safety issues that they needed to know to work safely. Again contractors were not as positive as their crew members about the safety training. About 47% of contractors thought that the pre-employment training did not cover all the safety issues. These contractors felt that the graduates of pre-employment training courses tended to be lacking an awareness of job hazards, lacked practical experience, and did not know how to work safely around the machines commonly used in the industry. Trainers in defence of pre-employment training course offered the following comments *"Those receiving training in a pre-employment situation get a lot of theory and not a lot of practical experience. This is caused by [the] difficulty of [getting] work experience placements in production crews"* and *"On a training course we can only cover so much ground in the time available. We can teach the general aspects encouraged generally*

on most logging sites. A lot of safety issues are specific for site and type of machinery being used. Therefore any trainee coming from a training course must be made aware of specific site hazards and [the] particular communication methods indigenous to that site". Table 19 shows the responses given by crew members, contractors and trainers to whether they thought current training pre-employment training covered all the required safety issues.

Table 19. Rating of safety issue coverage of pre-employment training according to group.

Does training cover all safety issues needed to work safely?	Crew Member (n=123)	Contractor (n=32)	Trainer (n=20)
Yes	83.7%	53.1%	70%
No	16.3%	46.9%	30%

3.5.5 Suggestions for improving the safety training aspect of pre-employment training

The only suggestions made by crew members for increasing the quality and utility of safety issue training was to include more training on hazard identification and repeat the safety training in the actual work setting. Contractors agreed with crew members about the need for more hazard identification training, with one contractor suggesting "*more emphasis on hauler rope hazards i.e. being aware of where ropes do/can land in event of breakage'.* Contractors also felt that the training should include how to work with and around the machines used in the industry. Contractors again expressed a desire for pre-employment training to have more practical experience, particularly in a productive environment. Trainers agreed with contractors that pre-employment training should be more hands on, working around other workers and working around machines.

3.6 Analysis of items relating to tenure and organisational climate

The final aim of this research was to determine if there are factors other than training that may be contributing to the ongoing poor occupational health and safety record of the logging industry.

3.6.1 Length of time spent working in logging

Crew members had been working in logging from less than one week to 39 years, with five crew members not responding to this question. The average time spent working in logging for crew members was 8.7 years, that is approximately 8 years, 9 months (n = 391). Maori and Pacific Island respondents had a mean time in logging of over ten years, while New Zealand Europeans had a mean of 8 years. The average time in logging was longest in the Central North Island region (approximately 9.5 years), followed by the South Island region (approximately 8 years, 8 months) and lastly the Northland region (almost 7 years). Apart from the two South Island region Pacific Island respondents (almost 21 years in logging), Maori in the Central North Island region had spent the longest time in logging, of eleven years. Table 20 shows the average length of time in logging for crew members by region and ethnicity.

Contractors had been working in logging from 5.5 years to 41 years, with three contractors not responding to this question. Overall, contractors had spent an average of nearly 22 years in logging (n = 46). Contractors in Northland, averaged less than 19 years, while Central North Island and South Island contractors averaged more than 22 years in logging. Ethnic differences were also found. Maori contractors tended to have spent more time in logging than New Zealand European across all regions. Table 20 shows the average time in logging for contractors by ethnicity and region.

Table 20. Average length of time in years, spent working in logging for crew members (n=391) and contractors (n=46) by ethnicity and region

	Maori		NZ European		Pacific Islander		Other	
Region	Crew	Cont.	Crew	Cont.	Crew	Cont.	Crew	Cont.
Northland	7.5	-	6.8	18.9	4.0	-	-	-
Cent. Nth Is	11.0	34.0	7.5	51.1	4.4	17.0	13.0	34.0
South Island	8.0	22.5	8.6	22.5	20.0	-	2.0	-
All	10.1	26.3	8.0	21.4	10.8	17.0	7.5	34.0

Trainers had spent between 1.25 to 44 years in logging, with seven trainers not responding to this question. The average time spent in logging was 18 years and 3 months (n = 16).

3.6.2 Length of time spent working in current job

Crew members had been working in their current job between 0.01 years (less than one week) and 30 years, with 60 crew members not responding to this question (n = 336). The average time crew members spent in their current job was 4 years and one month. Maori crew members tended to have spent a year or two longer in their current job than New Zealand European crew members. Table 21 shows the average time crew members spent in their current job by ethnicity and region.

Table 21. Average length of time in years, spent working by crew member in their current job by ethnicity and region (n=336).

Region	Maori	NZ European	Pacific Islander	Other
Northland	3.0	2.9	4.0	-
Cent. Nth. Is	5.1	3.1	4.4	18
South Island	5.1	4.1	17.5	1.5
All	4.8	3.6	11.0	7.0

When the average length of time crew members had spent in the industry is considered in relation to jobs the average crew member has worked at two to three different jobs. This suggests that crew members are relatively mobile as regards job positions.

3.6.3 Length of time spent working in current crew

Crew members had spent between 0.01 year (less than one week) and 20.25 years (20 years, three months) in their current crew, with 32 crew members not responding to this question (n = 364). Overall, the average time spent in the current crew was nearly two years and nine months (2.7 years). Crew members in the South Island region had spent longer (approximately 3 years and 5 months) than the average with their current crew, while those in the Central North Island region had spent a slightly shorter time with their current crew (approximately 2 years and 2 months). Maori in the Northland and South Island regions had remained with the current crew longer than the New Zealand Europeans. Table 22 (on the following page) shows the average time crew members had been in their current crew by ethnicity and region.

When the average length of time spent working in the industry is considered in relation to current crew, the average crew member has worked in three to four crews. This

suggests from a contractors perspective, crew members are highly mobile and relatively transient employees.

Table 22. Average length of time in years, spent by crew members working in their current crew by region and ethnicity (n=364).

Region	Maori	NZ European	Pacific Islander	Other
Northland	3.2	2.5	4	-
Cent. Nth. Is	2.1	2.1	3.0	3.5
South Island	4.1	3.3	7.0	1.3
All	2.4	2.9	5.3	2.4

3.6.4 Length of time spent working as a contractor

Contractors had spent between eight months and 28 years working as contractors, with four contractors declining to answer this question. Overall, the average length of time spent working as a contractor was 13 years and seven months. Contractors in the Central North Island region has spent slightly longer than the average (14 years one month), those in Northland had spent slightly less than the average (12 years three months). Central North Island Maori contractors had the longest history, with an average of 19 years working as a logging contractor. Table 23 shows the average length of time spent as a contractor by ethnicity and region.

Table 23. Average length of time in years, spent working as a contractor by ethnicity and region.

Region	Maori	NZ European	Pacific Islander	Other
Northland	-	12.3	-	-
Cent. Nth. Is	19.0	14.0	-	10.0
South Island	13.5	13.6	-	-
All	15.3	13.6	-	10.0

3.6.5 Length of time spent working as a trainer

Trainers had spent between 1 and 20 years working as a trainer. Overall, the average length of time spent working as a trainer was five years and seven months.

3.6.6 Organisational Climate

Organisation climate was investigated because results from Reisinger et al.'s (1994) research into "safety successful" contractors found factors associated with organisational climate (such as management attitude, leadership skills, and work environments) differentiated between contractors with good safety records and contractors with poor safety records. Organisational climate was measured using an organisational climate measure adapted to have an industry (rather than organisational) focus. The measure had eight scales that measured conformity, responsibility, standards, rewards, industry clarity, warmth and support, achievement orientation and role clarity. For each scale contractors and trainers were asked to rate their agreement (with 1 = strongly agree, 4 = neither agreement or disagreement and 7 = strongly disagree) with each of the following statements:

- This industry has many rules, procedures, policies and practices to which members have to conform rather than being able to do their work as they see fit (conformity statement).
- Members of this industry are given personal responsibility, they are encouraged to make decisions and solve problems without needing to check with their bosses (responsibility statement).
- This industry sets high challenging standards for its members (standard statement).
- This industry recognises and rewards its members when they perform well (reward statement).
- Members of this industry feel that things are well organised and the industry goals are clearly stated (industry clarity).
- Members in this industry trust one another and offer support to one another (warmth and support).
- This industry encourages its members to focus on high achievement (achievement orientation).
- This industry has clearly defined role specification and boundaries (role clarity).

Overall, contractors felt that the industry demanded conformity, had clearly defined roles and boundaries, but still managed to allow members some personal responsibility for their actions. They felt the industry set high challenging standards and focused on high

achievement but failed to recognise and/or reward good performance. Contractors also felt that the industry tended to be disorganised and industry goals tended to be unclear. Many contractors noted there tended to be a lack of support and trust from other industry members. Trainers held similar views to contractors except that they had a mixed response to the warmth and support question where similar numbers slightly agreed and slightly disagreed with the statement. It could be that trainers were thinking about colleagues in training institutes when answering this question, however the difference between trainers and contractors was not significant. The median and mean scores for each of the scale items is show in Table 24 below.

Table 24: Contractor and Trainer median scores for industry climate rating scales.

	Contractor		Trainer	
Industry Climate Scale Items	Median Score	Mean Score	Median Score	Mean Score
Conformity	2	2.6	2	2.9
Responsibility	3	3.3	3	3.5
Standards	2	2.1	2	2.21
Reward/recognise good performance	6	5.5	5	4.7
Industry clarity	5	4.6	4	4.0
Warmth & support	4	4.5	4	3.8
Achievement orientation	2	2.6	2	2.8
Role clarity	3	2.9	2.5	2.9

Median tests and t-tests showed that there were no significant differences between contractors and trainers on any of the industry climate scales.

Chapter 4: Discussion

4.1 Chapter Overview.

The results of this training needs analysis are discussed within the framework of the four aims outlined in the introduction (p. 34-35). The implications of the findings are next discussed, followed by the limitations of the research. Finally suggestions for future research are made.

4.2 Research findings in relation to research aims

4.2.1 Aim One

To identify if there are any deficiencies in the currently available training for logging workers (i.e. crew members).

On the whole, crew members and contractors were generally satisfied with the current training for industry members. However, there were some areas that were identified that could be improved.

The first area relates to the discrepancy between the most common jobs that crew members have and the most common jobs that trainers offer courses for. Crew members most frequently cited skid worker, faller and log maker as the jobs they were involved in. These jobs, together with breaker out are also the jobs most frequently combined with other jobs. The skid worker job (followed by faller, log maker, loader operator and breaker out) are most frequently cited as the crew members **main** job. These results suggest that the skills involved in the four jobs of skid worker, breaker out, faller and log maker should form the basis of logging training, especially as these jobs include the entry level positions of skid worker and breaker out. However, the information provided by the trainers indicates that the faller position was the position for which training was most commonly available, followed by skid worker, breaker out and log maker training. This

suggests that a refocusing of training emphasis should be considered as the current emphasis is on training fallers. The faller position is a specialised position and as such limited numbers of crew members will end up working in this position.

Results also indicate that training for machine operators is not widely or easily accessible, and currently there is no training available for mechanised fallers, a deficiency previously noted by Kirk, Byers, Parker and Sullman (1997). Fifteen percent of the crews in this sample used mechanised harvesters, a clear indication that there is currently a need for mechanised felling training.

There was very little variation in the distribution of logging jobs between the Northland, Central North Island and South Island regions. However, there was some indication that the job of breaker out was more common in the South Island and Northland regions, the hauler operator position was more common in the South Island and the mechanised fallers position was most common in the Central North Island region. This information suggests that consideration should be given to targeting training courses to meet these regional needs.

No individual contractor in our study currently had more than two crews, with the majority managing one crew of between 5 and 25 people. The relatively small numbers involved means that on-site training should be a manageable activity for most contractors, though the training does not necessarily need to be done by the contractor. However, most contractors do act as trainers for at least 10% of their worktime. Contractors also work as a member of the crew for between 39 and 80% of their worktime. This suggests that the worktime a contractor has available for training other crew members is quite limited and that contractors may not be able to perform the training function adequately due to other task demands.

Crew members most often indicated their workmates as the main providers of onsite training, closely followed by their contractor and a trainer. This differs from the contractors understanding, as they believed that trainers and contractors (themselves) supplied the majority of the crew members training. This discrepancy is worth further investigation as either the crew members are over estimating the training input of their

fellow workers or contractors are underestimating the training provided to crew members by their fellow workers. The majority of crew members identified multiple sources of training (as did the contractors) which suggests that this should be recognised and used constructively to promote a strong commitment to all forms of training including safety training. Whether the training provided by crew members is the training desired by the contractor should be investigated as Crowe, (1986, cited in Slappendel and Laird, 1991), noted the techniques passed on by fellow workers frequently promote productivity at the detriment of safety.

The majority of crew members were positive about the sufficiency of their initial training for safe and productive work in the logging industry. However, note should be taken of their call for more practical experience, more individualised attention, greater supervision and less pressure to maintain productivity levels when learning new skills. Despite the crew member's positive response about initial training, contractors had concerns about the skill ability of the new recruits. They agreed with the crew members' criticisms of their training. They also noted the need for greater safety awareness before crew members started their jobs. The differences between the contractor and crew member responses could be explained by crew members' overconfidence about their abilities while in the early stages of gaining skill competency, perhaps due to inexperience and lack of recognition of the hazards involved in logging work.

Crew members who had been trained predominantly by their contractors were the most positive about the sufficiency of that training. Commitment to safety and training "from the top" as shown by the boss providing the training, possibly has a beneficial effect on the perceptions of crew members. Crew members also viewed receiving training from a 'trainer' very positively. Although crew members recognise that they get on-going training from fellow workers, the value of contractor and trainer input can not be denied.

A high proportion of crew members affirmed that the FIRS modules covered the required skills for the related job. However, the deficiencies identified in the FIRS modules by all three groups frequently related to the standard at which the skills are assessed and the lack of sufficient time to consolidate the acquisition of those skills. The lack of modules for the more recent jobs in logging was frequently commented on. This

disagreement about the skill standard as assessed by the FIRS modules is a problem that needs to be addressed. All groups commented on the need to reinforce the message that the attainment of a FIRS module indicates that the minimum required skill level has been reached. Effort is still required to achieve mastery of the skills.

In summary, while the majority of crew members, contractors and trainers felt that the current training was adequate, the following deficiencies were identified:

1. Forestry Industry Record of Skills (FIRS) modules have not yet been developed for a number of positions, especially those positions that are relatively new to the New Zealand forestry industry (e.g. mechanised felling). This deficiency would be suitable for a training solution, as the development of training courses is required.
2. There is a lack of training for mechanised harvesting and other specialist machine operators. Again, training is a suitable solution to remedy the deficiency.
3. Contractors tend to underestimate the amount of training crew members receive from their workmates and overestimate their own contribution to crew members training. Training is not a suitable solution here. Instead, contractors need to become more aware of crew members input and check to make sure that the training crew members receive from their colleagues is passing on the desired skills.
4. Initial training should consist of individual attention while learning skills, close supervision while mastering skills, follow-up and feedback on skill acquisition with a strong emphasis on learning safe behaviour and developing safety awareness. There are a combination of training and non-training solutions required here. First, when delivering training, more time is needed for practical experience to be gained by the trainee (a change in training delivery). Second, contractors and/or trainers need to provide more feedback and supervision to trainee crew members until they have competently acquired the skills they were receiving training for (a change in work management practice).
5. All groups expressed concerns about the standard at which the FIRS modules are assessed, and the length of time allowed for training before assessment takes place. This requires a training solution, in that the governing body for industry training (Forest Industry Training and Education Council) needs to review the standard required to pass FIRS modules.

6. All groups noted there was a lack of understanding that the FIRS modules assess only whether the minimum required skill and knowledge standard has been achieved, instead many feel that having a FIRS module indicates mastery of the assessed skills. A suitable solution would entail ensuring that the meaning of passing a module is clearly explained to new entrants to the logging industry. If the contractor were to express expectations of continued skill improvement, this would also assist.

4.2.2 Aim Two

To assess the perceived effectiveness of current training methods in delivering safety messages to logging workers.

While most of the safety issues listed were identified as being covered in crew members training, there were differences between crew members, contractors and trainers in the percentage responses to each issue. When only those issues that had a percentage response of 90 or greater are considered, crew members most frequently identified the following issues (in order of frequency) as covered in their training:

- Personal safety around machines;
- Working safely with other people;
- Hazard identification and control;
- Personal safety on the skid site; and
- Bush code.

However, contractors most frequently identified the following issues as covered in their crew members training:

- Personal safety around machines;
- Hazard identification and control;
- Health and safety in employment act;
- Personal safety around chainsaws
- Personal safety on skid site;

- Working safely with other people;
- Bush code; and
- Company safety code.

Trainers most frequently identified the following issues as those covered when they trained crew members:

- Personal safety around chainsaws;
- Hazard identification and control;
- Health and safety in employment act;
- Bush code;
- Tree and area assessment;
- Working safely with other people;
- Personal safety on the skid site; and
- Working safely in a ground-based operation.

Contractors identified the largest number of safety issues, followed by trainers. As crew members did not list as many issues as either contractors or trainers, they may not be recognising training in safety issues when it occurs. This gap in communication needs to be addressed so that all groups agree on the safety issues covered. One way for contractors to check whether safety messages have been received and understood would be to review them at the monthly safety meetings. Where the contractor and crew travel together, the time travelling could be used to discuss safety issues. Contractors could also ask crew members to explain the safety messages in their own words to ensure that the messages were being accurately understood. A more radical suggestion would be to use accident simulations to improve safety communication and safe behaviour. Rubinsky and Smith (1973) found subjects who have been trained to use a power tool via accident stimulation methods performed significantly less unsafe acts than those who had been trained using written instructions or demonstrations of correct usage . Furthermore, subjects who had been trained via accident stimulation maintained their 'safer' behaviour for at least six months after the training.

Alternatively, the communication gap may not really exist. Crew members could be accurately reporting the safety training that they have received, and contractor may be over-reporting training due to social desirability pressure or cognitive dissonance.

The results also suggest each group have different priorities for recalling safety issues covered in training. For example, 'Personal safety around machines' was frequently identified by crew members and contractors, but was not identified as frequently by trainers, whereas 'Health and Safety in Employment Act' was frequently identified by contractors and trainers, but not by crew members. Understanding why some of the safety issues do not seem as important to crew members as they do to contractors and trainers would help in the future delivery of safety training. One way of reinforcing important safety information is to have follow-up sessions frequently, such as every few months (Topf, 1997).

While the number of crew members that rated the coverage of safety issues as 'not good enough' was very small, just over half the crew members rated the coverage of safety training as 'really well'. Contractors were less positive than their crew members about the adequacy of safety issue coverage with only 44% stating that the safety issues were covered 'really well'. As being safe is extremely important in logging, this result is disappointing.

Crew members, contractors and trainers all identified additional issues that were included in their safety training. All three groups frequently mentioned fire fighting, emergency procedures, nutrition, hydration and fatigue. First aid, man-machine interactions, crew bus driving, vehicle safety travelling to and from the worksite, communication on the worksite, safe behaviours, hygiene/personal health were all mentioned by at least two of the three groups.

While the majority of contractors and crew members did not name additional topics that should be added to safety training, topics that were identified included:

- nutrition, hydration and fatigue effects;
- coping with wind and wet conditions;

- felling on steep slopes;
- coping with production versus safety pressures;
- dangers of drug and alcohol use at work;
- safe behaviours at work;
- communication;
- defensive driving; and
- first aid.

Some of these topics are covered by some crews in their safety training, and new FIRS modules incorporating nutrition, hydration and fatigue effects are currently being developed. The issue of drug and alcohol abuse is timely as one of the large forestry companies has recently instigated a random drug testing policy for it's employees, which may be extended to become a requirement in future contracts.

Most relevant is the "coping with production versus safety pressures", as this suggests that the two are mutually exclusive i.e. in order to be productive, one must work less safely. Atkins (cited in Barker, 1992) notes that "under pressure to get the timber to save the company or their jobs, fallers may take risks with weather or terrain, techniques or timing, which increase the risk of injury or death. This attitude of production being more important than safety is both prevalent and persistent in the New Zealand industry (McLean, 1998) and hinders efforts to improve safety. Until the attitude 'the only acceptable production is safe production' is accepted as normal, ongoing efforts to significantly improve safety are likely to fail. In order to change current attitudes, forestry companies as well as contractors need to review the production expectations made of forestry workers to see if they are compatible with the safety expectations. If the two expectations are not compatible, forestry companies and contractors will need to make changes to ensure compatibility.

Three quarters of the trainers involved in this research were able to assess FIRS modules. However, none of the younger group of trainers were qualified to assess the FIRS modules. As the FIRS modules form the backbone of industry training, one would expect all trainers in the industry to be able to assess these modules. The industry may

need to impose standards on those wanting to be trainers to ensure that they are capable of assessing the modules.

In summary, while crew members, contractors and trainers felt that safety issues were generally adequately addressed, there was a discrepancy between the groups in the nature of the issues covered. Crew members identified fewer safety issues than either contractors or trainers. There appears to be a communication gap between contractor and their crew members regarding safety issues. Contractors need to make sure that crew members recognise safety training when they receive it.

4.2.3 Aim Three

To assess the perceived utility by contractors (employers) and crew members (training graduates) of the currently available pre-employment training programmes.

Approximately one third of the crew members had undergone some form of pre-employment training, most commonly polytechnic training courses. Seventy-five percent of the pre-employment training graduates found the training to be 'really useful'. The remainder felt the pre-employment training was 'OK', 'not much use' or 'useless', possibly indicating that there is room for improvement in some pre-employment training courses, although the correlation between quality of training and satisfaction with training may not necessarily be high. Crew members noted a lack of sufficient practical experience and the non-realistic work setting as the main deficiencies of pre-employment training. Contractors were less positive about the value of pre-employment training, with almost a quarter rating it as 'not much use'. Contractors felt that many of the pre-employment training programmes did not select motivated individuals. They also noted that graduates of these programmes did not have sufficient practical experience in a realistic work environment, adequate awareness of working with and around machines and were not sufficiently aware of common hazards. As contractors are the 'consumers' of pre-employment training graduates, those designing and delivering the courses need to make sure that the courses are meeting the 'consumers' needs. If these courses do not

meet contractors needs then it could be possible for the course graduates to sue the course providers under the New Zealand's consumer protection legislation, as the course has failed to provide them with skills employers find valuable, which would be contrary to advertising and reasonable expectation.

Trainers commented that while contractors wanted graduates with more practical experience, there were consistent and ongoing difficulties in obtaining work experience placements in production crews. Contractors need to recognise that if they wish to have pre-employment graduates with practical experience, they must be willing to provide assist in providing it. It may be that logging work is more suited to an apprenticeship training model rather than a course work based model.

Crew members were also positive about how well the pre-employment training covered the safety issues that they needed to know in order to be safe in an actual work setting, with 82% stating that all relevant safety issues were covered. The remainder may have concerns, which should be identified. Crew members did suggest that safety training be repeated in an actual work setting to emphasise its importance. Contractors were less positive than their crew members about the coverage of safety issues during pre-employment training, with only 40% of contractors believing that all relevant safety issues were covered. Contractors also suggested that practical application of safety training was required to improve the utility of pre-employment training. Trainers noted that while there are some general safety issues applicable to all forestry work, it is the contractor's responsibility to ensure that their workers are aware of any site specific safety issues.

In summary, the majority of crew members believe that pre-employment training adequately prepares them to work safely and productively in the logging industry. However, a large number of contractors disagree. In their opinion, pre-employment training graduates are not adequately prepared to work in a safe and productive manner. Trainers note that while contractors want the graduates to have plenty of work experience, the contractors are unwilling to assist in providing this work experience.

4.2.4 Aim Four

To determine if there are factors other than training that may be contributing to the ongoing poor occupational health and safety record of logging workers.

Tenure and turnover:

Although there was considerable variation in the length of time crew members were employed in the logging industry (1 week to 39 years), for the majority of crew members tenure is relatively short, x =8.75years (8 years, 9 months). Tenure is slightly longer than the mean for Maori and Pacific Island crew members. Average tenure is also slightly longer for central North Island crews compared to all crews. This has disturbing implications for the industry as it indicates a relatively high turnover (Kirk et al., 1997). Contractors may therefore be unwilling to commit large amounts of time and resources to training crew members when they are unlikely to stay with the contractor for sufficient time to recover the cost of training.

Also training needs of workers change throughout their working life. More experienced workers are likely to require periodic retraining of skills rather than the initial training required by less or inexperienced workers. This has implications for training design and delivery methods which need to adapt these different audiences.

Results obtained for crew members' tenure in the current job (average of 4 years, 1 month) and current crew (average of 2 years and nine months) further reinforces the notion of a relatively short career span. This has implications not only for training (training becomes a cost rather than an investment if the person leaves shortly after training) but also for other actions that need to be taken to address high turnover rate (see Figures 1 and 2, p12-13). Training is unlikely to be causing the high turnover rate, but it could be linked to the other areas in Bramley's algorithm (see p12)

Research by Adams (1993), Bomford and Gaskin (1988) Byers (1996) and Gaskin (1987) into turnover within the New Zealand logging industry, showed high rates of

turnover for logging workers, particularly for new entrants into the logging workforce. One forestry company is quoted as having a turnover rate of 47.7% per annum. This research noted that the turnover rate was smaller for loggers who held 'Logger's Certificates' (which have subsequently been replaced with FIRS modules). None of the authors investigated why the turnover was high, although all recommend that this be done.

Organisational analysis.

The industry climate as perceived by contractors needs to be taken into account as research by Rothwell (1999) showed that contractors perceptions of organisational climate are noted and absorbed by their crew members.

Conformity, personal responsibility and role clarity:

The fact that the industry is seen to demand conformity, has clearly defined roles and encourages personal responsibility for actions, suggests that safety training should fit naturally within the existing notion of strict rules and regulations that prevails. Safety training should be viewed as a normal outcome of this sense of conformity.

Standards, achievement orientation and rewards:

The contrast between the setting of high, challenging standards and focus on high achievement with the lack of recognition and rewards for good performance is a concern. Incentives for maintaining high performance may be lacking within the industry, and these prevailing attitudes would tend to encourage people to leave rather than remain in the industry.

Industry clarity, warmth and support:

The general response that the industry lacks organisation, and is not supportive of its members would again have the effect of encouraging members to leave the industry rather than remain.

4.2.5 Demographic variables

Gender and Ethnicity:

Currently there are few women working in logging. Only 10 (2.5%) out of the 396 crew members who participated in this research were women, and they were all located in the central North Island region. There was one female trainer. However, the number of women involved in logging is likely to increase as the need for physical strength decreases with increasing mechanisation. Current working conditions are quite rough (it is common for worksites to have no toilet facilities other than bushes) and some of the shelters crew members use during their breaks have 'penthouse-type' pictures on their walls. Future training programmes may need to incorporate such issues as appropriate attitudes and behaviours for a mixed gender working environment.

Approximately one third of participating crew members identified themselves as Maori, the greatest concentration being in the central North Island region. Training programmes need to be aware of any culturally specific issues that should be addressed and be aware of that their preferred learning styles may be different to those of New Zealand Europeans. They also need to ensure that any specific safety issues relevant to this group are included (e.g. lifestyle, education and health issues).

Contractors are predominantly male and of European ethnicity. Only two contractors were Maori, and both of these were located in the South Island region. Contractors need to be aware of cultural differences in communication styles, as these may be contributing to the current communication gap. Asking crew members to repeat what they have been taught in their own words is one way that contractors can check to see that 'what they think they said is what their crew members believe they heard'. Other active listening techniques may also be useful.

Age:

Although crew members had a wide age range (16-62), the majority were 30 years of age or younger. This suggests that the safety training should recognise that there are

subgroups within the crew member population and cater for the differing training needs of these groups. For example nutritional and rest needs change as people age. Age of crew members varied markedly across regions. Crew members in the Northland region were considerably younger than their more southern compatriots This suggests training course designers need to be aware of these regional differences. Generally, contractors tended to be older than their crew members. Age of contractors also varied across the regions, with the younger contractors to be found in the Northland region, and the older contractors in the South Island region. The central North Island region had a mix of contractor ages. The issue to consider for training is the experience factor, rather than age per se.

4.3 Limitations of the research

This section has been split into conceptual limitations and methodological limitations.

4.3.1 Conceptual Limitations

The main limitations of the TNA area as a concept, i.e. the lack of an accepted, generally agreed on definition, and the flexibility of the concept were not addressed by this research. In the introduction (p. 8), a definition was proposed for the concept but only time will tell if it accurately defines the area. The current definitional problem surrounding TNA means that research generally continues to provide new data without adding new knowledge or understanding to the area due to the all encompassing nature of the concept. This point has been made elsewhere in the Industrial/Organisational Psychology literature about other concepts that have become somewhat out of control in terms of their subsumative power e.g. job "stress" (e.g. Flett, Biggs & Alpass, 1995; Jackson & Schuler, 1985). This is not to say that such research has no value, rather that it has little value in academic terms and the value of the research is usually limited to those for whom the research is performed. And this may well explain the lack of literature about training needs analysis noted in the introduction.

The area of training needs analysis which is clearly defined – namely the job/task analysis – has a body of literature that exists independently from the training needs analysis literature. Job specifications and descriptions (the main outputs of a job/task analysis) are commonly used in business settings, both as selection tools and performance monitoring devices. The existence of research into this specific area may indicate that this aspect of the concept has been found to both produce information which is widely valued and assists in understanding how other aspects of organisations function.

Taking the training needs analysis methodology out of it's traditional sphere has it's own limitations, as to view the "big picture" one has to stand back from the smaller details. And when the smaller details are lost, only general recommendations can be made – some of which will not apply in all workplace or training situations across the industry. As such, TNA has only limited use as a concept for an industry or profession. The results of this broad-brush approach gives general areas of concern and possible solutions. However, individual organisations must then do their own investigations to determine and solve their particular problems.

4.3.2 Methodological Limitations

The use of a questionnaire method, while appearing a good choice according to Newstrom and Lilyquist, 1979, (i.e. has high employee involvement, high management involvement, moderate time requirement, moderate cost and high relevant, quantifiable data) has some limitations. A cross-sectional survey such as this provides only a 'snapshot' understanding of the industry. The causes and consequences of the training deficiencies are not clear. We are unable to determine if the type of main training provider (i.e. workmates, contractor or trainer) has any impact on the number or severity of accidents. These types of questions require longitudinal research.

The applied nature of this research also caused some problems. The use of a questionnaire assumed participants were literate. This is not always the case. During administration of the questionnaires, I was often asked to read the questions as participants explained that they had 'left their glasses at home', 'had a headache' or 'the

sun was too bright to see clearly'. In other situations, groups of participants would cluster together with one participant reading the questions and available responses, assisting others to complete the questionnaire. Other times, we were asked if the questionnaires could be taken home to complete - which may indicate that assistance with reading the questionnaire would be sought from a partner. Sometimes those who wanted to take part, did not do so when handed an information sheet and consent form. A number of consent forms were not filled in, even though the questionnaires were completed. A recent study by Cummins and Sullman (1999) found a significant proportion of forest industry workers did not have an adult level reading ability. Given that most of the training and safety information is currently presented in written form, these findings are disturbing. It is likely that future research may be better to employ other methodologies such as face-to-face interviews, behavioural ratings and behaviourally referenced assessment of competencies to collect data, accepting that these methodologies have their own strengths and weaknesses.

Forestry workers are also very sensitive regarding the skilled nature of their work, and are quick to take offence if any indication is given that the work is considered unskilled. This lead to difficulties getting accurate answers to the importance, frequency and difficulty to learn of logging skills as some participants assumed that these questions were disparaging their work. In order to get a more accurate response to these questions it would probably be necessary to use face-to-face interviews. However, the interviewer would need to be viewed as credible by the participants.

This questionnaire was a relatively broad brushstroke look at the current industry setting, and at this level the meaning of some of the observed findings is unclear. For example the discrepancies between contractors and crew members regarding training. It is difficult to tell whose perception is most accurate, and what importance should be placed on the differences in perceptions. Further research in this area is needed.

4.4 Implications of the research

The majority of those who participated in this research felt that the current training for both skills and injury prevention / safety training was adequate. However, these results seem to be in direct contrast to the evidence of poor occupational health and safety record reported in the introduction. It is possible that there is some cognitive dissonance occurring as the evidence suggests an industry is an unsafe place to work but improving safety costs money and time. As there is pressure to produce and to be economically viable, the way the cognitive dissonance might be resolved is by publicly stating support for improving safety, whilst not actually doing anything differently. Alternatively, it may be that Ostberg's (1980) findings that Swedish foresters accident rate could not be significantly reduced by more training and injury prevention activities, rather the foresters needed "better equipment, production methods and work organization which support safe behaviour" (p. 189) are indicative of the New Zealand situation.

While the current training is generally considered acceptable, the findings on tenure and organisational climate tell a different story. For the average logging worker, their tenure in the industry is relatively short and they are mobile within the industry. The average worker will work at two different jobs during their time in the industry and for two to three different contractors. This lack of stability in the workforce may well be contributing to the poor occupational health and safety record, as Reisinger, Sluss and Shaffer (1994) found stable crews to have better safety records (i.e. less accidents) than crews that had a high turnover of members. Reisinger et al. also found that highly skilled workers had fewer accidents than less skilled workers. As crew members, as a group, tend to move around between employers, they are in effect limiting their opportunities to become highly skilled.

Some of the features of the organisational climate as indicated by contractors probably impact on tenure. The lack of recognition or reward for good performance, the lack of organisation, and the lack of support could all have a net effect of decreasing crew member motivation and actively encouraging them to leave the industry as opposed to remaining.

4.5 Suggestions for future research

On the basis of the tenure results, it would be useful for the industry to understand why there is a high turnover rate of members.

Questions such as "Are members leaving because the physically demanding nature of the work becomes too much to cope with? Are members leaving because they decide that the job is just too dangerous to continue working? Are members leaving because the continual lack of recognition or reward for good performance drains their commitment to stay? Is there a particular time period when members leave?" would assist in determining why the industry turnover rate is so high and may indicate areas which could be improved to reduce turnover.

This type of research would involve a longitudinal design, commitment from contractors and ex-crew members willing to discuss their reasons for leaving.

Accident investigation could also prove useful. Retrospective designs, that investigate all fatalities and serious harm accidents to determine if there was a pattern to these incidents could potentially highlight areas or situations pose greater risk. Prospective designs for serious harm accidents would could again highlight areas that are high risk.

4.6 To conclude...

In summary, the research reported in this thesis has identified deficiencies in the current training for logging workers. Safety training was less effective than expected and results suggested there is miscommunication occurring between crew members and contractors regarding safety issues. Pre-employment training is generally viewed positively, but contractors have some concerns regarding the selection of trainees, the amount of practical experience gained in training and the lack of safety awareness of graduates. Perhaps more importantly, this study has highlighted the need to consider organisational climate variables (such as lack of recognition or reward for good performance, lack of

industry organisation, and lack of support for industry members) and high turnover as areas that are likely to effect the occupational health and safety record.

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Appendix 1: Crew member information sheet, consent form, and questionnaire

Evaluation of Training and Injury Prevention Programmes

INFORMATION SHEET

Kia Ora, Hello,

Liro Ltd and Massey University invite you to take part in a study of training and injury prevention programmes in forestry. ACC has provided funding to determine the effectiveness of the safety training programmes currently available to employees in the forestry industry.

The accident rate and the average number of deaths that occur in forestry are much higher than in the general workforce. Research has shown that training may help to improve safety and reduce injuries because training can improve work methods, teach correct care and use of equipment and increase productivity without increasing the need to take risks.

The people who will conduct this research are:

Helen Moffat (Research Officer, Massey University/LIRO) phone (06) 350 4148
Tina Cummins (Human Factors Researcher, LIRO) phone (07) 348 7168

To get a wide range of opinions we intend to seek information from forest owners through to harvesters and trainers. You have been selected as we believe that you could assist us in this project. You do not have to take part in this study, but if you choose to do so you will be asked complete a questionnaire. If you do take part, you can refuse to answer any or all questions at any time and this will not affect you or your job.

This study runs for about three years. You may be invited to participate again at a later stage and we will ask for your permission again.

Any information that you give will be confidential. No-one will be identified in any reports or publications of the study. All data will be reported as grouped data only. Your anonymity will be protected by the use of coded answer sheets and only the researchers will have access to individual responses. The results of the study will be published in a magazine such as "Towards Safer Forests", and a full copy of the study will be available from the researchers.

If you have any questions about this study please call one of the researchers and they will be happy to talk to you.

Evaluation of Training and Injury Prevention Programmes

CONSENT FORM

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I understand I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researchers on the understanding that my name will not be used without my permission. The information will be used only for this research and publications arising from this research project.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signed: .....

Name: .....

Date: .....

CREW TRAINING SURVEY

(Fill in blank space or tick appropriate response)

BACKGROUND INFORMATION QUESTIONS

1. How old are you? _____ (years)

2. Are you: ☐ Male ☐ Female

3. Are you: ☐ Maori ☐ NZ European ☐ Pacific Islander
   ☐ Asian ☐ Other (specify) _____

4. How long have you been:

   Working in logging _____ years _____ months

   Doing your current job _____ years _____ months

   Working in this crew _____ years _____ months

5. Which contractor do you work for _____

TRAINING QUESTIONS

6. What are the jobs you are doing today? (**Tick all that apply**)

   ☐ Faller (motor-manual) ☐ Faller (mechanised)
   ☐ Breaker out ☐ Skid worker
   ☐ Log maker ☐ Tractor operator
   ☐ Hauler operator ☐ Loader operator
   ☐ Processor operator ☐ Skidder operator
   ☐ Bell operator ☐ Other _____

6b. Go back and circle the **main** job that you are doing today.

☞

7. Do you think you got enough training when you first started doing these jobs?

☐ **Yes** ☐ **No**

If **No**, what other training do you feel you need to do the job well?

_____

_____

_____

_____

_____

_____

8. Who provided the training you received? (Tick all that apply)

☐ Workmates ☐ Foreman/Supervisor

☐ Contractor ☐ Trainer

☐ Other (specify) _____

8b. Please go back and circle the person who provided the **most** training for you.

9. What safety issues were covered in your training? (Tick all that apply)

☐ Personal safety around chainsaws ☐ Bush code

☐ Personal safety around machines ☐ Contractors safety code

☐ Personal safety on the skid site ☐ Companies safety code

☐ Working safely with other people ☐ Tree and Area assessment

☐ Hazard identification and control

☐ Working safely in a ground-based operation

☐ Working safely in a hauler-based operation

☐ Health and Safety in Employment Act

☞

10. Were there any other safety issues covered in your training?

11. How well were safety issues covered in your training?

☐ **Really well** ☐ **OK** ☐ **Not good enough** ☐ **Really badly**

What safety issues need to be added to the training?

12. The FIRS module for my current job(s) covers all the skills needed to do the job well?

☐ **Yes** ☐ **No** ☐ **Don't know**

If **No**, what other skills need to be in the FIRS module so that you can do your job well?

PRE-EMPLOYMENT TRAINING QUESTIONS

13. Did you do any logging training **before** you started work in a logging crew?

☐ **Yes** ☐ **No** (Please go to Question 16)

If **Yes**, what training did you do? (Please name who provided the training)

☐ Polytech course _____

☐ Marae/Iwi-based course _____

☐ Other _____

14. How useful was this pre-employment training when you started working in forestry?

☐ **Really useful** ☐ **OK** ☐ **Not much use** ☐ **Useless**

If your training was "**OK**", "**Not much use**" or "**Useless**", what needs to be changed to make it more useful?

_____

_____

_____

_____

_____

15. Did the pre-employment training cover all the safety issues that you needed to know to work safely?

☐ **Yes** ☐ **No**

If you answered **No**, what else should have been covered so that you could work safely?

_____

_____

_____

_____

☞

CURRENT JOB QUESTIONS

16. In the table below there are some skills listed for jobs in logging. Please tick how **important** you think the skill is in order to do your job well. Please write any skill not identified in this survey in the spaces at the end of the table.

ONLY COMPLETE THE SKILLS THAT YOU ARE USING TODAY

SKILL	Very Important	Important	Slightly important	Not important
Operating a chainsaw				
Maintaining a chainsaw				
Felling techniques				
Cutting techniques				
Tree assessment				
Operating machines				
Maintaining machines				
Area Assessment				
Hazard identification				
Hazard control or removal				
Grading logs				
Measuring logs to length				
Operating loader				
Maintaining loader				
Sorting logs				
Loading logs				
Wire rope splicing				
Wire rope maintenance				
Signaling				
Organising logging trucks				
Setting up hauler				
Operating hauler				
Maintaining hauler				
Planning drags				
Selecting drags				
Hooking up logs				
Preparing and doing line shifts				

☞

17. In the table below there are some skills listed for jobs in logging. Please tick how **often** you use the skill in order to do your job well. Please write any skill not identified in this survey in the spaces at the end of the table.

ONLY COMPLETE THE SKILLS THAT YOU ARE USING TODAY

SKILL	All the time	Most of the time	Sometimes	Rarely
Operating a chainsaw				
Maintaining a chainsaw				
Felling techniques				
Cutting techniques				
Tree assessment				
Operating machines				
Maintaining machines				
Area Assessment				
Hazard identification				
Hazard control or removal				
Grading logs				
Measuring logs to length				
Operating loader				
Maintaining loader				
Sorting logs				
Loading logs				
Wire rope splicing				
Wire rope maintenance				
Signaling				
Organising logging trucks				
Setting up hauler				
Operating hauler				
Maintaining hauler				
Planning drags				
Selecting drags				
Hooking up logs				
Preparing and doing line shifts				

18. In the table below there are some skills listed for jobs in logging. Please tick how **difficult** you think the skill is **to learn**, in order to do your job well. Please write any skill not identified in this survey in the spaces at the end of the table.

ONLY COMPLETE THE SKILLS THAT YOU ARE USING TODAY

SKILL	Very easy	Easy	A bit hard	Very hard
Operating a chainsaw				
Maintaining a chainsaw				
Felling techniques				
Cutting techniques				
Tree assessment				
Operating machines				
Maintaining machines				
Area Assessment				
Hazard identification				
Hazard control or removal				
Grading logs				
Measuring logs to length				
Operating loader				
Maintaining loader				
Sorting logs				
Loading logs				
Wire rope splicing				
Wire rope maintenance				
Signaling				
Organising logging trucks				
Setting up hauler				
Operating hauler				
Maintaining hauler				
Planning drags				
Selecting drags				
Hooking up logs				
Preparing and doing line shifts				

☺ **THANK YOU FOR YOUR HELP** ☺

Appendix 2: Contractor information sheet, consent form and questionnaire

Evaluation of Training and Injury Prevention Programmes

INFORMATION SHEET

Kia Ora, Hello,

Liro Ltd and Massey University invite you to take part in a study of training and injury prevention programmes in forestry. ACC has provided funding to determine the effectiveness of the safety training programmes currently available to employees in the forestry industry.

The accident rate and the average number of deaths that occur in forestry are much higher than in the general workforce. Research has shown that training may help to improve safety and reduce injuries because training can improve work methods, teach correct care and use of equipment and increase productivity without increasing the need to take risks.

The people who will conduct this research are:

Helen Moffat (Research Officer, Massey University/LIRO) phone (06) 350 4148
Tina Cummins (Human Factors Researcher, LIRO) phone (07) 348 7168

To get a wide range of opinions we intend to seek information from forest owners through to harvesters and trainers. You have been selected as we believe that you could assist us in this project. You do not have to take part in this study, but if you choose to do so you will be asked complete a questionnaire. If you do take part, you can refuse to answer any or all questions at any time and this will not affect you or your job.

This study runs for about three years. You may be invited to participate again at a later stage and we will ask for your permission again.

Any information that you give will be confidential. No-one will be identified in any reports or publications of the study. All data will be reported as grouped data only. Your anonymity will be protected by the use of coded answer sheets and only the researchers will have access to individual responses. The results of the study will be published in a magazine such as "Towards Safer Forests", and a full copy of the study will be available from the researchers.

If you have any questions about this study please call one of the researchers and they will be happy to talk to you.

Evaluation of Training and Injury Prevention Programmes

CONSENT FORM

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I understand I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researchers on the understanding that my name will not be used without my permission. The information will be used only for this research and publications arising from this research project.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signed: .....

Name: .....

Date: .....

CONTRACTOR TRAINING SURVEY

(Fill in blank space or tick appropriate response)

BACKGROUND INFORMATION QUESTIONS

1. How old are you? _____ (years)

2. Are you: ☐ Male ☐ Female

3. Are you: ☐ Maori ☐ NZ European ☐ Pacific Islander
   ☐ Asian ☐ Other (specify) _____

4. How long have you been:
   Working in logging _____ years _____ months
   Working as a contractor _____ years _____ months

5. How many crews do you manage? _____

6. For each of the crews that you manage, please indicate the number of people usually working in the crew?
   Crew 1_____ Crew 2_____ Crew 3_____ Crew 4_____ Crew 5_____

7. What percentage of your time on average do you spend:
   Working solely on contractor tasks _____
   Working as a trainer _____
   Working as a crew member _____

TRAINING QUESTIONS

8. What jobs are your crews involved in today? (Please tick all that apply)

☐ Faller (motor-manual) ☐ Faller (mechanised)

☐ Skidder operator ☐ Breaker out

☐ Skid worker ☐ Log maker

☐ Tractor operator ☐ Hauler operator

☐ Loader operator ☐ Processor operator

☐ Bell operator ☐ Other _____

9. Do you think crew members have enough training for their jobs when they start?

☐ **Yes** ☐ **No** ☐ **Don't know**

If you answered **No**, what other training do they need to work well?

_____

_____

_____

_____

_____

_____

10. Who provides the training your crew members receive? (Tick all that apply)

☐ Workmates ☐ Foreman/Supervisor

☐ Contractor ☐ Trainer

☐ Other _____(specify)

10a. Please go back and circle who provides the most training to your crew members

11. What safety issues are covered in the training your crew members receive?
(Tick all that apply)

- ☐ Personal safety around chainsaws
- ☐ Personal safety around machines
- ☐ Personal safety on the skid site
- ☐ Working safely with other people
- ☐ Hazard identification and control
- ☐ Working safely in a ground-based operation
- ☐ Working safely in a hauler-based operation
- ☐ Health and Safety in Employment Act
- ☐ Bush code
- ☐ Contractors safety code
- ☐ Companies safety code
- ☐ Tree and Area assessment

12. Are there any other safety issues covered in your crew members training?

_____

_____

_____

_____

_____

13. How well were those safety issues covered in the training your crew members received?

☐ Really well ☐ OK ☐ Not good enough

☐ Not at all ☐ Don't know

What other safety issues need to be covered or added to the training?

_____

_____

_____

_____

14. In your opinion, do the FIRS modules for the different jobs in logging cover all the skills needed to do those jobs well?

☐ **Yes** ☐ **No** ☐ **Don't know**

If you answered **No**, what other skills need to be in the FIRS modules so that a crews can do their jobs well?

_____

_____

_____

_____

_____

_____

_____

_____

_____

PRE-EMPLOYMENT TRAINING QUESTIONS

15. Did any of your crew members do any logging training before they started work in the logging crew?

☐ **Yes** ☐ **No** (Go to Question 18) ☐ **Don't know** (Go to Question 18)

If you answered **Yes**, what training did they do? (Tick all that apply)

☐ Polytech course _____

☐ Marae/Iwi-based course _____

☐ Other _____

16. Pre-employment training is normally undertaken before starting work. In your opinion how useful do you think pre-employment harvesting training is for someone who is just about to start work in a logging crew?

☐ **Really useful** ☐ **OK** ☐ **Not much use** ☐ **Useless**

If you think the training is "**not much use**" or "**useless**", what needs to be changed to make it more useful?

17. In your opinion are all the safety issues that someone needs to know to work safely in a logging crew covered in that pre-employment training?

☐ **Yes** ☐ **No**

If you answered **No**, what else should have been covered so that people could work safely?

JOB-RELATED QUESTIONS

18. In the table below there are some skills listed for each of the jobs in harvesting. Please **tick** how **important** you think the skill is, in order to do that job well. Please write in any skill not identified by this survey in the appropriate space below.

    ONLY COMPLETE JOBS THAT YOUR CREWS ARE INVOLVED IN

Job - Skills	**Very Important**	**Important**	**Slightly important**	**Not important**
Hazard identification				
Hazard control or removal				
Faller (motor manual)				
Operating chainsaw				
Maintaining chainsaw				
Felling techniques				
Tree Assessment				
Faller (Mechanised)				
Operating machine				
Maintaining machine				
Felling techniques				
Tree Assessment				
Skidder operator				
Operating machine				
Maintaining machine				
Area assessment				
Splicing wire rope				
Planning drags				
Hooking up logs				
Breaker out				
Signaling				
Hooking up logs				
Selecting drags				
Preparing and doing line shifts				
Wire rope splicing and maintenance				

Job - Skills	Very Important	Important	Slightly important	Not important
Skid worker				
Operating chainsaw				
Maintaining chainsaw				
Cutting techniques				
Log Maker				
Grading logs				
Measuring logs to length				
Tractor Operator				
Operating machine				
Maintaining machine				
Area Assessment				
Hauler Operator				
Setting up hauler				
Operating hauler				
Maintaining hauler				
Signaling				
Wire rope splicing and maintenance				
Loader Operator				
Operating loader				
Maintaining loader				
Sorting logs				
Loading logs				
Organising logging trucks				
Processor Operator				
Operating machine				
Maintain machine				
Bell Operator				
Operating machine				
Maintaining machine				

19. In the table below there are some skills listed for each of the jobs in harvesting. Please **tick** how **often** you think the skill is used in order to do that job well. Please write in any skill not identified by this survey in the appropriate space below.

ONLY COMPLETE JOBS THAT YOUR CREWS ARE INVOLVED IN

Job - Skills	**All the time**	**Most of the time**	**Sometimes**	**Rarely**
Hazard identification				
Hazard control or removal				
Faller (motor manual)				
Operating chainsaw				
Maintaining chainsaw				
Felling techniques				
Tree Assessment				
Faller (Mechanised)				
Operating machine				
Maintaining machine				
Felling techniques				
Tree Assessment				
Skidder operator				
Operating machine				
Maintaining machine				
Area assessment				
Splicing wire rope				
Planning drags				
Hooking up logs				
Breaker out				
Signaling				
Hooking up logs				
Selecting drags				
Preparing and doing line shifts				
Wire rope splicing and maintenance				

Job - Skills	All the time	Most of the time	Sometimes	Rarely
Skid worker				
Operating chainsaw				
Maintaining chainsaw				
Cutting techniques				
Log Maker				
Grading logs				
Measuring logs to length				
Tractor Operator				
Operating machine				
Maintaining machine				
Area Assessment				
Hauler Operator				
Setting up hauler				
Operating hauler				
Maintaining hauler				
Signaling				
Wire rope splicing and maintenance				
Loader Operator				
Operating loader				
Maintaining loader				
Sorting logs				
Loading logs				
Organising logging trucks				
Processor Operator				
Operating machine				
Maintain machine				
Bell Operator				
Operating machine				
Maintaining machine				

20. In the table below there are some skills listed for each of the jobs in harvesting. Please **tick** how **difficult** you think the skill is to **learn,** in order to do that job well. Please write in any skill not identified by this survey in the appropriate space below.

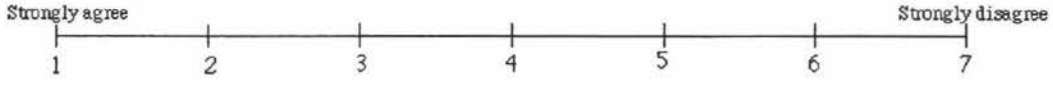
ONLY COMPLETE JOBS THAT YOUR CREWS ARE INVOLVED IN

Job - Skills	**Very easy**	**Easy**	**A bit hard**	**Very hard**
Hazard identification				
Hazard control or removal				
Faller (motor manual)				
Operating chainsaw				
Maintaining chainsaw				
Felling techniques				
Tree Assessment				
Faller (Mechanised)				
Operating machine				
Maintaining machine				
Felling techniques				
Tree Assessment				
Skidder operator				
Operating machine				
Maintaining machine				
Area assessment				
Splicing wire rope				
Planning drags				
Hooking up logs				
Breaker out				
Signaling				
Hooking up logs				
Selecting drags				
Preparing and doing line shifts				
Wire rope splicing and maintenance				

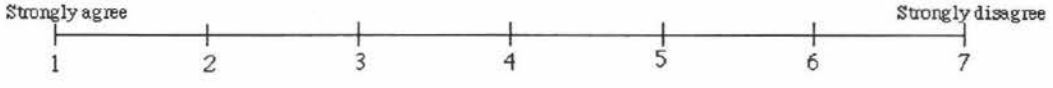
Job - Skills	Very easy	Easy	A bit hard	Very hard
Skid worker				
Operating chainsaw				
Maintaining chainsaw				
Cutting techniques				
Log Maker				
Grading logs				
Measuring logs to length				
Tractor Operator				
Operating machine				
Maintaining machine				
Area Assessment				
Hauler Operator				
Setting up hauler				
Operating hauler				
Maintaining hauler				
Signaling				
Wire rope splicing and maintenance				
Loader Operator				
Operating loader				
Maintaining loader				
Sorting logs				
Loading logs				
Organising logging trucks				
Processor Operator				
Operating machine				
Maintain machine				
Bell Operator				
Operating machine				
Maintaining machine				

21. Please answer the following statements about the forest industry by circling the number that best describes how you feel. The scale goes from 1 (strongly agree) to 7 (strongly disagree).

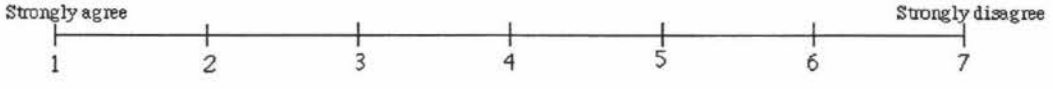
a) This industry has many rules, procedures, policies and practices to which members have to conform rather than being able to do their work as they see fit.



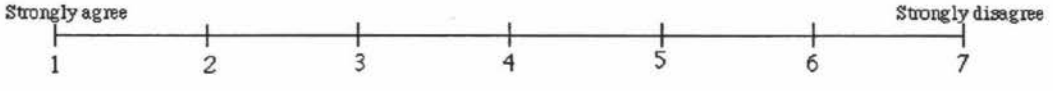
b) Members of this industry are given personal responsibility, they are encouraged to make decisions and solve problems without needing to check with their bosses.



c) This industry sets high challenging standards for its members.



d) This industry recognises and rewards its members when they perform well.



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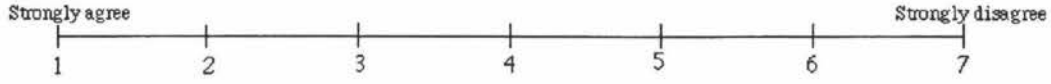
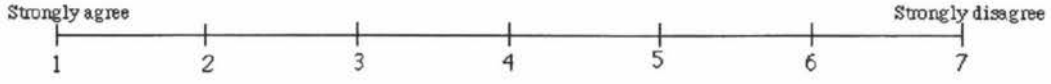
e) Members of this industry feel that things are well organised and the industry goals are clearly stated.



f) Members in this industry trust one another and offer support to one another.



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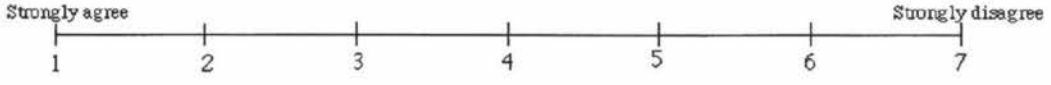
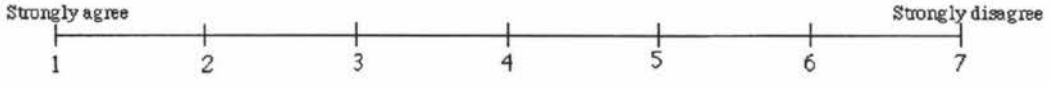


h) This industry has clearly defined role specifications and boundaries.



Thank you for your help

Appendix 3: Trainer information sheet, consent form, and questionnaire

Evaluation of Training and Injury Prevention Programmes

INFORMATION SHEET

Kia Ora, Hello,

Liro Ltd and Massey University invite you to take part in a study of training and injury prevention programmes in forestry. ACC has provided funding to determine the effectiveness of the safety training programmes currently available to employees in the forestry industry.

The accident rate and the average number of deaths that occur in forestry are much higher than in the general workforce. Research has shown that training may help to improve safety and reduce injuries because training can improve work methods, teach correct care and use of equipment and increase productivity without increasing the need to take risks.

The people who will conduct this research are:

Helen Moffat (Research Officer, Massey University/LIRO) phone (06) 350 4148
Tina Cummins (Human Factors Researcher, LIRO) phone (07) 348 7168

To get a wide range of opinions we intend to seek information from forest owners through to harvesters and trainers. You have been selected as we believe that you could assist us in this project. You do not have to take part in this study, but if you choose to do so you will be asked complete a questionnaire. If you do take part, you can refuse to answer any or all questions at any time and this will not affect you or your job.

This study runs for about three years. You may be invited to participate again at a later stage and we will ask for your permission again.

Any information that you give will be confidential. No-one will be identified in any reports or publications of the study. All data will be reported as grouped data only. Your anonymity will be protected by the use of coded answer sheets and only the researchers will have access to individual responses. The results of the study will be published in a magazine such as "Towards Safer Forests", and a full copy of the study will be available from the researchers.

If you have any questions about this study please call one of the researchers and they will be happy to talk to you.

Evaluation of Training and Injury Prevention Programmes

CONSENT FORM

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I understand I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researchers on the understanding that my name will not be used without my permission. The information will be used only for this research and publications arising from this research project.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signed: .....

Name: .....

Date: .....

TRAINER TRAINING SURVEY

(Fill in blank space or tick appropriate response)

BACKGROUND INFORMATION QUESTIONS

1. How old are you? _____ (years)

2. Are you: ☐ Male ☐ Female

3. Are you: ☐ Maori ☐ NZ European ☐ Pacific Islander
   ☐ Asian ☐ Other (specify) _____

4. How long have you been:

   Working in logging _____ years _____ months

   Working as a trainer _____ years _____ months

5. Are you able to assess FIRS modules?

   ☐ **Yes** ☐ **No**

6. Are you a: (Tick one)

   ☐ trainer working in a crew ☐ trainer in a Marae/Iwi based course
   ☐ trainer in a polytechnic ☐ trainer in other training organisation
   ☐ company trainer ☐ Other (specify)_____

7. On average, how much time do you spend training people in logging skills?
(Tick one only)

- ☐ 1 to 5 hours a week
- ☐ 6 to 10 hours a week
- ☐ 11 to 15 hours a week
- ☐ 16 to 20 hours a week
- ☐ 21 to 30 hours a week
- ☐ more than 30 hours a week

TRAINING QUESTIONS

8. What jobs do you train people for?

- ☐ Faller (motor-manual)
- ☐ Faller (mechanised)
- ☐ Skidder operator
- ☐ Breaker out
- ☐ Skid worker
- ☐ Log maker
- ☐ Tractor operator
- ☐ Hauler operator
- ☐ Loader operator
- ☐ Processor operator
- ☐ Bell operator
- ☐ Other _____

9. What topics are covered in the training you provide?

_____

_____

_____

_____

_____

_____

_____

10. Which of the following safety issues are covered in the training you provide?

- ☐ Personal safety around chainsaws
- ☐ Personal safety around machines
- ☐ Personal safety on the skid site
- ☐ Working safely with other people
- ☐ Hazard identification and control
- ☐ Working safely in a ground-based operation
- ☐ Working safely in a hauler-based operation
- ☐ Health and Safety in Employment Act
- ☐ Bush code
- ☐ Contractors safety code
- ☐ Companies safety code
- ☐ Tree and Area assessment

11. Are there any other safety issues covered in your training?

_____

_____

_____

_____

_____

12. In your opinion, do the FIRS modules for the different jobs in logging cover all the skills needed to do those jobs well?

☐ **Yes** ☐ **No** ☐ **Don't know**

If you answered **No**, what other skills need to be in the FIRS modules so that a crew member can do their jobs well?

_____

_____

_____

_____

_____

_____

PRE-EMPLOYMENT TRAINING QUESTIONS

13. Are you involved in pre-employment training for logging?

☐ **Yes** ☐ **No**

If you answered **Yes**, what pre-employment training do you do?

(Tick all that apply)

☐ Polytech course _____

☐ Marae/Iwi-based course _____

☐ Other _____

14. Pre-employment training is normally undertaken before starting work How useful do you think pre-employment harvesting training is for someone who is just about to start to work in a logging crew?

☐ **Really useful** ☐ **OK** ☐ **Not much use** ☐ **Useless**

If you think the training is "**not much use**" or "**useless**", what needs to be changed to make it more useful?

_____

_____

_____

_____

_____

_____

_____

_____

15. In your opinion, does pre-employment training cover all the safety issues needed in order to work safely?

☐ **Yes** ☐ **No**

If you answered **No**, what else should have been covered so that people could work safely?

CURRENT JOB QUESTIONS

16. In the table below there are some skills listed for each of the jobs in harvesting. Please tick how **important** you think the skill is in order to do that job well. Please write in any skill not identified by this survey in the appropriate space below.

ONLY COMPLETE THE JOBS THAT YOU TRAIN PEOPLE FOR

Job - Skills	Very Important	Important	Slightly important	Not important
Hazard identification				
Hazard control or removal				
Faller (motor manual)				
Operating chainsaw				
Maintaining chainsaw				
Felling techniques				
Tree Assessment				
Faller (Mechanised)				
Operating machine				
Maintaining machine				
Felling techniques				
Tree Assessment				
Skidder operator				
Operating machine				
Maintaining machine				
Area assessment				
Splicing wire rope				
Planning drags				
Hooking up logs				
Breaker out				
Signaling				
Hooking up logs				
Selecting drags				
Preparing and doing line shifts				
Wire rope splicing and maintenance				

Job - Skills	Very Important	Important	Slightly important	Not important
Skid worker				
Operating chainsaw				
Maintaining chainsaw				
Cutting techniques				
Log Maker				
Grading logs				
Measuring logs to length				
Tractor Operator				
Operating machine				
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Operating hauler				
Maintaining hauler				
Signaling				
Wire rope splicing and maintenance				
Loader Operator				
Operating loader				
Maintaining loader				
Sorting logs				
Loading logs				
Organising logging trucks				
Processor Operator				
Operating machine				
Maintain machine				
Bell Operator				
Operating machine				
Maintaining machine				

17. In the table below there are some skills listed for each of the jobs in harvesting. Please tick how **often** you think the skill is used in order to do that job well. Please write in any skill not identified by this survey in the appropriate space below.

ONLY COMPLETE THE JOBS THAT YOU TRAIN PEOPLE FOR

Job - Skills	**All the time**	**Most of the time**	**Sometimes**	**Rarely**
Hazard identification				
Hazard control or removal				
Faller (motor manual)				
Operating chainsaw				
Maintaining chainsaw				
Felling techniques				
Tree Assessment				
Faller (Mechanised)				
Operating machine				
Maintaining machine				
Felling techniques				
Tree Assessment				
Skidder operator				
Operating machine				
Maintaining machine				
Area assessment				
Splicing wire rope				
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Maintaining loader				
Sorting logs				
Loading logs				
Organising logging trucks				
Processor Operator				
Operating machine				
Maintain machine				
Bell Operator				
Operating machine				
Maintaining machine				

18. In the table below there are some skills listed for each of the jobs in harvesting. Please tick how **difficult** you think the skill is to **learn,** in order to do that job well. Please write in any skill not identified by this survey in the appropriate space below.

ONLY COMPLETE THE JOBS THAT YOU TRAIN PEOPLE FOR

Job - Skills	**Very easy**	**Easy**	**A bit hard**	**Very hard**
Hazard identification				
Hazard control or removal				
Faller (motor manual)				
Operating chainsaw				
Maintaining chainsaw				
Felling techniques				
Tree Assessment				
Faller (Mechanised)				
Operating machine				
Maintaining machine				
Felling techniques				
Tree Assessment				
Skidder operator				
Operating machine				
Maintaining machine				
Area assessment				
Splicing wire rope				
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Job - Skills	Very easy	Easy	A bit hard	Very hard
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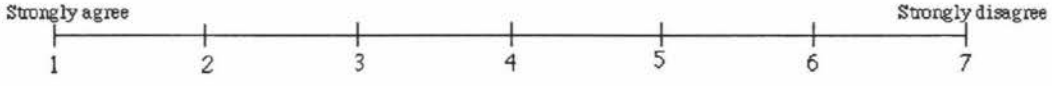
Maintaining machine				

19. Please answer the following statements about the forest industry by circling the number that best describes how you feel. The scale goes from 1 (strongly agree) to 7 (strongly disagree).

a) This industry has many rules, procedures, policies and practices to which members have to conform rather than being able to do their work as they see fit.



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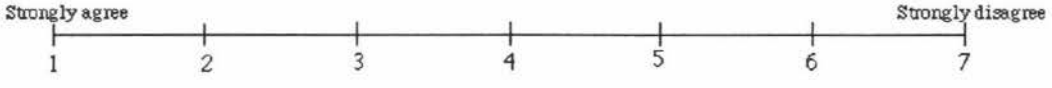

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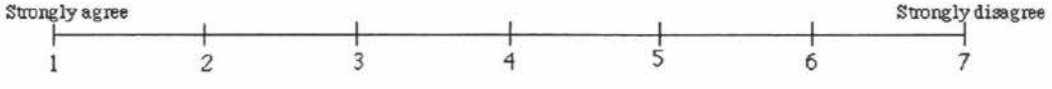

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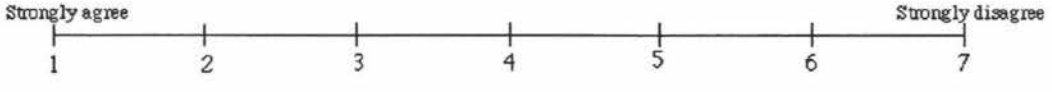
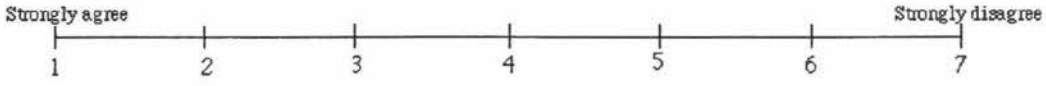


e) Members of this industry feel that things are well organised and the industry goals are clearly stated.



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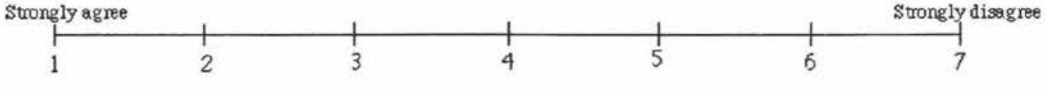

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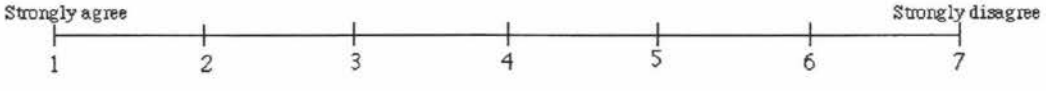
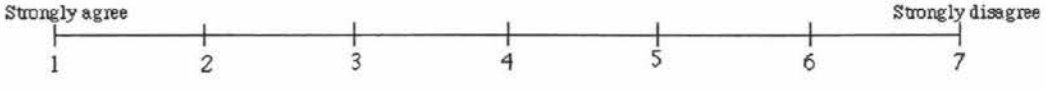


h) This industry has clearly defined role specifications and boundaries.



Thank you for your help