Structured literature review: Time for a switch?

Dr Suku Bhaskaran
GD Goenka World Institute-Lancaster University

Dr Kim Anne Menezes
GD Goenka World Institute-Lancaster University

ABSTRACT

The objective of this article is to foster greater retrospection and discourse on the process of conducting literature reviews when underaking scholarly business studies. The authors' present their experiences of 'experimenting' with a systematic and purposive process of conducting a review of the literature on customer beliefs in Australia regarding transgenic foods and food crops. Information across identical constructs from extant studies were identified, tabulated, reviewed and discussed. This process revealed that there are benefits in switching from the current dependence in business, humanities and social science research on narrative literature reviews to considering a switch to structured literature reviews, the predominant process of literature reviews in medical and physical sciences research. The authors conclude that structured literature reviews enable literature search and review to be conducted systematically and purposefully and facilitate more rigorous analysis of past studies across defined constructs such as study context, methodology, data analysis techniques, sample size and characteristics rather than primarily focusing on the conclusions of past studies, the predominant thrust in narrative literature reviews. Searching for specific information, capturing these and tabulating the information help identify knowledge gaps arising from methodological, contextual and other variations and thereby provides a more informed basis for constructing evidence based statement of knowledge gaps and the justifications for conducting research. This experiment is by no means exhaustive, it is a pilot study. However, the authors' are of the opinion that there is no need to conduct a more exhaustive study to justify the need to switch to structured literature reviews as the findings of this study provide sufficient evidence of the benefits of structured literature reviews.

Keywords - literature review, structured review, purposive review, systematic review, knowledge gaps, research justification

INTRODUCTION

This article discusses the authors' experiences and findings of experimenting with a process of purposefully and systematically extracting information from extant studies and reviewing past studies through more deliberate cognizance of factors such as study context, methodology, data analysis techniques, sample characteristics and sample size when reviewing past studies. The experiment by the authors' reveals that structured literature reviews, predominantly adopted in medical and physical sciences, offers distinct advantages in comparison to narrative literature reviews, currently the overarching basis of conducting literature reviews in business, humanities and social sciences studies.

The study advances knowledge on an important aspect of business research through proposing a process to systematically identify gaps in knowledge and justify the need for research. Research is highly demanding in terms of emotional, human and financial commitments (Heath, 2010). Consequently research that does not advance knowledge is wasteful and should not be pursued. Literature reviews forms the basis of determining the status of knowledge. Consequently, there is need to retrospect and investigate how gaps in knowledge can be more rigorously identified. The authors' concede that the findings in this study may not be generalizable and that further research may be needed. However, the thesis in this article has to be purviewed from the overarching objective of the article, foster retrospection and discourse on an important task when conducting business research.

Scholarly articles invariably review past studies and discuss the findings and conclusions of these studies. The raison d'être for this article is the authors' observation that literature reviews in business studies invariably tend to be narrative accounts that almost always focus on citing past studies to support the position of authors rather than explaining how past studies informed the research question and thereby justified the inquiry. The authors' contend that the literature reviews should clearly identify gaps in knowledge, omissions in past studies, errors or contextual and methodological limitations of past studies and thereby enable scholars to use information in past studies to justify the need for a new inquiry.

Scholarly research is a systematic inquiry. Consequently, it is appropriate that literature reviews that inform such inquiries should also be conducted systematically and purposefully. Systematically and purposefully conducted literature reviews, described in this article as structured literature reviews, help stakeholders such as funding agencies, reviewers and peers more readily identify methodological, contextual and other limitations of past studies, gaps in knowledge and appreciate the justifications for a research initiative (Armitage and Keeble-Allen, 2008; Petticrew and Roberts, 2006).

REVIEW AND DISCUSSIONS

Structured literature reviews are appraisals of past studies conducted systematically, purposefully and methodologically (Armitage and Keeble-Allen, 2008; Petticrew, 2001). Because natural sciences research draws on epistemological consensus whereas business research draws on ontological consensus, it has been argued that structured literature reviews are appropriate for natural science research and not so appropriate for social science or business research (Tranfield et al., 2003; Starkey and Madan, 2001; Petticrew, 2001; Tranfield and Starkey, 1998). This may explain why structured literature reviews are not used extensively in scholarly business research projects. Where structured literature reviews are used in business research, it tends to be studies that invoke meta-analyses or that focus on technical issues and use quantitative techniques (Woo et.al, 2011; Panayides et al., 2009; Stahlbock and Vos, 2008; Burgess et al., 2006; Steenken et al., 2004). It is also evident that

studies that invoke meta-analysis tend to examine only one or two specific variables (for example methodology) and do not critique past studies on the basis of multiple variables.

Key word search of bibliographic databases using words such as 'structured literature review', 'purposeful literature review', 'systematic literature review' and 'methodological literature review' identified only two articles. Consequently, it seems that that the term 'structured literature review', an extensively used nomenclature in the natural science domain is not part of the nomenclature in social science and business research. It could be that the term 'structured literature reviews' or similar terminology is not used in social science and business research but, nevertheless, researchers undertake literature reviews using this process. Further investigation revealed that this is not the case. Analysis of literature reviews in more than100 articles in the last five years in fifteen highly tiered business journals revealed that authors have not used structured literature reviews to conduct their studies. Further, of the 72 citations in Tranfield *et al.* (2003), all citations specific to structured literature reviews are from medical and health science journals. Therefore, there is overwhelming evidence that structured literature review is not widely used in business research. It seems that because of epistemological and ontological considerations, business scholars have assumed that structured literature reviews are not appropriate for their work.

In the last two decades there has been a proliferation of scholarly business journals, both in print and electronic format. Consequently, there has been substantial increase in the volume of scholarly articles. The high volume of scholarly business journals has fostered a parallel debate about the 'quality' of many of these publications. These concerns are evident from the actions of governments, top tier business schools and accrediting agencies to rank scholarly publications. For example, research quality assurance initiatives such as the *Research Excellence Framework* in the United Kingdom and *Excellence in Research for Australia* in Australia attempt to rank scholarly research publication and use 'quality of publications' (as determined by the publication outlet of the article) as one of the measures of research performance of universities. Even if one does not agree with journal rankings used in these research quality initiatives in the United Kingdom or Australia, the fact that governments in these highly research intensive countries have introduced journal rankings, suggest that the proliferation of scholarly journals have contributed to concerns regarding the quality of some of these journals.

In the last three decades, there has also been substantial increase in the use of bibliographic databases for literature search and retrieval. The ready availability of bibliographic databases has contributed to easier and speedier access of scholarly articles. Consequently, it can be surmised that the scope to pursue systematic literature search and review would have increased. However, notwithstanding the widespread availability of bibliographic databases, as discussed earlier, analyses of articles in fifteen highly tiered scholarly business titles for the past five years indicate that authors do not use structured literature reviews. Literature reviews are presented as discourses that focus on supporting the position of researchers through citing studies that support or refute statements made by them rather than being rigorous and critical analyses of current knowledge across defined constructs (Fink, 1998; Hart, 1998; Whitley, 1984a, 1984b).

Literature review and the scope to cite past studies have also become simpler because of the availability of information technology enabled capabilities such as *Endnote*. Increasingly, business research is pursued as cross-disciplinary initiatives. Consequently, traditional disciplinary silos such as that between marketing and management have become blurred. Furthermore, in the last three decades, there has been a proliferation of universities that provide doctoral and master's level business qualifications. This too has contributed to substantial increase in research student numbers and with it the volume of publications by research students and supervisors. The increase in research projects, growth in numbers of

scholarly journals through which the findings of these studies are disseminated and concerns regarding the quality of some of these publication outlets suggest that greater attention should be accorded to critical and rigorous review of extant studies so as to determine whether the time and financial investment in a proposed project is justified. It is imperative that scholarly research should use knowledge in extant studies, present the current state of knowledge and critically discuss the justifications for a study through, for example, identifying gaps in knowledge, methodological limitations, and contextual considerations that could limit the value of the knowledge in past studies.

No doubt, the structure used to review past studies would be informed by objectives of the proposed inquiry. It may, therefore, not be appropriate to prescribe a defined structure other than to recommend that literature search and reviews should be undertaken systematically and methodologically and that information should be presented in a structured format so that analyses of the justifications for the study from a scholarly, practitioner and policy informing perspective becomes clearer. Therefore, notwithstanding observations that because of contextual considerations and its applied orientation, it would be difficult to use structured literature reviews in business research (Tranfield and Starkey, 1998), based on project specific experience, this article presents a case for more widespread use of structured literature reviews in business inquiries. The use of structured literature reviews could improve the un-checked use of scarce human, financial and infrastructural resources to investigate issues that have already been researched or not using knowledge from past studies to appropriately inform new inquiries.

In order to capture context specific considerations, this article draws on the experiences of the authors in using a structured literature review to inform a research project on customer beliefs and attitudes in Australia to the use of transgenic food crops and processed foods. One of the reasons for using this study as a case example is because the literature search revealed that, notwithstanding evidence that the use of gene technology in food and crop production has evoked substantial public debate in Australia, only eighteen scholarly business articles on this topic could be identified through key word search. It could be contended that reviewing studies that report on research completed elsewhere in the world should also have been included in this study. However, the aim of the discussions in this article is to determine current knowledge regarding beliefs and attitudes of customers in Australia to the use of transgenic processed foods and crops. Consequently, knowledge from studies conducted in other countries is not central to this inquiry. Additionally, because the objective of this article is to review the benefits and limitations of invoking structured literature reviews in business research inquiries, limiting the review to Australia also enables easier operationalization of the study without diminishing its rigor.

The literature review discussed in this article aims to map extant knowledge; compare findings, review methods, data analyses and data interpretation techniques in past studies; identify the limitations, if any, of past studies; and thereby analyse the need to conduct a 'new' study. Additionally, adopting a systematic process of literature review also helped identify the potential contributions of the proposed study and thereby present evidence based justifications for the 'new' inquiry.

METHODS AND TECHNIQUES

The first task in conducting literature reviews is to undertake an exhaustive literature search. The literature search has to be conducted systematically and purposefully to ensure that all relevant articles are identified. In the case of the research discussed in this article, literature search was completed through key word search of the phrases 'genetically modified', 'genetically engineered', 'genetic manipulation', 'gene technology', 'novel food

technology', 'transgenic foods', 'transgenic crops', 'biotechnology' and 'Australia' within the subject areas of 'health and social science' and 'business' in the bibliographic databases *Business Source Complete*, *Emerald*, *JSTOR Business Collection*, *Web of Science*, *Web of Knowledge*, *Scopus*, *Zetoc*, *Proquest*, and *Australian Public Affairs Information Service*.

The keyword search yielded 215 records amongst which only 18 were peer reviewed scholarly articles. Based on reviewing the abstracts of these 18 articles, 16 articles that focussed specifically on the research issue (including one article by Norton *et al.* on the method used in an earlier study) were identified as being appropriate for the inquiry. Of the two articles that were eliminated, one focussed on trade issues (Anderson and Jackson, 2005) and the other focussed on regulatory issues (Brent *et al.*, 2003).

Next, the references in the 16 articles were checked to determine whether all peer-reviewed articles on the research issue had been captured through the key word search. After this, discussions were conducted with 'Key Informants' and peers regarding journals in which scholarly articles on beliefs of Australian consumers to transgenic foods and crops are likely to be published. Based on these discussions with 'Key Informants' and peers, the following ten scholarly journals were identified: *Appetite*, *Australasian Biotechnology*, *British Food Journal*, *Food Quality and Preference*, *Public Understanding of Science*, *Australian Journal of Experimental Agriculture, Australian Journal of Agricultural and Resource Economics*, *Food Policy*, *Geoforum*, *Nutrition and Food Science* and *Food Australia*. The 'Table of Contents' of all issues of these journals for the past five years were examined to determine whether there have been any articles in these journals that were not captured in the bibliographic databases or references of the 16 articles identified through key word search. These actions did not uncover any additional publications to that which were identified through the key word search.

Next, an 'Information Table' (Appendix 1) was created to capture the following information:

Column	Item	Objectives
1.	Author/year	To cite sources
		To track "datedness" of citations
2.	Study Objectives	To identify the motivations, aims and objectives of past studies
3.	Study Context	To determine the focus of the study in regard to region, market segment, industry segment, customer segment and types of respondents.
		To determine whether the study context had implications in informing the proposed study
		To critically assess the alignment of study aims and objectives to study contexts and thereby evaluate whether the findings and conclusions are appropriate
4.	Research Methods	To critically analyse the appropriateness and rigor of the research techniques and methods used in the study
		To determine if the research method and techniques used could potentially influence the findings
		To determine the implications of the study method on the generalizability of the findings
5.	Sample	To determine if the study sample and sample size are appropriate
		To determine if sample selection was conducted

		systematically and rigorously
		To identify potential implications of sample selection and sample size on method, data analyses and findings
6.	Data Analysis	To determine if data analysis methods are appropriate
7.	Response Rate	To assess response rate effects on findings
		To assess the actions taken to reduce response rate effects
8.	Conclusions	To state the conclusions of the study
9.	Remarks	To assess whether the conclusions of the study are appropriate on the basis of context, methods, sample, data analyses and response rates
		To assess the implications of the study's conclusions on the research project being developed

The 16 articles identified through the bibliographic database search were read purposefully with the objective of obtaining information to complete all sections of the 'Information Table' shown in the Appendix.

ANALYSIS AND FINDINGS

An obvious benefit of using this process is that it facilitates comparisons of study contexts, methods, study sample, data analyses and conclusions across all articles being reviewed. The approach generated information that reveals the scope and limitations of using knowledge in past studies to inform the research being pursued. For example, the completed 'Information Table' in the Appendix reveals that:

a) Sample selection in Baumüller (2001) and Schibeci *et al.* (1997) (Item 1 and 11) may not be useful to study the beliefs and behaviors of customers (consumers or business-to-business) regarding transgenic foods. Baumüller (2001) surveyed university students, sample size was small (n=39) and inter- and intra-group differences were not assessed. Schibeci *et al.* also used a small sample (n=60) of which 19 were university students. Although the objective of the Schibeci *et al.* study was to determine consumer beliefs, consumers *per se* were not surveyed. Therefore, these studies do not appropriately inform the research that was being investigated and therefore could not appropriately inform the study pursued by the authors'. Additionally, the review revealed methodological limitations in past studies thereby highlighting gaps in knowledge and justifications for the study.

b) Of the sixteen studies reviewed, eleven (Items 1, 2, 3, 5, 6, 7, 9 (2 articles), 11, 13 and 14) are purportedly based on survey of consumers. However, response rates in surveys that informed three of these studies (Items 3, 6 and 13) were less than 20%. These are low response rates and therefore further actions to determine the effects of non-response bias should have been considered. However, none of these studies report that actions were taken to check whether there was non-response bias. Five studies (3, 8, 9a, 13, 14) used structured questionnaires in surveys but there was no information on whether questions from past studies were replicated or whether new questions were developed. All five studies that used structured questionnaires used this method exclusively thereby presenting the possibility that other research methods such as focus

group interviews, in-depth interviews using single or multiple cues or observational studies could have yielded different results. It therefore seems that the conclusions in these studies may not have been based on rigorous methods of inquiry.

The article by Lockie *et al.* (Item 7) does not indicate response rates from the computer assisted telephone interviews or how the focus group participants were screened and recruited. There is also no information on how issues of non-response bias were handled. The article by Norton *et al.* (1998a) and Klerck and Sweeney (2007) (Items 9 and 14) do not indicate how the study sample was selected, response rates achieved in the surveys and how issues of non-response bias were addressed.

c)   Five studies (Items 4, 8, 10, 11 and 12) explored beliefs of key stakeholders. However, these studies do not reveal whether information from the consumer studies was used in these studies. As was the case with the consumer studies, the studies on key stakeholders too were based on small samples with potentially great variability in heuristics and, notwithstanding this limitation; inter-group differences were not investigated in these studies. For example, Dietrich and Schibeci (2003) and Russell (2008) (Items 4 and 10) investigated the beliefs of various groups but do not discuss the variability in attitudes, if any, across the groups that were researched. Also, these studies on key stakeholders do not explain how survey participants were identified and whether they were screened to check their appropriateness as informants. McDougall *et al.* (2001) (Item 8) administered 1,000 questionnaires to pulse farmers in Western Australia that yielded a response rate of 19%, however, McDougall *et al.* do not investigate non-response bias. Consequently, the information from this large (in terms of sample size and number of respondents) study does not provide conclusive knowledge about attitudes within an important industry group (pulse growers) to the adoption of gene technology.

CONCLUSIONS

This study used a structured and purposeful process to complete the literature review for a study on Australian consumers' beliefs and attitudes to transgenic foods and crops. The literature review revealed that, notwithstanding the fact that several studies have been completed on Australian consumers' beliefs and attitudes to transgenic foods and crops, there is significant 'gap in knowledge' on this issue. This is largely the outcome of the methodological limitations (such as low response rates to surveys, unrepresentativeness of the samples used in the study and sample size) in several of these studies. Other limitations identified included the use of single methods of inquiry, non-replication of questions in past studies, not testing for non-response bias, and not examining group differences or differences arising from heuristics. Additionally, the review indicates that most studies did not contain information on how the sample was selected and where such information was available it seems that there was bias in the methods used to screen and recruit survey participants. Because of these limitations, notwithstanding the fact that this question has been of interest to policy makers and researchers for nearly three decades, research on this topic can be described as being in its infancy. These gaps in knowledge and the consequent justification for a study on beliefs and attitudes of Australian consumers to transgenic foods and crops became more clearly evident because the authors' undertook a systematic and purposeful process of conducting the literature review. This knowledge may not have become so clearly evident if a traditional narrative form of literature review was conducted. Based on this

evidence, it can be concluded that the use of structured literature reviews should be encouraged in business research projects.

It is evident that structured literature reviews have not been widely used in business and marketing research. It has been used to a limited extent in meta-analyses and in some studies that use quantitative data analyses, particularly studies that focus on issues such as logistics, warehousing, transportation and supply chain. The findings of this inquiry indicate that structured literature reviews are rarely, if at all, used in most qualitative business research. Structured literature reviews help more clearly identify differences in extant studies across defined parameters, capture the value and limitations of extant studies in informing a 'new' inquiry and identify knowledge gaps. In short, important information is not buried in a narrative but is presented upfront. Based on this evidence, the authors' conclude that there is significant value in beginning a scholarly discourse on the value benefits of adopting systematic and purposeful literature reviews.

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Appendix
> **Information Table: Customer Belief about Transgenic Foods and Crops**

Item	Author/s (Year)	Study Objectives	Study Context	Research Methods	Sample	Data Analysis	Response Rate	Conclusions	Remarks
1.	Baumüller (2001)	Public opinion about GM foods (attitudes in general; attitudes to certain applications of biotechnology; knowledge of hazards from consuming GM foods; Knowledge of extent to which GM foods are sold in Australia; sources of information on GM foods; government actions required on GM foods - labelling; research; information campaigns	Consumers of GM foods	In-depth face-to-face interviews. Replicated questionnaire used in research commissioned by *Biotechnology Australia* Interviewees presented with six applications of genetic modifications (herbicide tolerance; better nutritional value; support production of medicines such as vaccines; greater crop yield; longer shelf-life foods; crops better adapted to grow in poor conditions, e.g. arid conditions	39 students at Macquarie University, Sydney. Majority (n=28) < 40 years with n=11 < 26 years. Majority enrolled in science degrees either at undergraduate (n=13) or postgraduate (n=8) levels	frequency analysis	Not indicated	Consumers concerned about health impacts from consuming GM foods. Consumers willing to accept risks if there are benefits from using GM foods Information availability influences willingness to purchase GM foods No association between fears of health risk and genetic modification - beliefs varied across different applications of GM modification Public consultation was reported to be important yet respondents were unaware of public consultations initiated by *Biotechnology Australia* and the *Interim Office of the Gene Technology Regulator.*	Not representative sample: students - education and age not representative of general community. Inter-group and intra-group variations not presented (gender, socio-economic class, overseas-local students etc.) Small sample size with potentially great within sample variations suggests that conclusions may not be well founded Conclusion that beliefs varied across different applications of GM modification: would not source credibility be a factor.
2.	Cox, Evans, and Lease, (2007)	Investigate consumer beliefs regarding risks, benefits, unnaturalness and safety of farmed prawns using different novel technologies including genetic modification	Consumers in Adelaide, Melbourne, Sydney and Brisbane	Focus group interviews: two groups each with nine participants differentiated on the basis of gender (male /female) Screening focus group participants: consumed prawns at least once every two to three weeks. Text descriptions of technology was pre-tested (n=12) Participants were randomly segregated into two	120 participants in each city (Total = 480)	Analysis of Variance: Acceptability and likelihood of consumption by location, gender and age Conjoint analysis to compute utilities and average importance Cluster analysis on conjoint data	Not indicated	Consumers are concerned about safety and benefit of using foods produced through novel technologies. Males more positive than females about use of novel technologies. Providing more information did not modify attitudes.	120 participants/city screened on two parameters (gender and whether consumer of prawns). Would education, profession, socio-economic and life style also determine attitudes? Sample size relative to variables considered seems too small to make informed conclusions.

No.	Author	Aim	Sample	Method	Data collection	Analysis	Response rate	Findings	Limitations
				equal groups (control group and information treatment group). Both groups received identical information about possible technologies for prawn farming but intervention group received additional information that emphasised potential problem of farmed prawns escaping and breeding with wild species. All questions used bi-polar rating scales. Socio-demographic characteristics of participants were collated. Final question: Open-ended question "What do you think is the environmental problem with farmed prawns"?		to identify segments within sample that had common relationships Factor analysis to reveal relationships between belief items			
3.	Evan and Cox (2006)	Determine attitudes to consuming foods produced by different novel technologies (high pressure processing; genetic modification; infertility technologies)	Consumers in Adelaide	Structured questionnaire adapted from *Food Choice Questionnaire* (Steptoe et al., 1995), Food Motivations Scale (Martins and Pliner, 1998) and Ethical Food Choice Motives (Lindeman and Vaananen, 2000). Three versions of questionnaires, each assessing three products were administered	830 questionnaires administered	Mean and standard deviation for five products across variables age, gender and frequency of consumption	142 (17%)	Differences in beliefs about products made with different novel technologies. Negative beliefs about products described as genetically modified. Beliefs are influenced by concerns such as effects on health, preference for natural products, familiarity with technology and political orientations	Low response rate 142 responses to measure beliefs and behaviours from respondents of diverse demographic backgrounds (gender, age, education, socio-economic) is a serious limitation Variations between respondents of diverse demographic backgrounds not captured in the study Potential impact of non-response bias not considered

				Questionnaires administered at six shopping complexes at different times and days of the week + questionnaires administered in student canteen at University of Adelaide to capture younger respondents					
4.	Dietrich and Schibeci (2003)	Assess public perception of gene technology	The following six groups in New South Wales were determined by the researchers to be key stakeholders: environmentalist; organic growers; permaculture farmers; health associations; Gene Wise and two rural community groups The six groups were selected on the basis of perceptions about capability to inform the research	Focus group interviews + administering questionnaires. Groups were identified on the assumption that community response to GM is influenced by personal situations and background and trust of information sources. Focus group discussions were contextualised to scientific, commercial, medical and policy aspects of GM through three scenarios: Macgregor's tomato (food); porcine somatotropin-treated pork (food); and gene therapy applied to cystic fibrosis. Each participant in the focus group asked to complete a questionnaire Prior to the group discussions and post the group discussions, two different	Six focus groups	Frequency analysis	Not indicated	Community opposed to GM other than for medical applications. Community concerns: risks to human health, danger to environment, trustworthiness of commercial companies that own the technology, and intents of regulatory agencies Authors recommend that policy initiatives should change - from dissemination of knowledge on gene technology to engaging with the community to build trust - community reaction suggest concerns about the trustworthiness of scientific and policy institutions	No information on how it was determined that the six groups are the key stakeholders. No information on number of participants in each focus group No information on how focus group participants were screened and the background of the focus group participants No information on the reasons for conducting the three stage interviews - one group discussion and administering pre and post discussion questionnaires

				questionnaires were administered on all focus group participants.					
5.	Fisher *et al.* (2007)	Community attitudes to GM technology	Consumers in New South Wales – urban (Sydney), rural (Albury)	Telephone survey of 420 individuals and in-depth interview of 292 individuals	720 individuals: equal numbers from city and country	Multiple regression analysis	Not indicated	Community support for gene technology is high and potentially would increase for some applications of gene technology	Only group differences considered is rural vs urban No information on how survey participants were selected
6.	James and Burton (2003)	Consumer attitudes to GM foods, 28 foods from three product categories	Consumers in Western Australia	Mail survey comprising questions designed as open-ended contingent valuation, scale-differentiated attitude statements, choice modelling questions and demographic information Sample randomly selected from telephone directory	2,080	Likelihood ratio test	370 (18%)	Price discounting important in encouraging the adoption of GM foods Males and older consumers are more likely to adopt GM foods Uncertainties regarding health and other effects is a major constraint to community accepting GM foods	Low response rate Non-response bias not examined Analysis only considers income differential, effects of other demographic variations not analysed
7.	Lockie et al. (2005)	Consumer attitudes to GM foods	Consumers in rural and urban Queensland and Victoria stratified on the basis of socio-economic and demographic differences	13 Focus groups interviews + 1,212 Computer Assisted Telephone Interviews (CATI). CATI interviewees randomly selected	Consumers	Path analysis	Not indicated	Negative beliefs regarding GM foods - believe that GM foods are not natural. Gender variations: female respondents show greater preference for natural foods	Product-specific behaviours and effects of type of gene technology used not considered. Gender is the only inter-group differences analysed Number of participants in focus groups and screening methodology used to select focus group participants not revealed
8.	McDougall et al. (2001)	Farmers' perceptions regarding use of GM technology in food crop production	Pulse farmers in Western Australia	Structured questionnaire using rating scale. Drew on questions used in consumers surveys (e.g. Norton *et al.*, 1998) to measure if there was differences in beliefs between primary producers and consumers Systematic sampling. 1,000 questionnaires administered through	1,000	Mean scores of responses for different measurement items Frequency analyses	190 (19%)	Positive beliefs about GM foods Positive beliefs about trialling GM modified crops Concerns regarding cross-specie gene transfer Want labelling of products with GM ingredients Concerns regarding corporate ownership and marketing of GM technology	Low response rates No test for non response bias

			incorporating one questionnaire in every fourth copy of the industry newsletter *Legume Logic*					
9	Norton et al. (1998a; 1998b)	Consumer attitudes to GM foods	Consumers Australia wide	Postal survey Questionnaire containing two opposing statements pertaining to use of gene technology. Each statement had six point rating scales Responses were contextualised as follows: (a) tomato with altered gene structure (b) cheese with gene engineered Chymosin (c) wheat containing Bt gene (d) blue rose containing genes from another plant (e) pork containing gene sequence of human origin (f) sheep genetic engineered to be resistant to blowfly strike (g) tomato containing gene sequence from fish	Interviewees randomly identified from "Electoral Roll" Total mail out: 1,940	Frequency analysis Means score of responses for different measurement items	1,009 (52%)	Majority of consumers (66%) accept GM plant products Consumers concerned about health effects of processed GM foods Majority of consumers (76%) concerned about environmental effects of GM farming Consumers are in favour of labelling GM foods Majority of consumers (92%) in favour of government control of gene technology Majority of consumers (93%) support public consultation prior to release of GM foods Majority of consumers (52%) believe that risks of adopting gene technology outweigh the benefits	Questions potentially subject to wide interpretation No information on whether the questionnaire was pre-tested Response rate high but does not capture differences across different demographic groups
10.	Russell (2008)	Consumer beliefs regarding use of Monsanto's gene technology based herbicides for production of GM cotton that is resistant to damage by insects	Groups in New South Wales: cotton farmers, women in cotton industry, workers from agricultural service industries, weed management businesses, consultants to the cotton industry, community and welfare workers, non-cotton farmers, members	Seven focus group interviews and observational surveys comprising five individuals each in five stakeholder groups and five farmers each in two farmer groups	Stakeholders in a cotton farming community in New South Wales	Thematic qualitative analysis using NVivo	35 individuals across six stakeholder groups	GM technologies have the potential to contribute to transformations that are beneficial to the community The contributions made will depend on the context in which the technologies are developed and the	Number of focus groups conducted not identified. Nine different strata/segments were delineated – no inter-group and intra-group variations are discussed

No.	Author	Topic	Sample	Method	Sampling	Analysis	Size	Findings	Limitations
		damage by insects	consultants to the cotton industry, community and welfare workers, non-cotton farmers, members of aboriginal community	farmers each in two farmer groups				will depend on the context in which the technologies are developed and the context in which the technologies are used	
11.	Schibeci et al. (1997)	Consumer attitudes to GM foods	60 individuals from four groups: 19 1st- 3rd year biotechnology student; 18 students pursuing science and related programs; students, 14 members of an environmental conservation organisation; 9 members of a consumer organisation	In-depth interviews using multi-media information packages to provide background knowledge on the research issue	Purposive sampling	Frequency analysis Qualitative analyses of interview transcripts	60	The research instrument was useful in measuring public perception - other than this there are no significant conclusions in this study	Small sample Sample seems not representative of the community/public: 62% of participants are students
12.	Wheeler (2007)	Differences in believes regarding use of gene technology in food production and organic farming of food crops	Agricultural professionals - Australia wide Sample demarcated into two groups: General Group (State and Commonwealth Organisations in South Australia) and Target Group (Agricultural professionals in public organisations)	Telephone survey	Interviewees selected randomly using a random number generator to achieve the pre-determined number of responses	Frequency and t-test	185 responses - response rate not revealed	Most agricultural professionals believe that genetic engineering delivers greater benefits than organic farming	Predetermined sample – not consumers but opinion leaders
13.	Burton and Pearse (2002)	Consumer beliefs regarding conventional beer, beer produced from GM barley to reduce cost, and beer with GM yeast to reduce cholesterol	Consumers in Perth	Postal survey administered on 1,563 individuals	Residents in five suburbs with different median incomes	Choice modelling	250 (response rate 16%)	Diversified preferences. About 30% unwilling to accept any level of GM ingredients whereas the remaining were willing to use GM foods if there were price advantages Some were willing to pay a price premium if there were health benefits in GM foods	No test for non response bias Low response rate, variations across respondents not captured
14.	Klerck and Sweeney (2007)	Objective and subjective knowledge of beliefs and attitudes to GM foods	Primary grocery shopper of the family Survey conducted in Adelaide	Face-to-face interviews with 240 shoppers using a structured questionnaire with items and measurement scales drawn from past studies Exploratory	12 suburbs in Adelaide selected randomly	Structural-equation modelling	20 shoppers in each area, n =240; response rate 57%	Subjective and objective knowledge about GM foods influence decisions to buy, dissemination of knowledge would increase propensity to purchase GM foods	No information on how interviewees were recruited.

				qualitative interviews with 25 shoppers					
15.	D'Souza and Quazi (2005)	Review literature on GM foods on a global perspective	Not applicable	Literature review	Not applicable	Not applicable	Not applicable	Conduct a marketing campaign to build customer trust and positive beliefs regarding GM foods	Basis of identifying and screening literature not explained. References to data on Australia are largely evidenced by citations from non scholarly publications