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Modelling Behavioural Antecedents of Inter-Firm Linkages in the Irish Road Freight Industry: an Application of the Theory of Planned Behaviour

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ABSTRACT

The Irish road haulage industry exhibits a structure dominated by single-vehicle owner-managed operators. This has implications for the Irish economy through reduced efficiency. It is crucial that Ireland's transport policies sustain its trade-dependent economy and this study can help inform those policies.

The European Union has made a commitment to promoting sustainable mobility through advanced transport logistics. One of the principal areas not previously addressed is that of barriers to collaboration.

This thesis initially examines economies of scale within the road freight industry and argues that collaborative networks can aid sustainable transport and increase efficiencies in logistics. It addresses the attitudes of operators towards collaborative alliances. An initial assessment of operators' economic-rational decision-making was employed. A theoretical framework of behavioural economics is presented and a conceptual model based on it was employed for extracting attitudes. Non-economic factors were explored as key influencers of decision-making. The Theory of Planned Behaviour (TPB) was used as the foundation of the research methodology.

A mixed-method survey approach was used, that is, qualitative and quantitative methods. Content analysis of the qualitative interviews was carried out in order to develop a list of modal accessible beliefs. A structured postal questionnaire was utilised as the primary research instrument.

Structural Equation Modelling was applied in order to model the key influencers on owner-managers' intentions to perform collaborative activities.

The TPB was found to be an effective method for eliciting the influencers on industry operators. It allowed the key indicators of their intention to perform collaborative activities to be determined. Three latent factors: economic appraisal, normative pressure and control over time were key influencers. The operator's perception of other people's opinions had a significant influence on their intention formation. It is concluded that an educational programme would act as a catalyst to collaboration.

DECLARATION

I certify that this thesis, which I now submit for examination for the award of Doctor of Philosophy (PhD), is entirely my own work and has not been taken from the work of others, save and to the extent that such work has been cited and acknowledged within the text of my work.

This thesis was prepared according to the regulations for postgraduate study by research of the Dublin Institute of Technology and has not been submitted in whole or in part for another award in any institute.

The work reported on in this thesis conforms to the principles and requirements of the Institute's guidelines for ethics in research.

The Institute has permission to keep, lend or copy this thesis in whole or in part, on condition that any such use of the material of the thesis be duly acknowledged.

Signature _____ Date_____

Candidate

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LIST OF ABBREVIATIONS AND SYMBOLS

Δ	Change
3PL	Third Party Logistics
4PL	Fourth Party Logistics
ADF	Asymptotic Distribution Free
AHP	Analytical Hierarchy Process
AIC	Akaike Information Criterion
AMOS	Analysis of Moment Structures
BID	British Industrial Distributors
CBI	Confederation of British Industry
CEC	Commission of the European Communities
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMB	Common Method Bias
CMIN	Chi-square Minimum
CO_2	Carbon Dioxide
CPC	Certificate of Professional Competence
CR	Critical Ratio
CSCMP	Council of Supply Chain Management Professionals
CSO	Central Statistics Office
CTM	Collaborative Transport Management
DfT	Department for Transport, United Kingdom
DoE	Department of Environment
DoT	Department of Transport, Eire
DTO	Dublin Transport Office
E	CO_2 Efficiency

ECMT	European Conference of Ministers of Transport
ECR	Efficient Consumer Response
EEA	European Environment Agency
EFA	Exploratory Factor Analysis
EM	Estimation Maximisation
ESRI	Economic and Social Research Institute
ETS	Emissions Trading Scheme
EU	European Union
EVT	Expectancy-value Theory
GDP	Gross Domestic Product
GFI	Goodness-of-Fit Index
GLS	Generalised Least Squares
GVW	Gross Vehicle Weight
HGV	Heavy Goods Vehicles
H&R	Hire and Reward
IBEC	Irish Business Employers Confederation
ICT	Information and Communication Technology
ILC	Industry Life Cycle
IPTS	Institute for Prospective Technological Studies
IRU	International Road Transport Union
JBC	Joint Business Council
JIT	Just-in-Time
JRC	Joint Research Centre - European Commission
KMO	Kaiser-Meyer-Olkin
KPI	Key Performance Indicators
K-S	Kolmogorov-Smirnov Statistic
L-E	Logical-Empirical

LSP	Logistics Service Provider
LTL	Less-Than-Truckload
LV	Latent Variable
MAP	Minimum Average Partial
MAR	Missing at Random
MAUT	Multi-Attribute Utility Theory
MCAR	Missing Completely at Random
MCDC	Multiple Criteria Decision Making
MES	Minimum Efficiency Scale
MGB	Model of Goal-directed Behaviour
MIMIC	Multiple Indicators Multiple Causes
ML	Maximum Likelihood
MLE	Maximum Likelihood Estimate
MV	Measured Variable
N-A	Normative-Affective
NDP	National Development Plan
NITL	National Institute for Transport and Logistics
OA	Own Account
OLS	Ordinary Least Squares
PA	Path Analysis
PAF	Principal Axis Factoring
PBC	Perceived Behavioural Control
PCA	Principal Component Analysis
PCLOSE	Probability of Close fit
PGFI	Parsimony Goodness of Fit
R-A	Resource-Advantage
RBT	Resource-Based Theory

RMSEA	Root Mean Square Error of Approximation
SB	Satorra-Bentler
SBE	Small Business Enterprise
SCM	Supply Chain Management
SCOR	Supply Chain Operations Reference Model
SD	Semantic Differential
SEI	Sustainable Energy Ireland
SEM	Structural Equation Modelling
SME	Small and Medium Enterprise
SPSS	Statistical Package for the Social Sciences
SRM	Social Rationality Model
S-W	Shapiro-Wilk Statistic
TACT	Target, Action, Context, Time
T-KM	Tonne-kilometre
TL	Truck Load (Full)
TLI	Tucker-Lewis Index
TPB	Theory of Planned Behaviour
TPL	Third Party Logistics
TRA	Theory of Reasoned Action
TRB	Transport Research Board
VIF	Variance Inflation Factor
V-KM	Vehicle Kilometres
Vol	Volume

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1 INTRODUCTION

1.1 Introduction

This chapter succinctly presents the pertinent implications of the status of the road freight industry for the broader economy. The thesis's objectives and research questions are highlighted. Key themes of the thesis are outlined with the aid of a flow diagram.

1.2 Prelude

The Irish road haulage industry exhibits a structure dominated by single-vehicle, owner-managed operators, providing basic transport services. This structure has adverse implications for Ireland's economy through hindering the efficiency of businesses and lessening the attractiveness of Ireland as a location for foreign direct investment. It is crucial that Ireland establishes efficiency-enhancing transport policies in order to sustain its trade-dependent economy.

This study employed the Theory of Planned Behaviour in analysing key influencers on operators in the Irish road haulage industry's hire and reward sector. The empirical application of this theory allowed for the identification of specific attitude-based influencers. The thesis deliberates on how policy can address some of the issues in the industry.

Road freight is of tremendous value to the Irish economy, as it significantly dominates freight transport in Ireland. Transport has been vital to the Irish economy in recent times, with particular regard to the 'Celtic Tiger' (Ireland's

economic boom of the 1990s), which was due to manufacturing for the export market. The Indecon (1999) report identified a number of issues in the Irish road freight industry and questioned its structure and professionalism. Also, it implicitly questioned the underlying decision-making in the hire and reward sector of the Industry. An efficient and effective freight transport industry is essential, so as not to aggravate the significant threats to the already ailing manufacturing industry. This need for efficiency and effectiveness is further added-to by Ireland's transport costs of exports being significantly higher than those of its EU neighbours (Forfás, 1995). Looking to the future and recognising that Ireland has a peripheral location in Europe, the impact of policies that would seek to internalise road freight transport external costs (such as those arising from the use of infrastructure or the costs to society of road freight transport emissions, noise and accidents) is potentially very significant.

1.3 Initial Research Objectives and Questions

The thesis proposes a number of initial questions, which are further refined and developed throughout. This refinement is aided by literature analysis and a preliminary empirical investigation.

The initial objectives of the study are:

- To assess whether intervention is required for the development of the Irish road freight industry, with particular reference to the positive and negative influencers on the large number of small operators.

- To determine the appropriateness of the Theory of Planned Behaviour in relation to Irish road freight operators' behaviour and, in particular, to apply the theory to
    - investigate and explain the structure of the Irish road haulage industry, with particular attention to its fragmented nature.
    - develop a theoretical framework for the study of owner-managed operators' behaviour.
    - develop an understanding of the drivers of change in the industry.
    - investigate the current status of inter-firm linkages in the Irish road freight industry.
    - develop an erudite approach to eliciting key factors influencing management in performing collaborative activities.

Stemming from the objectives a number of questions arise; these are:

- What underlying theory or theories explain the situation and behaviour of road freight operators?
- Are Irish road freight operators maximisers or satisfiers in terms of their decision-making in relation to collaboration?
- What methodology is applicable to this context?

This thesis has an emphasis on inter-firm linkages from a motivational perspective, contributing new knowledge to the literature in the field. There has been little research on small firm managers' attitudes to inter-firm linkages; hence perceived positive and negative influencers have not been assessed. An argument for and a theoretical approach to such an assessment are presented. Eliciting of key influencers facilitates optimally

targeted intervention to reduce barriers and/or increase positive behavioural attributes, thereby stimulating development. This theoretical approach is linked to the complementary theoretical concepts of confidence, self-efficacy and action-orientation that are essential components in the development of intentions and behaviour.

1.4 Scope of the Thesis

There are many components that influence industry structure. This thesis addresses the supply-side of the structure of the road transport industry: it relates to the achievement of economies of scale and the optimisation of organisational parameters, with particular reference to the hire and reward sector of the road freight industry in the Republic of Ireland.

1.5 Thesis Structure

The thesis is divided into a number of phases in its theoretical and empirical components. The contribution of each chapter is assessed in Chapter 11, section 11.3 — Contribution of the Thesis. A flow chart of key thesis themes is presented in Figure 1.1.

Chapter 2 provides an overview of the industry and its background. It highlights key areas of the industry and relates the importance of transport to the Irish economy. Shen's (1970) two factors affecting the supply side of a firm's growth (economies of scale and organisational parameters that restrain its growth) are introduced.

Chapter 3 utilises a structured theoretical framework approach and refers to the pertinent literature surrounding the first of Shen's factors (economies of scale in road freight transport).

Chapter 4 addresses the second of Shen's factors. The organisational parameters are reviewed from a theoretical approach that critiques neo-classical economics and moves towards behavioural economics, satisficing (working towards satisfying the minimum requirements to achieve a goal) and motivation theory.

Chapter 5 identifies what motivational theoretical framework can be applied as a result of the conclusions from Chapter 4. The Theory of Planned Behaviour is discussed with reference to the viability of its application to this context.

Chapter 6 develops the overall methodology stance from epistemological and ontological perspectives. It concludes with a paradigm that utilises a mixed methods approach (qualitative and quantitative).

Chapter 7 presents the initial empirical phase of the study (phase one). It relates to Shen's organisational parameters under a sub-structure adapted from Etzioni's (1988) dichotomous structure of decisions: logical-empirical (L-E) and normative-affective (N-A); it addresses, in particular, the logical-empirical component. Hire and reward road freight operators' decisions are analysed from an economic rational perspective. The empirical findings from semi-structured interviews and a postal survey are discussed.

Chapter 8 introduces phase two of the study and presents and discusses the qualitative pre-work, based on semi-structured interviews, to developing the primary research instrument (a detailed postal questionnaire), employing the Theory of Planned Behaviour in the context of Etzioni's (1988) normative-affective element. It augments the theoretical review of component-factors of small firm decision-making (presented in earlier chapters) with a discussion of the preliminary stage-two findings to inform the primary quantitative instrument and to formulate hypotheses for testing.

Chapter 9 discusses the development and implementation of the primary research instrument that was used to survey the influencers on operators to participate in inter-firm linkages. A conceptual model of collaborative intent in the Irish road freight industry is presented and the hypotheses that are to be tested are listed.

Analysis of the data generated by the primary research instrument is undertaken and discussed in Chapter 10. The model of influencers on operators to participate in collaborative alliances is analysed and its validity assessed by the application of Structural Equation Modelling (SEM).

Chapter 11 presents the conclusions and implications of this research for policy makers, operators and academics. It makes recommendations for policy in an attempt to address not only the industry's needs but also those of the broader economy and of society.

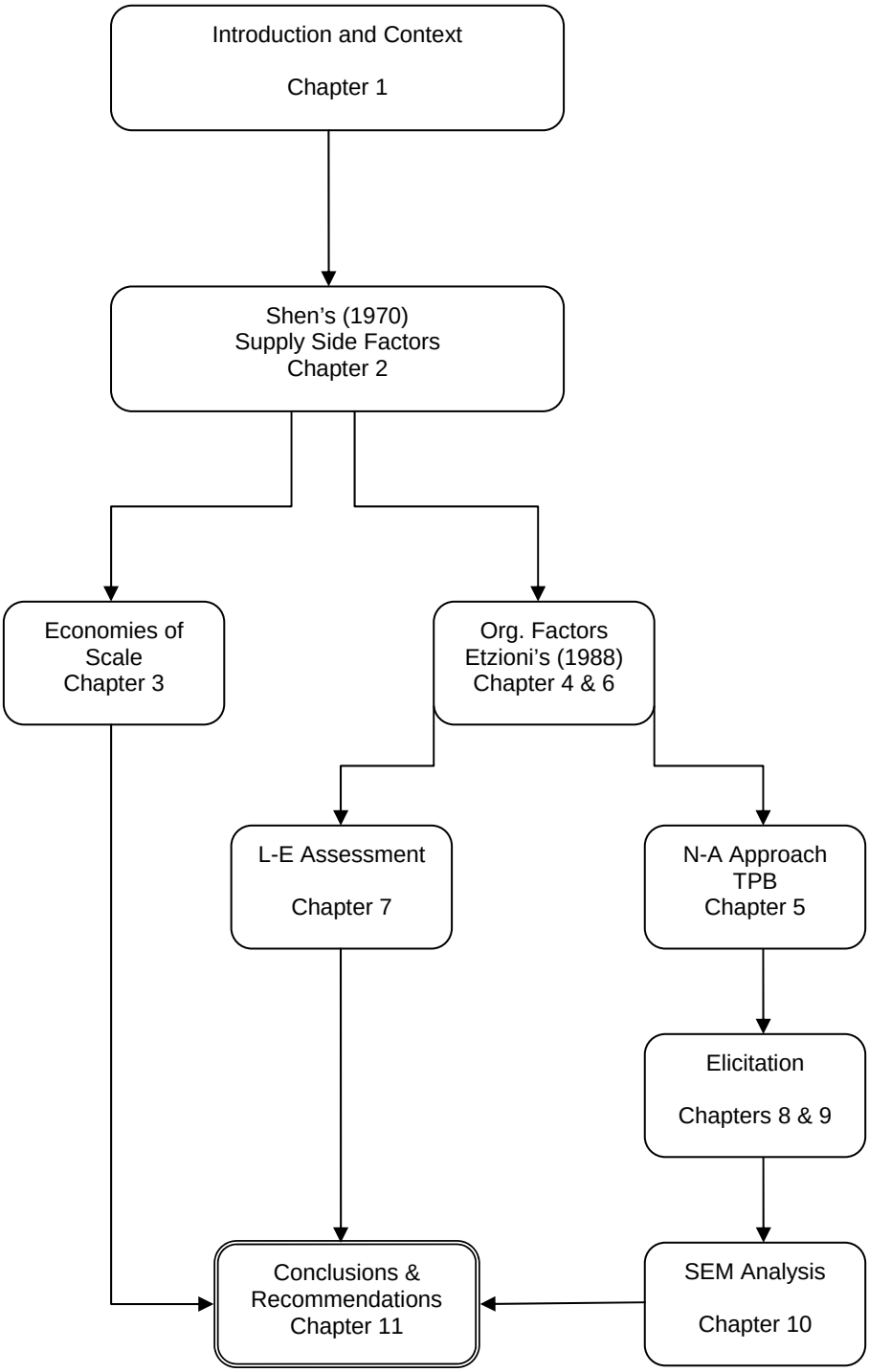

Figure 1.1 Flow chart of key thesis themes

2 TRANSPORT LOGISTICS IN IRELAND

2.1 Introduction

After laying out the structure of the thesis and its aims, this chapter's purpose is to set the scene for the thesis. This is achieved by a discussion of the relevance of transport in supply chain management (SCM), the Irish economy, the development of transport logistics in Ireland and the Irish road freight industry in the international context. The chapter highlights the industry's rapid expansion, while still remaining fragmented, which has implications for utilisation and efficiency.

2.2 Transport's Function in Supply Chains

The terms 'supply chain', 'logistics' and 'transport' are used throughout this thesis; in the interest of clarity it is important to define them.

In the past, the literature tended to contain many definitions of SCM and, in particular, confusion arose between this term and logistics. As the concept progressed in popularity, other terms such as 'value stream', 'supply network' or 'supply web' were developed and appear to be used interchangeably (Chopra and Meindl, 2004). These more recent terms are better reflections of the concept, aiding visualisation and supporting understanding. Figure 2.1 illustrates the supply chain process.

The supply chain is more than the physical movement of goods from one place to another. In this thesis, the definition owing to the Council of Supply Chain Management Professionals (CSCMP) is adopted:

> "*Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies...*" (CSCMP, 2006: 139)

However, this is not to be confused with the term logistics, which has a narrower focus and relates to one node in the supply network.

> "*The process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements.*" (CSCMP, 2006: 88)

Figure 2.1 Illustration of the supply chain process

(Supply-Chain Council, 2005)

Supply chains and logistics are normally presented and perceived from the perspective of a manufacturer or another node in the chain (customer or supplier). It is rare to see them presented from a transportation perspective.

Transport, from a supply chain perspective, can be defined as

> "…*the movement of product from one location to another as it makes its way from the beginning of a supply chain to the customer's hands*" (Chopra and Meindl, 2004: 412).

The movement of goods by road has traditionally been broken-down into two categories: Own Account (OA), and Hire and Reward (H&R). These terms are unambiguous; with Own Account relating to self-provided transport services, usually within a company, such as, a manufacturer. H&R relates to carrying goods for a third party and receiving a benefit for that service, usually payment. H&R has been the principal focus of regulatory bodies in the past (OECD, 2001).

Freight transport plays a key role in the development of an economy. This view is supported by Short (1985: 5):

> *"Good transport facilities can aid the development of areas of industries and can increase the scope of greater flexibility with regard to locational decisions and distribution systems. In a sense transport can almost be regarded as a factor of production, for without the ability to move materials into and out of factories production is impossible or pointless."*

The movement of raw materials or finished products is often taken for granted and under-represented in the literature (Short, 1985; Quinn, 2000). Carter and Ferrin (1995) suggest that most buyer-supplier contract negotiations ignore transportation costs and that supply chain costs cannot be optimised unless the transportation carrier is involved in the process. Transport is a critical component in supply chains; under-estimating its importance and its effect on the customer can undo the massive effort undertaken upstream (Quinn, 2000).

The 'Five *Rights* of Logistics'—the *right* items required for consumption or production, at the *right* place, at the *right* time, at the *right* cost, in the *right* condition (Lambert et al., 1998)—are increasingly pertinent for meeting customers' demands due to increasing application of philosophies and principles such as 'just-in-time' (JIT) and 'quick response planning'. Transport is fundamental to the meeting these demands and, therefore, to maintaining and increasing competitiveness, as supply chains compete.

2.3 History of the Industry's Development

As Ireland is a peripheral economy on the edge of Europe, which is also export-driven (Indecon, 1999), the cost of its transportation tends to be about double that of its European neighbours when transport costs are considered in relation to the buyer's product price (Forfás, 1995). The movement of goods is of critical importance to an economy, especially one that is dependent on international trade such as Ireland. The perception of the prominence of transportation costs is probably one of the lowest in the area of logistics and therefore their importance and significance are underestimated in many cases. The Indecon (1999) report on the future strategy of the road haulage industry identified a lack of information about the industry. There has been little improvement in the extent of research in recent years and there is only a handful of reports available on the industry over the past twenty years. The only exception to this appears to be the road freight activity survey, carried out by the Central Statistics Office (CSO) in accordance with EU regulations.

Ireland's history with regard to road haulage is similar to that of its European counterparts; its past is based on regulation in order to develop stability within the industry. In the 1960s opinions in relation to regulation began to change, principally due to the relaxation of the regulatory framework in Great Britain (Short, 1985). The first liberalisation act in Ireland was introduced in 1971, principally reducing restrictions on the transportation of commodities; the second was introduced in 1978, which relaxed the restrictions on the size of the haulage fleet. A report by the Transport Consultative Commission led

the Minister for Communications to liberalise the road haulage industry in 1984, subject to some qualitative controls.

In the Irish context, Jakee and Allen (1998) have a different perspective: that regulation played into the hands of the railways and the effects of political lobbying. Therefore the regulation decisions were not necessarily economy-based and efficiency-based.

Bayliss (1971) argues that regulation (Road and Rail Traffic Act in 1933) in the UK context was not necessarily evidence-based; *"The 1933 Act was to result in the stifling of a healthy and expanding industry"* (Bayliss, 1971: 34). Bayliss supports this view with evidence that bankruptcy rates were not numerous and implicitly suggests that regulation was introduced to protect the revenues of the four railway companies, rather than changing the railway companies' charging (regulated) system. Barrett (1982) and Short (1985) also view the regulation of road freight in Ireland as a railways protection policy.

McKinnon (1998: 212) argues *"As the railways were themselves were tightly regulated, it seemed only fair that the road freight industry should also be subjected to state control"*. McKinnon also refers to re-regulation in relation to the internalisation of negative externalities of road freight transport. The perspective was from an environmental aspect rather than economics and presents the view that a standard environmental levy on road freight may not be the best approach. The International Road Transport Union (IRU, 2000) proposes an environmental management system utilising incentives to promote best practice.

However, with the removal of regulation the industry's emphasis is now on free competition. Many challenges exist for the Irish haulier, such as underdeveloped infrastructure and a fragmented industry, with 80% of the H&R haulage businesses having three vehicles or less. However, when viewed on a total-vehicle-numbers basis the issue of fleet size appears less significant, as illustrated in Figure 2.2: about 41% of the vehicles are in fleets of three or less.

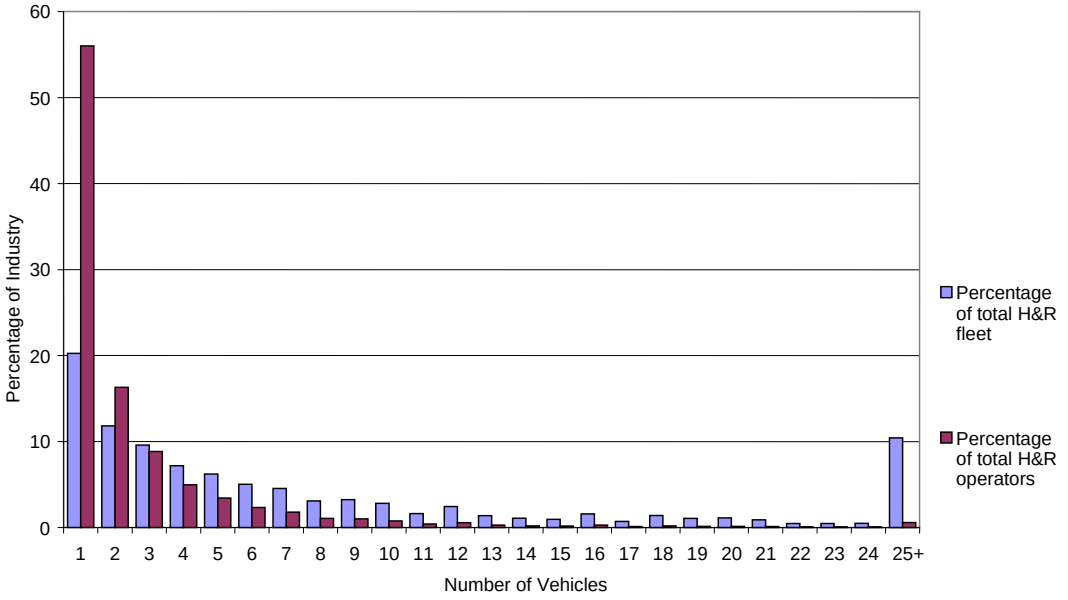

Figure 2.2 Industry breakdown: operators to vehicles

(Compiled from licensed hauliers database 2003)

The outcome of deregulation appears mainly to be positive with increased outsourcing and a reduction in rates of between 12% and 25% within the European Union. However, there is not a complete level playing field across Europe with different road tax regimes and some countries having restrictions on own-account operators carrying third party goods. The industry is also quiet fragmented across Europe, with only a small amount of concentration

(ECMT, 2002). There are many different sectors with varying characteristics, affecting back-loading abilities and the average length of hauls.

Shen (1970) advises of two factors affecting the supply side of firm growth: the first being economies of scale; the second being organisational parameters that restrain growth.

The traditional view of economies of scale is based on industry structure. Primarily road haulage (in a European context) tends to have the structural characteristics of a large number of small firms; therefore leading to the conclusion that economies of scale are unlikely to exist (Kritz, 1973).

However, Bayliss (1986) found that economies of scale exist on a vehicle rather than at a company level. Larger vehicles had a higher carrying capacity and a lower level of driver wages and fuel costs per unit carried. Small haulage operators tended to use smaller vehicles in comparison to their larger counterparts. Larger firms gained from the economies of improved vehicle mix.

An important influence on the size of firms appears to be demand. Demand tends not to lead to one optimum size, due to the heterogeneity of particular sectors of the industry, and demand is also inclined to be local. The principal features of demand that effect size are its geographical distribution and volume levels (Kritz, 1973).

Bayliss (1986) identifies a possible distinction of the market in which small hauliers operate. Small carriers tend to operate more in the construction and

tipper sector and large operators in long-distance work, although there tends to be a mix in the majority of sectors.

The lack of economies of scale in the road freight industry, in particular in the full-truck-load (TL) sector, has had a considerable influence on the industry's structure. There appears to be no incentive to increase firm size, as economies are only gained through vehicle size (Bayliss, 1986). In the TL sector demand usually far-exceeds the capacity of a vehicle, due to the nature of manufacturing and other businesses, resulting in concentrated loads on routes.

In the alternative sector, when the industry in broken-down under the classification of vehicle fill rates, less-than-truckload (LTL) operators appear to have limited economies of scale. There also appears to be somewhat more of a concentration of firms in this sector. Nevertheless, high levels of competition still exist (OECD, 2001).

Many studies have also identified positive effects of liberalisation, such as increases in efficiency, improved service quality, new entrants, substantial reduction in prices and increased employment (Boylaud and Nicoletti, 2001). However, some of these studies failed to consider the impact of the countries' economic performance on some of these figures, particularly employment creation. Liberalisation undoubtedly has had some effects on congestion and pollution, with trade-offs to and fro.

The Irish road haulage industry has experienced exceptionally strong growth in the late 1990s, principally due to its close correlation with economic growth

patterns. There are approximately 120,000 people employed in transport and logistics occupations in the Republic of Ireland. Road transport operatives (heavy good vehicles, bus and taxi operatives) number approximately 70,000 and have a low education profile (FAS, 2007).

Table 2.1 provides data that relate vehicle workload to vehicle year of manufacture. A number of key figures for the Irish industry are as follows (CSO, 2007):

- There was a 180% increase in tonne-kilometres (t-km) over the ten-year period from 1996 to 2006;
- The fleet size increased by 163% from 1996 to 2006;
- Goods vehicles completed 25.6 million loaded journeys in 2006, 5% more than in 2005 and 163% more than in 1996;
- Vehicles that were used mainly for H&R transport of goods were responsible for 56% of the total weight of goods carried in 2006 and accounted for 30% of all relevant vehicles;
- Vehicles owned by transport businesses performed 50% of the total activity in terms of tonne-kilometres in 2006.

Table 2.1 Haulage fleet by year of vehicle manufacture (CSO, 2006)

Year of Manu.	**Tonne-Kilometres** *Million*	*%*	**Tonnes Carried** *Thousand*	*%*	**Vehicle Kilometres** *Million*	*%*	**No. of Vehicles**	*%*
2005 –2006	3,851	21.8	56,181	18.0	513	20.3	16,190	15.3
2003 –2004	3,583	20.3	54,680	17.5	495	19.6	15,954	15.1
2001 –2002	3,621	20.5	61,917	19.8	502	19.9	15,874	15.0
1999 –2000	3,010	17.0	60,888	19.4	435	17.2	17,306	16.3
1997 –1998	1,724	9.7	34,550	11.0	256	10.2	12,931	12.2
1996 or before	1,897	10.7	44,696	14.3	323	12.8	27,630	26.1
Total	**17,687**	**100**	**312,913**	**100**	**2,523**	**100**	**105,885**	**100**

H&R vehicles also performed 71% of the total activity in terms of t-kms and travelled 54% of total vehicle kilometres, Figure 2.3.

The far majority of tonnage was carried in the 11 km to 25 km length of haul category. Consideration needs to be given to the prominence of Ireland's construction industry, at that point in time, with many tipper trucks carrying heavy tonnage on short journeys.

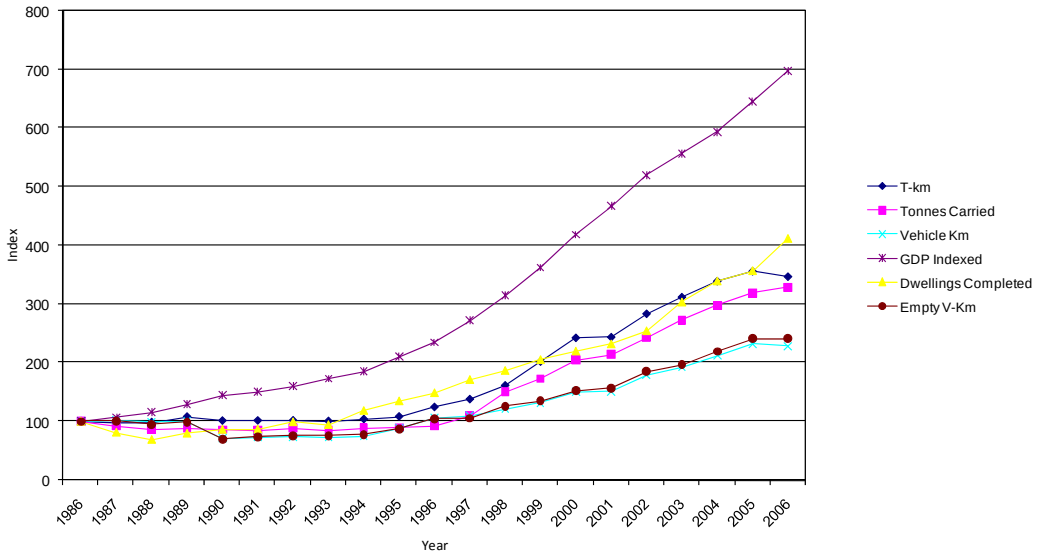

Figure 2.3 Road freight activity, GDP and residential building completions (indexed at 1986[1])

2.3.1 Change

As can be seen from the previous outline, road freight has increased enormously in Ireland and throughout the world, with the effect of globalisation and JIT principles resulting in the compression of time and increased frequency of freight transport journeys for certain sectors (Drewes Nielsen et al., 2003; Jespersen and Drewes, 2003).

This increase in road freight activity has resulted in increased internal and external costs. Congestion ties-up vehicles and reduces utilisation of road freight operators' fixed assets. Hence, additional vehicles may have to be purchased in order to meet their customers' needs. Congestion is also an external cost and may act in a multiplicative fashion on other externalities,

[1] Dwellings Completed, Source: DoE
http://www.environ.ie/en/publications/statisticsandregularpublications/housingstatistics/
Freight Statistics Source: Compiled from the CSO Road Freight Transport Surveys (1986-2006)

such as emissions, use of infrastructure, noise and accidents (Piecyk and McKinnon, 2007).

There has traditionally been a close correlation between GDP (Gross Domestic Product) and transport activity. Many researchers are now investigating this relationship (McKinnon, 2007; Kveiborg and Fosgerau, 2007; Lehtonen, 2006; OECD, 2003).

In the UK evidence has emerged that decoupling (reducing the link between economic growth and road freight activity) has begun (McKinnon, 2004). In Ireland and some other EU countries there appears to be a weak decoupling in progress. According to Tapio (2005) the GDP elasticity of transport can be calculated as follows: $\Delta Vol\% \div \Delta GDP\%$, where $\Delta Vol\%$ is the transport volume change percentage and $\Delta GDP\%$ is the GDP change percentage. In this context volume is measured in tonne-kilometres (t-kms) and decoupling is classified as elasticity values below 1. Using the t-km figures from the CSO Road Freight Transport Surveys (1986–2006) and the Department of Finance (2007) GDP figures, the elasticity figures can be calculated. Four periods are presented:

Period One:

GDP elasticity of road freight transport (1986–1995) = 8% / 110%

= 0.07 Elasticity

Period Two:

GDP elasticity of road freight transport (1996–2006) = 180% / 197%

= 0.91

Period Three:

GDP elasticity of road freight transport (2003–2006) = 11.2% / 25.3%

= 0.44

Period Four:

GDP elasticity of road freight transport (1986–2006) = 248% / 598%

= 0.41

Tapio's (2005) findings are confirmed in the above calculations comparing road freight activity to GDP. Strong decoupling was observed in the late 1980s and early 1990s (1987–1993, elasticity 0.09) and weak decoupling in the late 1990s and early 2000s. According to McKinnon (2007), decoupling can happen in three ways: the modal split (road freight t-km to total freight t-km), increased vehicle utilisation (vehicle km to t-km) and emissions (ratio of emissions to vehicle km—any increase in emissions per vehicle gives rise to an increase in the external costs associated with road transport).

A small amount of concentration appears to have taken place in the 1980s after deregulation, resulting in increased productivity, as the load factor increased substantially (t-km ÷ v-km; EEA, 2001) while GDP accelerated and empty running was reduced, resulting in decoupling. This can possibly be seen as a market correction; with the removal of economic barriers the market adjusts to reach equilibrium.

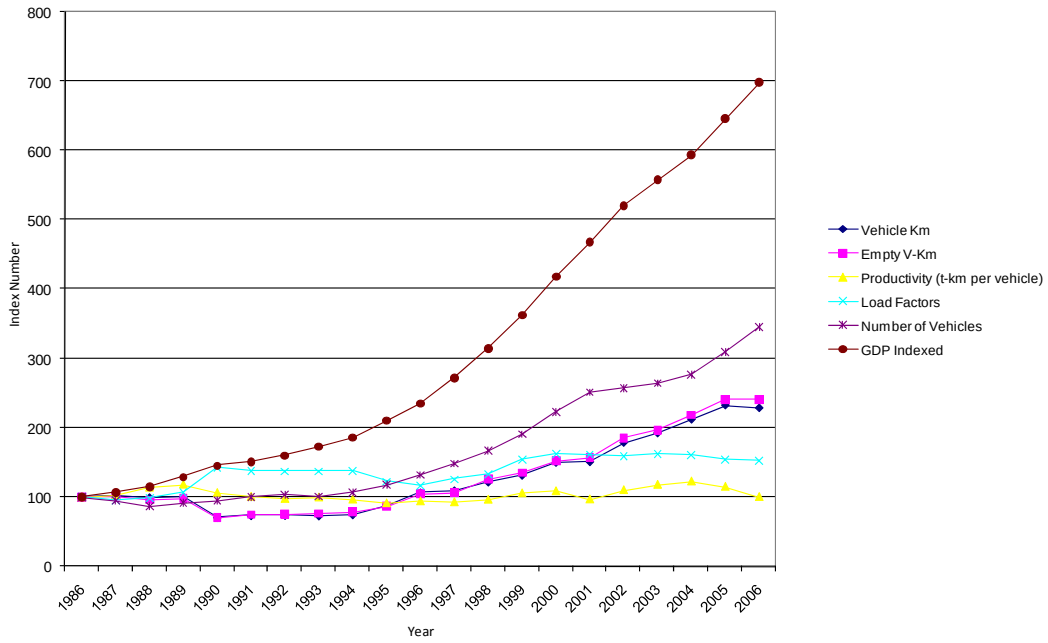

Figure 2.4 Index of productivity indicators

(Compiled from the CSO Road Freight Transport Surveys, 1986-2006)

From analysing industry developments under the classification of carrying-capacity effect and capital-efficiency effect *(*Aylward and O'Toole, 2007), it appears that Ireland has seen a rise in productivity from increased vehicle tonnage (carrying-capacity effect); this would account for the decoupling observed. Since 1990 the capital-efficiency effect and empty-running have remained relatively stable.

Figure 2.5 illustrates the level of increase in road freight activity in Ireland in comparison to its European neighbours. Ireland had an enormous increase in the level of freight intensity (ratio of tonne-km to GDP) from 1995 to 2003 and one of highest levels of empty running (1999–2007) in Europe: approximately 35 to 40 per cent of truck kilometres (McKinnon, 2008).

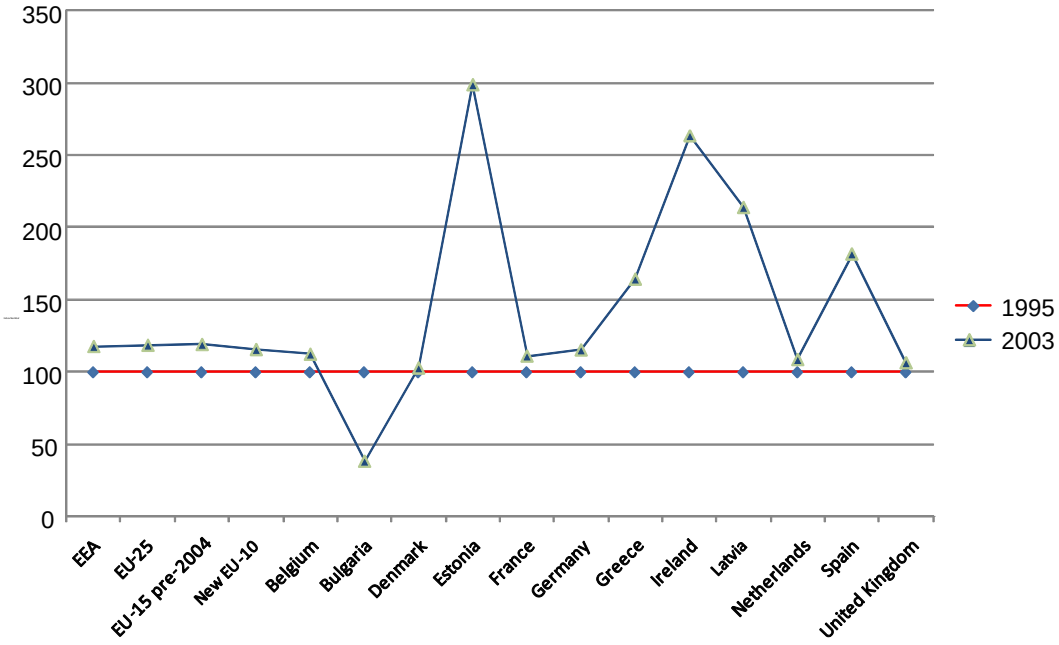

Figure 2.5 EU freight intensity indexed at 1995

(Source: EEA, 2005)

In the 1990s Ireland's economic boom ('the Celtic Tiger') was export driven, with the majority of goods transported by road; considering this in association with the increased productivity, a return to nearly equal proportionality in the elasticity figure was observed in period two.

Figures 2.6 to 2.12 were compiled from the freight activity surveys undertaken by the CSO. The statistics indicate a slowdown of road freight activity in the later years. Period Three's (2003–2006) elasticity figure demonstrates a weak decoupling. When the peaks and dips are ruled out, that is, examination of the elasticity over two decades (Period Four) is undertaken, an overall weak decoupling is evident, similar to that of Period Three.

The reason as to why decoupling is taking place is of key interest. However, it is a difficult area to measure as there are a number of confounding variables. Firstly, the nature of the economic growth affects elasticity; as economies develop a shift occurs from manufacturing to services-based activity. If the growth in the service economy occurs at a faster rate than growth in manufacturing, then this should have a downward pressure on the relationship of transport-activity to economic-growth. Also, the use of more efficient vehicles, factory-gate-pricing and Information and Communication Technology (ICT) can have a decoupling effect (McKinnon, 2007).

The many different sectors and types of goods in the road freight industry affect the t-km figures. There appears to have been a shift in the level of activity in the different sectors, representing a change in the type of freight transported.

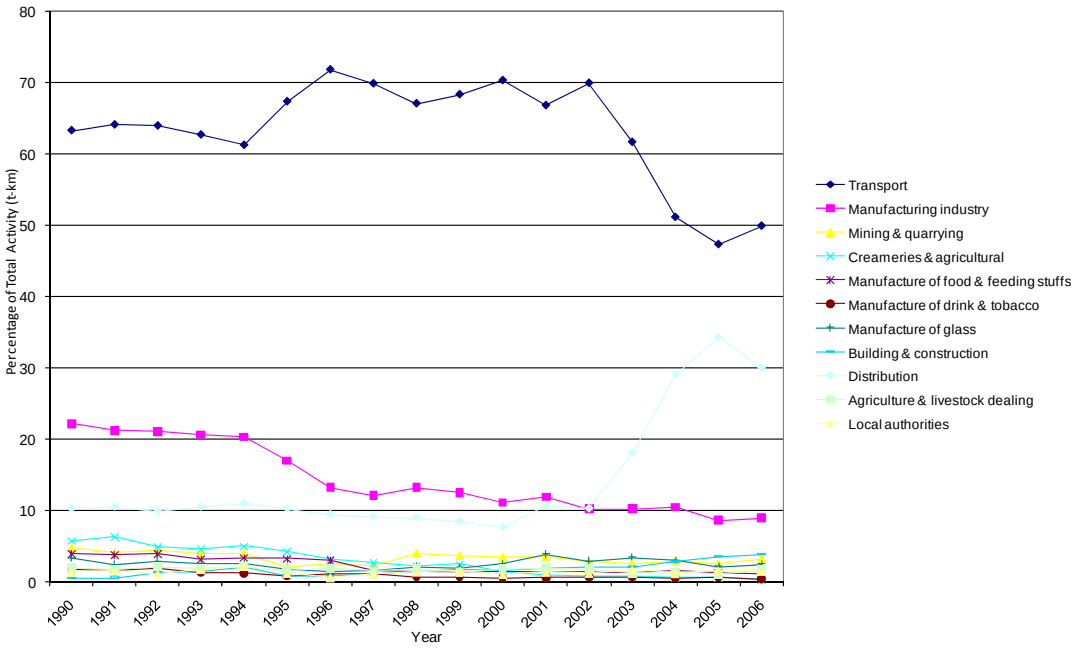

Figure 2.6 Transport activity classified by business of owner

Figure 2.6 demonstrates a significant shift in the early 2000s from transport to distribution. Within the distribution sector itself, a shift can also be seen from OA to H&R (Figure 2.7).

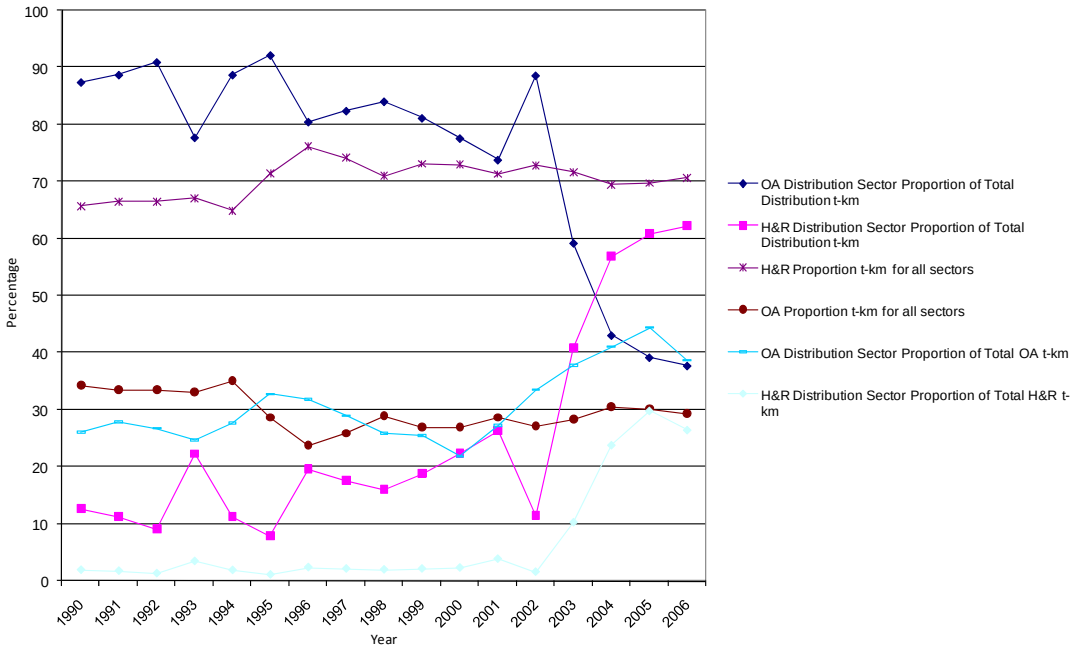

Figure 2.7 Comparisons of distribution proportions for H&R and OA

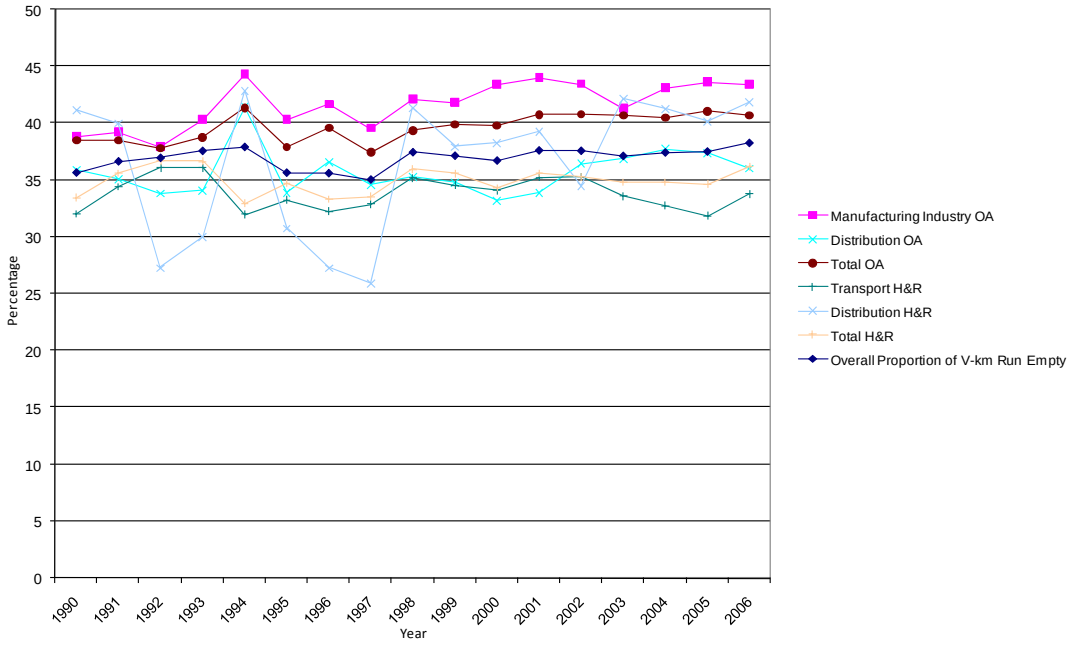

Figure 2.8 Percentage of empty running: v-km of total v-km within sector

However, over the time period, the H&R distribution sector's empty running figures are quiet high. The increase for distribution H&R towards the right-hand-side of Figure 2.9 can be seen to represent a distribution-H&R activity increase within the overall proportion of road freight activity. This becomes a serious threat to the overall efficiency of the road freight sector, considering the likelihood of distribution-H&R accounting for an increased proportion of total road freight activity in the future.

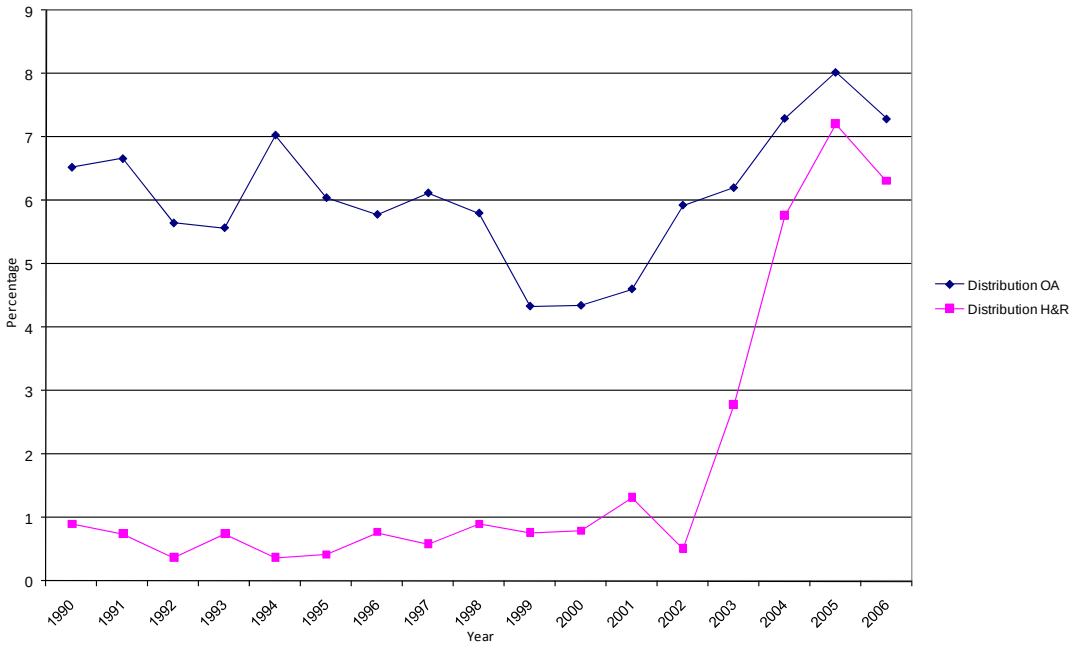

Figure 2.9 Empty running percentage of total v-km of all sectors

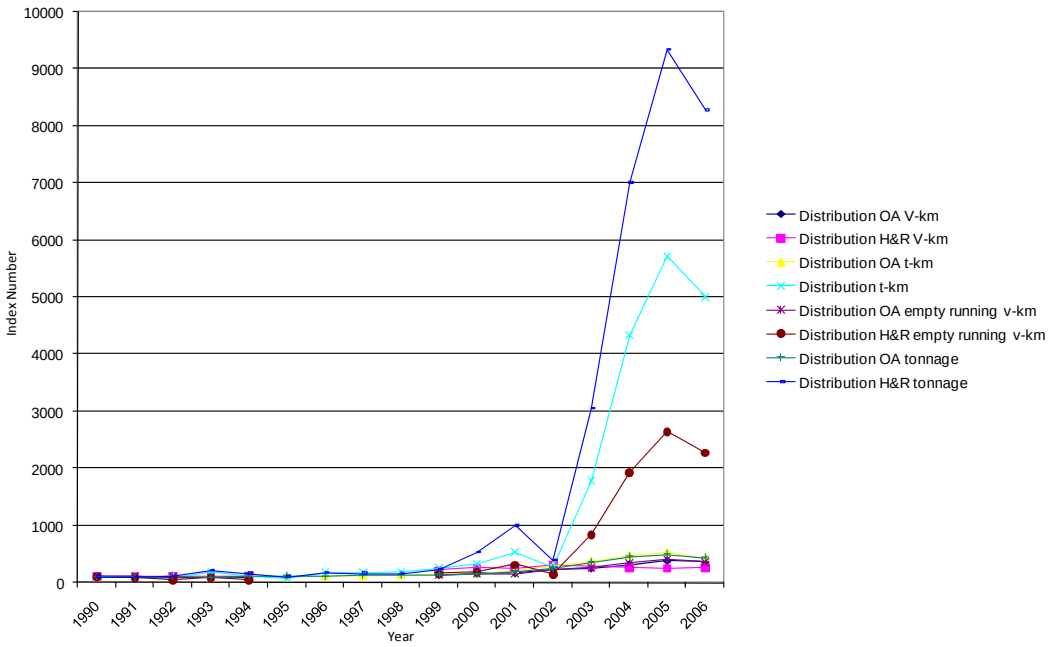

Figure 2.10 Distribution activity indexed at 100 at 1990

Looking at an explanation for these figures, the commodities classified as crude and manufactured minerals, building materials may have shifted into the distribution sector. This would explain the relatively high level of empty running, as it tends to be difficult for the carriers of these types of goods to obtain back-loads.

Figure 2.11 illustrates a significant shift in the unladen-weight of vehicles purchased, with heavier vehicles representing higher proportions of the total vehicle fleet. Trends in vehicle unladen weight between own account and H&R appear to be similar.

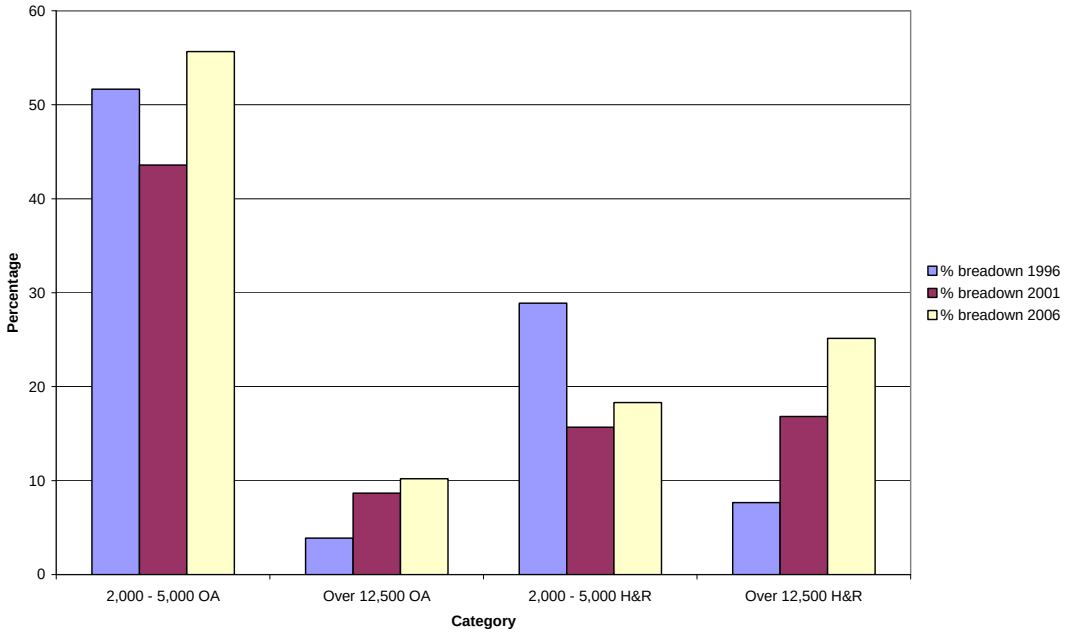

Figure 2.11 Shifts in number of vehicles in various unladen weight (kg) categories

It is not possible to calculate the load factors per vehicle in each sector, with the view of obtaining a somewhat disaggregate indicator of efficiency. As the number of vehicles in each sector of business of owner or main use of the vehicle were not measured in the surveys.

There are limitations to the statistics. They are only in relation to licensed operators in the Republic of Ireland. Therefore they do not measure foreign operators' activity in Ireland.

When comparing the activity of different sectors, consideration needs to be given to the heterogeneity of the sectors, such as varying average distances and that they carry different goods which also have varying characteristics, for instance, weight and volume. Figure 2.12 provides data that describe growth in activity and in vehicle usage for building and construction business

owners. The construction sector travels on average 15 km per trip, but has a higher tonnage. The distribution sector has longer average per-trip distances, but is volume-based, hence it has lower tonnage figures.

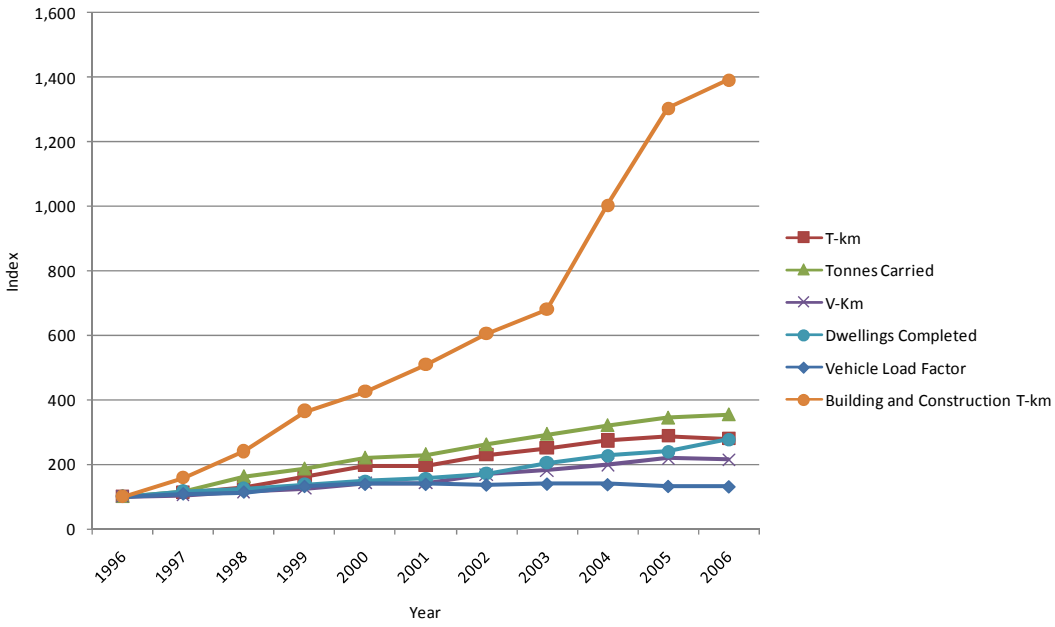

Figure 2.12 Comparison of road freight activity of building and construction business owners

There are a number of methods to increase the efficiency of transport logistics. Studies on the development of consolidation centres and collaborative ventures report positive results for utilisation and efficiency. This can assist the decoupling effect. Increased utilisation results in less vehicles on the road, lower transportation costs and less external costs (owing to emissions, noise, road space, accidents).

2.3.2 Collaboration

As a result of the general lack of economies of scale in road freight transport, other methods need to be considered in order to increase efficiencies and productivity (ECMT, 2002; OECD, 2001).

Collaboration has been investigated in a number of different industries. One of the recent extensions to the framework of investigations has been Collaborative Transport Management (CTM), focusing on Logistics Service Providers (LSPs). However, the term collaboration needs to be clearly defined, as numerous terms tend to be used, such as co-ordination, co-operation and consortiums.

There are various definitions of collaboration, for example "*Joint planning and execution of supply chain activities*" (Ayers, 2006: 208). This thesis adopts the definition by Simatupang and Sridharan (2002: 19) with a slight adjustment "*Two or more independent companies work jointly to plan and execute supply chain operations with* (the aim of) *greater success than when acting in isolation"*. The rationale for the adjustment in the definition, indicated by parentheses, is the fact that collaboration can be unsuccessful. There are few successful practical examples available across Europe (ECR, 2000b).

Table 2.2 Levels of intra-industry collaboration

Type	Indicators	Integration Level
Traditional	Adversarial	None
Informal Co-operation	Sub-contracting Ad hoc asset sharing	Low-Medium
Contractual co-operation	Shared demand Committed capacity	Medium-high
Consortium joint ventures	Multiple partners Relationship management 3rd party information hub	High

While the maximum benefits to operators appear to be from consortiums, organisations usually experience a number of phases before achieving this level of collaboration (Sutherland, 2003).

The term collaboration, as referred to in this thesis, is an umbrella term, incorporating the specific phases outlined in Table 2.2.

2.3.3 Justification for Collaboration

The Irish road haulage industry exhibits a structure dominated by single-vehicle owner-managed operators. Competition for high value contracts can be tough, especially when the customers are large organisations that have a preference for developing a relationship with only one transport service provider. However, there is evidence from the United States that this recent trend is being challenged and transport buyers are going back to smaller operators, principally due to capacity issues (O'Reilly, 2005).

Joining forces to form a road haulage consortium can allow small-to-medium operators obtain these higher-value logistics contracts. While this is not a

new concept, the potential benefits of such collaboration warrant serious consideration. Consortiums in the UK have been successful in this strategy.

The benefits of collaboration include the maximised utilisation of assets that can be achieved through two principal methods of operating. The first is co-loading or consolidating loads; this involves combining less-than-truckload (LTL) freight to create full truckloads, increasing utilisation and reducing the number of trips. The second is continuous move routing; this involves the creation of tours that reduce one-way movements and empty kilometres. It converts separate consignments into multi-stop trips to reduce costs (Schoemehl, 2004).

The Department for Transport in the UK has guidelines for operators who wish to explore this route through its Transport Energy Best Practice Programme. Equal partnership is encouraged in the consortium. The setting up of an independent control centre as a facilitator that manages the contract with the customer(s) and links activity levels to the vehicle pool is recommended.

Clearly Key Performance Indicators (KPI's) are important to give managers the information they need in assessing, evaluating and controlling the achievements of the consortia. Consortia have reported a number of additional benefits other than winning contracts: in particular, increased operational efficiency. The advantage of having regular-route contracts allows the consortium to source back-loads, increasing utilisation of assets.

Without doubt, information and communication technology (ICT) is an important component (ECR, 2000a; ECR, 2000b; Lalwani and Mason, 2004). It should be enabled to use LTL and TL data from multiple operators to identify collaboration opportunities, propose continuous move routes and shift freight from LTL to TL. The system should also offer Internet visibility, so shippers can accept or reject their portion of the co-loads and/or continuous move routes, and check shipment status online. Research indicates improved transport performance through better visibility, integration, control and planning possibilities resulting in improved asset utilisation, including vehicles and warehouses. However, larger companies (in the UK) appear to be reaping the benefits within the transport sector (DfT, 2004).

Thompson (2003) suggests a potential remedy for the low level of participation of small and medium operators in usage of ICT. The required information platform's base infrastructure (data collection, processing and communication technology) could be supported by the public sector in order to reduce the burden of knowledge and capital required for small operators to invest in advanced technology. Some operators may also be wary of ICT due to perceptions of freight exchanges being price-competition-based and not the collaborative relationships that they desire. Further in-depth operational techniques are discussed in the report Working Three-gether (ECR, 2000b).

However, not all freight exchanges are overly successful. There are many hampering factors too, such as inappropriate loads (difficult to standardise), unreliable logistics service providers, mistrust among the market players, reluctance to share know-how, lack of neutrality among the exchange

providers, or problems in finding appropriate pricing mechanisms (Polzin, 1999, in German, cited by BESTUFS, 2001).

Not only does collaboration have financial benefits for the operators involved, but for society as a whole. Sustainability and JIT appear to be at odds with each other. Increased frequency of delivery has the potential to cause problems with increased complexity of scheduling which may reduce opportunities for return loading, utilisation and also the environmental impact. Supply Chain co-ordination such as collaboration and freight consolidation initiatives will aid sustainability, through the upholding of load factors and vehicle productivity (McKinnon, 1999a). It appears to be a win-win situation for society and commerce.

The use of collaboration in cross-border expansion efforts appears to be minimal. Research on the expansion of UK Logistics Service Providers (LSPs) into Europe indicated that acquisition was the most favourable route, ensued by organic growth and piggybacking. The use of green-field sites has been perceived as risky and caution has surrounded the use of strategic alliances. Alliances appear to have been used to improve services to customers by following customer demand, as opposed to European expansion (Stone, 2001).

E-commerce also has implications for freight transport, because of its emphasis on deliveries in residential areas. Consolidation of e-commerce deliveries would be desirable for residents and would benefit freight transport providers by improving vehicle load factors, increasing drop densities and reducing the number of vehicles. *"This would benefit the company (higher*

efficiency), the customer (lower delivery costs) as well as the other residents (less traffic)" (BESTUFS, 2008: 62). However, many difficulties surround collaborative approaches such as: problems of logistics, cost accounting and distribution among the partners. Nevertheless, some consortiums have shown that it can be done.

E-commerce gives logistics service providers the opportunity to escape the fierce price competition by establishing long-term contracts and relations through close collaboration. However, with logistics becoming a core business in the e-retailers' value chain, they may try to keep control of this important process (BESTUFS, 2008).

Everything is not positive when it comes to collaboration. Some issues need to be addressed. Change in the operators' culture, moving from a traditional adversarial to a co-operative approach, and alleviation of fears and distrust need to be achieved. In order for consolidation to be successful, certain components are necessary: these are primarily the network capability of the LSP, as appropriate for the volume of throughput, and the flexibility and willingness of all participants to co-operate (ECR, 2000b)

Successful collaborative ventures not only benefit LSPs and supply chain partners—they have a broader economic benefit to end-consumers and non-consumers through reducing negative externalities.

The tipper and construction sector of the industry, which have a substantial proportion of tonne-km in Ireland, also have a role to play. The London Construction Consolidation Centre resulted in increased efficiencies in the

movement of construction material by reduced traffic congestion, reduced journey times and improved safety (DfT, 2007).

The Efficient Replenishment Project, phase two, demonstrated that LSPs are in an ideal situation to lead collaborative ventures. They are potentially in a neutral position and can facilitate restructuring of customers' distribution networks. The LSP is in a position to maximise distribution savings depending of the size, density and volume of the network. The project relieved the consolidation of manufacturers' distribution networks by utilising an LSP, which resulted in a twenty-eight per cent reduction in the number of shipments and a thirteen per cent reduction in logistics costs (ECR, 2000b).

2.3.4 Pallet Networks

Harrison (1963) advised of a new phenomenon where small operators were co-operating to reduce costs and compete for larger contracts. This area has grown substantially over the years with co-operation being recognised as a viable method to increase utilisation levels, therefore reducing unit carrying costs.

One of the principal issues in regard to transport co-operation and intermodal transport is the unit of transport. A standardised unit of transport, such as a pallet, facilitates transhipment and reduces space allocation issues. SCM principles and competitive pressures have lead to a rationalisation of transport costs and a search for economies of scale and scope (Groothedde et al., 2005).

Pallet networks have grown in popularity as a means of gaining these economies. Pallet networks offer consolidation of loads and therefore increasing utilisation levels. They also allow the members to pool resources reducing the burden of investing in fixed cost assets. Each member is based in a geographical region and members are reliant on other members to supply the consignments. In brief the members operate through a hub system. The hub is used to connect and tranship the consignments, resulting in higher inbound and outbound loads to and from the hub. It allows the members to offer distribution services to geographical dispersed locations. If the destination of the consignment is local, the member may decide to deliver it outside of the network as this may be more economical (Beaumont, 2004). Communication and co-ordination are imperative enablers in such networks.

The Wisbech Roadways case study illustrates the benefits of pallet networks through comparison of key performance indicators with industry benchmarks: vehicle fill of 85% versus the UK national average of 69%; empty running at 16% versus the UK national average of 19%; average weight-based factors of 82% in comparison to an industry average of 53% (DfT, 2006). In comparison, Ireland's empty running (across all sectors of the industry) is 35 to 40 per cent of truck kilometres (McKinnon, 2008).

For a practical guide to pallet networks and further information on the efficiencies that these networks can bring, the reader is referred to Beaumont's (2004) report and the development of one of the larger road freight collaboration networks (the National Freight Co-operation) is illustrated in Carroll's (2005) prosopographical case study.

Current pallet networks are attempting to grow and compete by offering services beyond national borders; principally to continental Europe (Anon, 2009). However, pallet networks are not limited to road freight. Groothedde et al. (2005) carried out a case study of intermodal pallet freight collaboration. The case study examined the shifting of loads to more appropriate modes. The characteristic of the goods and the resources available facilitated inland shipping, as the case study was based in the Netherlands which has inland waterways and the goods being transported were weight intensive.

Scale was an important component in this type of network as the capacity of a barge was 200 pallets (approximately 20 trucks). The hubs (for the transhipment of pallets from trucks to barges and vice versa) needed to be highly utilised in order to reduce the fixed costs per unit of throughput. If a high throughput was not achieved this would reduce the number of barges moving goods per day and therefore increase lead times. Higher throughput resulted in regular departures. This is important for certain sectors of industry, such as the fast moving consumer goods (FMCG) market, where quick responses are required. The network utilised a parallel transport system to maintain flexibility and the facility to expedite consignments. Road freight was used to increase the agility of the network by dealing with peaks in transport demand and urgent transport needs: as road transport for this network was approximately five times faster than the barge at reaching its destination. Road transport was also more cost efficient for local distribution (Groothedde et al. 2005).

Network design of hub and spoke systems is notoriously complex. The complexity revolves around finding the optimum location for the hub. If there

are multiple hubs in the network, questions arise in regard to the assignment of the point of origin/destination to one hub or multiple hubs and if points of origin and destinations are allowed to be directly connected (O'Kelly and Miller, 1994).

Horner and O'Kelly (2001) argue that hub systems are attractive to transport firms as they concentrate traffic flow density gaining economies of scale. They critique models of hub and spoke assessment as being over-simplified as many models do not take into consideration the traffic flow between links. They thereby imply that the discount obtained by using hub and spoke designed networks is due to internal considerations. A trade-off is present for firms contemplating a hub and spoke system. The discount gained from increased utilisation levels should offset the fixed investment in a hub network. Therefore, a minimum traffic level through the hub system is required. Firms would have to individually carry out a cost/benefit analysis by assessing their traffic flow. The sharing of resources can increase the traffic throughput and decrease the burden of the fixed investment. Thus the cost curve of the hub is concave in nature (Horner and O'Kelly, 2001).

Groothedde et al. (2005) compared the cost per pallet shipped via the hub network (barge and road transport) to direct road transport. However, as the consignment characteristics would vary with each shipment certain assumptions had to be made; such as the number of pallets, utilisation levels, distance travelled, origin and destination. The cost per pallet for direct transport was €17.37 in comparison to the hub network €15.05 per pallet. Almost 50% of the hub network cost per pallet was the road transport

element (from point of origin to the hub and from the hub to the destination). This illustrates the importance of hub location optimisation.

As resources are shared the fixed cost per unit will fall as more members join the system (assuming there is spare capacity). A natural threshold is reached due to diminishing marginal returns. As new members join the hub network the dilution of the fixed costs would be reducing. New members would be expected to make a contribution to compensate the initial members that invested in the fixed assets. Also, as the number of members increase the venture may become unmanageable in practical terms (agreements and co-operation). Therefore it may no longer be advantageous to the members in the network to accept new members once it reaches a saturation point (Groothedde et al., 2005). Increasing the number of warehouses has the potential to increase inventory costs and therefore total distribution costs, as per Figure 2.13.

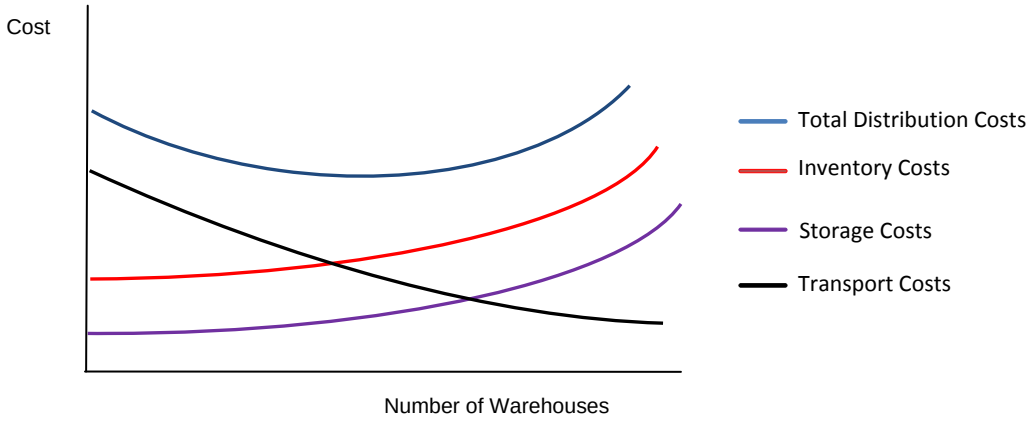

Figure 2.13 Logistical cost tradeoffs (Source: McKinnon, 2003)

The reader is referred to Croxton and Zinn (2005); and Croxton et al. (2003) for a review of complex modelling approaches to costing that consider inventory and location decisions.

2.3.5 Sustainable Logistics

Ireland is in a difficult position in regard to reducing its transport emissions as it is nearly the worst in the EU table for increases in emissions for the period 1990–2005, as seen in Figure 2.14 (EEA, 2008a).

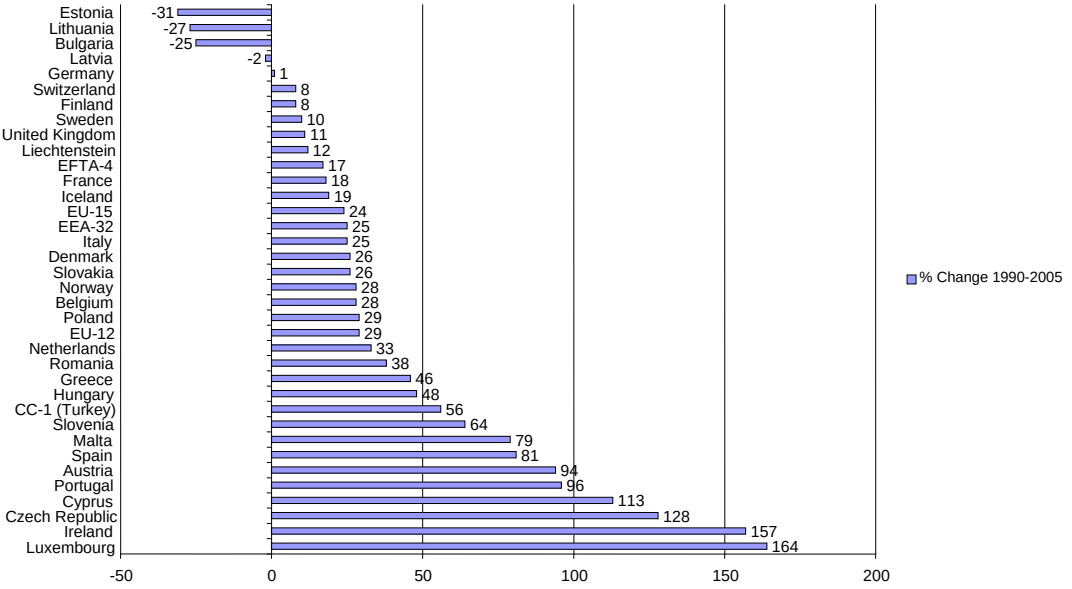

Figure 2.14 Greenhouse gas emissions from transport sector (EEA, 2008a)

Road freight experienced the largest growth in transport energy use from 1990 to 2006, increasing by 255%. Private car transport increased by 119% over the same period.

Since 1990 there appears to have been an expansive elasticity of road freight fuel consumption in comparison to GDP (SEI, 2007). However, fuel consumption fails to take into consideration that vehicle technology is

improving in relation to reducing vehicle emissions; therefore, the relationship between fuel consumption and emissions is unlikely to be constant.

Even though there are advances in vehicle technology, ever-increasing t-kms of goods are transported by road in Ireland (prior to the current economic slowdown). Hence, the targeting of the road freight industry appears ideal in order to aid Ireland in meeting the toughest target in cutting greenhouse gas emissions in Europe, a twenty per cent cut by 2020. Meeting the target is likely to cost the economy up to €1 billion per year by 2020 (Smyth and De Bréadún, 2008).

Calculating the costs of the emissions is not simple, with varying estimates of what will be the price for carbon credits. This uncertainty is an impediment to calculating economic tradeoffs, the broader social economic costs and benefits to the people of Ireland.

In calculating the CO_2-emission-related efficiency of road freight vehicles an indicator metric, t-km per emitted kg CO_2, is normally used (McKinnon, 1999b). The exact emission will of course depend on the vehicle; however, reference is made to a German study where the mean CO_2 efficiency (E) was 10.4 t-km/kg CO_2. Emission efficiency did show a large variation of between 0.8 and 26 t-km for 1 kg of CO_2 emissions (Leonardi and Baumgartner, 2004). The mean speed and the size of the vehicle also have an effect on vehicle emissions (Beuthe et al., 2002). Urban versus inter-urban road transport will have significantly different emissions per t-km.

There are calls for EU transport policy to act upon the growth of emissions, as it was a major stumbling block for the EU in meeting its obligations under the Kyoto protocol. The EU and others are going beyond simply demanding cuts in the transport sector's emissions (Beuthe et al., 2002). They are proposing integration of land use and transport in urban planning, as, within the EU-15, cities account for approximately eighty per cent of traffic congestion costs (EEA, 2008b).

Congestion is a significant problem in Dublin, with an average speed of travel during the peak period of 19.6 km/hr and 35.6 km/hr during off-peak periods (Gibbons and O'Mahony, 2002). Considering that Dublin is by far the centre of economic activity in Ireland and that the main route of import and export is through Dublin Port (Carl Bro and Goodbody, 2006), this congestion has significant implications for transport-logistics efficiency. The Dublin Port Tunnel may have relieved these figures to some degree.

EU policy is currently applying the 'polluter pays' principal. Internalisation of externalities in the road freight industry is currently being explored under the rationale that road freight operators should pay full costs, both the internal (operating cost) and external costs (emission, use of infrastructure, noise, congestion and accidents).

Ireland's road freight industry operators are not paying the full price, that is, the current levels of taxation do not cover the cost of all externalities. The figures would again vary per vehicle class. Research in regard to the UK indicates that, on average, a rise of about fifty per cent in taxation is needed to internalise externalities (Piecyk and McKinnon, 2007). As the UK has

higher diesel duty in comparison to Ireland, it seems logical to assume that an even greater increase in taxation is required in Ireland to achieve the same goal.

While there are a number of methods for achieving a reduction in emissions, it is apparent that no one single approach will result in Ireland meeting its obligation. It appears that collaboration has a role to play, with the resulting increased efficiency aiding the reduction in emissions through increased utilisation in both the carrying capacity effect and the capital efficiency effect.

While it would be ideal to give an estimate of the economic benefit collaborative ventures would provide through reducing the cost of externalities in Ireland, the figures are quiet broad in many of the previously mentioned studies and the limited statistics in relation to particular types of road freight would result in an estimate of the economic benefit of collaborative ventures being extremely crude and of limited benefit. With the statistics put-aside and a qualitative perspective taken, it is fairly clear from the previous argument that collaboration has an important role to play in aiding Ireland obtain a sustainable road freight transport industry.

2.4 Competitive Environment

The Irish road haulage industry is extremely competitive for a number of reasons, such as, low barriers to entry and a large number of small players. This results in a fragmented industry with eighty per cent of hire and reward haulage firms having three vehicles or less (Plant et al., 2003).

The haulage industry's margins are being squeezed. In recent years fuel costs have risen substantially, alongside generally high inflation. Driver shortages were an issue in relation to the working-time directive. The challenges have recently shifted emphasis to the broader economic environment. There is little to indicate that the industry's fragmented nature is easing or that consolidation of operation is occurring.

Future environmental and sustainability policies may well increase haulage operating costs, particularly if governments pursue a policy of making operators pay the full cost of transportation, including both internal and external costs. Considering this and the current slowdown in Irish and World economic activity, it looks likely that the industry will come under increasing pressure.

2.5 Policy Development

"*Economic efficiency ought to be the primary goal of government transportation policy*" (TRB, 2003:6). Irish government policy has been somewhat lacking in the area of improving logistics efficiency. The likelihood of surface transport being included in the Emissions Trading Scheme (ETS) after 2012 may have stimulated the Irish Department of Transport (DoT) to

develop a sustainable transport agenda: ‘2020 Vision—Sustainable Travel and Transport’. While it principally relates to public transport, road freight is also addressed. It highlights the general operational challenges and the potential to improve logistics efficiency (DoT, 2008a).

While ‘2020 Vision’ appears to represent a move by the Irish government towards sustainability, other reports had previously been compiled, such as the Indecon report (1999) and the Forfás report (1995), but there appears to have been little, or only limited, enthusiasm by government for stimulating and advancing logistics activities in Ireland.

There are one or two exceptions to these comments, such as the establishment of the National Institute for Transport and Logistics (NITL) in 1998, with National Development Plan funding, and the LogisticsXP programme which was aimed at creating efficient supply chain solutions for small and medium enterprises (SMEs) (InterTradeIreland, 2006).

The benefits of collaboration and freight quality partnerships were highlighted by a Dublin Transport Office (DTO) report (Carl Bro and Goodbody Economic Consultants, 2006). However, little evidence exists of government support to progress the development and uptake of these principles within industry. This is quite possibly due to a perception by government that the application of these techniques is beneficial to the bottom line of the logistics firms and, hence, self-adoption makes economic sense and therefore promotion should not be necessary. While the recent consultation document appears promising, previous government policy appears to have been somewhat weak.

Limitations on vehicle dimensions have an impact on the efficiency of road transport. Volume is an important aspect of goods transportation; hence vehicle height, weight and length have an impact on the costs to industry and also on the costs of externalities to society. The Irish government has implemented a maximum vehicle height limit of 4.65 metres (DoT, 2008b). Consideration needs to be given to the fact that one of our most important trading partners, the United Kingdom, has no maximum vehicle height. However, there has been the development of a custom height of approximately five metres (McKinnon, 2005). The lower vehicle height limit in Ireland has implications for the efficiency of transporting volume based goods. It can be speculated that the rationale behind the Irish government's introduction of height limits relates to the Dublin Port Tunnel, the Limerick tunnel and other infrastructure.

The Irish government is also implementing the Transport 21 project. The key features in this are primarily investment in infrastructure, that is, public transport in Dublin through extending and developing new tram lines, new metro lines and road infrastructure projects between major urban centres around the country.

The UK also has a higher weight limit for road freight vehicles in comparison to Ireland's weight limit of 42 tonnes, depending on the number of axles (DoT, 2008c). While the issue to increase the limit in the UK was controversial; the economic and environmental gains have outpaced expectations (McKinnon, 2005). The UK is also commencing trials on vehicle lengths.

The UK government's policies in association with the UK Department for Transport's Freight Best Practice programme appear, overall, to exert a positive influence in developing efficiencies in transport logistics. In comparison, the Irish government's policies seem to involve a degree of procrastination.

Looking beyond Irish policy, the European Union has made a commitment to promoting sustainable mobility through advanced transport logistics. One of the principal areas to be addressed is the potential barriers to advancing transport logistics and the attitudes of industry to this advancement. It is recognised that there is currently insufficient research in regard to these barriers and that there is a need to establish a measurement and benchmarking process (CEC, 2006).

There tends to be consensus with regard to the development of freight transport logistics primarily being an undertaking for the business community. However, the EU realises the potential benefits in having an effective, streamlined and value-adding logistics industry. Policy has a role to play in establishing the appropriate environment for logistics development (CEC, 2006). It is also recognised that the extent of research in Ireland (Indecon, 1999) and the European Union is insufficient to monitor or benchmark the industry's evolution over time or to provide a reliable picture. "*At the moment there is no comprehensive picture of concrete obstacles (bottlenecks) that hinder freight transport logistics from developing faster in Europe*" (CEC, 2006: 5). The EU has set out to increase the efficiency of transport through

greater integration and development of a common transport policy (CEC, 2001).

2.6 An International Comparison of the Irish Industry

Freight transportation within the Republic of Ireland, in comparison to many other member countries of the Organisation for Economic Co-operation and Development (OECD), is highly dependent on carriage by road, with approximately ninety-eight per cent of freight t-km carried in this manner (SEI, 2007).

The Irish road haulage industry exhibits a structure dominated by owner-operators of a single vehicle, performing basic transport services in contrast to other OECD countries (Boylaud and Nicoletti, 2001). This has implications for Ireland's economy by reducing the efficiency of businesses and the future attractiveness of Ireland as a location for foreign direct investment. As Ireland is essentially dependent on road freight, it has the potential to gain significantly from decoupling it from economic growth.

Ireland's road freight industry structure appears similar to that of Denmark, with an average of 3.8 employees per firm in the Danish industry and 4.8 in the Republic of Ireland (Boylaud and Nicoletti, 2001). If it is assumed that certain conditions in Denmark apply to Ireland, a significant point is that organisational change in the Danish transport sector is considerably lower than that in other business sectors (Sornn-Friese, 2000). Links can also be seen with the structure of other freight industries, such as the U.S. rail freight. Its fragmented nature has led to inefficient shipments and congestion. According to Lanigan et al. (2007) sharing facilities brings financial, energy

and time benefits for shippers and carriers. To summarise, the Irish industry's structure is leading to ineffective and unproductive operations and therefore services to customers (JBC and InterTradeIreland, 2002). Krajewska (2008) argues that with the increase in globalisation that competitiveness and efficiencies are increasingly important. Smaller freight enterprises can gain economies of scale and scope through collaboration in order to gain these efficiencies and maximise their profits. The reader is referred to Krajewska (2008) for a detailed approach to financial modelling of collaboration in transport and the assumptions of such approaches.

2.7 Summary and Conclusions

The use of JIT has forced many organisations to look in more depth at their transport suppliers. Given Ireland's distribution of manufacturing and other organisations throughout the country, it would be extremely difficult for the economy to operate without road haulage and, in a sense; many firms are dependent upon its effectiveness and efficiency. However, Ireland's enormous increase in freight intensity and high levels of empty running have implications for business efficiency, the economy and the environment.

As supply chain management involves a high degree of integrated planning in which transport plays a key role, undoubtedly communication and relationships are of key importance.

With the likelihood of the continuation of momentum of the activity in the Irish distribution sector and in consideration of the sector's high level of inefficiency and unproductive practices, the distribution sector appears an ideal target for a programme to address these issues. The figures suggest

that haulage operators are not developing into third-party logistics providers. It is unclear how this will progress in the future, as there is a lack of comprehensive research in this area.

While the heterogeneity of the various sectors of the road freight industry is recognised, collaborative ventures, both vertical and horizontal, have a role to play in logistics efficiency in Ireland and beyond. This heterogeneity would influence the effectiveness of collaboration aimed at meeting the goals of sustainable logistics and decoupling road freight activity from GDP.

As the distribution sector is becoming the primary sector of road freight activity, an increase in efficiencies in this sector would benefit the industry as a whole. There would be positive spin-offs for the economy and Ireland's competitiveness and, of course, a reduction in negative externalities.

3 NEO-CLASSICAL ECONOMIC THEORY OF THE FIRM

3.1 Introduction

The chapter aims to discuss the traditional view of the theory of the firm. As noted by Shen (1970), there are two factors affecting the supply side of firm growth; economies of scale and organisational parameters. This chapter addresses the first of these factors, economies of scale. It highlights the key assumptions associated with neo-classical economics, its lack of realism and how it has been applied in studies of road freight. It concludes with an alternative approach for investigation.

3.2 The Neo-classical Theory of the Firm

Neo-classical economics deals with the theory of the firm (also referred to as microeconomics). It states that the objective of the firm is to maximise profit and that this is achieved by the firm choosing the least costly way to achieve a certain output. The premises of neo-classical perfect competition are: perfect and costless knowledge, maximisation of self-interest and profit, and resources being limited to land, labour and capital.

The neo-classical economic literature in regard to transport appears to possess a number of underlying characteristics. Some publications are descriptive in nature, such as transport textbooks referring to revenue. In other publications the emphasis is on techno-economics: these tend to be more technical in nature. Costs and revenue are associated with transported commodities or goods and with vehicle specifications. The aim is to minimise

costs through innovation and technology (JRC-IPTS, 2003). Ideological economics is represented in many cases by government and EU publications with references to deregulation and industry competitiveness.

Accounts-based literature has seen some attention and links with the neo-classical premise of perfect knowledge. The author believes that this section warrants due consideration and review. In a highly competitive market environment accurate calculation and control of costs is of the utmost importance. Without an accurate costing model a company could suffer considerable financial damage.

In order to accurately set prices, the cost of performance needs to be calculated accurately. Over-costing can lead to unnecessarily high prices, losing the company contracts and hence market share. Under-costing can lead to unintentional erosion of profit margins.

A leverage effect also applies to pricing. The difference between the price that the business obtains for its services and what the buyer is willing to pay has a direct impact on the bottom line (Urbany, 2001).

In order to control costs it is necessary to calculate them accurately and understand how they behave. It is clear that controlling costs is important for effective decisions and maintaining profitability.

Before an analysis of cost control can be implemented the accurate recording of costs is a prerequisite. Vigilance is required to ensure that all necessary figures are collected and recorded (Lowe, 1989). It appears that pricing

decisions in road freight are often subjectively determined based on experience rather than on accurate and up-to-date information (Lowe, 1989).

Rushton et al. (2000) refer to an effective costing system as having a number of uses. These are to identify rapidly that something is wrong, identify with a certain level of ease where the issue lies and, therefore, be able to take some form of action to bring the issue to a close. This monitoring approach has been applied beyond costing to operationally based key performance indicators of the firm's activities, such as utilisation.

Fish (1983) argues that there are a number of reasons why it is essential for a firm to calculate its costs accurately, such as:

- to know the rate at which the firm can earn a profit
- to quickly reflect increased costs in their charges and demonstrate to their customers the validity of the increases
- to analyse costs, monitor performance and update budgets
- for forecasting purposes, such as to forecast cash flow and operating profit
- to judge how long a business can survive without covering its full costs
- to compare forecast with actual results.

It is also important that companies do not base their costing on the misconception that they can use average industry costs. A company's costs could be well above average and, therefore, using industry averages for making pricing decisions, monitoring costs and pinpointing particular problems would be problematic and would likely lead to erosion of the

company's profit margins. In order to gain the ability to control costs, firms first need to record and measure them (Indecon, 1999).

Button (1982) advises of four reasons why hauliers misperceive costs:

- minor costs are not considered worthy of attention
- certain variable costs are treated as fixed
- ignorance with regard to the action-to-cost relationship
- route and trip regularity leading to non-revision of costing information

Duke (1994: 15) perceives pricing research as offering very few guidelines for approaching problems, referring to pricing decisions as "*a seat-of-the-pants activity*". Research into pricing has not addressed the need for simple and quick assistance to aid pricing decisions. However, Tellis (1986) argues that a standard mark-up on costs might penalise some products, as the product may be able to bear a higher price in the market. Average costs are also referred to as potentially misleading, if demand changes when pricing is based on a fixed and variable cost system.

Duke also suggests that standard educational material examines separate issues of the pricing decision, but does not address the interrelationships of these issues. He argues that companies need to address a pricing strategy matrix that gives consideration to consumer characteristics, the competitive situation and company objectives. Duke refers to Kotler (1993), Kotler and Armstrong (1994), McCarthy and Perrault (1993) and Zikmund and D'Amico (1992) for the standard 'text book' linear approach to price decision-making.

Bourdon (1992) refers to pricing strategies in competitive markets; in particular referring to the British Industrial Distributors (BID) sector. Bourdon believes the BID sector consists mainly of privately or owner-managed businesses. The market is referred to as monopolistic or locally oligopolistic. Price setting is inter-dependent with other suppliers and price competition is intense within the market. This leaves the market in a difficult position where profitability is concerned. The revenue and profit for firms within this sector is low and price cuts are quickly matched by competitors.

Bell et al. (1984) found that decision-making by UK hauliers was non-neo-classical. Companies appeared to be establishing with an undetermined promise of work and to be unaware of the profitability of their vehicles and services. Under-pricing also occurred somewhat prematurely, reducing the profitability of the firm, and decisions on asset purchase and replacement tended to be made intuitively rather than on an economic basis. Therefore the neo-classical premises of perfect knowledge and profit maximisation were not evidenced by Bell et al.

3.3 Critique of the Neo-classical Approach

The literature has moved towards a critique on neo-classical economics in recent years, with particular reference to its premises. The critics propose alternative objectives and challenge the reality of the assumption of absolute knowledge.

Many authors also challenge the assumption of economic rationality, based on empirical evidence. Others believe that profit maximisation is a must in order to survive in a competitive environment.

> *"The unsuccessful ones need to maximize profits but are unable to. Whether the successful ones do, in fact, seek other goals or whether they are able to maximize profits even if they want to, are questions for empirical determination. The growth of large firms with huge financial resources at their disposal, and the separation of ownership and control accompanying this development, reinforces the likelihood of other goals; and there is an impressive mass of evidence indicating that the decision process that takes place inside firms is a far cry from profit maximization."* (Maxcy, 1968: 89).

Many of the critics of profit maximisation can be classified into two groups. One group is composed of those rejecting the maximisation concept based on empirical studies. The other comprises those seeking to maximise some other goal.

The neo-classical economic defenders argue that the theory is based on logic and is not proposed to be an explanation of organisational decision making (Lipsey, 1995). However, organisational behaviour and decision making appears to bridge some of the gap between the empirical studies and neo-classical economic theory.

Johannessen and Olaisen (2008) critique the broader theory of Neo-classical Utility with particular regard to the maxim that we all act for the purpose of maximising self-interest. Johannessen and Olaisen argue that NUT is missing a moral code and that if we all maximise we would be acting like machines. Furthermore, they argue that the theory is only relevant to limited

realms of economic transactions. The theory also implies absolute knowledge, and ignores human expectations and bounded rationality in lieu of perfect rationality. Other frameworks have been developed mainly out of the critique of Neo-classical Theory. The Social Rationality Model (SRM) attempts to integrate neo-classical and behaviour economics (Folmer, 2009: 267):

> *"It is based on (social) psychological and anthropological work and assumes a cognitively plausible, social agent with rationality that is both bounded and subject to social influence"*

The Theory of Planned Behaviour is closely linked to the SRM framework as it was developed in social psychology and recognises social influence and a bounded rationality approach. The Theory of Planned Behaviour is further discussed in section 5.2.

3.4 Application to the Road Freight Industry

A discussion of the neo-classical theory of the firm in the context of the road freight industry would not be complete without discussing the effects of size and economies of scale on road freight transportation. These effects were briefly mentioned in Chapter 2 in a wider discussion; however, their importance and significance in influencing firm behaviour warrants an in-depth review. As mentioned in Chapter 2, Kritz (1973) concluded that, based on the road freight industry's structure, economies of scale were unlikely to exist within it.

A number of studies had taken place under the basic assumption that if economies of scale existed that costs on a per unit basis would be higher for small hauliers and lower for large hauliers. Roberts (1956), Chisholm (1959) and Harrison (1963) all concluded that no economies of scale existed and Chisholm indicated that there was potential for diseconomies of scale. Kritz (1973) questioned the methodologies and the generalisability of these findings, as the samples used tended to be of specialised sectors of road freight transport.

Bayliss (1971) carried out a comprehensive study on road freight economies in the UK context. The study's view of previous cost approaches was critical and pointed out that small firms tended to have smaller tonnage vehicles and fewer trailers than their larger counterparts. The study used more appropriate measures of size, such as unladen weight and number of hours of operation. The overall conclusion was that no economies or diseconomies of scale existed and that returns to scale tended to exist. However, Bayliss (1986) found that economies of scale exist on a vehicle rather than at a company level. Larger vehicles had a higher carrying capacity, therefore resulting in lower levels of driver wages and fuel costs per unit carried. Small haulage operators tended to use smaller vehicles in comparison to their larger counterparts. Larger firms then gained the economies of improved vehicle mix.

Bayliss (1986) also investigated the concept of Minimum Efficiency Scale (MES). His approach was from two angles: the first analysis of industry structure and the second from a cost approach. Industry structure analysis

proved difficult since the industry at that time was regulated and differences were apparent between the UK and other countries.

The alternative approach that was adopted was to analyse whether the growth rate accelerated above a minimum firm size. The assumption was, all other things being equal, that increased growth meant increased efficiency. Bayliss (1986) compared data from licence applications in 1953 with data from 1965. The study found that hauliers had increased in size in all size categories, where size was defined by the number of vehicles. The greatest increase was in firms that had more than ten vehicles, which increased three-fold.

Bayliss analysed MES through the use of regression and the measure of size by unladen weight. The study found that the growth rate had little variation (three per cent) at twenty tonnes (approximately five vehicles). However, at thirty tonnes it increased to eleven per cent and at forty tonnes it had grown even further to twenty-six per cent. The study concluded that the MES was in the region of six vehicles. Twenty-four per cent of the fleet had over six vehicles in 1953; this had increased to forty-one per cent in 1965.

Before any conclusions can be drawn consideration needs to be given to the fact that this research took place predominately in a regulated market. This potentially has consequences for the results of the survey.

In reference to the UK, Nelson (1965: 420) gives some insight:

> *"in motor trucking, government entry control has limited the number of firms and has encouraged large firms in spite of small fixed investment and the negligible evidence that larger firms were more efficient than small or medium sized firms"*.

A more important influence on the size of firms appears to be demand. Yet demand tends not to lead to one optimum size due to the heterogeneity of particular sectors of the industry and demand is also inclined to be local. It is important to note that this is based on a regulated environment, where restrictions were in place on the geographical market in which the transport service provider was allowed to operate.

One advantage that a large haulier may have over their smaller counterpart is in dealing with big business. Many firms now like to deal with one firm to provide them with certain services. It allows them to develop a relationship with this service provider and also saves them expenses in administration and co-ordination (Kritz, 1973).

A more recent view by the OECD supports Bayliss's conclusions on sectors. When the industry in broken-down under the classification of vehicle fill rates, less-than-truckload operators appear to have limited economies of scale. There also appears to be somewhat more concentration of firms in this sector, but high levels of competition still exist (McMullen and Tanaka, 1995; OECD, 2001). McMullen and Tanaka point out that traditional studies of economies of scale do not explore economies of integration which are important for LTL carriers that have not maximised their load factor and route

density, therefore requiring co-ordination and consolidation to increase utilisation levels.

Small operators can use clearing house (freight forwarders) and co-operation to increase vehicle fill rates. This potentially leaves the large firm with little scope for achieving cost savings. Co-operative organisations, without the individual firms increasing in size, can provide: a range of services, geographical or qualitative, that would otherwise be outside their means; obtain reasonable rates through the elimination of the middle man; allow small operators to compete for large contracts; and reduce costs through bulk buying (Harrison, 1963).

Overall, economies of scale seemed to depend on the sector (Emery, 1965). Smykay (1958) called for a shift away from the cost statistics, the assumption that shippers are purely cost orientated, and a move towards institutional analysis.

The Sornn-Friese (2005) study of the Danish trucking industry has implications for Ireland as there are considerable similarities in industry structure. Sornn-Friese (2005) points out that the theory of industry life cycle (ILC), which was developed in the manufacturing industry, tends not to fit the road freight industry as a whole, due to the heterogeneous nature via multiple subsectors of the industry. ILC is a process theory that seeks to understand the evolution of industries through a number of stages, that is, emergence growth, maturation and decline. ILC is based on economies of scale existing as a motivator for growth. As a result of the lack of economies of scale in certain sectors of the road freight industry, this theory is not generally

applicable. This has implications for previous studies that applied ILC in their analysis of industry development with forecasts of industry shakeout and consolidation (Sornn-Friese, 2005).

Bonaccorsi and Giuri (2000) refer to the turboprop engine industry and the lack of returns to scale resulting in a steady coexistence of generalist and specialist firms with a non-shakeout of the industry. Sornn-Friese (2005) applies this concept to the Danish road freight industry, but also highlights that economies of scale might be indeterminable for the industry due to its heterogeneous nature.

Those involved in bundling shipments from less-than-truckload (LTL) to truck load (TL) require terminal operations. To acquire such large assets would indicate a requirement of large operations to absorb such costs. Others point out that small and medium operators are in a position to lease such assets and avoid the fixed costs (Elzinga, 1994). Even still, inter-firm linkages can facilitate such endeavours through sharing facilities, reducing investment and facilitating economies of scale without integration (Sornn-Friese, 2005). Fernandez et al.'s (2002) study of the Spanish trucking industry concluded with similar findings, advising that 'quasi-integrated' owner-operators can gain economies of scale, but referred to utilisation of specialised assets as the motivator.

Motivation, lifestyle and non-pecuniary utility appear to be gaining acclaim in the literature as key influencers for operators' entry and exit (Sornn-Friese, 2005; Peoples and Peteraf, 1995). The author's view extends this position beyond entry and exit to development and growth.

3.5 Summary and Conclusion

Under neo-classical economics there is the assumption that the firm acts in an economic-rational manner, their decisions are always made with the objective of maximising profit, and that they have absolute knowledge. Evidence is presented of the behaviour of road freight firms in the United Kingdom being in disunity with neo-classical economics.

Initially MES was thought to play a significant role. However, further developments illustrated that a firm's size was not critical as inter-firm linkages could create economies of scale outside of the traditional view. As Kritz (1973) discussed, geographical distribution and volume levels are significant for the LTL sector. The heterogeneity of the industry and the lack of application of ICT have important implications for the dynamics and structure of the industry.

The premises of Neo-classical economic theory appear not to hold, with studies indicating non-pecuniary influencers on owner-operators' behaviour.

4 ALTERNATIVE THEORETICAL PERSPECTIVES

4.1 Introduction

This chapter introduces a more appropriate theoretical conceptualisation of the firm. As noted by Shen (1970), there are two factors affecting the supply side of firm growth. Chapter 3 reviewed one of these factors, economies of scale. Attention is now turned to the second, organisational parameters.

It was seen in the previous chapter that neo-classical economics has been criticised for being unrealistic and for lacking support from empirical studies. The behavioural theory of the firm is believed to bridge some of the gap between neo-classical economics and reality. This chapter aims to discuss the key processes and developments in this field and relate their implications to the study of the Irish road freight industry.

Halldorsson et al. (2007) argue that we cannot depend on one theoretical approach when analysing phenomena in the context of Supply Chain Management. Utilising several theories that complement each other leads to a comprehensive view of SCM, "*we cannot rely on one unified theory to explain inter-firm governance structure and management decisions in a supply chain, but have to apply complementary theories*" (Halldorsson et al., 2007: 293). Stock (1997) supports this view with the application of theories from other disciplines to aid a scientific approach to logistics. Halldorsson et al. (2007) argues that further empirical and theoretical work is needed in this area.

Bendoly et al. (2006) carried out a meta-analysis of studies with a behavioural theoretical framework in operations management. They found 52 studies in a number of peer reviewed journals. However, none of them were transport based. They also commented on the types of journals cited in such studies: 58% of citations were from business disciplines other than operations management. They concluded with recommendations for further studies from a behavioural context in order to refine, test and strengthen the approach with the benefits of more realistic operations management theories and models. Hence, a number of perspectives linking various theoretical aspects are presented in this chapter.

In analysing attitudes towards growth, Davidsson and Wiklund (1999) argue that it is possible to classify three areas for micro study, based on their underlying theoretical perspectives. These are the resource based perspective, the motivation perspective and the strategic perspective. These perspectives are relative to three units of analysis: the activity, the individual and the governance structure. While each unit of analysis can be used with each perspective, they advise the best unit of analysis for each perspective as:

resource-based / activity,
motivation / individual and
strategic adaption / governance structure.

Davidsson and Wiklund (2001) classify analysis in entrepreneurial research into two levels, which they refer to as micro levels of the individual and firm: the first level relates to Shen's (1970) organisational parameters; the second

is the aggregate level, an industry-level perspective with similarities to Shen's economies of scale.

4.2 Seeking Other Goals

4.2.1 Firm Growth

Studies of firm growth have principally been based on larger firms, traditionally manufacturing firms, with a separation of ownership and control (agency). Although other theories exist, the initial concentration will be on the 'Penrose Effect' as it sets the scene for the relevant fundamentals.

The 'Penrose Effect' is essentially erosion of profitability due to increased growth. This erosion originates from increased managerial costs. These costs have the potential to increase prices, leading to a fall off in demand, output and growth (Penrose, 1995).

Duke (1994) argues that company objectives and strategies impact on prices. Some examples of objectives and strategies might be market share maximisation, profit maximisation, return on capital employed, defence of home or niche market and so on.

There is a tendency towards early growth rates in SBEs (Small Business Enterprises), indicating life cycle effect. However, Gilbrat's Law states that the growth of the firm is a random proportion of its size (Reid, 1992). Size and age of the firm since financial inception are key variables in Reid's (1992) study. The study found that size and age had negative relationships with growth, size being the most important influence. The study proposes that profit and growth have two-way causation: growth generates profits and

profits are important for financing growth. Shen (1970) supports this view that the growth decision is reliant on the availability of funds, in particular internal funds.

Reid (1992) looks to establish whether the 'Penrose Effect' occurs in SBEs by investigating if a negative relationship exists between growth and profitability. The study's variables include endogenous (growth and profit rate) and exogenous (market share, sales, age, and gearing) variables. He found that

> "*The less the dependence on local markets, or put another way, the greater the nationality or (even better) the internationality of markets for the main product, the greater the growth rate, all other things being equal.*" (Reid, 1992: 18).

An important finding is that level of control of the business has a significant effect on profitability. It was found that the lower levels of control (by the type of business organisation) resulted in lower levels of profitability (Reid, 1992). Shen (1970: 702) reports

> *"a positive relationship is found between the correlation of growth rates of plants in successive time periods and economies of scale. However, the implications of economies of scale on growth behaviour of plants were more than offset by the opposite impacts of organization parameters. As a consequence, rapidly growing firms in one period are compelled to slow down their growth in the next period, while other plants are able to catch up."*

The balance of these two factors is believed to partly explain growth. Shen (1970) also advises that the 'Penrose Effect' is more than just managerial costs but also management awareness, preliminary planning and the willingness of management to undertake risk.

4.2.2 Maximisation of Shareholders' Wealth

As a result of the separation of ownership and control, financial management literature has examined the issue of agency and put forward the argument that the theoretically correct objective of the firm is to maximise shareholders' wealth and not necessarily profit. In the literature the firm is viewed as an investment agency (invest money to make money) and the firm exists to benefit its owners (Atrill, 2003). Maximisation of shareholders' wealth is achieved by increasing the value of the firm, usually through growth. In order to combat the challenges associated with agency, Atrill proposes the use of financial incentives such as share incentive schemes for decision-making management. The logic behind such schemes is to shift managers' goals from being subjective to harmonisation with organisational objectives.

4.3 Resource Based Perspective

Firms can be conceptualised as a bundle of resources and the deployment of these resources is an administrative decision (Davidsson and Wiklund, 1999).

Resource-Based Theory (RBT) has been placed into the context of strategic management literature. The theory focuses upon the link between strategy and the external environment in order to create a sustainable competitive

advantage. Examples of this are Porter's industry analysis and competitive positioning.

Grant (1991) proposes a five-stage model for strategy development from an RBT perspective. The five stages are:

- Analysing the firm's resource base
- Appraising the firm's capabilities
- Analysing the profit-earning potential of the firm's resources
- Selecting a strategy
- Extending and upgrading the firm's pool of resources and capabilities to sustain competitive advantage.

The theory compares the firm's resources and capabilities against the market (competitors, customers' needs) in order to assess how it can best utilise its resources. It is termed 'the resource based view of the firm' as the various contributions lack an amalgamated framework (Grant, 1991).

A number of studies in Supply Chain Management have utilised this theory as a framework under which firms can develop a sustained competitive advantage (Armstrong and Shimizu, 2007).

The Theory of Resource-Advantage (R-A) takes a more integrated single framework approach. It is a theory of competitive firm behaviour with its foundations in Edith Penrose's (1995) Theory of the Growth of the Firm among many others such as that of Grant (1991). To summarise, R-A "*is a process theory of competitive firm behaviour that stresses the importance of market segmentations and resources*" (Hunt, 1997a: 60). It rejects many of

the premises of neo-classical economics and takes a realist epistemological approach (Hunt, 1997a). It is well placed as an underlying theoretical framework for this study.

The R-A theory appears to have highly predictive and explanatory abilities that have been attributed to its descriptively realistic approach, based on its underlying foundational premises in realism. A comparison of neo-classical and R-A's premises illustrates this.

The premises of Research-Advantage Theory (Hunt, 2003) are:

- Demand is heterogeneous across industries and within;
- Consumer information is imperfect and costly;
- Human motivation is constrained self-interest seeking;
- The firm's objective is superior financial performance;
- The firm's information is imperfect and costly;
- The firm's resources are financial, physical, legal, human, organisational, informational and relational (tangible and intangible);
- Resource characteristics are heterogeneous and imperfectly mobile;
- The role of the management is to recognise, understand, create, select, implement, and modify strategies;
- Competitive dynamics are disequilibrium provoking, with endogenous innovation.

In comparison, the premises of neo-classical perfect competition are: perfect and costless knowledge, maximisation of self-interest and profit, and resources being limited to land, labour and capital. It is clear that R-A Theory

incorporates market realities that other theories ignore. Its focal point is on the efficient and effective use of resources, leading to a comparative advantage, in turn resulting in a competitive advantage, aiding the firm's goal of superior financial performance (Hunt, 1997b). It attributes a number of internal and external factors to maintaining a firm's competitiveness. Internally, a firm may fail to reinvest in a resource, eroding the value of its output to customers. Management may lack the understanding or the ability to recognise the source of their success. Failure by the firm to modify its resources contributing to efficiency and effectiveness in a changing environment can lead to a shortening of the length of time in maintaining its competitive advantage.

External factors (political, economical, social and technological) affect the life span of a firm's competitive advantage. Actions by governments, through legislation, may render the resource inefficient or ineffective. The life span of the resource advantage can be shortened by customers changing their preferences in a particular market segment. Competitors will attempt to neutralise the firm's competitive advantage through improved management, and increasing the efficiency and effectiveness of their resources.

Intangible assets such as relationships are more difficult for competitors to copy and will likely extend the firm's competitive advantage in comparison to physical assets. Due to this, theory is increasingly recognising the value of soft resources. R-A theory recognises that human action is an important factor in relation to economic actors, both as inhibitors or enhancers to desirable economic outcomes (Hunt, 1997a).

According to R-A theory firms learn through competing and feedback is driven from the effects on financial performance and this in turn drives organisational change. The dynamics of competition concentrate on proactive or reactive measures to competition, and how competing firms manage their resources. Reaction usually concentrates on imitating the resources of others. Using relationships (a soft, intangible resource approach) can maintain a firm's competitive advantage, as this is difficult to imitate.

Competing through networks has seen increased attention, as the synergies they create, when successfully implemented, are difficult to copy. Relationships are viewed by R-A theory as intangible and imperfectly mobile, that is, difficult to transfer from one firm to another, unlike physical resources. This is likely to lead to a longer life span of competitive advantage in comparison to physical resources. However, networks can be difficult to implement. They rely on the behavioural assets and the culture of the firm. In order for networks to succeed, they need to be mutually beneficial to the parties involved and compliment the firm's existing competencies, while providing an increased value offering to the market (Hunt, 1997b).

There have only been a few studies utilising an RBT theoretical framework within Supply Chain Management. Pettus (2001) applied an RBT approach to road freight firms. The study concentrated on patterns and sequences in resource development and did not consider inter-firm relationships. It also speculated that the study could be applied to other small firms. Olavarrieta and Ellinger (1997) reviewed resource-based theory and its application to strategic logistics management. They identified that a further area of

research is logistics managers' perceptions and cognitive biases. However, Olavarrieta and Ellinger (1997) warned of the potential for knowledge leakage and for the firm to decide how much of their valuable skills and tacit knowledge they wished to transfer to clients. Hunt and Davis (2008) applied R-A theory to purchasing decisions and found it had an applicable framework. Their study concluded that RBT theory and Supply Chain Management were both work in progress and could benefit from further exploration.

Armstrong and Shimizu's (2007) meta-analysis study has similarities to that of Davidsson and Wiklund (2001) in terms of level of analysis. They highlight that aggregative levels of analysis can lead to obscurity due to tradeoffs at deeper levels. However, Armstrong and Shimizu (2007) reviewed 125 studies and found only twenty at levels lower than the firm, only two of these were at the individual level. They believe that resources should be understood within the context in which the firm is operating, as resources potentially co-evolve with industry, and therefore advocate that a study should concentrate on a single industry. Armstrong and Shimizu (2007) also advise that analysing management cognition may provide important insights since managers closely interact with their competitors.

Firm networks have been studied under entrepreneurial research as a means of knowledge transfer. Lechner and Dowling (2003) studied networks in an information technology cluster in Munich and found that networks are used for a number of functions; they may be vertical or horizontal and they change as the firm moves through its life cycle. There functions are social networks,

reputational networks, technology and innovation networks, marketing networks and knowledge networks.

Lechner and Dowling (2003) viewed co-opetition networks as a feature of mature clusters; that is networks that co-operate with competition. They report that it is a frequent strategy in Germany, leading to capacity flexibility through subcontracting to other firms. Many of the firms in the study were specialists in nature; therefore they could not provide complete solutions as required by many large clients—hence, the development of a co-operative approach. Lechner and Dowling (2003) believe these types of networks are principally regional due to cultural attitudes and trust is a necessity, therefore requiring frequent interaction to build trust over time.

Child et al. (1998: 76) advise of a number of motives for strategic alliances and other cooperative strategies:

> "*(a) that such a form represents the lowest transaction cost alternative; (b) that it enables an improved strategic position to be achieved, and/or (c) it gives an opportunity for organisational learning*".

It is quite clearly a rational evaluative approach rather than affective.

Brunetto and Farr-Wharton (2007) examined the role of trust in owner-managers' decision-making in relation to collaboration. Their study was based in Australia and concentrated on innovative and product design firms. They found trust, as a component of risk, to be an important factor in moderating networks and that learning was seen as a key benefit of

networking. They also found that there was a negative perception by these managers toward collaborating to gain supply chain advantages. Bosworth, as cited by Sherer (2003), referred to supply chain networks as being 'hard' networks requiring a higher level of interdependence and therefore risk in comparison to 'soft' training networks.

Sherer (2003) found that the majority of SMEs in the United States were favourable to participating in networks. The study concentrated on the manufacturing industry and concluded that participants' character (trust and commitment) and confidence were important success factors. However, a study by Deans et al. (1997) found Australian SMEs in manufacturing and service sectors against the concept of 'hard' networks and only 30% of service companies were involved in formal networks. The top three perceived benefits in the service sector were profits/profitability, growth and recognition. The majority of service companies that had rejected the network approach advised that they wanted to remain independent and those that were interested found uncertainty about how to operate a network an inhibiting factor.

The Donckels and Lambrecht (1997) Belgian study found that highly trained entrepreneurs that are growth orientated have a good position towards networks. Due to time pressure they tend to be managers as opposed to doers. They utilised a number of methods to achieve networking, such as external consultants and attending seminars.

Sherer (2003) refers to a gap in the understanding of SME's involvement in networking. Networks have a direct impact on the business through the

actions of others, whereas industry associations tend not to, as members' business success is not significantly dependent on the actions of others (Sherer, 2003).

There have been a number of studies in supply chain collaboration and third party logistics. Studies by Gentry, 1996; Skjoett-Larsen, 2000; Skjoett-Larsen et al., 2003; Mason et al., 2007; have concentrated on supply network integration and its strategic advantage. They utilise case-based research from the perspective of the dominant node in the network. The principal emphasis of these studies was concerned with vertical integration of large players, concluding with ideological strategic advice on how they can influence/control supply networks.

A number of studies have concentrated on third party logistics providers (3PLs) as a method of bringing efficiency and effectiveness to supply chains/networks. There are several definitions of 3PLs: this study adopts the definition by Berglund et al. (1999: 59):

> "*Activities carried out by a logistics service provider on behalf of a shipper and consisting of at least management and execution of transportation and warehousing (if warehousing is part of the process)*".

These studies tend to take a theoretical prescriptive approach at a strategic level, aimed towards large players or multi-national organisations. They also tend to be from the perspective of the shipper or the controlling/influencing node in the supply network. Their concentration is on trading partners and

vertical integration. They implicitly assume economic rationality at a disaggregate level, that is, the decision-making of freight transport operators, thereby ignoring potential issues of bounded rationality, information processing ability and the possibility of other goals. Their main concern is the use of 3PLs (and more recently 4PLs) for gaining efficiency through economies of scope (Hertz and Alfredsson, 2003), that is, a single point of contact for nodes in the supply chain/network for the bundling of services.

There has been considerable research in supply chain collaboration and efficiency, but few studies at disaggregate levels in the supply chain in relation to transport. Transport has a role to play in the efficiency of supply chains/networks, as it is important for the work carried out throughout the chain/network not to be undone by the connections between the nodes.

> "*Transportation management is an area that remains critical to overall logistics and supply chain success*" (Stank and Goldsby, 2000: 71)

Hong and Jeong (2006) addressed the impact of small and medium enterprises (SMEs) on the supply chain and the differences between large enterprises and SMEs from a business growth perspective. They took a multi-industry approach. The study highlights that large players are dominant, commanding and controlling the supply network. The strategy of smaller players is to specialise in niche products/services. The SMEs either accept command and control or develop collaboration with other SMEs. However, the study was theoretical in nature and classifies SME firms into four categories; Efficiency, Collaboration, Coordination and Innovation depending on their chain position and strategic focus.

Halldorsson and Skjoett-Larsen (2004) develop a typology of relationship levels of 3PLs with a node in the network. The typology is theoretically grounded from a resource-based perspective and ranges from low levels of integration (market exchanges) to high levels of integration (in-house logistics) depending on whether the 3PL's skills are complementary to the shipper's core competencies. The principal reason for outsourcing logistical activities is generally related to the benefits it brings to the firm. However, other reasons were identified including

> "*unawareness of the true logistics costs was in fact one of the reasons for outsourcing and that the amount of money paid to the service provider would at least give some insight into these costs*" (Halldorsson and Skjoett-Larsen, 2004: 437).

Their study also analysed the characteristics of highly successful partnerships: a clear separation of responsibilities (shipper takes the leading role), tiered provider structure (subcontracting), close dedicated working relationships (customisation) and being highly performance orientated (regular performance reviews). This study has indirect implications for standard transport service providers who may take a horizontal collaborative approach with other operators or intend to provide subcontracted (second tier) services to the 3PLs.

Van Laarhoven et al. (2000) compare the development of 3PLs over a five year period. This study is orientated towards the shippers' perspective. They found that the scope of services provided by 3PLs has increased. The

driving forces for shippers to outsource logistics activities are still a need to reduce costs or amount of capital investment, improve service quality, or gain strategic flexibility. The realised benefit is that the shipper can concentrate on core competencies. Similar results were found in a Singapore study (Bhatnagar et al., 1999).

Mason et al. (2007) addresses pallet networks as a form of horizontal collaboration. This perspective is again from a single point of control. Their approach has similarities to a top down viewpoint, with a driving/leading force. The study recognises that significantly more work is required and calls for a holistic approach to leverage change in behaviour. The authors did not consider the transport operators' perspective. Understanding the operators' behaviour appears vital.

Placing this study into a resource-advantage framework may allow some practical analysis. R-A theory advises that relationships are intangible assets, which are difficult to imitate, leading to a competitive advantage. Fernandez et al. (2002) advise that a hybrid form of collaboration is more efficient than vertical collaboration for road freight operators in Europe. Pallet networks appear to be shifting these intangible assets towards realisation. The potential complexity in copying such networks would appear less difficult than hybrid approaches. As a result, the potential for sustainable competitive advantage under the transparency principal is lowered in resource-based theory.

Arrunada et al. (2004) compared the European trucking industry's structure with that of the United States and concluded that labour regulations and tax are barriers to vertical integration, that is

> "*the preference for subcontracting over vertical integration in Europe is the result of European institutions - particularly, labor regulation and tax laws—that increase the costs of vertical integration*." (Arrunada, 2004: 867).

However, this appears to somewhat conflict with Peters et al.'s study:

> "*The purpose of most TPL alliances reported is to provide services that cannot be provided in-house. The need for strategic alliances in Europe's TPL industry is therefore tempered by the vertically-integrated nature of many of Europe's leading TPL providers. For instance, European freight forwarders differ from their American counterparts by owning or controlling many assets, whereas American forwarders are more 'pure' and sub-contract more extensively.*" (Peters et al., 1998: 13).

The study by Arrunada et al. (2004) points out that integration (mergers and acquisitions) in the LTL transport-logistics sector is not necessarily a good method to achieve economies of scale, as efficiencies can be gained by contractual means. Sornn-Friese (2005) examined horizontal collaboration of road freight transport service providers in Denmark, from an economies of scale perspective. These studies fail to address the second source on the supply side as advocated by Shen (1970), that is, organizational parameters.

This study proposes the examination of organisational parameters, in particular the constraints and motives of the transport service providers' decision-makers.

The McMullen and Tanaka (1995) study of road freight operators in the United States advised of no reason for trucking firms to increase their capacity due to lack of economies of scale. This results in a trucking firm maximising its own capacity and subcontracting to gain flexibility. Other studies carried out in Mexico (Arroyo et al., 2006) and in Indian (Mitra, 2006) found low up takes of 3PLs in a fragmented market.

Few studies have been undertaken from a 3PL perspective, as opposed to the shippers' perspective (Hertz and Alfredsson, 2003; Carbone and Stone, 2005). Hertz and Alfredsson's (2003) study is also one of the few that refer to standard transport service providers and how they can develop into 3PLs by increasing problem solving abilities and adapting to customers' needs. Their case studies identified large standard transport service providers developing into 3PLs by carving out niche areas, developing and increasing levels of services in cooperation with their customers.

In Japan the structure of the road freight industry appeared similar to that of Europe with many small and medium operators. On closer inspection the similarities were not so great. Satio's (2007) study classified small and medium operators as those with less than 300 employees and employing capital of less than 300 million Yen. However, unlike other studies, Satio's study concluded that 3PLs viewed human resources as a more important factor for growth than information technology. A historical business study of

National Freight Co-operation in the United Kingdom, now Exel logistics which is part of the Deutsche Post group, identified motivation, corporate culture and employee values influencing attitudes to their operational roles as factors that influenced efficiency (Carroll, 2005).

Carbone and Stone (2005) review horizontal and vertical alliances. They use the term *alliance* as formal or informal co-operation between two or more companies with common objectives. They identify reasons why 3PLs implement horizontal alliances: to strengthen their geographical network, to penetrate new markets that require new services and to strengthen new geographical cross-border markets.

Grimm et al. (1993) investigated strategic change in the LTL sector of the US road freight industry. The study was built upon an earlier study by Corsi et al. (1991) and was designed to answer the question "*why some firms altered strategy over time while others did not*" (Grimm et al., 1993: 57). Grimm et al. utilised a discrete choice approach to the study and found support for their hypothesis; firms in a dynamic environment that changed their strategy to remain aligned with the environment would out-perform those that did not change. However, Grimm et al. compared two time periods. The first was in a regulated environment, potentially limiting the generalisation of such results due to the unique circumstances.

An earlier study of strategic change in the US railroad industry by Grimm and Smith (1991) found management ability and experience as influencers on strategy change. Bigelow (1982) found support for changes in strategy occurring when drivers (stimulus) creating pressure to change overcome

drivers (stimulus) creating resistance to change. Abrahamson (1986, cited by Ginsberg, 1988) advises that shifts in the values of key organisational stakeholder may impair on the alignment of the organisation with its environment.

Ginsberg (1988) conceptually examined how to measure and model strategic change. He identified a number of determinants to change. These variables included not only the external environment but internal organisational issues, such as: resources and resistance to change. Ginsberg argues that two criteria must be fulfilled for a firm to alter its strategy. The first criterion, the key decision-maker(s) must be aware of the need to change strategy; secondly, the firm must have the ability to change. Ginsberg presented a number of factors that could potentially influence the aforementioned criteria. These influencers are: financial performance, ownership of the firm by senior management, the size of the firm, the initial strategy, and characteristics of senior managers. Ginsberg acknowledged that further empirical work was needed in order to draw evidence-based conclusions.

Grimm et al. (1993) study utilised many of these factors for the development of hypotheses. The study found that smaller firms, in comparison to larger firms, are more likely to change strategy. Nevertheless, their strategic choice towards low costs failed to improve profitability. Grimm et al. suggests that small firms are more capable of changing strategy, but may be less knowledgeable about the correct strategic fit and that firms' strategic change decisions are influenced by firm-specific characteristics.

Previous studies have not fully addressed Shen's (1970) second issue on the supply side of firm growth/development, that is, organisational parameters (or micro variables). This study proposes to address this gap, in particular decision-making behaviour.

There appear to be a number of studies in the broader area of Resource-Advantage theory. However, as far as the author is aware, R-A theory has not been applied to inter-firm linkages in any industry on a behavioural level.

4.4 Multiple Criteria Decision Making

Neo-classical Economics looks to maximise profits for the firm or utility for the individual. However, its premise of absolute knowledge and having a single goal are unrealistic (Folmer, 2009). Multiple Criteria Decision Making (MCDM) approaches such as Analytical Hierarchy Process (AHP) and Multi-Attribute Utility Theory (MAUT) have received considerable attention over the past two decades. MCDC techniques are used to identify optimal decisions (Herath and Prato, 2006). MCDM has been utilised in a transport setting. Banai-Kashani (1989) applied AHP to assess modal choice in urban transport and Zak (1999) applied MCDM to develop optimal vehicle and crew scheduling in urban transport, thereby increasing vehicle utilisation. However, based on the objectives of the thesis, to extract the antecedents of one particular behaviour (collaboration), AHP and MAUT's approach of pairwise comparisons through the use of multi-criteria to arrive at the optimum decision (Cheng et al., 2002; Forman and Gass, 2001; Kahraman et al. 2003; Saaty, 1990) do not meet this objective.

4.5 Development of the Behavioural Approach

The Behavioural Theory of the Firm (behavioural economics) originates from the Carnegie School in the 1950s (Hosseini, 2003). Many authors felt that the neo-classical approach did not represent reality and that individuals made decisions and factors that affected these individuals also affected their decisions and hence the organisation.

There are many authors in the area of organisational behaviour and decision making. Principally their work is complimentary and augmentative (Hosseini, 2003).

Simon (1978: 364) described firm decision makers with alternative goals than profit maximisation as satisfiers:

> "*Most of them depart from the assumption of profit maximization in the short run, and replace it with an assumption of goals defined in terms of targets – that is, they are to greater or lesser degree satisficing theories. If they do retain maximizing assumptions they contain some type of mechanism that prevents the maximum from being attained, at least in the short run.*"

Decision making can be categorised into programmed (routine) and unprogrammed (unstructured, strategic) decision making. Many of the models (in particular, programmed decision models) are similar and consist of a number of steps in the decision making process—they are typically found in management textbooks.

Decisions are complex and contain a considerable number of variables; therefore a simplified model of the problem is developed. Alternatives are considered sequentially and the first outcome that is satisfactory is accepted, consequently decision-makers are satisfiers, not maximisers. There are a number of different facets of rationality. The objective facet involves choosing the option that reveals the highest measured gains and the subjective facet seeks to maximise the attainment of personal goals. Many of the sequential decision models are seen as 'perfect rationality' as opposed to the 'bounded rationality' model, the later is supported by empirical evidence (Simon, 1976).

Lindblom's (1959) approach is similar to Simon's 'bounded rationality' approach. Lindblom referred to finite intellectual capacity and information access that decision makers tended not to possess. However one benefit, *increased efficiency in decision-making*, was thought to arise from this.

Mintzberg and Raisinghani's (1976) model of unstructured decisions is one of the most renowned, a summary of which should provide expedient insight into the topic. They viewed problems and opportunities as the antecedents of decisions in the organisation. They also believed other factors affected the simplicity of decision making, such as organisational politics. The model consists of twelve elements, classified into three central phases, three sets of supporting routines and six sets of dynamic factors.

Central phases are the processes that occur during decision-making. However, Mintzberg and Raisinghani believe that they are not necessarily

linear and are dynamic. When information is obtained the alternatives are impulsively evaluated.

It is undeniable that road freight operators are, in the majority of cases, small firms. Therefore, consideration of the literature on the management of small firms, with particular reference to growth/development, would give valuable insight into the potential dynamics within freight operators.

Demand characteristics have an influence on decisions. Freight transport modal choice is essentially a purchasing decision. Developing an understanding of how freight transport customers make these decisions would be of advantage to road hauliers and would shed light onto demand dynamics.

The study by Evans et al. (1990) of UK manufacturing firms found that the highest-valued criterion is that of service quality, as defined by punctuality, flexibility and non-damage to goods. This allows manufacturers to carry lower levels of safety stock and therefore reduce inventory-carrying costs.

Evans et al. (1990) identified small manufacturing firms as sourcing motor carrier service providers for particular contracts from current providers. They seldom searched outside of this and tended to only drop a service provider if the provider fell short of expectations. The manufacturing firms surveyed tended to give hauliers who had initially offered an unacceptable price the opportunity to re-price appropriately to the situation, once the haulier met the required quality of service criteria. This, in turn, has implications for decision

making within the road freight transport firms, identifying quality of service and pricing decisions as high priority.

Perren (1999) attempted to integrate individual models of various aspects of explaining growth in micro-enterprises. This ought to serve as a strong underlying modelling approach and offer guidance in deciding on the factors to consider in assessing the motives of road freight operators' and the barriers to inter-firm linkages.

Perren identified sixteen independent factors influencing four growth drivers. These independent factors are: desire to be one's own boss, desire to succeed, active risk taker, innovative, transferrable personal capital, transferrable primary skills, transferrable support skills, transferrable network of contacts, family 'investing' friends, key employees-partner, active professional advisers, debtors and creditors, societal and other outer factors, the state of the economy, product sector and market segments, competitive dynamics.

The four growth drivers were: owner's growth motivation, demand, resource access and enterprise in managing growth. The study found five of the independent factors influenced the owner's growth motivation. The most potent factor affecting growth motivation, both positively and negatively, was desire to succeed. Other factors, influential to a lesser degree, were desire to be one's own boss, active risk taker, family 'investing' friends, competitive dynamics. This approach is further supported by Liao et al. (2001). Their study empirically assessed two micro factors of growth in entrepreneurial

firms. The findings demonstrated that motivational factors explained 21.19% of the variance.

Foss (2003) assessed the application of bounded rationality to the field of economics and concluded there was under-utilisation of such approaches. The study argued that paying more attention to behavioural facets allowed for opulent comprehension of the managerial task.

Kaufman (1990) presents a number of reasons why, in Kaufmann's view, Simon's *bounded rationality and satisficing* theory is not utilised and will remain on the fringe of economics. He claims that Simon's approach is far more complicated for researchers to work with than profit maximisation. Kaufman argues for a reformulation in order to provide a new theoretical rationale. In his view, satisficing behaviour is an issue of motivation and, therefore, theories of motivation must be utilised; these theories refer to the determinants of goal directed behaviour and the factors that instigate and maintain human action. Kaufman further claims that the debate over profit maximisation is essentially a debate over human motivation pursuing a variety of wants.

Etzioni (1988) proposes a move towards a new decision-making model outside of the rationalist framework, viewing human nature and individuals in a normative-affective manner. Etzioni argues that many decisions are a combination of logical/empirical factors, based on inferences and facts, and normative-affective factors, where choices are dominated by values and emotion that not only affect goals but also the means of achieving them. This concept has been challenged on the ground that state-of-mind is not

observable. However, there is support for extending the methods proposed by Etzioni to address network phenomena and other normative considerations (Selviaridis and Spring, 2007).

4.6 Theoretical Framework

Recent articles advise the use of multiple theories to build a comprehensive approach. However, the theories presented in this chapter have a considerable history. The 1978 Nobel Laureate for economics Herbert Simon (1978: 350) explains the relationships underlying decision theory:

> "*During World War II, this territory, almost abandoned, was rediscovered by scientists, mathematicians, and statisticians concerned with military management and logistics, and was renamed 'operations research' or 'operations analysis'. So remote were the operations researchers from the social science community that economists wishing to enter the territory had to establish their own colony, which they called 'management science'. The two professional organizations thus engendered still retain their separate identities, though they are now amicably federated in a number of common endeavors.*"

Returning again to Shen's (1970) structure, it was seen that inter-firm linkages can create economies of scale. Looking to the second component under Shen's framework, organisational parameters, strong links are identified with resource-advantage and the administrators' decisions in regard to these resources, both tangible and intangible. Collaboration has potential benefits not only for freight transport service providers, in terms of

efficiency and utilisation, but also for wider society through reduced externalities. R-A theory appears to be a relevant, appropriate and an explanatory framework for this research. R-A theory is supported by the behavioural view of the firm as it recognises human motivation as a key component. The use of collaborative networks appears to go somewhat towards the EU's goals of increasing sustainability, efficiency, effectiveness and competitiveness of European logistics.

However, collaboration may require significant change for many organisations. Human factors such as trust and control could be potential barriers. Are motives strong enough when traded-off against these potential barriers? Nevertheless, consortiums can succeed and overcome some common difficulties, with the realisation of substantial benefits. The review of the literature begs the questions: what are the behavioural components of motivation and the barriers to collaboration, and how can such concepts be extracted and analysed? Olavarrieta and Ellinger (1997) refer to a potential limitation of RBT. There is an underlying theme of firms with superior resources achieving superior performance, but if the deployment of resources is an administrative decision this may not hold.

From a behavioural economics perspective, the elements of strategy and cognitive processes of decision-makers in the industry become important components that have implications for the industry's development.

Ginsberg (1988) framework for modelling strategic change in firms identified two fundamental questions: *"(1) what factors influence the occurrence of various types of change? and (2) what are the performance outcomes of*

these various types of change?" (Ginsberg, 1988: 562). These questions are integrated into this study. The applied framework relates to the perspective approach described by Ginsberg (1988). Thus the thesis is looking internally in the organisation.

Another important component in the development of an effective strategy is the decision-maker's mental model of the competitive arena. If they become out-of-step with the changing conditions of the market place, they are unlikely to formulate an effective strategy (Hodgkinson, 1997).

4.7 Summary and Conclusion

Studies to date have overwhelmingly concentrated on the shippers' perspective in regard to gaining strategic advantages through vertical integration and control. Arguments have been made for a research approach at a disaggregated level. Studies have indentified that road freight operators can potentially gain economies of scale through collaboration. The implications of economies of scale can be offset by organisational parameters. Networks can be difficult to implement and rely on the behavioural assets and the culture of the firm. All these aspects have not been explored.

Motivational research has received recent attention, with studies recommending that this area needed further work. An assessment to identify an appropriate methodology to extract and analyse behavioural influencers while maintaining high levels of robustness appears warranted. In the past logistics has adopted theories from other disciplines. The possibility of

adopting a motivational theory from another discipline and exploring its potential for rigorous application to transport-logistics should be assessed.

The amalgamation of theoretical perspectives towards logistics has been applauded for being a comprehensive approach. Resource-based theory and motivation-based theory appear to have common ground. Sherer (2003) identified a gap in relation to the networking of SMEs; the present study moves towards addressing the networking gap within the Irish road freight industry. However, a thorough understanding of the motivation of those who make the critical decisions within the industry and the factors that influence those decisions is required in order to develop effective policies to aid efficiency. The next question is how to operationalise such an approach.

5 THEORETICAL APPROACH

5.1 Introduction

Chapter 4 concluded by arguing for the use of an attitude-based theory to extract positive influencers and negative barriers towards collaborative activities in the Irish road freight industry.

Etzioni (1988) advises that there have been developments in approaches that can measure intangible values. Studies that include attitudes often have improved predictive power. Etzioni refers to Ajzen and Fishbein's Theory of Reasoned Action as a promising lead.

The principal question addressed in this chapter is: is Ajzen's (1985) Theory of Planned Behaviour conceptually viable as a means of extracting key influencers on decision-makers in the Irish road haulage industry with regard to collaborative activities?

As human factors play an important role in motivation, resources, management and competitive advantage, it follows that the behaviour, intentions and attitudes of key personnel are of significance in understanding the development of road freight collaborative networks. Individuals in the organisation are the decision makers; therefore it follows that whatever factors influence their decisions are central to gaining an understanding of organisational decisions. Behavioural decision theory is presented as a method for extracting these influencers.

The Theory of Planned Behaviour (TPB) has been employed in previous studies to elicit attitudes, extract barriers and develop an understanding of significant influencers on behaviour (Ajzen, 1991). TPB had initially been applied to the field of health science, but it has been used subsequently in multiple disciplines (Leone et al., 1999). Armitage and Christian (2003) argue that TPB is the most dominant model of attitude-behaviour relations. More recently the theory has entered the transport research domain, principally in the area of transport planning and public transport users' choice. Eliciting the antecedents of intention has been successful in other disciplines at extracting barriers, as, for example, in a study of the determinants of recycling behaviour by Tonglet et al. (2004).

Considering the research objectives and aims of this thesis and the unit of analysis, which is the individual manager, the use of TPB appears appropriate. Leone et al. (1999) compared three theories of attitude-behaviour: the Theory of Reasoned Action, the Theory of Planned Behaviour and the Theory of Self-Regulation and found that the Theory of Planned Behaviour was a valuable attitude measurement model. Armitage and Connor (2001) conducted a meta-analytical study review of 185 independent studies of the Theory of Planned Behaviour and demonstrated that TPB accounted for 39% of the variance in intention and 27% of the variance in behaviour. As suggested by Ajzen (1991), adaptations have been made to the theory in many studies to increase context specificity.

5.2 The Theory of Planned Behaviour

Expectancy-Value models have held a pertinent position in motivational psychology:

> "*According to these models an actor intends to perform the action alternative which has the highest product of expectancy for achieving the aspired goal by the personal value (incentive) of that goal*" (Kuhl and Beckman, 1985: 3).

Transforming motivation tendencies into actual behaviour is addressed by the Theory of Planned Behaviour (TPB). It is an extension of previous work undertaken by Fishbein and Ajzen (1975), principally the Theory of Reasoned Action (TRA). The underlying theme is that human behaviour is goal directed, following a line of relatively well formulated plans (Ajzen, 1985). Ajzen's TPB conceptualises behaviour through intentions. The theory states that beliefs are antecedents of attitudes and in turn attitudes are an antecedent of intentions.

The Theory of Reasoned Action "*traces the links from beliefs, through attitudes and intentions, to actual behaviour*" (Ajzen, 1985: 11). The TRA was refined to take into account possible inconsistencies between intentions and actions due to confidence and volitional control. Ajzen developed the Theory of Planned Behaviour as an extension of the TRA to incorporate factors of uncertainty. Therefore the model measures not just intention but behavioural expectation (Kuhl and Beckman, 1985). The Theory of Planned Behaviour has a number of key components which are graphically illustrated

in Figure 5.1. These components will be defined and explained in the following sections.

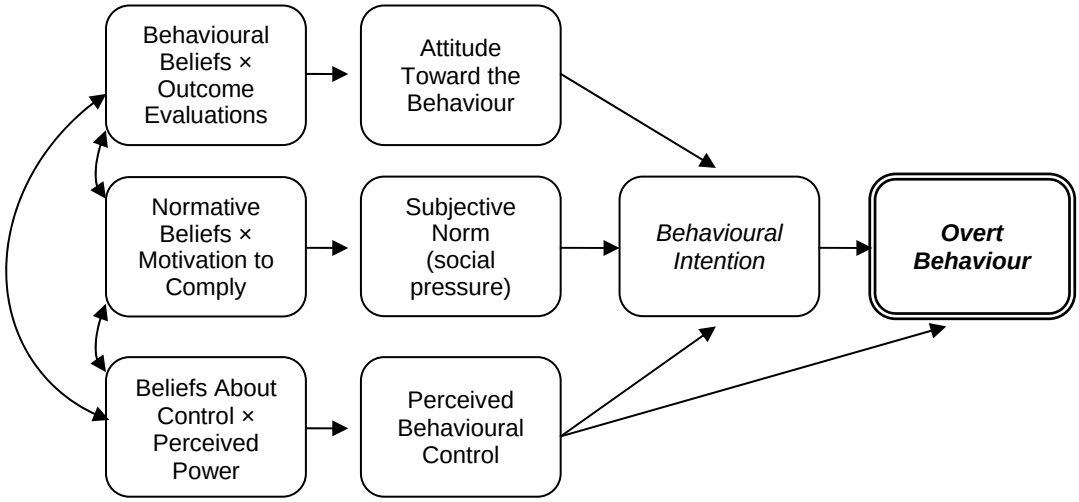

Figure 5.1 Diagram of the theory of planned behaviour

The formula for calculating the behavioural intention is as follows:

$$BI = (W1)\ AB[(b)\times(e)] + (W2)\ SN[(n)\times(m)] + (W3)\ PBC[(c)\times(p)]$$

BI: Behavioural Intention

AB: Attitude toward behaviour

(b): strength of each belief

(e): evaluation of the outcome

SN: Social Norm

(n): strength of each normative belief

(m): motivation to comply with the referent

PBC: Perceived Behavioural Control

(c): strength of each control belief

(p): perceived power of the control factor

W : empirically derived weights

5.2.1 Attitude

Attitude is defined as "*a learned disposition to respond in a consistently favourable or unfavourable manner with respect to a given object*" (Fishbein and Ajzen, 1975: 6).

Response consistency can be distinguished into three types. The first type is stimulus-response consistency: to consistently perform the same response in the presence of a given stimulus. However, this fails to distinguish between attitude and other concepts such as habit.

The second type of response consistency is consistency between the responses to the same object: response-response consistency, as judged by being on the same side of a particular dimension. The particular dimension utilised can affect whether the response is considered consistent or inconsistent. Therefore response-response consistency also fails to distinguish between attitude and other concepts—as the definition of attitude refers to *favourable* or *unfavourable*, evaluation is required.

The third type of response consistency is overall evaluative or affective consistency: this is what distinguishes attitude from other concepts, such as trait, motive and habit. Attitudes are latent; therefore they have to be inferred (Fishbein and Ajzen, 1975).

The determinants of attitude are the saliency of the sets of beliefs toward the object/stimulus. The evaluation of each salient outcome, weighted by the

subjective probability towards the outcome, contributes towards the attitude (Ajzen, 1985). The access to beliefs and attitude is therefore believed to moderate the link between attitude and behaviour (Fazio et al., 1989).

5.2.2 Subjective Norm

Subjective norm is a component of the determinants of intention. It is also a function of beliefs. A normative belief is the belief of an individual that other individuals or groups think they should or should not perform a particular behaviour. Normative beliefs are weighted by the individual's motivation to comply. If the individual is motivated to comply with the perceived beliefs of others that they value, this will put pressure on them to comply.

5.2.3 Perceived Behavioural Control

Attitude and Subjective Norm were components under the Theory of Reasoned Action. However, this theory assumed volition control. After a number of years of empirical evidence had been gathered, Ajzen (1985) returned to take into account factors that influence control over the behaviour/goal. Perceived behavioural control is a component of the theory of planned behaviour that represents how well an individual perceives their ability to execute courses of action (Ajzen, 1991). It is an individual's perceptions of the individual's beliefs in self-control.

To look at the components of the theory of planned behaviour in more detail the following example is offered: a person intending to perform certain behaviours will require information, skills and ability. A person may discover when trying to enact the behaviour that they are missing one or more of these components.

Power of will is another component; this will affect an individual's perceived ability of control over planned behaviour. It is related to Kuhl's (1985) Action Control Theory, which considers action versus state orientation. The theory proposes that an action orientated person concentrates on knowledge and abilities to control their performance; a state orientated person is likely to concentrate on their feelings rather than actions consistent with their intentions.

Emotions and compulsion may also moderate the probability of carrying out planned behaviour. These factors are difficult to neutralise: emotional responses and compulsions are often performed despite effort to the contrary (Ajzen, 1985).

External factors also affect the control over the situation and the likelihood of carrying out planned behaviour. Time and opportunity are required and circumstances can change. Unanticipated events may occur. These events can impact the opportunity to carry out the behaviour. Dependence on others also results in incomplete control over the behaviour. However, with dependence on others, the underlying motivation may not change and the individual may decide to carry out the behaviour with a different person or persons (Ajzen, 1985).

The Theory of Reasoned Action was extended to take into consideration control factors such as those that have been mentioned and the Theory of Planned Behaviour was the outcome. Each control belief is weighted by the

perceived power of a control factor for inhibiting or facilitating the performance of the behaviour (Ajzen, 1985).

5.2.4 The Intention-Behaviour Relation

Many factors can influence the stability of intention; in particular the length of time between the intention and enacting the behaviour. Intentions can change for a number of reasons. Having a considerable amount of time between intention and the behaviour allows for increased possibilities of changing beliefs. New information may become available thereby influencing an individual's beliefs and therefore intention. Other beliefs may become salient as the time to enact the behaviour draws near. Competing opportunities may come or go (Ajzen, 1985).

Hypothetical bias has been studied as a possibility for explaining discrepancies between intention and behaviour. Individuals can respond favourably in a hypothetical situation but unfavourably in the more demanding real context. The significant differences between the hypothetical and real-world contexts are seen as contributors to the discrepancies between intention and behaviour. As a result Ajzen et al.'s (2004) study emphasises that in certain situations it is important for the hypothetical situation to be realistic.

5.3 The Development of Attitude Measurement

There have been a number of developments in attitude measurement over the years. The current thinking is to initially develop a list of modal salient beliefs utilising a qualitative approach, prior to quantitative measurement. Measures are direct or indirect in nature.

Indirect measures are usually used to overcome certain barriers, such as unawareness of motives, politeness and irrationality. They include statement-completion techniques, and projection techniques such as picture interpretation.

Direct techniques, for instance using closed-ended questions in questionnaires, involve a quantitative scaling approach. There has been a tendency in recent years to utilise a seven point Semantic Differential scaling technique developed by Osgood, as this tends to be the most reliable direct measure (Oppenheim, 2000). This technique utilises a bi-polar scale with a neutral midpoint. The endpoints on each side of the scale are usually weighted with opposite adjectives. Multiple measures should be used as they are more effective at measuring latent attitudes (Ajzen, 1975). As mentioned in the previous sections, a multiplicative approach is taken. Therefore, the value associated with the behavioural belief is measured on a scale and the outcome evaluation is measured on another scale and then the two are multiplied. As multiplication of scale values is involved, Likert scales (where respondents indicate their level of agreement with a statement) tend not to be used due to the assumption that two negatives would equal a positive. Likert scales are also considered ordinal in comparison to SD, which is considered as a span of equal-appearing intervals (Ajzen, 1975).

There have been a number of challenges to the multiplicative nature of the measurement techniques put forward in the Theory of Planned Behaviour. A recent study by Ajzen and Fishbein (2008) refutes the dispute via the examination of the literature and data simulation.

Prior to the development of Semantic Differential a number of alternative measures were utilised. These techniques include Guttman's Scalogram, and Thurstone's Equal-Appearing Interval Scale. A number of alternative techniques are also available, such as disguised techniques (Hammond's Error-Choice Technique, Estimation of Others' Responses, and the 'Bogus Pipeline' Technique), and physiological measures (Galvanic Skin Response and Pupillary Response) among others. It is beyond the scope of this study to discuss such alternative approaches in detail. The reader is referred to Fishbein and Ajzen (1975), and Oppenheim (2000).

5.4 Change and Persuasion

Fishbein and Ajzen (1975) address the principals of change. They highlight an underlying assumption that changing beliefs and therefore intention will change behaviour. They also highlight two strategies to change behaviour: firstly, the participant approach where the individual observes and evaluates the attributes of the object of the behaviour and, secondly, the communication approach where the person who is being influenced is informed by an outsider. Each strategy relates to previously mentioned additional information that can impact on the relationship of intention to overt behaviour (see Section 5.2.4).

A person rarely questions their own sensory observations; therefore the desired object-attributes should be presented in the participant approach. In the case of the outside communication approach, the outcome depends on whether the individual being influenced accepts the information or not. Therefore this approach requires the identification of the fundamental beliefs

of the individual in relation to the dependent variable of interest. These fundamental beliefs are the determinants of the individual's attitude to the dependent variable. It is these beliefs that should be targeted in order to change behaviour. Fishbein and Ajzen (1975) advise of difficulties in predicting the change in behaviour that will result from a change in beliefs. It is possible with an information campaign, for instance, that other beliefs (external to the beliefs that one wishes to influence) will also be influenced, possibly leading to unexpected changes in behaviour.

5.5 Modifications to the Theory

5.5.1 Desire

Bagozzi (1992) critiques the Theory of Planned Behaviour for not containing a component of desire. Bagozzi believes that having a positive attitude is not sufficiently motivating, "*one must want or desire to do it*" (Bagozzi, 1992: 184). A person may find an act appealing and have no intention of acting on it, while an individual may find an act unappealing and still want/desire to do it. Desire is linked closely with anticipated emotions; which are discussed in section 5.5.5. However, Bagozzi believes desire will not result in an act without self-efficacy.

5.5.2 Self-efficacy

Self-efficacy (SE) is "*their belief in their level of capability to execute the designated activities*" Bandura et al. (2001: 191). This concept is similar to Ajzen's (1985) perceived behavioural control. Both PBC and self-efficacy refer to peoples' perceived beliefs about being capable of performing a specific behaviour. However, they are usually operationalised differently. Eccles and Wigfield (2002) carried out a review of self-efficacy as a major

determinant of goal setting. They revealed that it has been applied in many disciplines with strong evidence to support its theoretical performance.

Boyd and Vozikis (1994) theoretically integrate the concept of self-efficacy into entrepreneurial intentions, actions and goal directed behaviour. They postulate self-efficacy as a means of explaining entrepreneurial intentions and development. However, they do not empirically test the concept.

5.5.3 Past Behaviour

Leone et al. (1999) tested model fit of TRA when the model was augmented to include past behaviour. They used a Structural Equation Modelling (SEM) approach and the result of taking past behaviour into account was an improved fit between the empirical data and the conceptual model.

Ajzen (2002) examined the impact of past behaviour on intentions. He found there was little evidence of habituation or of practical support for the inclusion of past behaviour when intentions are weak and unstable.

5.5.4 Self-identity

After a number of studies had been carried out utilising the Theory of Planned Behaviour, a number of researchers began to question the sufficiency of the normative component of the model. Research then began to focus on the self-concept and how the way that individuals view themselves could influence their intentions, that is, how role identities relate to the person's position in the social structure. Zelalem and Kraft's (2001) study augmented TPB with a self-identity component and applied the concept to the use of contraception by female adolescents in Ethiopia. The study

found that self-identity makes a significant contribution to the prediction of intention.

5.5.5 Anticipated Emotions

Bagozzi (1992) develops the concept of self-regulation, particularly related to goal directed behaviour. Goal attainment interplays between goal-directed behaviour and the facilitating and inhibiting conditions. The Theory of Self-Regulation is more complex than others and utilises an outcome-desire emotions approach.

After a person forms an intention, they are faced with how to reach that goal. The individual will appraise the method to achieve the goal, resulting in beliefs about such means and the desirability of such an approach. The chosen means will be optimum or at least a satisficing option. After this, acts are implemented, monitored and controlled to achieve the goal.

Perugini and Bagozzi (2001) attempt theory deepening by introducing a new construct that incorporates anticipated emotions and desire. They claim to find support for their Model of Goal-directed Behaviour (MGB). In the model the anticipated emotions are evaluated after the goals are formulated, resulting in increased complexity. However, they advise that further studies to validate such an approach are required. Abraham and Sheeran (2003) found support for the incorporation of anticipated regret into the TPB model, as it improved intention to behaviour consistency.

5.5.6 Cognitive Dissonance

This concept of Cognitive Dissonance is not new, but is not incorporated in the pure TPB model. The Theory of Cognitive Dissonance was coined by Leon Festinger. It considers the relations between two cognitive elements that are psychologically inconsistent (Wood, 2000). Dissonance is psychologically uncomfortable and a person is motivated to reduce the dissonance. Smoking is normally used as the example to demonstrate dissonance. The following is an example: 'I know I smoke' and 'I know smoking causes cancer'. The dissonance is moderated in two ways. Firstly a new cognitive element may be added such as 'I know I enjoy Smoking'. Secondly, a person may reduce the importance of one or two of the elements in the dissonance relation (Fishbein and Ajzen, 1975).

The magnitude of the dissonance increases the importance of the elements to the person. A newer approach to cognitive dissonance views the concept as negative consequences from freely chosen behaviour. The negative consequences threaten the moral goodness of the self-concept and self-integrity. Wood (2000) advises that people prefer to directly change their attitude and behaviour to reduce dissonance. Dissonance has been viewed as a method of persuasion.

5.5.7 Theory of Entrepreneurial Cognition

Baron and Ward (2004) present a theoretical paper on applying cognitive science to entrepreneurial cognitions They address a number of questions in relation to the potential application of cognitive science towards broadening and understanding entrepreneurs' cognitive processes in comparison to others, with the underlying theme that entrepreneurs are 'go getters' and opportunistic in nature.

Mitchell et al. (2002) review developments in the application of cognitive science to entrepreneurship. They promote the entrepreneurial cognition approach as a progressive step towards the development of concepts and techniques that will allow explanations of the human element in entrepreneurship.

Wiklund and Shepherd (2003) studied small business managers' motivation to expand. They examined the expected consequences of growth their approach was built upon the expectancy-value theory of attitudes. Their study suggested that non-economic factors may be more important than financial outcomes. Empirical evidence was presented to support the view that employee well-being and independence were moderators of growth intentions.

Wiklund and Shepherd (2003) found empirical evidence of growth increasing with aspirational levels; this supported the behavioural-intention to overt-behaviour link. They also cautioned on the generalisability of the study across countries due to differences between cultures. They demonstrated this in their Swedish study by comparing the variation in the proportion of

firms that grow to a large size in various countries. Their study concluded that resources and opportunities were needed in association with growth aspirations and that the Theory of Planned Behaviour could be further utilised in similar studies.

5.6 Extraction of Barriers

Previous studies such as Tonglet et al. (2004) were successful at extracting barriers utilising a TPB approach. Since attitudes and beliefs are measured as both favourable and unfavourable, it should be quite clear which determinants of collaborative activities are inhibitors and which are positive influencers. This allows for a greater understanding of the process and the targeting of specific beliefs for optimal intervention, if desirable.

5.7 Theoretical Concept and Preliminary Model

Following the literature review a number of components were identified for consideration in the development of a conceptual model. The principal studies of concern were: Perren's (1999) micro-enterprises growth study, Wiklund and Shepherd's (2003) study of resources and opportunities, Roper (1999) in relation to growth, and studies on entrepreneurial cognitions by Mitchell et al. (2002), Baron and Ward (2004), and Boyd and Vozikis (1994). A number of Theory of Planned Behaviour research guideline publications such as: Francis et al. (2004a), Ajzen (2006) and Oppenheim (2000) had a strong influence on the design of the present study and are referred to subsequently. It was realised that the application of the augmentations to the Theory of Planned Behaviour had the strong possibility of greatly increasing

the complexity of the study. It was decided to keep an open mind as to their possible influences.

As further development and evaluation of the preliminary model was needed, further refinement, through primary research, was planned prior to the presentation of the final model in this thesis. The final model is presented in Chapter 9 as the design of a primary quantitative instrument and is represented diagrammatically (in Figure 9.2).

5.8 Summary and Conclusion

As the Theory of Planned Behaviour had been shown to have the capability of eliciting beliefs in a number of disciplines, it was postulated that it possessed the ability to extract positive and negative influencers on individual managers with regard to forming collaborative alliances in the Irish road freight industry,.

Considering the previous discussion, the TPB model appeared conceptually viable as a framework for eliciting barriers and positive influencers in the context of attitudes, peer pressure and control.

6 OVERVIEW OF RESEARCH METHODOLOGY

6.1 Introduction

This chapter outlines the paradigm of the research methodology and the best data collection techniques to utilise, considering the research needs.

All studies have constraints that need to be considered when planning the research process. Some of those that are common to many doctoral theses are time, finance and, particularly for social-science-based research, the co-operation of others.

> *"Research methodology is essentially a decision making process. Each decision made is affected by, and in turn, influences every other decision."* (Brannick and Roche, 1997: 3)

This methodology looks to bring together ideas (theories) and evidence (data) through primary research (Brannick and Roche, 1997). In order to understand the methodology employed in this study, it aids to understand where it fits-in with regard to the broad area of research itself.

6.2 Research Paradigm

Methodology classification is discriminated into two fundamentals, ontology (the way in which we notice things) and epistemology (what counts as knowledge). Generally speaking, there are principally two ways of making sense of things, through scepticism or conviction, which relate back to individuals' chosen epistemology and ontology (Jankowicz, 2000).

Positivism relates to scepticism, in that it evolved from the belief that no human is perfect and one's beliefs could be incorrect or self-delusional. Hence, the way to identify if one's beliefs are correct is to question them. There are a number of ways in which this can take place. Evidence (empirical data) can be compared to the evidence of others through debate and other methods (publication, literature) (Jankowicz, 2000). Positivists search for the truth and believe this can be achieved through scientific means, that is, the hypothetico-deductive method; where concepts, objectives and questions are developed prior to the execution of gathering empirical evidence (Jankowicz, 2000, Brannick and Roche, 1997).

Constructivism (also referred to as phenomenology) takes a somewhat opposite approach to that of positivism, in that it fails to attempt to seek the truth, but instead concentrates on agreed social knowledge. Constructivists work on the basis of convincing society of the accuracy of their views. Constructivists' findings are always exposed to reconsideration, even with a consensus by society on the theorist's knowledge (Jankowicz, 2000).

The research in the present study employed a hypothetico-deductive methodological approach. Predefined hypotheses, objectives and research questions were developed prior to the use of the primary research instrument. In relation to research questions, Brannick and Roche (1997) pointed out that they can be broken down into three broad categories: explanatory (what?), descriptive (when, where, who?) and explanatory/causal (how and why?).

In accordance with the hypothetico-deductive approach, literature was examined prior to the systematic gathering of empirical evidence. Considering the small quantity of literature with regard to Irish road hauliers, not only was multi-disciplinary literature reviewed, but an initial qualitative investigation was undertaken in order to enhance the literature and aid the development of concepts, research questions, hypotheses and variables. Therefore, the research approach was taken in a number of steps, moving from exploratory, in the initial investigation (phase one), to descriptive and explanatory by exploiting a primary research instrument (phase two).

The initial (phase one) investigation consisted of a qualitative and quantitative approach. Once the key variables and research questions had been identified in the qualitative element, a quantitative approach was used in order to utilise statistical techniques. A '*dominant-less dominant design*' has been described by Creswell (1994: 177); this term refers to a mixed-method approach where one method is dominant and the second method is less dominant, but supports the dominant method. Hence, a *dominant-less dominant* design was utilised with the emphasis being on the quantitative instrument (a structured postal questionnaire) over the qualitative semi-structured interviews. Phase one is discussed in detail in Chapter 7.

Conversely there has been debate in the literature as to whether a qualitative and quantitative approach to research is acceptable. The debate can be broken down into three principal categories. The '*pragmatists*' are concerned with practicality and try to incorporate both types of methods into a study. The '*purists*' stick rigidly to tradition, that is, the non-mixing of qualitative and

quantitative approaches, while the '*situationalists*' assert that the circumstances dictate the appropriate methods to use.

However, there is a trend towards acceptance of both qualitative and quantitative methods in research studies (Creswell, 1994: 176). The research contained herein is related, above all, to the situationalists. This study's situation dictated the need for qualitative research as a foundation for the quantitative study. Boyer and Swink (2008) argue for the use of a mixed methods approach, to mitigate the weakness of a single method, in supply chain management research.

A triangulation approach to data gathering was taken into consideration and adopted. The rationale for this is explained well by Kane (1985), who believes that different methods (such as questionnaires, interviews, observation and so forth) are overlapping in scope:

> *"If you had to stake your life on which of these is likely to represent the most accurate, complete research information, you would choose the centre (of the overlap) in which you got the information through interviews and questionnaire, reinforced it by observation, and checked it through documentary analysis. In the centre section, you are getting not only what people say they do and what you see them doing, but also what they were recorded as doing"* (Kane, 1985: 51).

Jick (1979) also supported this view of Kane's, with the assumption that bias as a result of a particular data source would be reduced or eliminated when cross referenced with another data source. Triangulation approaches can be

broken down into two broad categories, '*within methods*', where the study maintains the same research paradigm throughout or '*between methods*', such as the present study's approach, drawing on qualitative and quantitative data collection techniques.

The sequential triangulation approach that was adopted for this study also complimented the '*dominant-less dominant design*' structure. The principal purpose of the use of this approach over others has been previously articulated by Greene et al. (1989) as one of five purposes of combining methods in a single study, that is, developmentally*, "one method is implemented first, and the results are used to help select the sample, develop the instrument, or inform the analysis for the other method*" (Greene et al., 1989: 267). Another purpose is "*triangulation in the classic sense of seeking convergence of results*" (Creswell, 1994), giving further support to Kane's view. Triangulation has been successfully utilised in the logistics domain and can lead to greater insights in comparison to a single research methodology (Mangan et al., 2004).

Mentzer and Kahn (1995) noted a lack of rigorous approaches to logistics research. They highlighted that logistics research takes a positivism approach, looking to explain and predict reality. Positivism approaches build "*mountains of knowledge*", placing research findings on top of one another. As "e*rror is an unavoidable element when trying to connect abstract theoretical concepts to concrete measurements*" (Mentzer and Kahn, 1995; 237), research studies require the assessment of validity in order to verify the acceptability of the studies' findings.

Gammelgaard (2004) advises of a number of schools of thought in logistics research and highlights three: the analytical (positivism), systems (holistic) and actors (sociological meta-theories). While to a large extent agreeing with Mentzer and Kahn (1995) that positivism is dominant, she highlights that they all tend to lead to similar questions and answers.

This thesis utilised a blend of the analytical and actor school approaches, that is: explanatory theory testing, cause-effect relationships, hypothesis testing and the frequent use of quantitative statistical data analysis. This was integrated with the actor school approach to bring research and practice closer together. The actor school of thought is based on human governance and allowed the explanation of the human side of logistics strategy, that is, applying social theories such as the Theory of Planned Behaviour to a logistics context. Gammelgaard's (2004) meta-analytical review of logistics research did not find any studies that utilised an actor's school approach to their research. However, the social capital concept (which refers to connections between social networks) was subsequently applied to supply chain management in studies by Cousins et al. (2008) and Lawson et al. (2008).

Keller et al. (2002) highlight the move towards latent concepts: the use of social science and survey method techniques in business logistics. They recommend a qualitative approach such as interviews and observations in order to accurately conceptualise ideas.

Utilising the Theory of Planned Behaviour as a template for the primary research instrument in phase two of the empirical research required a

substantial quantity of pilot work. The pilot work's aim had a qualitative nature: to elicitate salient behavioural, normative and control beliefs for inclusion in the development of the primary quantitative instrument (Oppenheim, 2000: Ajzen, 2006; Francis et al., 2004a).

6.3 The Framework for Questionnaire Design

Considering the proposed objectives of the research study, the decision was made to encompass a questionnaire as the primary research instrument, that is, a dominant deductive (positivist) design. The majority of the literature supported the view that attitudes and behaviour could be measured through such a means. Only one exception to this view was found, arguing that attitudes only played a minor role and were therefore irrelevant (Gendall, 1998). However, the broader academic community rejected such a stance (Oppenheim, 2000; Oskamp, 2004; Francis et al., 2004a; Fishbein and Ajzen, 1975).

6.4 Data Collection Methods

The research strategy was divided into two phases. The initial investigation (phase one) concentrated on the neo-classical view of the firm, that is, profit maximising behaviour. Road freight operators' behaviour was assessed by analysing the industry's costing and pricing procedures. Phase one was divided into two sections, firstly a qualitative approach to gain additional insight, followed by a quantitative approach in order to gain an industry-wide snapshot. This research phase is presented and discussed in Chapter 7.

The results of phase provided important insights and generated tentative conclusions, but they also raised more questions. The behaviour of road freight operators in Ireland did not support profit maximisation and the neo-classical view of the firm. This, alongside the EU's objectives to develop advanced transport-logistics and the fragmented nature of the Irish road freight industry, called into question any assumptions that might be made about the industry's behaviour and, therefore, about how any efficiency issues might be addressed.

Phase two commenced from a behavioural decision-making / behavioural economics standpoint. Since economies of scale appeared not to exist in certain sectors of the industry, the overall question was: what are the key influencers on the Irish road freight industry towards performing advanced transport-logistics activities via industry co-operation?

A number of methodologies were reviewed. The scenarios method was rejected as an approach due to its level of complexity, the limited time that was available and the resources that would have been required to carry out the substantial number of quasi-experiments needed to apply statistical analysis techniques. Also the principal function of the scenarios approach tends to be the exploration of alternatives (Aiman-Smith et al., 2002), which was not aligned with the objectives of this study. Quasi-experimental research designs attempt to replace the rationale of experimentation where formal controls over stimuli cannot be utilised. Romanelli and Tushman's (1996) study applied this type of research design to examine the influence of managers and environments on organisational activity. As their approach was longitudinal in nature, it is somewhat unsuited to doctoral research.

Quasi-experimental approaches fail to allow for causation, as the researcher has not full control of all the variables. Internal validity is also questionable, as these techniques tend to use non-random sample selection (Harris et al., 2004). The Theory of Planned Behaviour, however, was appropriate due to its behavioural and attitudinal nature, and its ability to extract barriers in a variety of contexts and disciplines.

Hence, phase two utilised a mixed methods methodology. As the primary research instrument was to be based on a semantic differential measurement technique for empirically employing the Theory of Planned Behaviour, substantial pilot work of a qualitative nature was necessary in order to effectively elicitate salient beliefs. This pilot work built the foundations of the quantitative instrument. (Ajzen, 2006; Oskamp, 2004)

The repertory grid, as a technique for qualitative investigation, was reviewed but rejected. The repertory grid originated in psychology with the comparison of photos and objects to extract beliefs (Oppenheim, 2000). Operationalisation of such an approach to this study would have been problematic. No adequate representation of the concept of collaboration with visual stimulus was found to be acceptable. The application of this technique to this study would have been cognitively taxing on the interviewees in the absence of such visual prompts. There was a serious doubt as to the ability of an interviewee to keep the various aspects of collaboration in their mind and compare it with other concepts while trying to extra similarities and differences. Therefore, the repertory grid technique did not lend itself well to this study. Interviews appeared more appropriate.

Semi-structured individual interviews and a group interview were utilised to augment the literature and the previous findings. The purpose of the interviews was to extract salient modal beliefs, as recommended by Fishbein and Ajzen (1975) and Francis et al. (2004a).

The development of the structural research instrument utilised the qualitative results already obtained. The elicitation of salient beliefs, along with the literature review, furnished the structured postal questionnaire. The questionnaire utilised a seven point semantic differential technique, as supported by Oppenheim (2000). Further details of phase two are discussed in Chapters 8 and 9. The analysis was implemented by the application of Structural Equation Modelling and is discussed in detail in Chapter 10.

6.5 Summary and Conclusion

This chapter has provided an outline of the philosophical approach to the research paradigm. In a move away from the traditional single-paradigm approach, it has provided support for a mixed method approach using a situationalist's paradigm that includes both qualitative and quantitative techniques. The chapter has also outlined the developmental steps of the empirical research, which was consistent with the philosophical approach that was adopted.

7 PHASE ONE: INITIAL STUDY

7.1 Introduction

This chapter discusses the initial empirical phase of the study and its place in the overall thesis. It highlights the techniques utilised to investigate the industry from a neo-classical perspective. That is, it investigates whether the industry's operators are profit maximisers. The methodological strategy to this phase is discussed. The findings are deliberated and related to the development of the principal empirical investigation, phase two.

7.2 Research Strategy

This phase of the empirical research utilised a mixed methods, two step approach, with the purpose of the first method (qualitative) aiding development of the second (quantitative).

The aim of the quantitative element was to take a snap shot of a number of the issues that were identified in the literature review and augmented by the qualitative element. The research concentrated on owner-operators in the hire and reward sector of the industry. Previously in Ireland only minor research had been based on these operators. Their increasing percentage of road freight activity in Ireland was having an impact on transport-logistics efficiency and the broader economy. The results would aid understanding and give insight into policy implications.

7.3 Qualitative Investigation

7.3.1 Data Collection Methods

The qualitative section of phase one remains within the exploratory research category. Hence, the semi-structured interview technique was used in order to gain an in-depth understanding of Irish road hauliers' costing and pricing procedures, while maintaining flexibility to investigate relevant tangents.

Questions on macro industry subjects were drawn up prior to the interviews. These interviews took place on an individual basis, in a formal setting. In order to maintain the interview momentum, the respondent's answers were recorded for later analysis. The use of key informants was chosen due to the aim of this section of phase one: to gain knowledge of this industry in a broad context. The use of key informants appeared to be the most efficient way to achieve this.

This technique was decided upon due to the nature of the questions. They were mainly of a *what and why* type that required detailed answers. Therefore, other techniques such as a postal questionnaire would have been unsuitable, since many of the answers were not foreseen. The semi-structured interview questions are available in Appendix A. Considerable amounts of data could have been obtained from a single in-depth study. However, it was realised that several firms would need to be studied, as their procedures and techniques for analysing costs or for rate setting and their general opinions were expected to differ depending on the operators' characteristics (University of New Brunswick, 1999).

It was initially determined that an appropriate number of firms to visit to obtain the required data would be four hire-and-reward operators from different segments of the industry. As appropriate literature on this topic was available, such as best-practice literature on costing and pricing procedures, the purpose of the small number of qualitative interviews was to support the status quo (Bock and Sergeant, 2002). That is there was substantial *a priori* evidence, qualitative evidence was undertaken to confirm existing beliefs about the phenomenon. Therefore only a small quantity of initial primary qualitative research was required to assess if the literature needed augmenting. This decision was reviewed after the interviews had taken place and found to be acceptable based on the quality of data obtained and data repetition.

Previous short or detailed studies into similar areas with small sample sizes have been carried out, such as, Cook (1967) and Gentry (1996). The sample in this study consisted of a cross section of hauliers. Their details were obtained from a number of sources, such as the Irish Road Haulage Association (IRHA) commercial directory and the Irish online freight directory—freightfox.com.

The sample frame hauliers were initially contacted with a cover letter on official institute headed paper. It briefly explained the reason for the study. It also listed the supporting organisations: the Department of Transport, the Chartered Institute of Logistics and Transport (CILT) in Ireland and the Irish Road Haulage Association (IRHA). The letter also advised the recipients to expect future contact by phone, which would be to provide further information on the research, answer queries and schedule appropriate interview

appointments. In the ensuing telephone conversations with the haulage operators, the mutual benefits the study would provide were stressed. The contact letter is available in Appendix A.

An important feature that was considered was the likelihood of the co-operation of the haulage operators. A number of articles of a research news nature were published in the IRHA's publication, Knights of The Road, and the CILT publication, Linkline. The aim of this was to promote the research and, it was hoped, assist in gaining haulage operators' co-operation and trust. However, hauliers were by no means forced nor pressurised to participate, as any such element could have led to bias and reduced the quality of the data.

Consideration was also given to the potential for discrepancies in the sampling plan. No source was available from which a sound sampling plan could be developed to take account of the heterogeneous sectors of the industry. However, this was judged not to be a major issue for this section of the research, although it could have had more important repercussions for the following section, which would attempt to gain statistically significant results that were representative of the target population.

Content analysis was applied to the data. The data were coded and categorised manually. The rationale behind manual coding, as opposed to the use of a software package, was that the length of time it would have taken to learn to use a software package for qualitative analysis would have outweighed the benefits, since there were only a small number of participants in this section of the study.

In implementing the qualitative research, awareness was maintained in relation to a number of points. For example, how the interviewer was dressed might affect the respondent and their attitude towards the interview. Different approaches needed to be considered due to class, gender, culture and levels of education.

Qualitative research will always be open to bias. The question was, how to minimise it? An awareness of the potential for bias would allow the interviewer the opportunity to minimise any such bias.

Awareness involved observation of body language: for example, did respondents take a defensive position, or were they holding back? The articulateness of the respondents was also considered, or inaccurate data could have been collected. The interviewer also attempted to obtain clarity on any ambiguous or incomprehensive explanations. Consideration was also given to whether the answers, which the interviewee supplied, were first hand or from secondary sources. Idiosyncratic factors were also considered, such as a respondent's mood and their background, as this had the possibility of affecting their perception of the issues. Deliberation was also given to the possibility that the interviewer might also be biased due to preconceptions and perceptions (Jankowicz, 2000). The interviewer attempted to maintain an open mind and objectivity.

7.3.2 Analyses and Results

Consideration was given to reducing the effects of individual perception on the results and increasing their reliability through the use of a crosscheck

system, Cohen's Kappa, wherein a second person would also code the transcripts. The two results would then have been compared and a discussion would have taken place until more useful definitions of categories evolved (Cohen, 1960).

However, after reflecting on this, it was decided not to take such an approach. The availability and the goodwill of a colleague to participate in this process, spend the required amount of time and have the dedication to analyse the transcripts comprehensively was doubtful and a less-than-thorough implementation might have led to erroneous results. Therefore, a single content analysis was undertaken to code and categorise respondents' answers.

A number of issues were extracted from the qualitative study. The procedures of the operators for costing, pricing and optimal-revenue decision-making were underdeveloped in the majority of cases and, generally, a dichotomy was found between large and small operators. The accuracy of the operators' data analysis procedures was at the core of this issue. Since small operators appeared not to monitor their costs, it was difficult for them to accurately cost jobs, implement cost control or adhere to budget targets.

Further probing revealed that lack of education/skills and time were key barriers to having effective data analysis procedures in place. A large operator that was interviewed had an administrative team and monitored costs effectively through the use of spreadsheet and other computer

packages; the members of the administrative team were highly qualified, such as a chartered accountant.

Smaller operators advised that they were under pressure to ‘be on the road’ utilising their vehicles, thereby reducing the amount of time they had available for administrative activities.

The phase one qualitative study concluded that with an intensive working environment and possible issues of bounded rationality, the competitiveness of the haulage industry was pressuring many owner-managers into working long hours on jobs that were potentially unprofitable, as their financial viability has not been accurately assessed. It appeared that the size of the operations had an impact on their administrative efficiency: large operators’ indirect administrative costs were diluted over higher levels of activity, whereas their smaller counterparts found it difficult to commit adequate resources to their administrative needs.

7.4 Quantitative Study

7.4.1 Aims and Hypotheses

The overall objective was to assess the previously identified profit maximisation and bounded rationality themes in the Irish road haulage industry’s deregulated environment.

The size of road freight operators had previously been investigated in a regulated environment in order to assess if economies of scale existed, as discussed in Chapter 3, but the findings were not necessarily relevant to Irish road freight operators. Was the size of large Irish operations related to the

capacity to distribute over large geographical areas? Therefore, were operators attempting to have national coverage rather than collaborating with regional operators? Hypotheses were developed that moved towards answering these questions.

Initial Study Hypothesis 1: Firms that operate on a national or international basis have larger operations (Geographical Hypothesis: HG).

Initial Study Hypothesis 2: The profitability of hire and reward haulage operators varies in relation to size (Size Hypothesis: HS).

7.4.2 Data Collection Method

The literature and the categories identified by the semi-structured interviews were utilised to develop a large-scale postal questionnaire with structured, closed-ended questions, which were standardised to aid comparisons. The aim of this questionnaire was to generalise the results to the whole population. Therefore, an assessment was to be undertaken for the whole Irish industry.

The qualitative section of phase one greatly assisted in the appropriate wording and relevance-assessment of the questions. Careful consideration was given to the layout and sequence of the questions in order to minimise bias. The questionnaire contained a number of sections, in accordance with standard practice (Wisker, 2001). Personal information (such as level of education) about the respondent was left to the end of the questionnaire.

The first step was to identify the required information and from whom it should be sought. The information that was mainly required had been established from the qualitative study as the level of costing refinement and the procedures followed in the development of rate calculation. The investigation concentrates on the barriers to effective procedures, that is, obstacles to calculating and obtaining acceptable rates from customers. The questionnaire was addressed to the general manager, as they are the most likely costing and pricing decision-makers. Thus the questionnaire is extracting data on costing, pricing procedures and competitive pressure that hauliers are experiencing. The postal questionnaire, due to its nature, will be broad but shallow. However, in combination with the semi-structured interviews, which were narrow, but in-depth, a satisfactory cross analysis emerged.

A mail survey was chosen as the data collection method because the sample was a large population that was geographically dispersed. Time and budget constraints meant that other methods were unsuitable

Being a mail questionnaire it was naturally self-administrated; hence it needed to be clearly understood. Thus, it had explanatory notes and the majority of question types were close ended, with a number of Likert scale responses for simplicity and comparability (Appendix A contains a copy of the questionnaire).

While drafting the questionnaire frequent referrals were made back to the hypotheses and research objectives. An attempt was made to exclude information that was seen as unnecessary, but nice to know.

The sampling unit for the postal questionnaire was individual businesses, that is, hire and reward haulage operators. The sampling element was the person responsible for costing and pricing decisions. The representativeness of the sample to the target population was given careful consideration. Stratified random sampling would have been the most beneficial in gaining high level representation (Jankowicz, 2000).

However, due to lack of information about the population, with particular reference to the size and proportional percentages of each subgroup and sector, stratified sampling proved to be impossible. The use of cluster or quota sampling was also ruled out for the same reason. The best alternative was to perform systematic random sampling using the Department of Transport's database on licensed hauliers for hire and reward, which was freely available from the Department of Transport Website. From the database, the population size was 4,380.

Considering the constraints on the study of cost, time and the data processing required, a survey sample size of 20% of the population was selected. Questionnaires were sent to a random sample of 20% of the population; that is, 876 questionnaires were issued.

An estimated response rate of 25% was chosen from a textbook average for response rates to postal questionnaires (Saunders et al., 1997). The estimated number of responses was therefore 4380 × 0.20× 0.25 = 219, or 5% of the population.

It was expected that a response rate of at least 25 per cent would be achieved, due to the previously mentioned research news articles and the support of prominent organisations. A stamped addressed envelope was included with the questionnaire in order to make the process as simple as possible for the respondents (Wisker, 2001).

The researcher was very much aware that once the postal questionnaire had been issued it would have been very difficult, if not impossible, to make corrections and that this had the potential to derail the research process. In order to ensure that any such derailment was avoided pre-testing and pilot testing were implemented prior to the principal issue of the questionnaires.

The pre-test was implemented by obtaining feedback from a number of staff within the Department of Transport Engineering and prominent members of the industry. The pre-testing and pilot testing allowed for the checking of question wording, as well as of the administration and analysis processes. Some minor changes were made as a result of the pre-tests. During the pre-test stage an article was published in Fleet Management, the largest trucker magazine distributed in Ireland. This article was published at a key time in order to maximise the response rate of the postal questionnaire. A pilot test was then carried out on a small percentage of the sample (10%). No changes to the research instrument were identified by the pilot test. Since no discrepancies were detected, the questionnaire was issued to the remainder of the sample.

As part of the process of ensuring that the maximum possible response rate was received, the questionnaire cover letter and reminder letter received due

thought. The cover letter contained information for the respondents on the background to the research and the benefits that should emerge. The sponsor (Dublin Institute of Technology) was stated on the letter in order to increase the recipient's perceived authenticity of the survey.

The sample selection procedure was briefly explained in order to reduce fears of mistrust. Confidentiality was illustrated by means of an identification number and the assurance that results were going to be used for aggregated statistics. The cover letter also explained what was involved in the survey, that is, the completion of a postal questionnaire.

A contact name, phone number, postal address and email address were provided in case the recipients had any queries and also to increase the perceived legitimacy of the survey. Finally, appreciation for their co-operation was thankfully mentioned (Brannick and Roche 1997). The cover letter is available in Appendix A.

A reminder letter was issued to the entire sample two weeks after the issue of the questionnaire. As it was sent to the whole sample, it thanked those who had previously replied and urged those who had not to do so immediately. It also provided contact details in case the questionnaire was misplaced or never received.

The front cover was also given considerable attention in order to catch the respondents' interest. To achieve this, the survey was given a title and graphics were added (Frazer and Lawley, 2000). The sponsor of the survey was mentioned and a contact name, phone number, postal address and

email address were also included, in case of separation of the questionnaire from the cover letter.

The questions were divided into five areas, in order to obtain logical question routing and structure.

Section A was a light introduction to the questionnaire. This section appeared first in the questionnaire as it was the simplest for the haulier to answer and this could positively affect the response rate.

Section B related to costing practices. The rationale for placing it before pricing was the theoretical concept that costs should be analysed before rates can be set accurately. Thus the positioning of the questions followed the natural flow of the theory and what should have been technically correct in practice and aided the flow of the questionnaire. No bias was believed to be introduced by ordering the questions in such a manner.

Section C was concerned with the procedures and methods used in rate calculation. Section D concerned management and competition issues and was related to budgeting, planning and, in particular, the external environment.

Section E sought data on the company profile to investigate the relationships between education, experience, appropriateness of procedures, firm size and profitability. These potentially sensitive questions were left towards the end of the questionnaire, as this could have a positive impact on the response rate. At this section of the questionnaire the respondents would already have

completed the majority of the questions and were therefore likely to complete the remainder. Also, the respondents would have known at this stage what data their personal details were being linked with.

Section F provided a space for comments and clarification of answers. A copy of the questionnaire is available in Appendix A.

7.5 Analyses and Discussion

The following section outlines the descriptive statistics of the respondents and presents the key findings from the quantitative element of phase one. The responses were analysed with the assistance of SPSS (Statistical Package for the Social Sciences), version 14.

7.5.1 Descriptive Statistics

Responses were received from 162 hauliers, a response rate of 18.5%. Unfortunately 10 were discarded due to respondents' principal operations being outside the Republic of Ireland or insufficient completion of the questionnaire (where over 50% of questions were unanswered). Therefore, there were 152 valid responses, a valid-response rate of 17.5%.

The percentage breakdown of numbers of respondents by county was compared to the breakdown by county of the addresses in the population database. The distribution of respondents' addresses varied in comparison to that of the population, with some sizeable percentage fluctuations. In general, the geographical spread of the respondents was wide throughout the country. The breakdown of respondents' bases of operation is available in Appendix A.

Table 7.1 Respondent's principal sector of operation

Sector	Freq	Percent	Cumulative Percent
General Haulage	52	34.2	38.8
Tipper/Construction	48	31.6	75.7
Refrigeration	13	8.6	86.2
Groupage	8	5.3	44.1
Container	7	4.6	4.6
Bulk	4	2.6	89.5
Hazardous	4	2.6	94.7
Liquid	4	2.6	92.1
Livestock	3	2.0	77.6
Heavy	1	.7	86.8
Other	8	5.3	100.0
Total	152	100.0	

As shown in Table 7.1, the highest numbers of responses were received from the general haulage (34%) and tipper/construction (32%) sectors. Unfortunately, no comparable data were available for the population database.

Table 7.2 illustrates the respondents' geographical basis of operations: regional, national or international. When compared with the type of licenses issued in the population database, that is, national or international, discrepancies were present between the responses and the population data. The population data indicated that 43.5% of hauliers had national licenses and the remaining 56.5% international licenses.

Respondents who operated on a regional or national basis were most likely to hold a national licence and thus should be compared on that basis. That is, 81% of the respondents compared to 43.5% of the population, while the remaining 18.9%, who claimed to operate on an international basis,

compared to 56.5% in the population database. However, the seemingly very large discrepancies could partially be explained. In 1998 the national and international Certificate of Professional Competence (CPC) were brought together; it is probable that from that point in time those who received their license would be classified as having an international license in the haulage database. In hindsight it would have proved useful to ask the respondents what classification of a license they had as a separate question. Table 7.2 therefore provides the best estimate of the breakdown of hauliers by geographical basis.

Table 7.2 Respondent's geographical basis of operation

Geographical Basis	Freq	Percent	Valid Percent	Cumulative Percent
Regional	51	33.6	35.7	35.7
National	65	42.8	45.5	81.1
International	27	17.8	18.9	100.0
Total	143	94.1	100.0	
Missing	9	5.9		

The final comparison of survey responses to the total population database was the number of own vehicles that the haulage firm operated (not including subcontracted hauliers). Firms were categorised as small, medium or large, depending on the number of vehicles. The breakdown of the respondents was 70% small (less than or equal to three), 22% medium (greater than three and less than ten) and 8% large (greater than ten). This was approximately reflective of the population database: 78% small, 16% medium and 5% large. The mean number of own vehicles was 4.8 for the respondents and 3.13 for the population. This indicated a tendency for a greater proportion of large to medium firms to respond to the survey. However, it is worth noting that this is approximately a 50% difference. This figure could also be influence by the

nature of the population data being historical and the accuracy and currentness of the database.

An analysis also took place comparing late to early responses, as it is believed that late respondents provide similar responses to non-respondents (Lu et al., 2007; Liao et al., 2007). Therefore, any trends or differences would give an insight into possible biases in the data owing to non-respondents. Early respondents were defined as those who responded before the reminder letter and late respondents as those who responded after the reminder letter was issued. Cross tabulations and t-tests were carried out. No statistically significant differences were detected.

The data variances between the respondents and the population could have been partly explained by changes over time, as the questionnaire related to a different point in time to the population database. However, on the whole, the data presented illustrate that the responses were reasonably representative of the hire and reward haulage population.

Appendix A provides a summary of the scale data obtained from the questionnaire. Some caution is necessary in interpreting the profitability figures for small operators. As Bayliss (1986) noted, firms (in particular small firms) may allocate the net proceeds of trading between wages and profits as a means of reducing tax liability.

The positions of the respondents in the haulage firms are illustrated in Table 7.3. Owner-mangers made up by far the highest proportion of respondents. The cover letter with the questionnaire had indicated that the questionnaire

was intended to be filled-in by the person responsible for costing and rate setting.

Table 7.3 Respondent's position

	Frequency	Percent	Valid Percent	Cumulative Percent
Owner-Manager	137	90.1	92.6	92.6
General Manager	4	2.6	2.7	95.3
Accountant	7	4.6	4.7	100.0
Total	148	97.4	100.0	
Missing	4	2.6		

Table 7.4 provides data on the educational levels of the respondents, while Table 7.5 provides data on the respondents' highest transport qualifications. The data in Tables 7.3 to 7.5 could not be compared with the entire haulage population due to lack of comparable data for the population.

Table 7.4 Respondents' highest general education

	Frequency	Percent	Valid Percent	Cumulative Percent
None	5	3.3	3.4	3.4
Primary	25	16.4	16.8	20.1
Junior Certificate	46	30.3	30.9	51.0
Leaving Certificate	46	30.3	30.9	81.9
Higher Certificate	6	3.9	4.0	85.9
Diploma	6	3.9	4.0	89.9
Bachelor	7	4.6	4.7	94.6
Postgraduate	1	.7	.7	95.3
Pro Qual. = to Bachelor	7	4.6	4.7	100.0
Total	149	98.0	100.0	
Missing	3	100.0		

Table 7.5 Respondents' highest transport qualification

	Frequency	Percent	Valid Percent	Cumulative Percent
None	30	19.7	20.1	20.1
CPC	113	74.3	75.8	96.0
Diploma	2	1.3	1.3	97.3
Advanced Diploma	1	.7	.7	98.0
Degree	3	2.0	2.0	100.0
Total	149	98.0	100.0	
Missing	3	2.0		
Total	152	100.0		

7.5.2 Hypothesis Testing

In order to test the hypotheses, which were described in section 7.4.1, operationalisation was required. Bayliss (1986) used 'number of vehicles' as a measurement of assets and therefore size in a study. Although far from perfect, a simple approach was decided upon. Large geographical spread was defined as having operations on a national or international basis. Operation size was based on the number of vehicles that legally required a licence. Size of the operator was classified into two groups: small, less than or equal to three vehicles and large, greater than three vehicles. Profitability was defined by net profit margin.

Table 7.6 Geographical hypothesis t-test

	Geographical Basis	N	Mean No. Vehicles	Std. Deviation	Std. Error Mean
Vehicles over 3.5 GVW own fleet	Small (regional)	48	1.85	1.891	.273
	Large (national and international)	89	5.92	9.315	.987

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff.	Upper	Lower
Equal variance assumed	15.143	.000	-2.987	135	.003	-4.07	1.362	-6.760	-1.374
Equal variance not assumed			-3.970	100.852	.000	-4.07	1.024	-6.099	-2.035

A statistically significant difference in operators' mean size based on geographical coverage would confirm the Hypothesis 1; therefore a t-test was appropriate. The results are presented in Table 7.6. In regard to hypothesis 2 (relationship of profitability to size), a statistical significant difference in profit margins based on operator size would confirm this hypothesis; therefore a t-test was also appropriate as presented in Table 7.7.

Table 7.7 Size to profit hypothesis t-test

Firm Size		N	Mean Profit	Std. Deviation	Std. Error Mean
Profit/ Loss	Small <=3 vehicles	64	18.21 %	12.682	1.585
	Large > 3 vehicles	33	7.01 %	6.520	1.135

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Diff.	95% Confidence Interval of the Difference	
									Upper	Lower
Profit/ Loss	Equal variance assumed	18.012	.000	4.749	95	.000	11.20	2.357	6.516	15.875
	Equal variance not assumed			5.742	94.998	.000	11.20	1.950	7.325	15.066

Both hypotheses were upheld, as the means were statistically different, with 2-tailed significance levels below 0.05. Hence,

- firms that operated on a national or international basis had larger operations than those that only operated on a regional basis

and

- the profitability of hire and reward haulage operators was greater for small operators and less for large operators.

7.5.3 Profit Maximisation

Even though no sophisticated measure of economic rationality was used, it was apparent that the decision-making of large firms featured a more economically rational process, in contrast to the decision-making of small firms. Therefore, the larger firm seemed to have the potential for higher levels of profitability or to control costs, resulting in increased competitiveness. However, small hauliers reported significantly larger profit margins in comparison to larger operators.

A high and low profitability divide, Table 7.8, was developed through the use of the respondents' mean net profit margin of 14.36%, Table 7.9. Those operators below the mean were considered to have low levels of profit margin and vice versa. There was also a moderate to strong negative correlation between profit margins and size, based on the number of vehicles.

Table 7.8 Mean high and low profit to number of vehicles

Profit Group High/Low		Years Experience	Profit/Loss	Vehicles Over 3.5	Number of Drivers	Years Established
Low	Mean	17.580	5.20	7.170	8.950	16.110
	N	51	53	53	53	53
	Std. Deviation	9.632	5.149	10.216	15.810	12.945
High	Mean	20.500	26.79	1.980	1.930	13.840
	N	42	45	45	42	45
	Std. Deviation	11.710	8.683	1.925	1.956	10.639
Total	Mean	18.90	15.110	4.790	5.850	15.070
	N	93	98	98	95	98
	Std. Deviation	10.662	12.856	8.025	12.338	11.936

Table 7.9 Correlation of profit/loss margin to firm size

	Mean	Std. Deviation	N
Profit/Loss	14.36	12.117	98
Vehicles over 3.5 GVW own fleet	4.40	7.599	146
Number of Mngt/admin	1.60	2.540	146

		Profit/Loss	Vehicles over 3.5 GVW own fleet	Number of Mngt/admin
Profit/Loss	Pearson Correlation	1	-.324(**)	-.306(**)
	Sig. (2-tailed)	.	.001	.003
	N	98	98	95
Vehicles over 3.5 GVW own fleet	Pearson Correlation	-.324(**)	1	.693(**)
	Sig. (2-tailed)	.001	.	.000
	N	98	146	142
Number of Mngt/admin	Pearson Correlation	-.306(**)	.693(**)	1
	Sig. (2-tailed)	.003	.000	.
	N	95	142	146

** Correlation is significant at the 0.01 level (2-tailed).

7.5.4 Economies of Scale

The primary research instrument did not yield figures on operating costs. Therefore, the analysis in this section was based on the industry's structure. However, analytical power was reduced due to the lack of data on the industry's structure in previous years. This same lack of data also impeded the determination of a possible minimum efficiency scale (MES) or ideal firm size based on structural change (Bayliss, 1986).

The initial investigations into market structure indicated that approximately seventy five per cent of haulage firms had three vehicles or less. From a neo-classical perspective this evidence supported the view that economies of scale did not exist based on this structure. As the road haulage industry was believed to be a competitive environment, the tendency should have been for optimum size to be attained naturally in order to survive. Therefore, based on the data, economies of scale tended not to exist or, if they did exist,

counter-acting factors may have been eroding their benefits. However, this was based on taking a whole-industry view. Nevertheless, sub sectors did exist and it appeared likely that economies of scale existed in the distribution sector.

Further investigation into market share, based on number of vehicles, illustrated the fact that the dominance of the small hauliers was not as great as it seemed at first. A smoothing out effect occurred when the industry structure was viewed in terms of industry capacity, as illustrated in Figure 7.1. There were assumptions associated with Figure 7.1: that all vehicles had equal capacity and that the questionnaire response levels were similar for all categories of vehicle size.

However, these figures were on an aggregate level. Breaking down the figures into the various sectors revealed that small hauliers were the dominant players in the tipper/construction sector and at a local level. Larger players tended to be active in international transport, refrigeration, liquid transportation and general haulage, indicating a difference in markets depending on size.

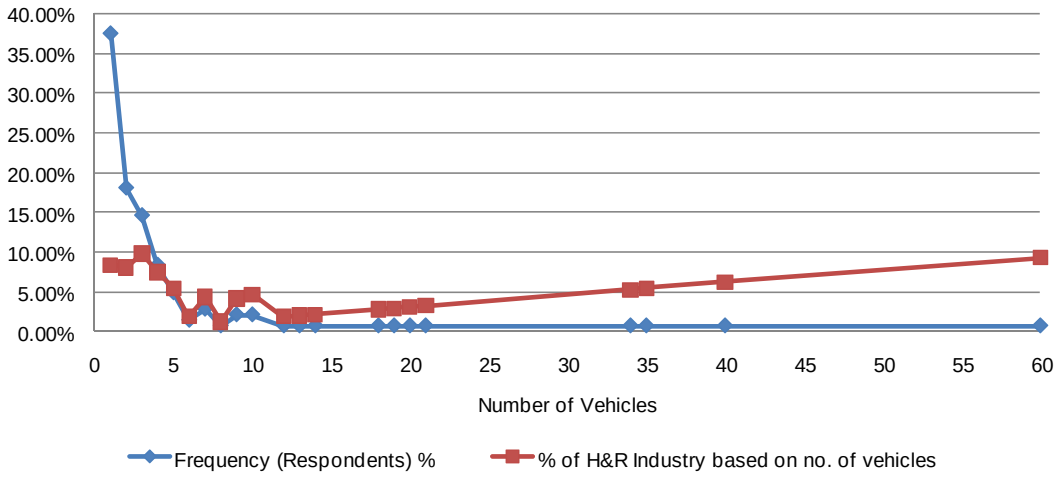

Figure 7.1 Comparison of number of firms with market share

(plotted against number of vehicles operated)

7.5.5 Bounded Rationality

Considering the importance of costing and pricing in the literature, the survey data were used to analyse the economic rationality of decision-making within the firms. An assessment was made of the collection, analysis and use of data for rate decision-making. It was found that small hauliers, principally owner-managers, did not collect or analyse sufficient cost data in order to make pricing decisions accurately. The tipper/construction sector, in particular, had a high level of price taking. The survey asked the hauliers to rank from one to seven the most common method they used for calculating prices, one being for the most common method and seven being for the least. The mean results are presented in Table 7.10. There was a high amount of missing data for this question. This was possibly an indication of the lack of understanding that existed in relation to this topic in the road haulage industry. Full cost plus mark-up was the most common costing method.

Table 7.10 Ranking of standard rate setting methods

	N	Minimum	Maximum	Mean	Std. Deviation
Full cost plus mark-up	73	1	6	2.25	1.706
As high as customers will pay	77	1	7	2.68	1.788
Competitors' prices	72	1	7	2.88	1.727
Consigner stipulates	76	1	6	2.91	1.768
Contribution over direct costs	57	1	7	3.98	1.664
Follow market leader	61	1	7	4.16	1.655

It can be seen from Table 7.11 that small hauliers had lower levels of education and higher levels of profitability in comparison to larger operators. This seemed illogical at first, although the heterogeneous nature of the industry was likely to distort any direct relationships.

The association of low levels of education with small hauliers relates to Lindblom's (1959) and Simon's (1976) 'Bounded Rationality' theory. However, it is also worth noting that time was one of the principal obstacles to the respondents improving their decision-making, linking the results to Lindblom's (1959) suggestion of efficiency benefits from simplified decision-making. However, from the survey results 'simplified' might have been an understatement of the approach taken by many of the industry's smaller operators. Many operators appeared not to have the skills and resources to manipulate and maximise profits, thereby refuting neo-classical economics and leaning towards the theory of satisficing, behavioural economics and bounded rationality. Based on this evidence, small hauliers appeared not to be maximisers.

Table 7.11 Highest levels of education to size and profit

Highest General Education		Vehicles over 3.5 GVW own fleet	Profit/Loss %
None	Mean	2.00	20.50
	N	5	4
	Std. Deviation	1.000	6.658
Primary	Mean	2.50	22.00
	N	22	13
	Std. Deviation	2.874	13.552
Junior	Mean	2.380	16.35
	N	45	24
	Std. Deviation	2.103	14.506
Leaving	Mean	3.62	12.49
	N	45	36
	Std. Deviation	4.136	10.924
Higher Certificate	Mean	2.00	18.33
	N	6	3
	Std. Deviation	1.789	9.074
Diploma	Mean	7.33	8.77
	N	6	6
	Std. Deviation	3.882	11.002
Bachelor	Mean	7.86	16.68
	N	7	6
	Std. Deviation	12.280	18.814
Postgraduate	Mean	19.00	2.00
	N	1	1
	Std. Deviation	.	.
Pro Qual = to Bachelor	Mean	24.57	11.22
	N	7	5
	Std. Deviation	21.196	11.855
Total	Mean	4.42	15.06
	N	144	98
	Std. Deviation	7.649	12.846

7.6 Summary and Conclusion

This chapter gave an outline of the approach to the initial empirical investigation. The complexity of real-world, social-science-related research was evident. A number of factors were pushing and pulling on the road freight industry. However, as with social science research it was difficult to segregate-out and exclude certain influences, that is, experimental design was problematic. There was some difficulty pinpointing and quantifying the relevant influences due to process overlap and interaction.

The findings pointed to a conclusion that operators in different sectors of the industry and, in particular, small operators were not maximisers. Therefore, neo-classical economic theory appeared inadequate for explaining their activities. Two hypotheses were examined via t-tests and were upheld.

It materialised that the theory of satisficing, behavioural economics and bounded rationality might be more appropriate than neo-classical economics for explaining road freight operators' activities. This would have implications for the industry's structure and development. The initial study raised questions about road freight operators' key influencers. An understanding of such influencers was central for comprehending policy implications and improving effectiveness, such as the promotion of advanced transport-logistics activities and gaining the associated efficiencies.

The evidence supported the view that human factors played an important role in motivation, use of resources, harnessing of skills, management and competitive advantage. It appeared that the behaviour, intentions and attitudes of key personnel were of significance in understanding the development of Irish road freight industry. Individuals in the organisations were the decision makers; therefore what influenced their decisions was key to gaining an understanding of organisational decisions.

8 PHASE TWO: QUALITATIVE APPROACH

8.1 Introduction

The previous chapter concluded that as people were the decision-makers in an organisation, certain influencers on people also influenced the organisation's decisions. This chapter describes the qualitative part of phase two of the study, which was based on semi-structured interviews with road freight operators. The interviews were conducted to provide the foundation for the quantitative part of phase two and with a view to applying the Theory of Planned Behaviour to the Irish road freight industry. The qualitative research approach that was used and its aims are described, the findings are discussed and the implications for the quantitative primary research instrument are set out.

8.2 Research Strategy

The research strategy for phase two was similar to that for phase one. An initial qualitative investigation was utilised to aid development of the quantitative research instrument. Oppenheim (2000) advises that careful pilot work prior to attitude measuring is an essential task. It has key implications for the content of the research instrument and for accurate measurement through quantitative means.

Oppenheim highlighted the importance of all aspects of qualitative pilot work, not only for qualitative, but for quantitative measurement. Qualitative pilot work aids survey research through appropriate wording of questions, design of letters and ordering of questions. Although it can be time consuming, pilot

work lowers non-response rates and is essential to preventing later problems in the principal instrument, as it may be impossible to rectify errors or oversights at that stage.

8.3 Initial Qualitative Investigation

The aim of the initial qualitative investigation was to elicit the modal salient beliefs of Irish hire and reward road freight operators about collaboration, for the purpose of informing the quantitative survey to follow. This qualitative approach was undertaken on a developmental basis, moving from an exploratory conversation-based approach with key informants to a semi-structured approach for the target population. A cross sectional study was chosen as this would facilitate assessing various beliefs within subsectors of the population.

8.3.1 Population and Sampling

An updated database of licensed Irish road haulage for hire and reward was obtained and utilised for the sampling frame. Haulage firms were randomly selected to receive initial contact by letter, asking them for co-operation with the research study. A number of approaches advocated by Oppenheim (2000) to increase response rates were used. The letter was designed to give advance warning of the study rather than cold calling. The sponsoring and supporting organisations were mentioned to give credibility. A report of the key findings was offered as an incentive to encourage responses. Confidentiality and anonymity were assured. The contact letter is provided in Appendix B.

As there were 4,931 operators in the database, the decision was made to issue interview letters to 45, which corresponded to every 109th entry in the database. This figure was decided upon due to an anticipated participation rate of approximately 20% and should have resulted in interviews with nine operators. Follow-up telephone calls were made to each operator in the sample. However, the co-operation of hauliers was not easily attained. Additionally, contacts through the Department of Transport Engineering in DIT and through the IRHA were utilised; two interviews were obtained through these means.

Six face-to-face interviews, one telephone interview and one group interview were carried out. One of the face-to-face interviews was with a person who had already been used as a key informant. Some other interviewees were: a development manager of a pallet network, an owner-manager of a regional haulier that was a founding member of a pallet network, and an owner-manager of an international freight forwarding business. The remaining interviewees, including the telephone-interview interviewee, were owner-managers of various road freight operators. They were geographically dispersed throughout the country and were operating in various sectors, such as: fruit and vegetable distribution, general haulage, tipper/construction and animal feed distribution.

8.3.2 Interviews

Members of two collaborative networks were interviewed. The first network was hierarchical in structure and appointed regional operators as agents. A semi-structured interview was carried out with the development manager of the controlling company. The members of the second collaborative network

took part in a group interview session, with all eight members of the network present. The individual in-depth and group interviews concentrated on motives for forming and joining a network, and on whether or not aspirations had materialised. As mentioned in section 7.3.1, the interviewer maintained their objectivity and developed a rapport with the interviewees. The individual face-to-face interviews were held in a formal setting, in the office of the interviewee, except for two interviews which were held in their work place canteen.

The group interview was held in a boardroom setting, utilising an oval table facilitating eye contact. A number of the questions received very little feedback, either verbal or through body language. The interviewer believed more data could have been obtained from individual interviews. However, as time was a resource in short supply for all concerned, the group interview facilitated the pressing needs.

The questions for the interviews were drawn-up based on the literature and the empirical research prior to the interviews. They were subdivided into nine sections, concentrating on slightly different themes. The interview commenced with a number of simple questions to give confidence to the interviewee. The following sections then concentrated on the core issues. Firstly, change in the road freight industry was of principal interest. The interview then moved on to different aspects of change, such as growth, withdrawal, development and collaboration. The final section addressed personal questions. The questions are available in Appendix B.

8.4 Content Analysis

Content analysis was utilised in order to categorise the raw data into key themes. As previously stated, the methodological approach in this study was multi-method in nature, providing mitigation of the weakness of the application of a single method (Kolbe and Burnett, 1991).

The literature was reviewed in relation to guidelines for the application of content analysis. Quantitative content analysis guidelines recommended a number of stringent procedures to ensure reliability and the ability to replicate the study and minimise interviewer's bias and subjectivity. Decision rules and operational definitions should be established in order to ensure best practice (Kolbe and Burnett, 1991; Mayring, 2000).

The qualitative critics of quantitative content analysis argued against the procedure of using category frequencies, regarding it as superficial and not respecting latent constructs (Mayring, 2000).

However, the aim of this phase of the research was not to generalise findings, but to aid the development of the following phase. The aim of the content analysis was therefore developmental in nature. Similarly to many applications of content analysis, the output was intended to be descriptive (Rourke et al., 2001). Kolbe and Burnett (1991) advise that content analysis can be utilised without intending to make generalisations to the wider population. These types of studies fulfil a number of roles. Under Kolbe and Burnett's (1991) taxonomy, this study's application of content analysis fulfilled the roles of interpretation (to describe and explain the phenomenon),

hypothesis-generation and theory confirmation (to appraise the presence of the predicted content).

The unit of analysis was the interviewee's response to questions, in terms of themes. Therefore, the principal categories were not rigorously predefined, as would have been best practice for quantitative studies that utilised a content analysis technique.

This approach was supported by Ajzen, (2006) and by Francis et al (2004), who advise that formative research, by utilising a sample from the population that a questionnaire will be applied to, is required in order to assess the relevant beliefs associated with the research.

8.5 Implications for Quantitative Study

A number of key beliefs were elicitated and coded into themes. The highest frequency of belief was that increased utilisation would be an advantage of collaboration, as all interviewees stated this.

A number of other beliefs were common throughout the majority of the interviews. The frequently reported positive beliefs associated with collaboration were: it could provide a broader customer base reducing dependency, financial rewards and the ability to compete with larger players. The most frequent negative belief reported was that collaboration could involve loss of control.

A belief reported by half of the interviewees, on a positive note, was that increased services to customers would be an advantage of collaboration.

However, on a negative note, half the interviewees believed there would be stress and damage to service levels. The majority of respondents who reported those negative beliefs also advised that support with training and planning would assist them.

A minority of the interviewees reported negative beliefs relating to trust, financial risk and red tape, particularly red tape associated with regulations in relation to employees. A minority also reported being open to opportunities, facilitates collaboration and development, and that following customers and their needs was an important motivator. Finding a satisfactory partner to work with and guide them was fundamental for many operators. Following customers' needs and allowing the firm to compete with larger players was the prime reason for moving into pallet network operations.

These beliefs highlighted important positive and negative attitudes, social norms and control issues that needed to be taken into consideration when designing a Theory of Planned Behaviour questionnaire tailored towards measuring and extracting influencers and barriers to advancing transport-logistics activities.

8.6 Relating Findings to Theory and Development of Hypotheses

The key beliefs discussed in section 8.5 were supportive of a number of theories. In particular, similarities could be drawn between the results of the content analysis and the issues of resources and opportunities that had been highlighted by Wiklund and Shepherd (2003).

It was recognised that the level of knowledge or awareness was a determinant of attitude. The fundamental inference in this study was that enhanced information would tend to lower barriers to change. Wiklund and Shepherd (2003) held a similar view. They concluded that mitigation of possible negative consequences could have a greater motivational impact than potential financial benefits. This has vital implications for evaluation of future and past aspirational and ideological policies.

The evidence obtained thus far was supportive of the view of resource advantage theory, that is, collaborative relationships were a resource that could lead to a competitive advantage (Hunt, 1997a)

Supply Chain co-ordination such as collaboration and freight consolidation initiatives aid sustainability, the upholding of load factors and the improvement of vehicle productivity (McKinnon, 1999a). The content analysis was supportive of this view and indicated that the majority of operators interviewed supported such a view.

Two hypotheses were formulated based on the literature review and the obtained empirical evidence. The validity of these hypotheses was to be determined by systematically gathering statistically significant data via an attitudinal questionnaire.

The first hypothesis was concerned with the application of the Theory of Planned Behaviour (the conceptual model) as an adequate methodology to extract the key barriers to performing advanced transport-logistics activities.

The second hypothesis was closely related to a rhetorical question and stance of Wiklund and Shepherd (2003):

Would education and skills mitigate the barriers to, as opposed to highlighting the advantages of, collaboration? Therefore, skills and education would be fundamental in reducing barriers.

Therefore, the first two hypotheses were:

Hypothesis 1:

The conceptual model will be of adequate fit in representing the Irish road haulage industry's intention towards collaborative ventures.

Hypothesis 2:

Highly educated operators will have a more positive attitude to performing collaborative ventures.

A number of other hypotheses were also developed—these are detailed in Chapter 9.

8.7 Summary and Conclusion

This chapter justified the approach to content analysis as a developmental phase to the planned primary research instrument. The findings confirmed that previous theory and literature were relevant in this domain and resulted in the development of hypotheses that could be tested for validity. The elicitation of beliefs provided significant input to the questionnaire design.

9 PHASE TWO: PRIMARY QUANTITATIVE INSTRUMENT

9.1 Introduction

This chapter presents and discusses the design and implementation of the quantitative primary research instrument, which was a detailed postal questionnaire. The questionnaire itself is available in Appendix C. A process flow chart for phase two is presented in Figure 9.1. Both the primary quantitative instrument and the analysis of the survey returns it yielded were based on a conceptual model of collaborative intent in the Irish road freight industry, which is postulated and described in this chapter. It was proposed to analyse the results of the questionnaire primarily through Structural Equation Modelling—that aspect is addressed mainly in the next chapter—and this had a major influence on the design of the primary quantitative instrument. Whereas the previous chapter set out the basis for constructing hypotheses to be tested using the data from the primary quantitative instrument, this chapter lists the hypotheses.

The present chapter provides details of the endeavour that was made to ensure validity and reliability of the data collection technique and also a rigorous application of the quantitative research approach generally.

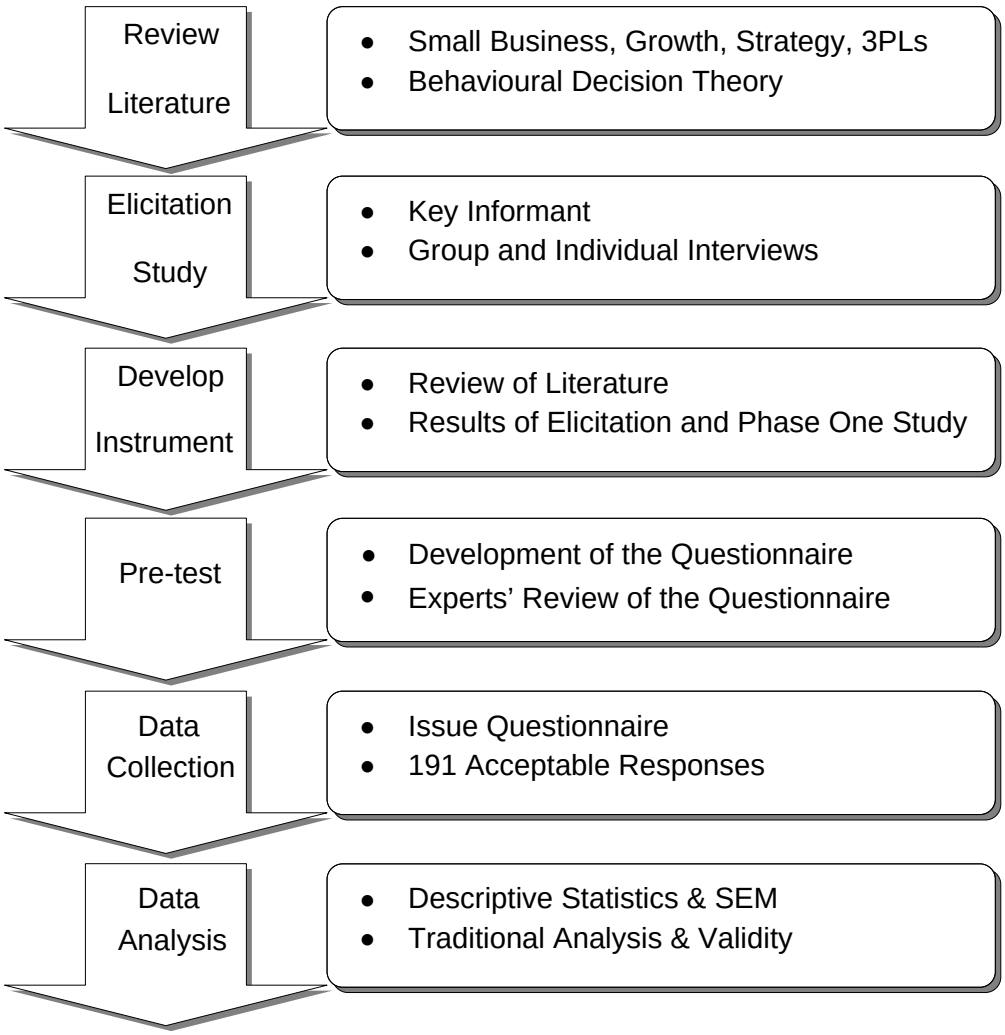

Figure 9.1 Process flow chart for phase two

9.1.1 Rigour in the Quantitative Research

Mentzer and Flint (1997) argue for the development of rigour in logistics as the discipline expands. Increasing the rigour of the research tools that are applied results in increased quality of the research outcomes.

9.1.2 Formative Use of Structural Equation Modelling

As developing an understanding of behavioural antecedents was at the heart of the present study, and as this implied a direction of causality, a formative Structural Equation Modelling approach was postulated. This was in contrast to the more common usage of SEM, where a reflective structure was

employed. The use of a formative structure necessarily resulted in atypical approaches to a number of the components of construct validity.

9.2 Population and Sampling

Sampling was an important component in ensuring that the study was representative and maintained maximum external validity, that is, the generalisability of the results to the broader population (Mentzer and Flint, 1997). The issue of the quality of the data about the target population was highlighted in Chapter 8, section 8.3.1, in connection with the qualitative part of phase two.

For this quantitative part of phase two, careful consideration was again given to the sample size. A number of tradeoffs were identified. One aspect of the approach that demanded a large sample size was the method of analysis, that is, Structural Equation Modelling (SEM). It has been well recognised in the literature that SEM requires a relatively large sample size, depending on the complexity of the model and the statistical method used. This is discussed further in Chapter 10, section 10.5. Other factors tending to require a large sample size were the desired confidence interval and the desired confidence level. Most researchers use a 95% level of confidence and so that level was chosen.

Aspects that tended to require a small sample size were the available resources, principally of time and finance. Considering the aforementioned trade-offs and issues, a sample size of 200 was selected (Worthington and Whittaker, 2006).

A standard formula was used to investigate the trade-off between the sample size and confidence interval. The simplified version of the formula, without the correction for finite population size, is as follows:

$$ss = \frac{Z^2 \times p \times (1\text{-}p)}{C^2}$$

where

ss = sample size

Z = Z value (1.96 for 95% confidence level)

p = fraction picking a choice (0.5 used where sample size is needed)

C = confidence interval, expressed as a decimal fraction

(e.g. 0.068 = ± 6.8%)

It was convenient to make use of online sample-size calculators, which included the correction term for a finite population and so required the population size as a further input[2].

As there were 4,931 operators in the database and with an expected response rate of 20%, the issue of 1,000 questionnaires should have yielded the desired sample of 200 operators. The survey selection fraction therefore corresponded to approximately every 5th entry in the database.

9.3 Hypotheses and Conceptual Model

There were a number of research questions concerning various aspects of the thesis that needed to be addressed. These included the following:

[2] http://www.surveysystem.com/sample-size-formula.htm and http://www.macorr.com/ss_calculator.htm

- Was an underlying Theory of Resource-advantage reflected in the domain of the Irish road freight industry?

- Could Ajzen's Theory of Planned Behaviour (1991) be successfully executed in the context of the Irish road freight industry and could it successfully extract barriers to collaborative activities?

- Would the construct/model developed from literature and refined via qualitative investigation fit the empirical data and achieve acceptable levels of validity?

Phase one of the study had strongly suggested that neo-classical economic theory was not clearly reflected in the Irish road freight industry. It was hoped that phase two would clarify the matter by clearly identifying and measuring the influencers on owner-operators towards engagement in collaborative activities. This would be achieved if positive answers were obtained to the three research questions listed above.

9.3.1 The Conceptual Model

The conceptual model that was proposed for the behavioural antecedents of inter-firm linkages in the Irish road freight Industry is presented in Figure 9.2.

The Formative Indicators, illustrated by rectangles enclosed within outer rectangles with sharp corners in the diagram, were measured variables utilising the Semantic Differential scale approach. This approach, as it applies to attitude measurement, is further discussed in section 9.4.

The Latent Factor variables, represented by oval shapes, were measured through Reflective Indicators, which are represented by rectangles enclosed within outer rectangles with rounded corners. The Reflective Indicators were also measured utilising the Semantic Differential scale approach.

The shared common variance (factor) of the Reflective Indicator variables represents the Latent Factor variable. Hence the Reflective variables for each Latent factor are inter-correlated. The number of directional arrows in Figure 9.2 is reduced for ease of viewing. The directional arrows are actually from each Formative variable to the Latent variable and from the Latent variable to each Reflective variable.

The model contained twenty formative indicators for attitude, six formative indicators for subjective norm and five formative indicators for perceived behavioural control (PBC).

A multiple indicators multiple causes (MIMIC) approach was required in order to analyse the Formative-Indicator-based conceptual model through SEM. Therefore, a number of Reflective Indicators of the Latent variables (Attitude, Subjective Norm and PBC) were required. Direct measures were used as reflective measures of the latent variables. At least two or three Reflective variables were essential in order to carry out the analysis successfully—this is further discussed in Chapter 10, section 10.3. The Latent Constructs (represented as ovals in Figure 9.2) of Attitude, Subjective Norm and PBC had four, five and three reflective indicators respectively.

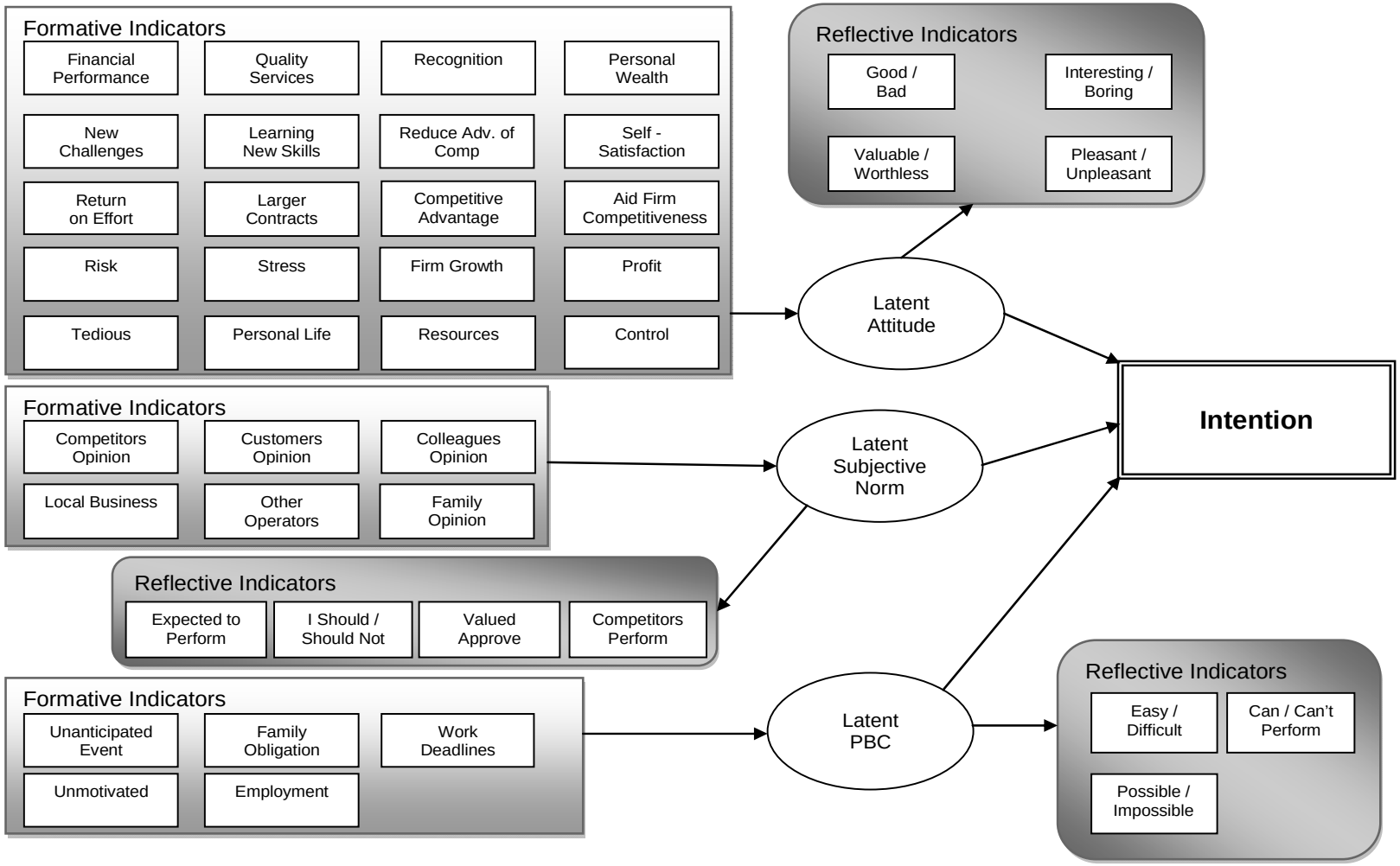

Figure 9.2 Conceptual model of collaborative intent in the Irish road freight industry

9.3.2 The Hypotheses

Eleven hypotheses were developed. They are listed below, as they were drawn-up; rather than repeating information and to aid the flow of the thesis, they are discussed further in Chapter 10, section 10.11, which deals with the operationalisation of the hypotheses and the analysis of the results relating to each.

These specific hypotheses were identified using a number of processes as per section 8.6 in Chapter 8. Advocates of a formative approach to SEM argue the point that each relationship in the construct should be hypothesised and tested (Jarvis et al., 2003). However, due to the census approach to formative indicators (Diamantopoulos et al., 2008), wherein the set of indicators must cover the entire scope of the each latent variable, this could have resulted in an overwhelming number of hypotheses. The eleven hypotheses that were used were considered to strike a reasonable balance. Construct validity is further discussed in section 9.6.2.

Hypothesis 1:

The conceptual model will be of adequate fit in representing the Irish Road Haulage industry's intention towards collaborative activities.

Hypothesis 2:

Highly educated operators will have a more positive attitude to performing collaborative activities.

Hypothesis 3:

The self-efficacy of managers will act as a moderator to developing collaborative activities.

Hypothesis 4:

Successful past experience of implementing new developments will have a positive impact on intention to perform collaborative activities.

Hypothesis 5:

The age profile of owner-managers will act as a moderator of intention to perform collaborative activities.

Hypothesis 6:

Family commitments of owner-managers will act as a moderator on intention to perform collaborative activities.

Hypothesis 7:

The manager's perception of the economic environment will moderate or intensify the intention to perform collaborative activities.

Hypothesis 8:

Economic conditions and perceived consequences of past behaviour will influence the perception of risk. Therefore they will act as moderators on intention to perform collaborative activities.

Hypothesis 9:

Managers who have other business activities will have a higher level of intention to perform collaborative activities.

Hypothesis 10:

Personal factors in owner-managed firms have a high degree of influence on intentions to perform collaborative activities.

Hypothesis 11:

Operators concerned with less-than-truckload activities will have higher levels of intention.

9.3.3 Attitude Measurement and Measurement Scales

Attitude measurement scaling has had a number of developments throughout the years. The discussion in this section is by no means exhaustive. Its aim is to highlight the key concerns when designing an attitude measurement instrument, as this activity was central to the process of designing the primary research instrument for the study.

Attitude measurement has been predominantly based on Expectancy-value Theory (EVT). The authors Fishbein and Ajzen are credited with significant development of attitudinal theory. The reader is referred to Fishbein and Ajzen (1975) for a thorough discussion of the developments in attitude measurement techniques.

A variety of techniques are used in attitude measurement, from direct and indirect approaches to projective techniques and statement completion

techniques (Oppenheim, 2000). As attitudes are latent in nature they cannot be directly observed and must be inferred, usually through questionnaire responses. These responses may be directly or indirectly measured, each approach having various consequences.

There are some assumptions associated with using these techniques. A major assumption is that individuals have direct access to their attitudes or to their beliefs, which form their attitudes, and are capable of quantifying or describing their attitudes or beliefs through responding to questions in a questionnaire.

Direct measures are generic in nature. They tend to be easily developed and have common end points across studies, aiding comparability. However, they are at an aggregate level and ambivalence tends to play a role (Francis et al., 2004b).

Indirect measures break down responses into a disaggregated level. Therefore, investigation prior to the quantitative element is required, as beliefs can be specific to the target population. Indirect measures utilise a multiplicative approach, that is, the perceived likelihood of a belief multiplied by the desirability of the outcome. The scores of the indirect measures are then summed. This approach assumes that people can accurately report relative weightings of specific beliefs. Tourangeau and Rasinski (1988) advise that people go through a four stage process in developing a response to attitude questions. Firstly, respondents interpret the attitude question, followed by retrieving the relevant belief and feelings. Thirdly, they apply these beliefs and feelings to arrive at the appropriate judgement and finally

they use this judgement to select a response. Tourangeau and Rasinski advise that each of these four steps in the process can be influenced by carryover effects, that is, prior stimulus/questions. Thus careful question ordering is essential. Respondents may use earlier answers as anchors with answers to following questions contrasted against them.

The development of the content of the questionnaire utilised in this study was aided by an exploratory qualitative investigation, as previously mentioned. The questionnaire then utilised both direct and indirect measurement techniques to mitigate the weaknesses in each and aid convergent validity by means of correlations between the two measures (Francis et al., 2004b).

Attitude measurement scales have become more sophisticated over time, progressing beyond basic measurement principles of uni-dimensionality and equality of intervals to the weighted bipolar Semantic Differential (SD) scaling technique.

On reviewing studies employing attitudinal scales and, in particular, the use of these scales in association with the Theory of Planned Behaviour, scale measures were found to lean towards the bipolar Semantic Differential measurement scale. This was supported by best practice guides, such as, Ajzen (2006), Francis et al. (2004a), Francis et al. (2004b) and Oppenheim (2000).

There has been considerable discussion in the literature comparing unipolar scales with bipolar and generally this has emphasised their lack of similarity. Fishbein and Ajzen (1975) argue that unipolar scales cannot be used for

respondents who may have opposing views, that is, positive and negative responses cannot be measured on a unipolar scale.

> "*The Semantic Differential (SD) measures people's reactions to stimulus words and concepts in terms of ratings on bipolar scales defined with contrasting adjectives at each end.*" (Heise, 1970: 235)

The optimal number of points on the scale and the tradeoffs between reliability and validity have been debated in the literature for a considerable period. Cox (1980) advises that the magic number is seven, plus or minus two depending on certain circumstances. Gleeson et al. (2003) argue that there is no perfect scale and that the choice should be aided by the research objectives. The seven point SD scale technique provides a wider spread of responses in comparison to scales that incorporate a smaller number of points, such as Likert's five point scale.

Weathers et al. (2005) highlight that the number of points on the scale affects response accuracy, depending on the target population. Al-Hindawe (1996) argues in favour of a seven point scale due to the finer gradation that also allows for a midpoint.

Oppenheim (2000) argues that research evidence points to a seven point semantic differential scale being optimum. Oppenheim classifies Semantic Differential as 'equal appearing' and advises that bipolar scale measurements of the proximal predictors of intention (attitudes, subjective norms and perceived behavioural control) are reasonably consistent. The classification of the data obtained from Semantic Differential scales is often

treated as interval in nature, due to the necessity for complex analyses (Kamishima, 2003).

This present study applied a seven point SD scale with a view to having a finer grade of data capture, as supported by best practice guides.

As indirect techniques utilise a weighted (multiplicative) approach using two indirect measures, one of probability and one of outcome, two bipolar measures would lead to invalid calculations. For example, responses on the two bipolar scales of -3 would result in an erroneous calculation: (−3 × −3 = +9). The possibility of a double negative threatens face validity (see section 9.6.3.).

For the primary research instrument in the present study a bipolar scale (−3 to +3) was used in general in analysing the questionnaire responses, but a one to seven scale was used for the probability/likelihood questions (Francis et al., 2004b). Using the example above of the two lowest answers on the scales, the final result would be +1 × −3 = −3; a negative belief would thus be accurately scored.

Attention to the balance between the different aspects of perceived behavioural control is required to avoid bias. Reducing the measured beliefs and controls to a smaller number prematurely will influence the summed indirect measures score. This entails tradeoffs between internal consistency and maximising content validity by breath of content (Francis et al., 2004b).

In the present study considerable breath of content was incorporated, as can be seen in the questionnaire. However, careful balance was also required in deciding on the questionnaire length in order to avoid increasing the non-response rate. Careful consideration was also given to the end points used for each question's semantic differential scale to ensure the respondents' interpretation was consistent with what was intended and that each end point was perceived by the respondent as opposite to its counterpart.

9.4 Potential Sources of Error

Potential sources of error were considered during the research design phase, in order to minimise their effects. Even though this study utilised a mixed methods approach in order to mitigate the limitations of one single method, it was still predominantly based on a quantitative questionnaire approach. Consideration had therefore to be given to biases that could potentially occur with this methodological approach.

9.4.1 Trait Variance

A trait is a psychological characteristic that is usually represented as a construct or concept in a study, such as anxiety or warmth. McCrae (2001: 819) defines a trait as *"endogenous basic tendencies that, within a cultural context, give rise to habits, attitudes, skills, beliefs and other characteristic adaptations."*

Variance is a statistical measure; *"the variance is the mean square deviation of the variable around the average value. It reflects the dispersion of the empirical values around its mean"* (OECD, Glossary of Statistical Terms, http://stats.oecd.org/glossary/).

King et al, (2007) define trait variance concisely: *"Trait variance is the variance in a trait that we want to measure, stripping out measurement error"*. Cote and Buckley (1987; 315) provide a little more detail in relation to trait (or construct) variance:

> *"Measures of a construct have variance due to the construct or trait being measured and variance due to measurement error. Measurement error can be divided into two components, random error and systematic error (the term "measurement error" refers to the combination of random error and method effect)"*.

9.4.2 Common Method Bias

The 'method effect' referred to in the above quotation is also known as Common Method Bias. Podsakoff et al. (2003) were not the first to address Common Method Bias (CMB) but are recognised as having written one of the most comprehensive articles in reviewing CMB. The instruments used for measurement, quiet often self-report questionnaires, may influence the scores and measures:

> *"Method bias is the systematic variability that can be introduced into the data that are gathered in a study by the method that is used to gather the data ('artifactual covariation')"* (King et al., 2007: 458).

Schwarz et al. (2008) also referred to CMB as common method variance and monomethod bias. Method bias is a threat to validity as it possibly provides

another explanation for the relationships between measures of different constructs (Podsakoff et al., 2003; King et al., 2007).

Attitude research appears to be subject to high levels of potential measurement error, threatening validity and therefore conclusion (Podsakoff et al., 2003). Cote and Buckley (1987) reviewed a number of studies and differing constructs. They found that attitude constructs have high levels of method variance. They reviewed eleven studies based on attitude constructs and revealed that method variance accounted for 40.7% of the variances in those constructs. On a wider review of reported studies they found trait variance accounted for less than 50% of the observed variance in measures.

9.4.3 Sources of Common Method Bias

Podsakoff et al. (2003) outlined sixteen potential sources of common method bias and suggested remedies for each. In general they are broken down into three categories: common rater, item context and measurement context. Summaries of the main sources of CMB, as adapted from Podsakoff et al. (2003), are presented in Tables 9.1, 9.2 and 9.3.

Table 9.1 presents potential common rater sources of common method bias. This type of bias can occur where the same source is used for predictor and criterion variables. A predictor variable is one that predicts another variable, while a criterion variable is one that is predicted. The source is referred to as a ‘common rater’ in these cases. In other words, the predictor and criterion variables are measured by the same respondents and bias can therefore be introduced in the ways listed in the table.

Table 9.2 lists potential item context sources of common method bias, where respondents may be influenced by or interpret an item based on its relation to other items. The table lists ways in which this can occur.

Table 9.3 lists potential measurement context sources of common method bias (measurement context effects) where artifactual measures can be produced from the context in the ways listed in the table.

As mentioned previously, respondents go through a number of stages when attempting to respond to a questionnaire, such as comprehension, retrieval, judgement, response selection and reporting. The possible causes of CMB may affect different and multiple stages; in Tables 9.1 to 9.3 the stages affected are indicated.

Table 9.1 Potential common rater sources of common method bias

Potential Cause	**Meaning**
Consistency motif *Stage affected: Judgment and Reporting*	Respondents try to maintain consistency
Implicit theories and illusionary correlations *Stage affected: Judgment*	Respondents' beliefs about covariation among trait and outcomes
Social desirability *Stage affected: Reporting*	Respond based on social acceptability
Leniency bias *Stage affected: Reporting*	Positive aspects associated with concepts/people they like and vice versa
Acquiescence bias *Stage affected: Reporting*	Agree with items regardless of content, yea and nay saying
Mood state affectivity *Stage affected: Retrieval*	The propensity of the respondent to view themselves and the world around them in positive or negative terms
Transient mood state *Stage affected: Retrieval*	Recent mood-influencing events influence responses
Item characteristics *Stage affected: Judgment*	Items may influence the respondent's interpretation
Item social desirability *Stage affected: Retrieval*	Items may be written in such a way to reflect more socially desirable responses
Item demand *Stage affected: Judgment and Reporting*	Hidden cues on how to respond
Common scale formats *Stage affected: Comprehension and Selection*	Ambiguity allows respondents to respond heuristically
Common scale anchors *Stage affected: Selection*	Covariance due to same scale formats, extreme end points (and non-opposite end points)
Positive and negative item wording *Stage affected: Retrieval*	May produce artifactual relationships

Table 9.2 Potential item context sources of common method bias

Potential Cause	Meaning
Item priming *Stage affected: Retrieval and Judgment*	The placing of a predictor or criterion variable on the questionnaire may result in increased saliency
Item embeddedness *Stage affected: Retrieval*	Neutral items can take on evaluative properties
Context-induced mood *Stage affected: Selection*	First question induces a mood for responding to the remainder
Scale length *Stage affected: Retrieval*	Shorter length questionnaires, previous responses likely to be remembered and potentially influence others.
Intermixing of items and constructs *Stage affected: Retrieval*	Different construct measures grouped together may decrease intraconstruct correlations and increase interconstruct correlations

Table 9.3 Potential measurement context sources of CMB

Potential Cause	Meaning
Predictor and criterion variables, same time *Stage affected: Retrieval*	Measures may produce artifactual covariance independent of the content of the constructs
Predictor and criterion variables, same location *Stage affected: Retrieval*	Different constructs measured in the same location may produce artifactual covariance independent of the content of the constructs
Predictor and criterion variables, same medium *Stage affected: Retrieval*	Measures of different constructs, measured by the same medium may produce artifactual covariance independent of the content of the constructs

9.4.4 Remedies for Common Method Bias

Podsakoff et al. (2003) identify many of the method bias variances as occurring in the final stage where people edit their response before reporting them. It logically follows that concentrated effort should be given to this area in order to minimise CMB. Remedies for CMB are broken-down into two broad areas: design of the study's procedure and statistical controls.

Procedural remedies involve addressing the design of the study through splitting the measurement of prediction and criterion variables or ensuring wording or questionnaire formats do not indicate or demand biased responses.

Campbell and Fiske (1959:102) commented on the difficulty of measuring trait variance: *"With only one method, one has no way of distinguishing trait variance from unwanted method variance"*. However, splitting the measurement of criterion and prediction variables by means of using different sources or temporal/psychological separation would have proved problematic for many studies including the present one.

The present study proposed to measure the attitudes and intentions of managers in the road freight industry towards collaboration. Splitting the measurements and creating a temporal gap between two questionnaires would have been problematic for many reasons. Such an approach might have introduced contaminant factors: for example, attitudes can be transient and can change over time. Also, such approaches tend to require additional resources as they are more demanding of time, expense and effort: on that basis too they were not attempted in the present study.

There is another procedural remedy recommended by Podsakoff et al. (2003) that is more practical to implement and requires lower levels of resources in comparison to those previously mentioned. Allowing respondents to be anonymous and assuring them that there is no right or wrong answer will reduce apprehension, in particular for the final stage of reporting where a considerable amount of evaluation occurs. This reduces the respondents'

likelihood of editing their responses in order to appear more socially desirable, or lenient, and thereby reduces acquiescence and consistency motif biases. However, Podsakoff et al. (2003) point out that this procedure cannot easily be used with the procedure of dividing measurements between two questionnaires, as a link would need to be created between the questionnaires, potentially undermining anonymity.

Another procedural option is to counter-balance the order of questions, that is, to ask the first half of the respondents questions about the predictor variable first and the other half questions about the criterion variable first. However, for many studies this may cause difficulty with utilising the funnelling effect: moving from general to more specific questions (Podsakoff et al., 2003).

The present study applied the interspersion technique as recommended by Ajzen (2006), that is, mixing the SD questions between measuring attitudes, subjective norms and measures of control. The recommendations of Francis et al. (2004a) to reverse anchors were applied, for instance, starting with negative on the left and positive on the right, then reversing for a number of questions and so on. These techniques are believed to relate to the psychological separation of measurement as recommended by Podsakoff et al. (2003); with the aim of disrupting consistency motif and social desirability biases by reducing the number of previous answers in the respondent's short-term memory. They are also believed to reduce item context effects and acquiescence bias.

Improving scale items is another technique to reduce CMB. Keeping questions simple, concise, avoiding double barrelled questions and avoiding complicated syntax were applied. These issues were taken into consideration in the present study through referring to the guides on the preparation of TPB questionnaires by Ajzen (2006) and Francis et al. (2004a) and by augmenting the primary research instrument with the qualitative investigation and pilot work.

There are a number of statistical approaches recommended by Podsakoff et al. (2003) to control the effects of measurement and random errors. A solution to measurement error is the use of Structural Equation Modelling to allow for the control and analysis of measurement error (Cote and Buckley, 1987). However, this solution is based on a reflective structural equation model, utilising exploratory factor analysis. As the present study employed a formative model the majority of statistical solutions appeared irrelevant. Podsakoff et al. (2003) advise that procedural methods are potentially the most effective way of controlling CMB in formative constructs.

A formative construct is utilised when it appears more theoretically rational that the flow of causality is from the indicators to the latent variable (Podsakoff et al., 2003). The indicators in the present study were conceptually distinct and not interchangeable, thereby supporting a formative approach to the construct (MacKenzie et al., 2005). Misspecified models (specified as reflective when in fact the construct is formative in nature) affect the parameters calculated in SEM. Podsakoff (2006) reported 62% of models in strategic management journals as being misspecified.

Care must be taken when specifying or respecifying/purifying model indicators to secure substantive validity and protect construct validity. Misspecifying models has the potential to lead to erroneous conclusions (Diamantopoulos et al., 2008). In order to avoid model misspecification and ensure construct validity a number of guidelines for developing and evaluating constructs were followed: those of MacKenzie et al. (2005) and Diamantopoulos et al. (2008).

Non-response bias is another concern for postal questionnaires. A bias can be introduced from the lack of response from certain categories of respondents. Surveys can be designed to try to mitigate the level of non-response bias (Oppenheim, 2000). Many studies have available data, such as socio-economic data, to compare respondents with the population to ensure representation. However, in this study little characteristic data was available from the population database. A number of comparisons were carried out with the limited data available by dividing the respondents into two groups to compare early/on-time respondents to late respondents, as late respondents are believed to hold similar views to non-respondents (Lu et al., 2007; Liao et al., 2007).

9.5 Validity

9.5.1 Internal and External Validity

Validity tends to be broken down into two broad categories, internal and external. Internal validity relates to the ability of the measures to conceptualise variables and their relationship to one other, that is, construct validity. External validity is the extent to which the test results can be generalised, that is, applied to other firms, industries, scenarios and so forth

(Dunn et al., 1994). The discussion in this section is focused on internal validity.

9.5.2 Construct Validity

Construct validity *"shows how well the test links up with a set of theoretical assumptions about an abstract construct"* (Oppenheim, 2000: 162).

Construct validity has a number of components which need to be upheld in order to ensure authenticity. These components are content validity, substantive validity, unidimensionality, reliability, convergent validity, discriminant validity, and criterion (concurrent) validity (Garver and Mentzer, 1999). However, it is again important to highlight that formative constructs differ considerably from reflective constructs, which results in varying appropriateness of certain statistical tests of construct validity and its components. In formative models, construct validity should be assessed by criterion-related, nomological and individual indicator validity (MacKenzie et al., 2005), which is discussed in the following sections.

9.5.3 Face Validity

Face validity is concerned with a measure seeming like it is going to measure what it is supposed to measure. Oppenheim (2000) argues that face validity is not really good enough and therefore this study utilised content validity in its place. Face validity is similar to, but looser than content validity.

9.5.4 Content Validity

"*Content validity exists when the scope of the construct is adequately reflected by the items as a group*" (Dunn et al., 1994: 157). Content validity has no formal statistical test. Instead, the researcher's judgement must be employed.

In the present study theory and substantial pilot work led to the development of the measures to evaluate the latent constructs. These were operationalised by utilising the Semantic Differential (SD) scale, following recommendations by Ajzen (2006), Francis et al. (2004a) and Fishbein and Ajzen (1975) advise to utilise multiple indirect measurements featuring affective end points. A wide variety of items were measured using SD scales to ensure sufficient span of the construct (Dunn et al., 1994).

9.5.5 Substantive Validity

Substantive validity must be present in order to have content validity. Substantive validity is concerned with the linkage between the concept (theory) and the individual items measured in the construct. As previously mentioned in the literature chapters, the application of the Theory of Planned Behaviour to this context was carefully considered to ensure this validity. Exploratory Factor Analysis (EFA) was utilised to assess the substantive validity of the measured reflective indicators (Dunn et al., 1994).

However, consideration was given to the fact that the structural equation model employed was formative in nature, unlike most SEMs which are reflective. Diamantopoulos (2008) warns against eliminating items due to low

levels of correlation and refers to this as incorrect item purification. As a formative model utilises reverse arrow dynamics the formative indicators do not have to be correlated. In fact, the opposite is the case as checks for multicollinearity are a priority. In spite of this, as a formative MIMIC (multiple indicators multiple causes) model was being employed, exploratory factor analysis of the reflective indicators of the latent variable was expected to aid substantive validity.

9.5.6 Convergent Validity

Convergent validity is principally concerned with a reflective model, where a number of measures of the same construct should be related (converge) to one another by means of a common statistical factor (Mentzer and Flint, 1999). Convergent validity for formative items is not relevant, as formative items do not have to be correlated. As mentioned previously, construct validity should be assessed by nomological and criterion-related validity (MacKenzie et al., 2005). However, individual indicator validity captures the construct in formative models. This was assessed by the significance and strength of the path (arrow) parameters in SEM.

9.5.7 Criterion Validity

Criterion validity is verified by testing how well a scale correlates with what it is trying to predict. If the criteria it is attempting to predict exist in the present it is referred to as concurrent validity and if they will exist in the future it is predictive validity (Dunn et al., 1994). As this study was attempting to predict current intention it was concurrent validity that was to be verified. This could be verified statistically through the use of SEM by assessing the indirect

effect of the formative indicator's impact on the reflective component of the latent variable (MacKenzie et al., 2005).

9.5.8 Discriminant Validity

Indicators of constructs should load on one construct, that is, discriminate against each construct with little overlap between constructs (Mentzer and Flint, 1997). Latent variables that correlate too highly may be measuring the same construct (Garver and Mentzer, 1999). Relatively low correlations between latent variables indicate discriminant validity.

9.5.9 Nomological Validity

There is no empirical test for nomological validity. It relates to how theoretically plausible is it that each of the components in the construct links into the construct (Mentzer and Flint, 1997). It is essentially theory testing; therefore the construct should behave in the way the theory predicts. If it fails to behave as expected there is either a problem with measurement of the latent variable or the theory needs amending (Dunn et al., 1994). This type of validity can be assessed using groups with recognised differences and testing whether the mean in the construct varies in the hypothesised direction (MacKenzie et al., 2005).

9.5.10 Reliability

Reliability is the internal consistency of the measure, that is, how consistent the measurement instrument is. The procedure of test-retest can be used; all things being equal the same values should be obtained. The main source of unreliability is measurement error (Garver and Mentzer, 1999). In a reflective

model internal consistency can be assessed by means of statistical tests, such as Cronbach's Alpha. Tests of reliability assume unidimensionality; therefore unidimensionality must be achieved first (Garver and Mentzer, 1999). Unidimensionality is concerned with how well the scale measures the construct (Dunn et al., 1994) and that it is, in fact, measuring the correct thing.

However, the above approach for testing for internal consistency cannot be used for models with formative indicators, as these indicators have no theoretical reason to correlate with each other, unlike reflective indicators (MacKenzie et al., 2005). Diamantopoulos and Winklhofer (2001) argue for the test-retest approach for verifying reliability of formative indicators. However, such an approach has the drawbacks of being resource intensive. Attitudes may also be transient; therefore a temporal gap may be problematic, as attitudes may have changed.

Another method, as recommended by MacKenzie et al. (2005), is to correlate the indicators with a global measure of the latent variable. Diamantopoulos et al. (2008) question the results from such a procedure. The alternative global measure may not be reliable and questions also arise as to whether it is more of an assessment of convergent validity, which is irrelevant to a formative approach. However, comparing the formative indicators to the global measure would lend some support to reliability.

9.5.11 External Validity

External validity is concerned with the capability of the findings to be generalised, not just to the respondents or even the entire sample, but to the

whole population. Achieving this means ensuring adequate methods were enforced and ensuring representativeness of respondents by means of random samples, sufficient sample size and adequate response rates. The methods applied to this study were outlined previously. However, no single study can definitively establish generalisability. In order to achieve this it needs to be replicated. Realism is also an essential component to achieve generalisability of the findings. It is concerned with the research being conducted in a realistic manner, so that the respondents can respond in a realistic way. Pilot work and exploratory investigations on questionnaire development can greatly aid this component of external validity (Mentzer and Flint, 1997).

9.6 Questionnaire Design

As no previous validated questionnaire was available, this study required the development of its own questionnaire to meet its objectives. A postal questionnaire was chosen due to the wide geographical spread of the target population. Publications by Gendall (1998), Oppenheim (2000), Francis et al. (2004) and Ajzen (2006) were utilised as guides for questionnaire design in association with the previous discussions on effective measurements, minimising potential sources of error and validity.

Gendall (1998) breaks down the design of questionnaires into a number of categories, that is, in terms of questions, words used and layout. The recommendations are typically generic in terms of questionnaire advice. The use of unfamiliar words should be avoided and closed–ended questions are preferable. Detailed instructions on how to answer the questions should be

provided. A downward funnel technique should be used by placing general and non-threatening questions first.

Wisker (2001) recommended leaving personal questions to the end of the questionnaire as the respondents would be able to assess what information they were linking their personal details to. All of these principles were applied with a slight exception to funnelling, as Ajzen (2006) recommended interspersing questions in designing a Theory of Planned Behaviour questionnaire utilising a Semantic Differential scale. The anchors were also reversed on a number of occasions.

The questionnaire was broken down into six sections, each section specifying what approach was to be taken by the respondents. The rationale for including the questions was based on the literature and the preliminary qualitative study to elicit modal attitudes, social norms and control issues. The number of formative indicators was large, following the recommendation of Diamantopoulos et al. (2008) to have a census of indicators.

Oppenheim (2000) provides a number of recommendations that were applied to increase responses rates. The following were applied to the cover letter:

- An explanation for the respondent's selection for inclusion in the study was given.
- Supporting organisations were highlighted.
- For the majority of cases, the envelope and the cover letter were addressed by name to the respondent.
- Confidentiality and anonymity were guaranteed.

- The planned usage of the data for statistical purposes only was communicated.
- Reminder letters were also issued two weeks after the initial questionnaire was issued.

The questionnaire was designed as a simple booklet and the front cover contained some graphics. The length was kept under review and an attempt was made to balance this with the recommendations on variables that should be measured. A response envelope, prepaid and addressed, was included with the questionnaire.

9.6.1 Pre-test

Once the questionnaire had been developed, it went through a number of stages of cross checks and verifications, primarily by independent experts. Firstly the questionnaire was reviewed by the research supervisor in regard to layout, design, ease of understanding and so forth. A number of formatting changes were made as a result.

An experienced sociologist based at University College Dublin reviewed the questionnaire and recommended some minor changes to formatting. These changes were implemented.

An experienced expert in the Theory of Planned Behaviour at Cardiff University reviewed the questionnaire. The review indicated no changes.

The Statistical Consulting Unit at the University of Limerick carried out a review of the questionnaire from a statistical point of view**.** The review

outlined some views on a number of aspects of the questionnaire. The main review points were:

- that a five versus seven point scale tended to have higher reliability and internal consistency
- that using a consistent order of positive and negative end points should be considered
- that response types by category might be used rather than exact figures (percentages), as questions that sought exact figures could be difficult to answer
- that the length of the questionnaire be considered.

Consideration was given to each of these views and the decision was made to maintain the structure and format of the questionnaire. The previous sections dealing with potential sources of error (section 9.5) and measurement (section 9.4) have highlighted the logic behind the decision in relation to the trade-off between gradation and reliability and also previous research implementing the Theory of Planned Behaviour utilised a seven point scale (Kominis and Emmanuel, 2007; Shih and Fang, 2004). Podsakoff et al. (2003) and Francis et al. (2004a) recommend the reversal of anchors to jolt the respondent to think about their position in regard to the question. Therefore, the variability in the order of positive and negative anchors was maintained to reduce the potential for CMB. A pilot test was used to assess any potential misreporting due to the respondent's lack of observation of reversed end points.

As it was planned to use multivariate analysis, interval or scale data were required. Therefore the questions requiring respondents to state their

answers in figures (percentages) were maintained. The length of the questionnaire was long with a large number of questions. However, as discussed earlier, for a model with formative indicators it was necessary to adopt a census approach to those indicators (Diamantopoulos et al., 2008). All the questions were reviewed and were seen as necessary. They were therefore retained.

9.6.2 Pilot Test

A pilot test was implemented on the 5th October 2007 by issuing the questionnaire to 10% of the sample, which was the first eighty on the sampling plan. Twelve responses were received. There appeared to be no issues. A review to assess the reverse anchors revealed no apparent oversight. A test analysis utilising Statistical Package for the Social Sciences (SPSS) to assess the questionnaire's coding concluded satisfactorily.

During the test analysis the geographical location of the respondents could not be examined as there was no question in the questionnaire to gather this data. The questionnaire was amended with the addition of question A3 asking the respondent to state the county where they were principally based.

The change was not pilot tested, as it was considered only a minor change. However, in hindsight this appeared to be a mistake as many operators had mistaken the question for country. A possible explanation for this was the influence of the Road Freight Activity Survey administered by the CSO.

9.6.3 Implementation

The primary quantitative instrument questionnaire was issued on the 13th November 2007. As recommended by Oppenheim (2000), a reminder letter was issued two weeks later in order to increase response rates. The questionnaire was anonymous; therefore the whole sample was sent the reminder as no distinction could be made between respondents and non-respondents. The letter explained this and thanked those who had already replied. In case the questionnaire had been misplaced, the letter gave two options for acquiring a replacement. Firstly, the letter contained a website link to the questionnaire in PDF format and secondly the option of contacting the researcher for a replacement. The questionnaire, cover letter and reminder letter are available in Appendix C.

Although the reminder letter aided the response rate, the desired sample size was not obtained, with only 140 responses received by 11th December. Therefore the decision was made to re-issue the questionnaire to a new target selection from the database. The second issue of the questionnaire occurred on 12th December 2007.

Possible explanations for the lower than anticipated response rate included survey fatigue, as many businesses are frequently surveyed. The timing of the issuing of the questionnaire was at the lead-up to Christmas. However, it was thought that the peak transport of goods for the Christmas period would have occurred prior to this, perhaps from late October to early November.

The total number of responses that appeared initially valid reached 219. However, twenty eight were discarded due to high levels of missing data, resulting in 191 valid responses.

9.7 Appropriate Statistical Analysis

The traditional method of analysing data in the context of the Theory of Planned Behaviour has been multiple regression. Nevertheless, as can be seen from the validity discussion, Structural Equation Modelling has considerable advantages. The use of SEM to analyse the data is complex. However, modelling data has a number of advantages over the traditional approach. The appropriate statistical technique in SEM depends on the data characteristics; preliminary analysis via descriptive statistics is a prerequisite to this assessment. The rationale for the application of SEM is discussed further in section 10.2.

9.8 Summary and Conclusion

The purpose of this chapter was to give the reader an insight into the key influencers and milestones in the development of the quantitative instrument. It discussed and justified the techniques utilised to minimise potential bias and error. The research instrument was designed with a strong emphasis on ensuring reliable and valid results. Upholding such a rigorous and robust process provided support for and aided the substantiation of the conclusions.

10 PHASE TWO: EMPIRICAL ANALYSIS AND MODELLING

10.1 Introduction

The previous chapter detailed the approach to the quantitative study. This chapter's aim is to present the statistical analysis of the primary research quantitative instrument, principally through the application of Structural Equation Modelling (SEM) in order to assess model goodness of fit.

A prerequisite for the development of a clear comprehension of the findings was an insight into the characteristics of the data. This was particularly important in a study where the respondents had different characteristics owing to the heterogeneous nature of the Irish road freight industry. Therefore, descriptive statistics were used initially to evaluate the nature of the data in order to avoid the classical pitfalls in the application of statistical techniques, such as:

- Small sample response size: the sample size is too small for satisfactory inferences to be made regarding important research questions.
- Using inappropriate statistical methods, for example, applying methods for continuous data on ordinal data, applying statistical models without checking that the basic assumptions for those models are satisfied or inferring causation from correlation.
- Non-response or missing data bias: the data are not representative of the population being studied.

The respondents were classified into various groups depending on a number of characteristics. These characteristics related to the testing of hypotheses through t-tests and other statistical methods. Factor analysis was carried out in order to determine the principal factors affecting attitude: these factors were the antecedents of attitude formation towards collaborative alliances within the Irish road freight industry.

The core data and analysis results are presented in tabular and graphical form within this chapter and additional outputs are contained in Appendices D to J. Sufficient detail is reported to allow an interested researcher to replicate the study (Aiman-Smith et al., 2002) and to allow the reader to assess the merits of the case (Gefen et al., 2000; Holbert and Stephenson, 2002).

Firstly the data were re-coded from a simplified input method (the SD scale on the questionnaire) to the relevant values as required under the TPB model and, where relevant, scores were reversed. Appendix D lists all the question numbers and the characteristics of the data values. The analysis utilised two software packages: Statistical Package for the Social Sciences (SPSS) for Windows, version 14, and Analysis of Moment Structures (Amos), version 6.0.

10.2 Initial Considerations

10.2.1 Factor Analysis

Factor analysis is a statistical technique that examines the inter-relationships of variables and reduces the number of variables into a set/factor. Factor analysis is classified into two types exploratory (EFA) and confirmatory (CFA).

Yuan et al. (2002: 95) described Exploratory Factor Analysis as follows: *"In an EFA model, the correlations among the observed variables are assumed to be generated by a few unobserved common factors"*. In the present study the unobserved common factors were the latent variables and the observed variables were the reflective indicators in Figure 9.2, Chapter 9. EFA assesses the relationship of variables to one another. Variables that 'clump' together, through high correlations, are believed to be measuring the same underlying factor. EFA is utilised to explore what variables clump together when the variables are free from parameters (relationships). As EFA is used to explore the data set, drawing conclusions from such analysis should be avoided (Costello and Osborne, 2005).

The second type of Factor Analysis is Confirmatory Factor Analysis (CFA). CFA requires the researcher to specify the relationships (parameters) prior to statistical assessment. CFA is utilised to confirm the hypothesised relationships and measure the strength of these relationships (Curran et al., 1996).

10.2.2 The Choice of Structural Equation Modelling

Considering the number of variables and relationships to be examined, the application of multivariate analysis techniques was required. Considering the characteristics of the data and the need for the testing of model fit and hypotheses, SEM was chosen as the best technique. Previous studies had shown that SEM was superior for extracting and identifying relationships, in comparison to traditional modelling and testing techniques such as multiple regression (Cheong and Leckenby, 2004).

> "*The primary purpose of SEM is to test and analyse interrelationships between latent constructs and their measured variables*" (Reisinger and Mavondo, 2006: 42).

Bagozzi and Philips (1982) advise of the benefits from utilising a structural equation modelling approach to specifying and testing theories in organisational research. This type of approach integrates theories with their measurement and permits the assessment of non-observational hypotheses through the use of error terms.

SEM allows the testing of paths and structural models between subgroups. It permits an analytical approach as to whether there are significant differences in latent variables between groups (Coughlin and Knight, 2007b).

Shaw and Shiu (2003) argue that SEM is suited to the application of TPB due to the nature of the underlying cognitive (latent) constructs. SEM allows for analysis of more complex models than regression, such as chains with mediating variables, that is, variable A influences variable B, which in turn influences variable C (Streiner, 2005).

Garver and Mentzer (1999) argue in favour of the application of SEM in logistics, advocating the rigour of scientific research as the discipline of logistics matures. There have been a number of applications of SEM in the logistics domain in recent times, such as, Au and Yeung (2007), Lu et al. (2007), Shang and Marlow (2005) and, in particular, Golob and Regan's (2005, 2003) application of SEM to the trucking industry in the United States.

SEM is often dichotomised into exploratory and confirmatory factor analyses. However, this is not essentially precise as there is no contradiction or antagonism between these components. Some researchers are now viewing SEM as a two step approach, an orderly progression (Anderson and Gerbing, 1988) and this was the view taken in the present study. However, there appears to be some confusion as to the boundaries of SEM with regard to Factor Analysis. Other researchers, such as Coughlin and Knight (2007a) refer to SEM as the relationship between latent constructs. SEM is often referred to as a group of analytical approaches of which Confirmatory Factor Analysis (CFA) and Path Analysis (PA) are members. However, strictly speaking, SEM goes beyond PA and CFA. PA allows the specification of directional and non-directional relationships between measured variables (MVs). CFA includes directional relationships from measured variables to latent variables and the non-directional relationships between latent variables (LV). Nevertheless, SEM not only includes CFA but allows for the specification of directional patterns between LVs (Shah and Meyer-Goldstein, 2006).

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are argued to complement each other. A careful consideration of the evidence through EFA reinforces CFA, with the possibility of EFA refining the model (West, 2006). Together, the two approaches allow a comprehensive confirmatory assessment of construct validity (Anderson and Gerbing, 1988). However, this is principally referring to a reflective model structure. Procedures for a formative model are not as comprehensive, as has been discussed in a review by Diamantopoulos and Winklhofer (2001), which

provides recommendations for validity assessment in formative SEM analyses.

10.2.3 The Choice of Parametric Statistical Analysis Technique

The default parametric statistical analysis associated with structural equation modelling has inherent limitations. There are many underlying assumptions and breaches of these assumptions will usually result in increased errors, such as increases in incorrectly rejecting model fit (type 1 error). The principal assumptions are: multivariate normality, missing data are unbiased and random, linearity of relationships and adequate sample sizes (Reisinger and Mavondo, 2006)

The present study was based in the context of behavioural and social science. Unlike in the natural sciences, data are often inconvenient to analyse, due to their nature: missing data and non-normal distribution are generally prevalent (Yuan et al., 2002).

10.2.4 The Choice of a Formative SEM Approach

Before the detail of the analysis is presented, it is important to give the reader a clearer outline of and justification for the adoption of a formative, rather than reflective, SEM approach. SEM is routinely undertaken and has close links to scale development. However, the analytical approach applied in the present study varied somewhat from the standard approach.

SEM involves latent (intangible or non-directly measurable) factors that usually form a structure where changes in the latent factors cause their indicators to change. Under this structure, the indicators are taken to be

reflective or effect indicators. However the present study's underlying theoretical construct, objectives and hypotheses implied that changes in certain indicators caused changes in the latent variables, that is, the indicators were taken to be formative or causal indicators. The direction of the path was the theoretical causal direction (McPherson and McCormick, 2006), in other words, it was the stated direction of the relationships. Experimentally controlling the conditions to meet causality criteria, such as controlling for spurious relationships and time order, were not feasible in the present study.

Many researchers assume that a reflective approach is correct without an attempt to verify this form of construct. A study by Jarvis et al. (2003) highlights that model misspecification—treating constructs as reflective when they are formative and consequently applying incorrect analysis methods—leads to serious consequences for the theoretical conclusions and, therefore, erroneous inferences.

Jarvis et al.'s study was carried out in the field of marketing. It found that 29% of studies in the top four marketing journals that utilised latent constructs were incorrectly modelled. The far majority were formative indicators incorrectly modelled as reflective constructs. This type of misspecification distorts the researchers' understanding (Bollen and Ting, 2000). Jarvis et al. (2003) made a number of recommendations for specifying formative models that were closely followed in the present study.

Researchers in the social sciences are moving quickly towards formative approaches (Ringle, 2007). The present study's approach was supported by

previous studies in the discipline of entrepreneurship, such as Wiklund et al. (2003) and Stetz et al. (2000). In the marketing discipline, the study by Jarvis et al., as referred to above, identifies a number of studies, which involved attitude and belief theoretical frameworks, that utilised formative indicators for latent constructs.

No comprehensive list existed to aid researchers' decisions as to whether a construct was formative or reflective. However, some guidelines were available. Jarvis et al. (2003) and Coltman et al. (2008) outline some decision rules and characteristics in order to elicitate whether the indicators are reflective or formative. They concentrate on the nature of the construct, the direction of causality and the characteristics of the indicators. These decision rules were applied in the present study. An empirical test (vanishing tetrad analysis) of the data has been devised and utilised (Bollen and Ting, 2000; Wilson et al., 2007). However, alternative explanations (other than formative indicators) are possible for rejection of a reflective construct under tetrad analysis (Coltman et al., 2008). No definitive guidelines for the application of a tetrad analysis were available. There are also very few papers illustrating the practical application of a tetrad analysis approach. Therefore, tetrad analysis was not utilised in this study.

10.2.5 Some Implications of a Formative SEM Approach

A formative approach has implications for construct and model validity, identifiability and measures of model fit (Diamantopoulos and Winklhofer, 2001). These indicators are exogenous and determining their validity is problematic. Formative indicators may not correlate with each other; therefore measures of internal consistency are of minimal importance; test-

retest reliability or temporal stability is more appropriate (Francis et al., 2004a).

Model identifiability is complex; in these circumstances the model has to be placed into a larger model, that is, a Multiple Indicators Multiple Causes (MIMIC) Model. In order to estimate the model, a latent variable requires three endogenous measured variables (three reflective indicators). The model can then be estimated through Confirmatory Factor Analysis (CFA) (Diamantopoulos and Winklhofer, 2001). It is worth noting that with three reflective variables the model may be identified and parameters estimated. However, measures of model fit cannot be calculated due to the number of degrees of freedom being equal to the number of estimated coefficients (McDonald and Ho, 2002). Therefore, comparing model fit with a construct of only three reflective indicators is hindered. This can be overcome by having a direct path to another latent variable through Structural Equation Modelling.

Unfortunately Exploratory Factor Analysis and measures of internal consistency were not relevant for formative indicators; therefore an alternative means, index construction, was utilised.

The model that was specified (Chapter 9, Figure 9.2) was recursive, that is, the path model led in one direction; no feedback loop was present (McDonald and Ho, 2002; Edwards and Bagozzi, 2000), as they tend to result in analytical problems (Streiner, 2005). For further information on standard structural models that are recursive the reader is referred to Kline (2006:43)

10.3 Index Development

Diamantopoulos and Winklhofer (2001) highlight four issues that are critical to the successful construction of a formative indicator index. These are: Content specification, indicator specification, indicator collinearity, and external validity. In the present study these issues were consistently monitored through the various phases in constructing the index. Content specification and indicator specification were highly important, as the latent variable was a composite of the formative indicators. Hence, a wide number of indicators were measured in order to adequately define the construct.

Multicollinearity (where variables are too highly correlated, leading to potential duplication) was examined, as the formative model assessment was based on multiple regression. Tolerance and Variance Inflation Factor (VIF) figures were approximately 0.5 and 2 respectively for each of the variables. In the literature there appeared to be lack of agreement on cut-off points for tolerance (from below 0.1 to 0.4) and VIF (from above 2.5 to 10) (Chen et al., 2007). The results for Tolerance and VIF were within the strictest criteria. Therefore multicollinearity was not an issue.

Internal validity is a thorny issue with formative models. Internal consistency is irrelevant; having too many indicators is problematic due to demands of data collection and the number of parameters; removing indicators can also be problematic with the potential for changing the construct (Diamantopoulos and Winklhofer, 2001)

Each indicator can be assessed by its correlation to an external variable to the index that is theoretically relevant. This study utilised a MIMIC model approach, where the latent construct was defined by a number of reflective indicators allowing model identification and assessment of the contribution and significance of the individual formative indicators. If overall model fit was found to be acceptable, this would support the validity of the latent variable formative indicators (Diamantopoulos and Winklhofer, 2001).

In the conceptual model that was postulated in this study the Index of Intention to Perform Collaborative Activities (the Intention index) was the sum of the three indexes corresponding to the three latent variables: attitude, subjective norm and PBC. The formulae for the index calculations for the latent variables of Attitude, Subjective Norm, PBC and Intention were as set out below, where the symbols, such as B1 and C7, were the scale values from the questionnaire:

Attitude =

$$(B1 \times C7) + (B2 \times C15) + (B3 \times C8) + (B4 \times C16) + (B5 \times C18) + (B6 \times C17)$$
$$+ (B25 \times C1) + (B26 \times C2) + (B27 \times C4) + (B28 \times C5) + (B29 \times C6)$$
$$+ (B30 \times C3) + (B31 \times C9) + (B32 \times C10) + (B33 \times C11) + (B34 \times C12)$$
$$+ (B35 \times C13) + (B36 \times C14) + (B37 \times C19) + (B38 \times C20)$$

Subjective Norm =

$$(B22 \times D17) + (B23 \times D11) + (B24 \times D13) + (D12 \times D16)$$
$$+ (D14 \times D19) + (D15 \times D20)$$

PBC =

(D1 × D6) + (D2 × D7) + (D3 × D8) + (D4 × D9) + (D5 × D10)

Intention = {Attitude} + {Subjective Norm} + {PBC}

The maximum and minimum values for the indexes were calculated as follows:

Attitude:

There were 20 items; the possible range was

(7 × ±3) × 20 = −420 to +420

Subjective Norm:

There were 6 items; the possible range was

(7 × ±3) × 6 = −126 to +126

PBC:

There were 5 items; the possible range was

(7 × ±3) × 5 = −105 to +105

Intention:

The number of items was the sum of the items for the Attitude, Subjective Norm and PBC latent variables. Thus there were

20 + 6 + 5 = 31 items; the possible range was

(7 × ±3) × 31 = −651 to +651

Therefore the highest possible value for the Intention index was 651, and the lowest possible value was −651. The mean index values are contained in Table 10.1. The number of missing values from the intention calculation was high due to the nature of the index calculation. If one variable was missing in the component calculation the intention figure could not be calculated (SPSS inserted a decimal point for missing values) and to assume a zero value would have introduced bias. Missing data are further discussed in section 10.5.

Minimum and maximum values were investigated to verify that the indexes were calculated correctly. In order to understand the index numbers without complication, they were rescaled to give each of them a value within the range −10 to +10. Therefore, Attitude was divided by 42, Subjective Norm was divided by 12.6, PBC was divided by 10.6 and Intention was divided by 65.

Table 10.1 Index mean values and tests of normality

	Intention	Attitude	Sub Norm	PBC
N Valid	138.000	150.000	173.000	186.000
N Missing	87.000	75.000	52.000	39.000
Mean	99.010	130.300	-20.060	-16.170
Median	99.000	131.000	-18.000	-15.500
Std. Deviation	108.940	85.540	38.270	28.750
Skewness	0.385	0.175	0.177	0.359
Std. Error of Skewness	0.206	0.198	0.185	0.178
Kurtosis	0.522	-0.466	0.111	1.838
Std. Error of Kurtosis	0.410	0.394	0.367	0.355
Range	623.000	392.000	198.000	192.000
Minimum	-180.000	-60.000	-108.000	-87.000
Maximum	443.000	332.000	90.000	105.000

The measured variables are described in Appendix D, Table D.1.

10.4 Descriptive Statistics

Data screening was carried out by means of inspection of the minimum and maximum values of frequency distribution of categorical data and in addition the mean and median were inspected to verify the plausibility of continuous variables (Pallant, 2001). A number of values outside the range of possibilities were reviewed and the correct values entered.

10.4.1 General Characteristics of Respondents

A number of tables and figures are initially presented illustrating the general characteristics of the respondents. Direct measured means of attitude, subjective norm, perceived behavioural control and intention are presented in a range from 1 to 7. Respondents were involved in a number of sectors with General Haulage the largest sector, followed by Tipper/Construction, Figure 10.1.

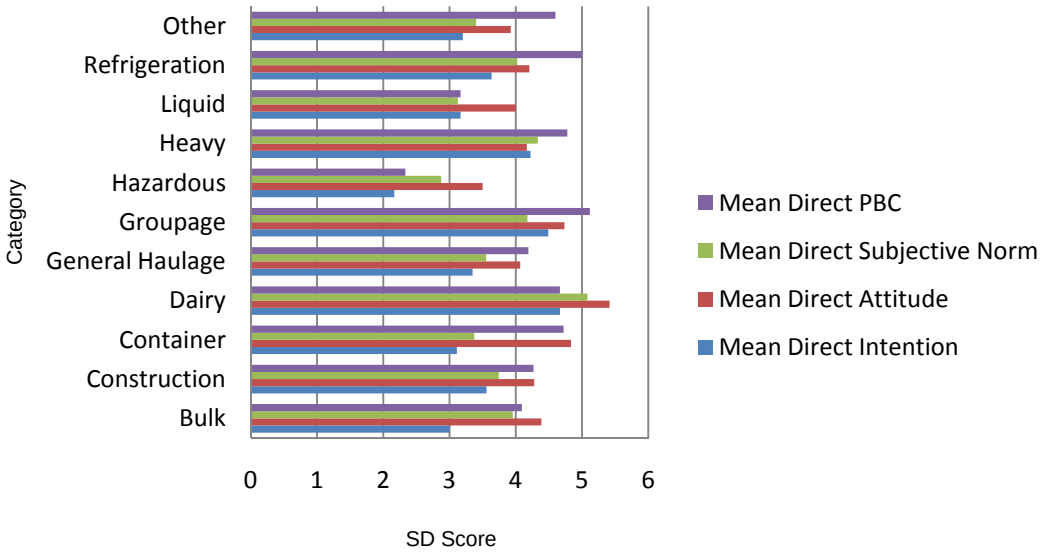

Figure 10.1 Attitude, subjective norm, PBC and intention by sector

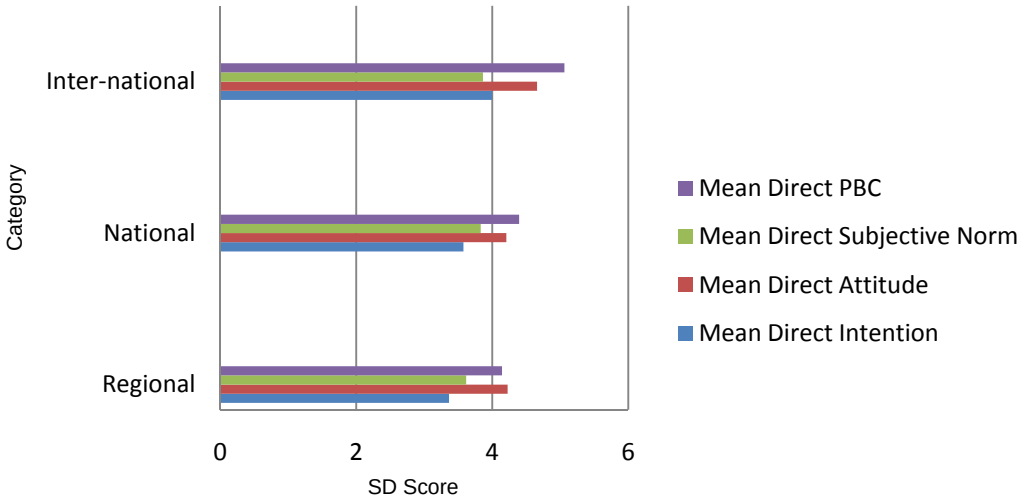

Figure 10.2 Attitude, subjective norm, PBC and intention by operation basis

Figures 10.1 and 10.2 illustrate that the dairy, container and groupage sectors and international transport operators had additional positive attitude to collaboration relative to their counterparts.

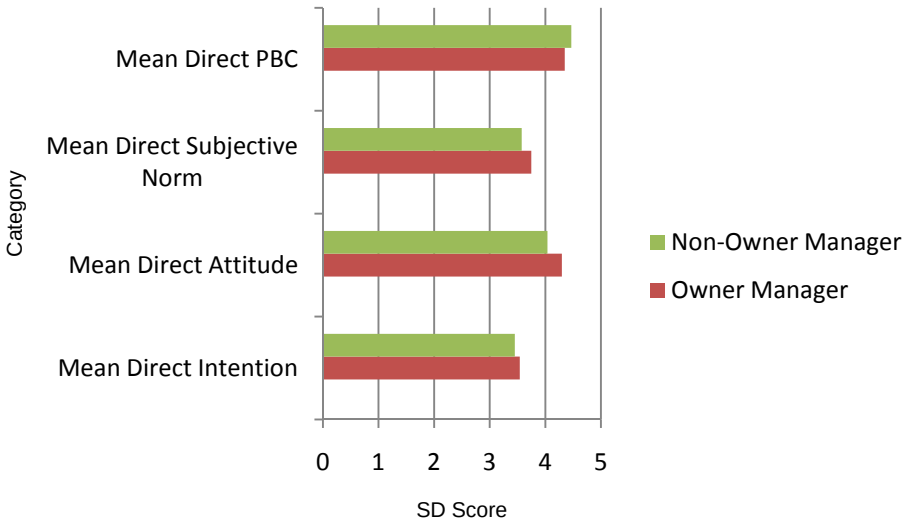

Figure 10.3 Intention, attitude, subjective norm and PBC by management type

Respondent's position was reclassified into management type. The mean values of TPB components were then compared between owner and non-owner managed firms. Initial inspection revealed no notable differences in mean values, Figure 10.3.

The variable 'highest level of general education' was re-coded into two groups and the mean of direct TPB components for each group was compared. Group 1 included respondent categories ranging from no formal education to Junior Certificate (90 cases). Group 2 included the highest level of general education, that is, from Leaving Certificate to bachelor and professional qualification (97 cases). No initial differences were apparent between the groups.

Table 10.2 displays general characteristics of the respondents and Figures 10.4 and 10.5 illustrate levels of collaboration. Unfortunately there were insufficient data about the population to verify the representativeness of the respondents to the population.

Table 10.2 General characteristics of respondents

	N	Minimum	Maximum	Mean	Std. Deviation
Years Established	148	0	98.000	15.440	148
Age	183	26	70.000	46.480	183
Years Experience in Transport	186	4	46.000	21.320	186
Vehicles in Fleet	186	0	40.000	4.300	186
Vehicles Subcontracted	185	0	50.000	0.840	185
Valid N (pairwise)	140				140

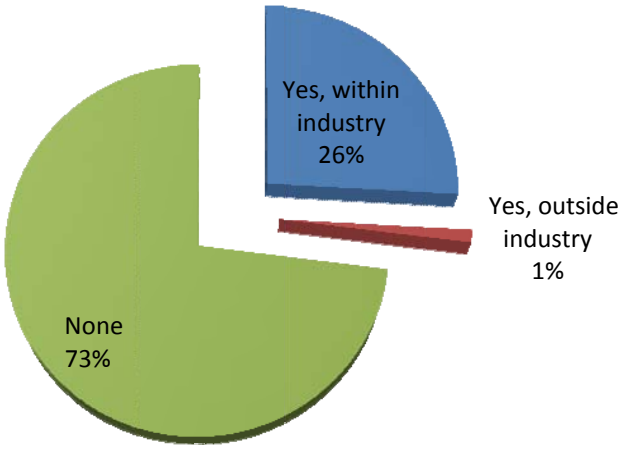

Figure 10.4 Collaboration in the industry

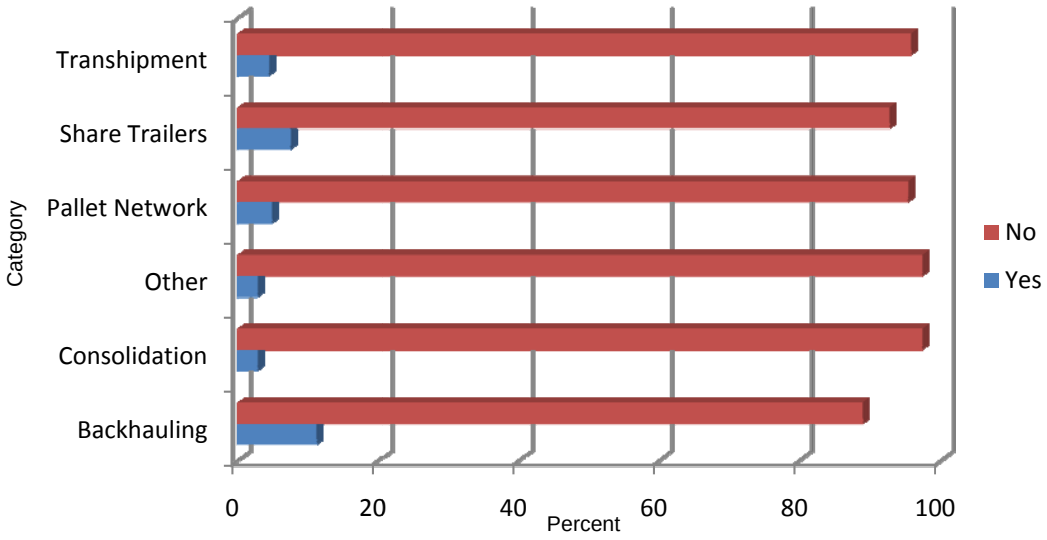

Figure 10.5 Type of collaboration by respondents

The industry was divided into two groups, groupage and non-groupage. 43 percent of the respondents in the groupage sector performed within industry collaboration in comparison to 24 percent in the non-groupage category. Only 1 percent of all respondents indicated collaboration outside of the industry.

10.4.2 Normality of the Distributions of Variables

Skewness and Kurtosis tests were applied to verify the normality of the distribution of the variables (Pett, 1997). The majority of the variables had mesokurtic (bell shaped) distributions, indicating normality. However, some variables had leptokurtic distributions (with an overly high number of cases close to the mean and so an overly peaked distribution curve), represented with a kurtosis statistic above zero. Some variables had platykurtic characteristics (with a graphically flat curve due to a large spread of results on the fringes), indicated by a negative figure.

Curran et al. (1996) advise that the exact point at what non-normality of data causes statistical difficulties is unclear, but that, roughly, values of skewness and kurtosis approaching 2 and 7 respectively appear appropriate as guidelines.

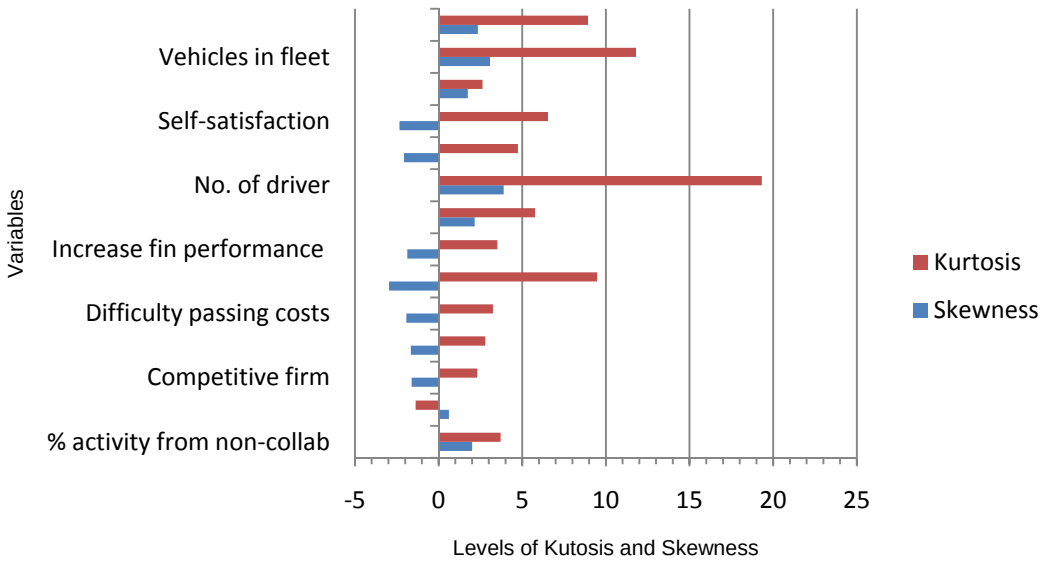

Figure 10.6 Breach of acceptable levels of Skewness and Kurtosis

For this study an examination of histograms and Kurtosis figures larger than ±2 were used to evaluate breaches of acceptable levels of normality (Pett, 1997). Variables that breached acceptable levels are presented in Figure 10.6. The results were not surprising and reflected the theoretical construct of the model. The majority of the variables that appeared to have a non-normal distribution were not among the measures in the Intention to Perform Collaborative Activities Index. However, a visual inspection was undertaken as these statistics were only indicators and were very sensitive to divergence from normality (Pett, 1997).

A visual examination of Normal, Detrended Normal Probability Plots, and Histograms confirmed the previous statistics. It revealed that the previously referred-to variables had non-normal distributions. However, a larger sample size and the application of SEM could overcome strongly kurtotic data, that is, a sample size ratio of approximately ten cases to the number of free parameters (Hair et al., 1998)

A search for outliers through the analysis of extreme values and Box Plots revealed a number of outliers for a large number of variables and a small number of extreme outliers associated with highly skewed variables.

A number of statistics were available to assess distribution normality by comparing the empirical data's distribution with a sample normal distribution. SPSS had the facility to calculate Kolmogorov-Smirnov (K-S) Lillefors and Shapiro-Wilk (S-W) statistics and these statistical tests were utilised for all of the measured variables. In the K-S and S-W statistics the levels of significance were mostly zero and all were below the minimum acceptable

significance cut-off point of 0.05, suggesting non-normal distributions. However, these tests were known to be sensitive to a number of aspects, such as misreporting with larger samples (Pallant, 2001).

The testing of variables to verify normality while controlling for segmented groupings failed to produce normal appearing distributions (Pallant, 2001).

Therefore, when the statistical tests were considered in conjunction with the previous descriptive analysis, the data generally appeared to have relatively normal distributions. The reader is referred to Yazici and Yolacan (2007) for further discussion in regard to the power of tests of normality.

10.5 Implications of Data Characteristics for Analysis Techniques

Data characteristics have significant implications for the appropriateness of different statistical analysis techniques. A number of variables had a non-normal probability distribution; however, the majority of these variables were concerning the descriptive and characteristic elements and were not key to the core analytical approach.

10.5.1 Handling Missing Data

Missing data analysis was utilised and missing data appeared not to be missing completely at random (MCAR) as Little's chi-square was statistically significant at probability 0.004, indicating differences between partial and completed data. Unfortunately there was no test for missing at random

(MAR) data that allowed for imputation methods and maximum likelihood estimation in CFA (Potthoff et al., 2006; Muthen et al. 1987).

28 cases were deleted as they had a high percentage, over forty seven per cent, of missing variables. Therefore, the total valid number of cases was 191. The respondents were then divided into two groups (deleted and not deleted) and their characteristics compared through cross tabulation and Pearson's Chi-square correlation. There were some differences detected between the two groups.

'Whether they performed collaborative activities' reached statistical significance under Pearson's Chi-square statistic, with the deleted group not performing these activities in contrast to the remaining cases group. Therefore, it was not surprising that there was a significant difference (independent group t-test) between groups on question B9 (affective question), 'whether collaborative activities were good or bad'. Respondents in the deleted 28 group who answered the question (5 respondents) were negative towards the concept and mainly saw it as a bad idea. The operating geographical basis appeared to be mainly regional (64%) for the deleted cases group and reached significance under Pearson's Chi-square. Significant differences were seen between the two groups.

Therefore it appeared patterns existed in the characteristics of the missing value respondents. Careful consideration was needed with regard to the possible effect of introducing bias, if deletion of these cases were maintained. The decision was made to leave these cases out of the analysis, principally because the high levels of missing values would have resulted in errors

through the use of imputed substitution methods. The tables are available for viewing in Appendix E.

The respondents' 'positions' in the deleted cases group had a higher tendency towards the 'other position' category than the 'owner-manager' and 'general manager' categories. Again this was difficult to examine thoroughly due to the high level of missing responses for those particular questions. Tabulation of missing patterns revealed a pattern between question B3 'outcome of efforts', Attitude and Intention. This was not surprising considering a missing value for B3 in a case would not allow SPSS to calculate an attitude score and therefore an intention score. The decision was made to retain B3 for the calculation of the attitude score, even though it had missing values in 13% of cases (missing value replacement is described subsequently). The variable 'value expectation' (question A7B) was not used in the principal analysis due to a missing value rate of 78 per cent.

The 'family obligations' question (D8, missing 1.6%) also showed some missing value patterns with PBC, as the response to this question was included in the PBC score. It was speculated that this question was probably seen as irrelevant by non-owner manager categories of respondents. However, a cross-tabulation of responses revealed that it was purely owner-managers who failed to answer this question. However, approximately ninety percent of respondents were owner managers. Another possible explanation was concerns with regard to privacy.

Due to one missing variable impacting on a case's overall intention score, substitution methods for calculating missing values were appealing. A

number of approaches such as Listwise, Pairwise, Estimation Maximisation (EM) and Regression were compared to establish which approach would best suit the data. Comparisons of means, correlations and scatter plots were undertaken in order to verify the best approach to estimating missing data values (Hill, 1997). EM and regression gave comparable results, with regression slightly outperforming EM. These results, of regression being an appropriate method for missing value substitution for these data, concurred with previous similar research with missing values of ten per cent or less (Shang and Marlow, 2005). Therefore, regression was used in order to calculate the missing values of the variables to calculate the attitude, subjective norm, perceived behavioural control and intention to perform collaborative activities indexes, that is, questions B1 to D20. With the application of regression substitution, only ‘quality of service’ (question B2) was positively skewed and had a kurtosis value of 9.5.

With the exclusion of question B3 ‘return on effort‘ and D8 ‘family obligations‘ Little’s Chi-square was not statistically significant. This indicated that when these two variables were not included, any missing values were missing completely at random (MCAR). Therefore the patterns in the index data appeared to be due to the structure of the index calculation itself. Due to the small amount of missing data in question D8 ‘family obligations’, it was retained for the calculation of PBC.

Mean, median and standard errors were compared between Intention index results with and without replacement of missing values. No significant differences in these two statistics were detected, with the exception that for the Attitude sub index the mean was approximately 10% higher with replaced

missing values and, as a result, Intention was approximately 20% higher due to the high positive value of the Attitude sub index. An explanation of this was that the replacement of missing values allowed the calculation of the attitude sub index for the cases where a previously missing second variable value of a product pair had been replaced. The components of the attitude sub index were only slightly higher (to one or two decimal places).

10.5.2 Normality of the Data

Skewness and kurtosis tests were applied to verify the variables' normality of distribution (Pett, 1997). PBC was slightly leptokurtic. A visual examination of Normal Probability Plots, Detrended Normal Probability Plots, and Histograms confirmed the previous statistics. All other variables within the index were normally distributed. Parcelling was believed to have had a key role in this. Holt (2004) points out that parcelling has many advantages, such as improving the normality of data distribution and increasing validity, reliability and overall model fit. It could be seen from the data that when the variables were multiplied the level of kurtosis and skewness reduced.

10.5.3 Rationale for Choosing SEM

The rationale for choosing SEM was that it is was a superior family of techniques, when compared to the traditional approach of multiple regression. SEM had somewhat more flexibility with regard to multicollinearity (when two or more predictors are highly correlated they may in-fact be measuring the same thing resulting in a doubling-up). SEM facilitated the use of confirmatory factor analysis in order to reduce measurement error by having multiple indicators per latent variable. Path

analysis was an attractive feature of SEM that allowed easy graphical illustrations of the model and the relationships within it.

SEM has the capability to test models with multiple dependents, to model mediating variables rather than being restricted to an additive model, to model error terms, to test relationships across multiple between-subjects groups and to handle difficult data (non-normal data, incomplete data). In contrast to this regression is highly susceptible to error of interpretation by misspecification. The SEM approach of comparing alternative models to assess relative model fit encourages robustness (Schumacker and Lomax, 1996).

Hence, the abilities of SEM to handle non-normal data and carry out Path, Exploratory Factor and Confirmatory Factor analysis all sat well with the aims of this study and the characteristics of the data.

10.5.4 Selection of Statistical Techniques

What statistical techniques to use for SEM was a key concern, as the default statistical techniques, Maximum Likelihood (ML) Estimation and Ordinary Least Squares (OLS), were known to report erroneous increases in type 1 errors with non-normally distributed data. Many researchers with non-normal distribution of variables choose to transform the data into a different scale so as not to breach the assumption of normality of many parametric statistics. However, there are some potential issues with transforming the data: would it undo the phenomena under investigation, what are the theoretical consequences of such a transformation and how can it be known that the transformation has been successful? (Cohen et al., 2003).

There appeared to be a lack of unified approaches to breaches of assumptions. There were, of course, multiple approaches for the analysis of data with non-normal distribution. The literature was vast and wide, constantly testing new and improved methods and statistics.

Where the choice was between transformation of data and applying a non-default statistical technique, such as generalised least squares (GLS), current recommendations leaned towards GLS (Cohen et al., 2003).

Yuan et al. (2002) while attempting to develop a unified approach to EFA with missing and non-normal data revealed that Bartlett's correction was superior to the likelihood ratio statistic. Fouladi (1998) reported similar results, with support for Bartlett's correction where latent variables were orthogonal (not correlated). However, where non-orthogonal (correlated) latent variables existed, alternative methods of structural analysis were preferable. For small sample sizes the results of the study favoured Satorra-Bentler's adjusted procedure over Bartlett's procedure, while for large sample sizes Satorra-Bentler's scaled procedure outperformed both the adjusted and Bartlett's procedures.

Reviews of bootstrap approaches to the application of SEM with missing data and non-normal distribution revealed that they should be used with caution (Yaun et al., 2002). Enders (2002) evaluated the Bollen-Stine bootstrap approach with missing and non-normal data and obtained promising results. Caution was urged with regard to sample size, as a sample size of approximately 200 cases was the minimum acceptable level.

Curran et al. (1996) compared the accuracy of the statistics ML, ML corrected with Satorra-Bentler Chi-square (SB) and Asymptotic Distribution Free (ADF) for non-normal data. The study revealed that SB performed the best, outperforming ML and ADF in nearly all conditions. The study highlighted the limitation of ADF in complex models or with smaller sample sizes, as in these situations the ADF statistic tended to inflate the model chi-square. ADF was rejected for the present study, as it was likely to yield inconclusive results due to the sample size and the level of model complexity.

A number of authors have advocated the use of GLS instead of Maximum Likelihood, as it is more tolerant of breaches in assumptions (Muthén, 1984; Cohen et al., 2003; Skrondal and Rabe-Hesketh, 2005). If univariate non-normality was present then the data were highly unlikely to have multivariate normality (Curran et al., 1996).

Unfortunately, the above review was still inconclusive as to the one single appropriate approach to take towards the analysis in the present study. The decision criterion was therefore based on choosing the most powerful explanatory technique, balanced with the practicalities of the situation: time resources and the availability of suitable software packages to undertake the statistical studies.

Cohen et al. (2003) advise that the most appropriate approach should be judged by the best model fit. However, this could not have been examined until after the techniques had been applied

A decision was made to apply Maximum Likelihood as, according to Ringle et al. (2007), it resulted in the most appropriate estimates when applied to formative models. However, it was also decided that this approach should be compared and contrasted with the traditional analytical process of multiple regression, as advised by Francis et al. (2004a).

10.6 Traditional Analytical Approach

Firstly the traditional approach is presented, followed by SEM analysis and a comparison between the two. The EFA and CFA that were preparatory to the SEM analysis are presented before the SEM analysis itself. Direct and indirect measures were analysed using the guidelines recommended by Francis et al. (2004a). In the terminology of Francis et al. 'direct and indirect measures' were similar to reflective and formative indicators respectively, as described in the present study so far.

Direct measures that were negatively worded were reversed using the recode command in SPSS. Internal consistencies of the responses for each construct were assessed by Cronbach's Alpha. The following results were obtained:

- Attitude: There were four measures of attitude with an alpha level of 0.803. The removal of responses to question B9 'collaborative activities good/bad' increased the alpha level to 0.825. However, in order to effectively represent the attitude construct, question B9 was retained.

- Subjective Norm: Question B11 ‘whether I perform collaborative activities is up to me’ had a low negative inter-correlation with the other variables; therefore it was removed leaving an increased alpha of 0.596.
- Perceived Behavioural Control: All three responses correlated to a fairly high degree giving a Cronbach’s Alpha level of 0.7
- Intention: All three variables were highly inter-correlated resulting in a Cronbach’s Alpha of 0.739

Excluding subjective norm, where internal consistency was a little low, the remaining direct measure scales had acceptable levels of internal consistency. The variable B11 (PBC variable, ‘up to me’) appeared to be measuring some other construct, possibly a mix of factors as it was a broad question. As recommended by Francis et al. (2004a) the scores for each scale were obtained by calculating the mean score of the variables in each scale.

The mean scores (with a possible range of 1 to 7) were as follows; Intention 3.53 (B10, B17, B21), Attitude 4.27 (B9, B13, B16, B20), Subjective Norm 3.73 (B8, B12, B15, B19), PBC 4.36 (B7, B14, B18).

The model was subjected to multiple regression analysis in order to test model fit. Prior to this, kurtosis, skewness, bar charts of distribution and scatter plots of linear relationships between independent and dependent variables were used to verify that no assumptions in relation to normal distribution and linearity were breached.

Multicollinearity was assessed by examining correlations between each pair of the variables. The correlations were strong, with intention, attitude and subjective norm having correlations above 0.7 in comparison to PBC of approximately 0.5 (see Table F.4, Appendix F).

Collinearity diagnostics were inspected to gain greater insight. Tolerance and VIF (variance inflation factor) were approximately 0.5 and 2 respectively for each of the variables, indicating that multicollinearity was not an issue.

Homoscedacity (a constant equal scattering of residuals around the regression line) and independence of variables were assessed by inspecting the residual scatter plot and the normal probability plot. The rectangle shape of the plot indicates that the assumption was not violated. Mahalanobis Distance values were inspected to check for outliers: 3 values were found above the critical value of 16.27 for three independent variables (Pallant, 2001). Considering the sample size some outliers were expected; however, the outliers were not extreme and were therefore retained. There appeared to be no breach of assumption in relation to the variables being normally distributed.

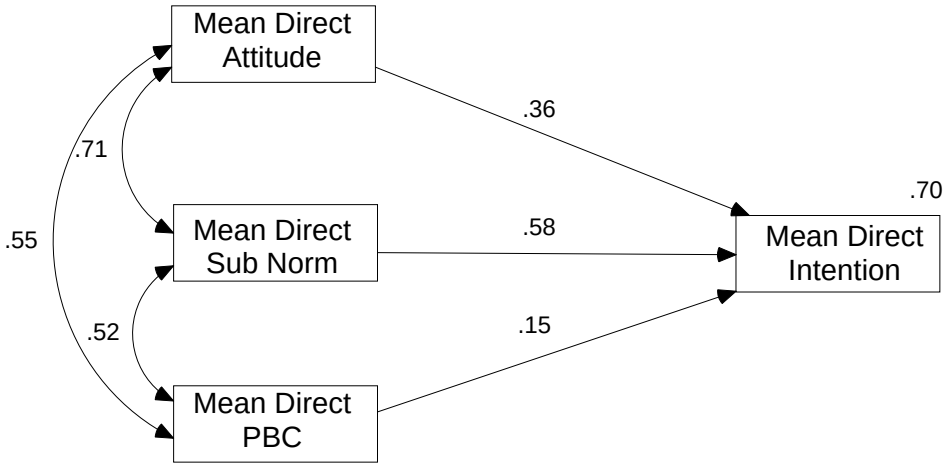

Figure 10.7 TPB model direct measures regression weights, R and R^2

As seen in Figure 10.7 the model explained 69.6 percent of the variance in intention. The model reached statistical significance. Standardised beta coefficients were examined in order to evaluate the independent contribution of each of the variables to the explanation of the variance in intention (dependent variable).

The strongest unique contribution to the variance in intention in terms of standardised beta values was from subjective norm (0.47), followed by attitude (0.32) and perceived behavioural control (0.15). Standardised beta values indicated, for example, that a change of 1 standard deviation in subjective norm would result in a change of 0.47 standard deviations in intention. Standardised values are used if the units are different or if they are at various levels of aggregation (Aiman-Smith et al., 2002)

Unstandardised beta values are considered raw figures and are used to estimate the impact of the change in a predictor variable of the dependent variable (Pallant, 2001). Therefore, for example, a change in subjective norm by 1 would have resulted in a change in Intention of 0.58. The

unstandardised beta values for attitude and perceived behavioural control were 0.36 and 0.15 respectively, as shown in Figure 10.7.

The statistical significance (p-value) for all three independent variables was below 0.05. This indicated that they were making a significant unique contribution to the prediction of the independent variable, intention. Partial correlations, indicating by what amount the prediction of the coefficient of determination (R^2) of intention would fall by if that variable were excluded were as follows: Attitude 0.215 (21%), Subjective Norm 0.326 (33%) and PBC 0.124 (12%).

Indirect measures analysis firstly involved a series of bivariate correlations between direct and indirect measures, which were utilised in order to verify validity of the indirect measures. Pearson's correlation results were as follows: intention 0.481, attitude 0.429, subjective norm 0.428 and reached significance, p, of 0.000. Perceived behavioural control resulted in a Pearson's correlation of 0.152 with a statistical significance, p, of 0.035. It appeared the indirect measure of PBC may not have adequately covered the breath of the measured construct.

The prediction of direct measures was analysed through the employment of multiple regression. Mean direct attitude was entered as the dependent variable and predictors of all individual weight beliefs as the independent. An R^2 of 0.362, that is 36.2% of the variance in the dependent variable was explained by the predictors.

The standardised beta scores indicated that indirect measured variables FB25C1 (Financial Performance) 0.281, GB27C4 (Growth) 0.249, RB38C20 (Resources) -0.201, CB35C13 (Competitive Advantage) 0.196 and WB34C12 (Personal Wealth) 0.177 were the best predictors. With the regression analysis reduced to just these predictor variables, R^2 fell to 0.30 with a significance level of at least 0.05 except for personal wealth, which had a value of 0.079.

With the elimination of other variables, beta value scores changed due to the removal of overlap. Table 10.3 presents mean direct attitude regression beta values with five predictor variables.

Table 10.3 Attitude regression coefficients and beta values

	Standardised Coefficients	Sig.	Correlations			Collinearity Statistics	
(a)	Beta		Zero-order	Partial	Part	Tolerance	VIF
(Constant)		.000					
Financial Performance	.273	.001	.447	.238	.206	.569	1.759
Growth	.172	.026	.368	.163	.139	.650	1.539
Personal Wealth	.138	.079	.364	.129	.109	.624	1.602
Competitive Advantage	.188	.020	.382	.171	.145	.598	1.672
Resources	-.237	.001	.050	-.240	-.208	.771	1.297

a Dependent Variable: Mean Direct Attitude

The beta score indicated the number of standard deviations the dependent variable would change with one standard deviation in the predictor variable.

Figure 10.8 illustrates the Path Analysis of unstandardised regression weights and squared multiple correlations of indirect attitude predictor variables on the direct dependent variable, attitude.

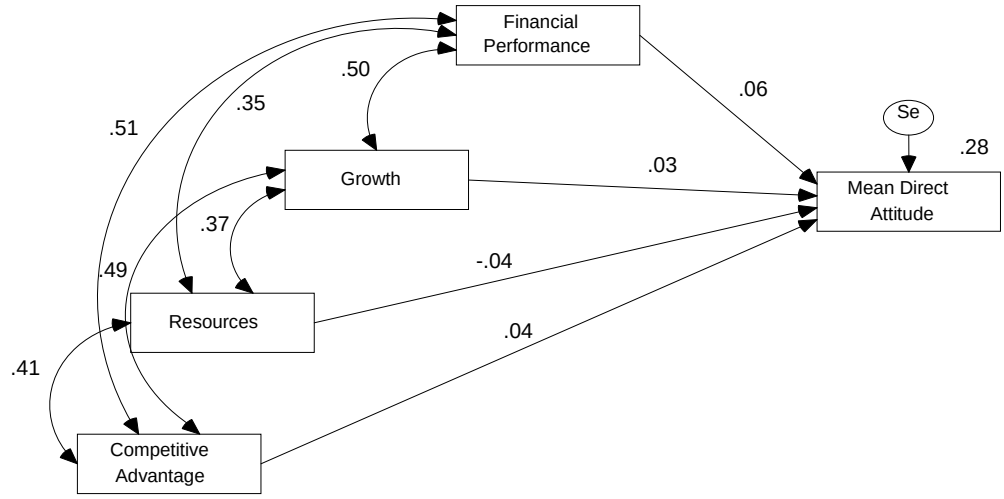

Figure 10.8 Indirect attitude unstandardised regression weights

The unstandardised regression weights in Figure 10.8 demonstrated the percentage change in overall attitude with a change in the independent variables. Therefore, for example, an increase in the variable 'financial performance' by 1 unit would have resulted in an increase in overall attitude of 0.06 units.

10.7 Exploratory Factor Analysis

Exploratory work was undertaken to verify the validity of the reflective components of the model.

Theoretical measures were reviewed as outlined by Francis et al. (2004a). This was followed by measures of internal consistency (Cronbach's Alpha) and exploratory factor analysis of each latent construct. The next stage implemented confirmatory factor analysis before adding the formative indicators to the model.

Initially the data characteristics were analysed in order to verify that the assumptions of EFA were not breached. The sample size of 191 appeared sufficient in comparison to previous studies in light of the ratio of cases to variables (Pallant, 2001).

The EFA was applied to each of the latent variables, one at a time. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was above the minimum criterion of 0.6, indicating that the data could be grouped into a smaller set through factor analysis. Bartlett's Test of Sphericity was significant to three decimal places, revealing that confidence could be had in the tests. The linearity assumption was verified through spot checks of scatter plots. No outliers existed, as per previous minimum and maximum value tests. Considering the results of these preliminary tests, it appears safe to proceed.

Exploratory Factor analysis was carried out using Principal Axis Factor (PAF) extraction in order to investigate the underlying construct. The PAF method was chosen due to the aim of the EFA application, to uncover a solution uncontaminated by unique and error variability, that is, with only shared variance (Tabachnick and Fidel, 1996: Coughlin and Knight, 2007b). The aim of this EFA was to investigate the validity of the latent reflective construct. Worthington and Whittaker (2006) and Widamen (1993) supported the view that PAF was more appropriate than PCA (Principal Component Analysis) for the development of new scales and obtaining latent structure parameters. The structures were later assessed through exploitation of Confirmatory Factor Analysis (CFA).

The criteria for sample size adequacy surpassed Worthington and Whittaker's (2006) advice for sample size of between 150 and 200, and approximately met the remaining criteria of: communality values of 0.5, or ratio of cases per item of between 5:1 and 10:1; ratio of items per factor of 10:1 and factor loadings of 0.4. The extraction broadly met Thurstone's simple structure approach, that the items loaded strongly (above 0.4) on one factor (Coughlin and Knight, 2007b).

10.7.1 Attitude Exploratory Investigation

A theoretical review provided guidance in relation to overall measures for reflective indicators, such as: good/bad type questions (B9) should be included and to keep the model simple (Francis et al., 2004a). The indicator valuable/worthless (B13) also appeared theoretically sound. These variables had a correlation of 0.404. Internal consistency revealed a Cronbach's Alpha figure of 0.613, which was acceptable considering there were only two items on the scale (Dornyei, 2001).

The Kaiser-Meyer-Olkin (KMO) statistic was 0.5, indicating that the amount of variance within the data that could be explained by factors was poor. However, Bartlett's test of sphericity, a sensitive test, was significant ($p = 0.000$), indicating the data were probably factorable (Brace, 2006). Fair to medium positive linearity was verified through a scatter plot. The extraction communality values were 0.441. A Scree plot was examined, but provided very little information due to only two variables being extracted. The Kaiser-Guttman (KG) rule (to accept all Eigenvalues above 1) also appeared irrelevant in this case due two only one factor being possible. However, PAF

analysis revealed an Eigenvalue for one factor of 1.442, explaining 44.1 percent of the variance and a factor loading of 0.664.

There was increasing consensus in the literature that Parallel Analysis was superior to the Kaiser-Guttman rule and yielded optimal solutions (O'Connor, 2000). Parallel Analysis (Eigenvalues compared against random sets) and Velicer's Minimum Average Partial (MAP) test—for relevant amounts of systematic and unsystematic variance in the correlation matrix—appeared superfluous with single factor extraction. Also, the MacParallel program to randomly generate Eigenvalues required a minimum of five variables (Watkins, 2000).

A competing construct was also determined using all four measured reflective attitude indicators ('Good/Bad' B9, 'Valuable/Worthless' B13, 'Pleasant/Unpleasant' B16: 'Interesting/Boring' B20). The construct had a Cronbach's Alpha of 0.803. One factor was revealed with a KMO of 0.777 and Bartlett's reaching significance. This construct explained 52 per cent of the variance with mean extracted communality of 0.317 and mean factor loadings of 0.715. It appeared that Cronbach's Alpha would also increase to 0.825 if B9 was removed, leaving a latent construct with three reflective indicators. However, theoretically, this would have been difficult to justify, as it was an overall indicator as recommended by Francis et al. (2004a). Further clarification would be required employing confirmatory factor analysis and assessment of model fit.

10.7.2 Subjective Norm Exploratory Investigation

EFA of the Subjective Norm component revealed a similar situation to that of Attitude. The indicator, 'to perform is up to me' (B 11) was removed due to low negative correlations and it was the only variable loading on a second factor. Hence, it was measuring a different construct. A four indicator construct was revealed ('People important think I should/not' B8, 'Competitors perform' B12, 'Expected of me' B15, 'People's opinions I value would approve' B19) with a Cronbach's Alpha of 0.596. The Scree plot and Kaiser-Guttman revealed a structure of only one factor. The single factor structure resulted in 27.4 percentage of variance being explained.

The adequacy of the sampling of the one factor construct was assessed by: KMO of 0.627 and sample size of 191 cases with a Bartlett's Test of Sphericity reaching significance. This structure had a mean extracted communality value of 0.28, ratio of cases per item of 48:1, ratio of items per factor of 4:1 and a mean factor loading of 0.521 indicating acceptable sample size.

10.7.3 PBC Exploratory Investigation

Internal consistency of the reflective indicators ('Easy/Difficult' B7, 'Confident I can perform' B14, 'Is possible to perform' B18) was verified through Cronbach's Alpha of 0.700. The Kaiser-Guttman rule and Scree plot revealed a structure of only one factor. The single factor structure explained 45 per cent of the variance. It also revealed a KMO of 0.654 and Bartlett's Test of Sphericity reached statistical significance. There were 191 cases with a mean extracted communality value of 0.450, a ratio of cases per item of 63:1, a ratio of items per factor of 3:1 and a mean factor loading of 0.664.

10.7.4 Intention Exploratory Investigation

Internal consistency of the three reflective variables ('I plan to develop new collaboration in one year' B10, 'I will make an effort' B17, 'I intend to perform on a regular basis' B21) was verified through Cronbach's Alpha of 0.739. The Kaiser-Guttman rule and Scree plot revealed a structure of only one factor. The single factor structure explained 50 per cent of the variance. Tests of sample size adequacy revealed a KMO statistic of 0.664 and Bartlett's Test of Sphericity reached significance. There were 191 cases with a mean extracted communality value of 0.500, a ratio of cases per item of 63:1, a ratio of items per factor of 3:1 and a mean factor loading of 0.700.

Removing the variable B10 from the construct would have increased internal consistency slightly (by 0.004 Cronbach's Alpha). Although this would have resulted in the KMO statistic falling to 0.500, the Bartlett's test would have remained significant and the variance explained would have increased to almost 60 per cent. Communality would also have increased to 0.591 and factor loading to 0.769. However, it was decided to retain this indicator, as deleting it could have reduced the breath of coverage of the latent variable. Also, for the next stage of analysis, Confirmatory Factor Analysis, three measured variables were required with a causal path from the latent variable. This was required in order for the model to be identifiable (capable of estimating the unknown parameters) (Diamantopoulos and Winklhofer, 2001).

EFA resulted in very strong support for the reflective component of the conceptual model. Confirmatory Factor Analysis was then employed to compare the observed data to the conceptual model.

10.8 Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was used to link the observed variable to the latent constructs. Hence, it was employed in the analysis of individual latent factors (Coughlin and Knight, 2007a). As recommended by MacCallum and Austin (2000), a comparable models strategy was engaged, that is, a multiple number of models, including the conceptual model and several competing structures were specified and evaluated. The usual graphical representations were utilised for the CFA in order to ease explanation of the models. Various shapes and arrows in the diagrams represented various types of variables and parameters: an oval shape was a latent variable, a rectangle was a measured variable. Single-ended direct path arrows showed relationships between indicators and latent variables and were labelled with regression weights, while curved double-ended arrows showed correlations between indicators and were labelled with the corresponding correlation coefficients.

Model fit and modification indices, as recommended by Arbuckle (2005), Worthington and Whittaker (2006); Goffin (2007); Barrett (2007) were reviewed for all CFA and SEM analyses with the aim to have model parsimony, hence a balance between model complexity and goodness of fit. A problematic issue was that the accuracy of a number of the measures of model fit could vary depending on sample size and level of complexity. In order to avoid erroneously accepting or rejecting a model, a variety of

measures of fit were contemplated. Acceptable levels of fit and cut-off criteria varied in the literature. The levels that were broadly acceptable are briefly discussed below.

10.8.1 Acceptable Levels of Model Fit

Chi-square minimum (CMIN) discrepancy statistic of overall model fit range from the perfect fitting model (Saturated Model) with a Chi-square of 0 to a maximum value revealed by the Independent model (no paths included). The probability (p) that the model fits perfectly in the population should reach non-significance (Schumacker and Lomax, 1996). However, there are some issues that can impede the accuracy of the Chi-square statistic. Complex models often result in difficulty attaining non-significant p values and large sample sizes can result in incorrectly rejecting the model fit based on the Chi-square index. Small samples may be liable to accept poor model fit under Chi-square. Thus, it is advisable to review Hoelter's N at 0.05 probability, to assess the potential impact of sample size (Reisinger and Mavondo, 2006).

The Hoelter's N measure reports the largest sample size such that one would accept the model by Chi-square. Chi-square tends to become inflated with large sample sizes, with the potential to erroneously indicate poor model fit and possible model rejection. A minimum sample size is also relevant, with various studies pointing to a minimum sample size ranging between 100 and 200 (Schumacker and Lomax, 1996). However, as previously discussed, the number of parameters to be estimated will influence this figure.

Other measures of model fit include the minimum discrepancy divided by the degrees of freedom (CMIN/DF) ratio: 1 being a perfect fit and one to three

being a reasonable fit; however, sample size is an issue. Root Mean Square Error of Approximation (RMSEA) below 0.8 is a reasonable fit and below 0.5 is a good fit. However, RMSEA tends to favour models with many parameters. Probability of Close fit (PCLOSE), estimates the probability the RMSEA is above 0.05, therefore if p is greater than 0.05 the fit is close. Goodness-of-Fit Index (GFI) measure how much the model fits compared to no model, 1 being a perfect fit (McDonald and Ho, 2002).

There are also statistics that encounter no penalty for model complexity: Parsimony Goodness of Fit (PGFI) adjusts the goodness of fit for model complexity. This index and Parsimony Normed Fit Index (PNFI) are used for comparing models with different degrees of freedom: cut-off for acceptable fit is considered greater than 0.5 (Keller, 2006). Differences between models of 0.06 and 0.08 indicate substantially different fit (Caro and Garcia, 2007). Akaike Information Criterion (AIC) allows comparisons of competing models, the smaller value is preferred. This combination of measures attempts to obtain the bigger picture of the model fit by minimising the inadequacy of individual measures. (McDonald and Ho, 2002)

10.8.2 Attitude Construct Confirmatory Investigation

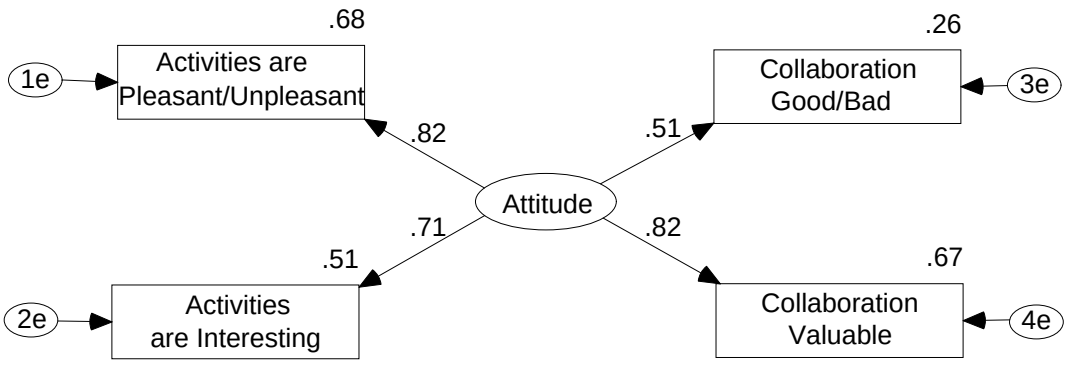

Figure 10.9 Attitude: four reflective indicators construct (Standardised regression weights)

The Attitude model with four reflective indicators revealed an excellent fit of Chi-square of 1.14 with p of 0.565, CMIN/DF ratio of 0.570, GFI 0.997, RMSEA of 0.000 and Hoelter's N of 1,000. All these measures indicated a very good model fit. EFA highlighted a competing model with two reflective variables. However, as there were only two reflective variables, the model could not be identified. Therefore the competing model had to be compared to the current model, as presented in the following section (SEM Analysis, Section 10.9), as a path to a latent variable (intention) was required for identification (parameters estimation).

The formative indicators were then added to the model. A large number of variables were removed due to insignificant loading, low Critical Ratio values (CR below 1.96) and non significant relationships ($p < 0.05$). Initial measures of fit are reported in Appendix F. The trimmed model is graphically represented in Figure 10.4 and reported excellent measures of model fit: Chi Square 24.5, with a p value 0.704, CMIN ratio 0.845, GFI 0.977, RMSEA 0.000, PCLOSE 0.974 and Hoelter of 331.

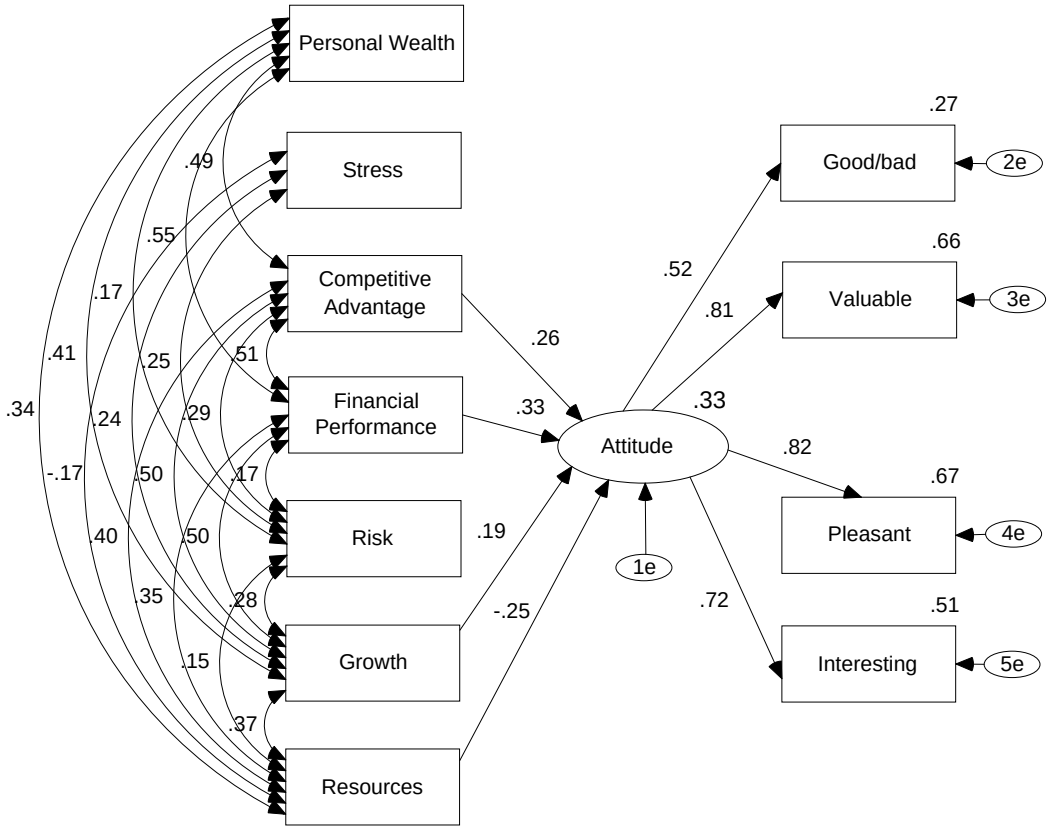

Figure 10.10 Formative attitude model with four reflective indicators

(Standardised regression weights)

Model modification was an iterative process, as one change resulted in knock on effects on other variables. However, the final attitude model under CFA is presented in Figure 10.10.

Figure 10.10 illustrates the standardised regression weights of the key influential indicators, that is, a change by one standard deviation in the predictor variables will result in one standard deviation change in latent attitude. Financial performance was the most influential formative indicator, followed by competitive advantage. The Resources variable closely followed competitive advantage but was negative in its influence. Growth was also positively influential on the latent attitude variable. As belief outcomes

towards resources increased, this had a negative impact on the attitude score. The converse was also true: as perceptions of resources decreased, attitude towards collaboration increased. This appeared to be initial evidence to support Resource-Advantage theory: in particular, collaboration seemed to be more important to firms with minimum resources.

In Figure 10.10, the smaller oval shapes that contain the letter e in their variable name are measurement error terms. They represent the variance that is not explained by the predictor variable(s) (Diamantopoulos, 2006). Therefore the variable 'collaborative activities are valuable' had an explained variance (coefficient of determination, or R^2) of 0.66; the remaining unexplained variance was therefore 3e and had an R^2 of 0.34.

10.8.3 Subjective Norm Construct Confirmatory Investigation

Figure 10.11 graphically represents the CFA of Subjective Norm prior to the addition of formative variables. The four reflective indicator model revealed a very poor model fit, with Chi-square of 14.6 with p of 0.001, CMIN/DF ratio of 7.032, GFI of 0.960, RMSEA of 0.183 and Hoelter's N of 78. EFA highlighted a competing model with two reflective variables. However, as there were only two reflective variables the model could not be identified; therefore the competing model had to be compared to the current model (see the following SEM Analysis).

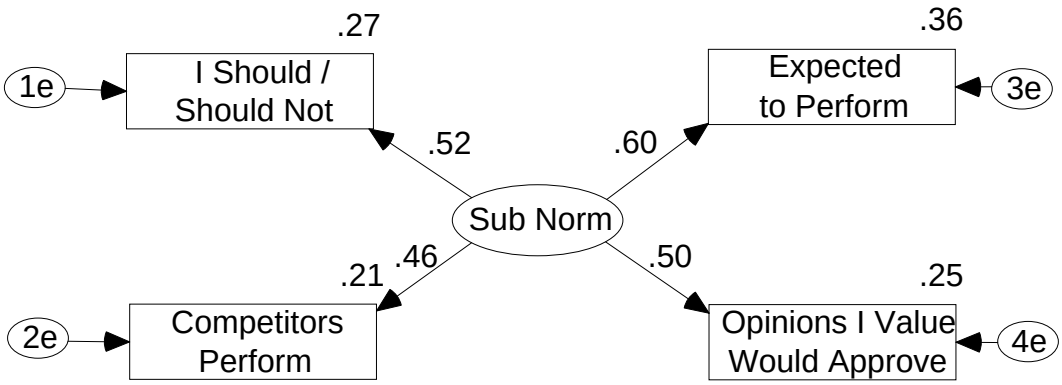

Figure 10.11 Subjective norm CFA without formative indicators

(Standardised regression weights)

The formative indicators were then added to the model. A number of direct paths were removed due to insignificant loading, low critical ratio values (CR < 1.96) and non significant relationships ($p < 0.05$). Direct links were then established for variables above eight on the modification index. Variables below eight tended to have a low critical ratio and would therefore have warranted removal in another iterative step.

The trimmed and augmented model is graphically represented in Figure 10.12 and reported acceptable measures of model fit: Chi-square 37.523, with a p value of 0.010, CMIN ratio 1.876, GFI 0.960, RMSEA 0.068, PCLOSE 0.176 and Hoelter's N of 160. The standardised weighted regressions are reported in Figure 10.12

The influence of the respondent's family was by far the most influential formative indicator. Perceptions of 'what customers think' were also influential, but loaded on 'expected to perform', a reflective indicator.

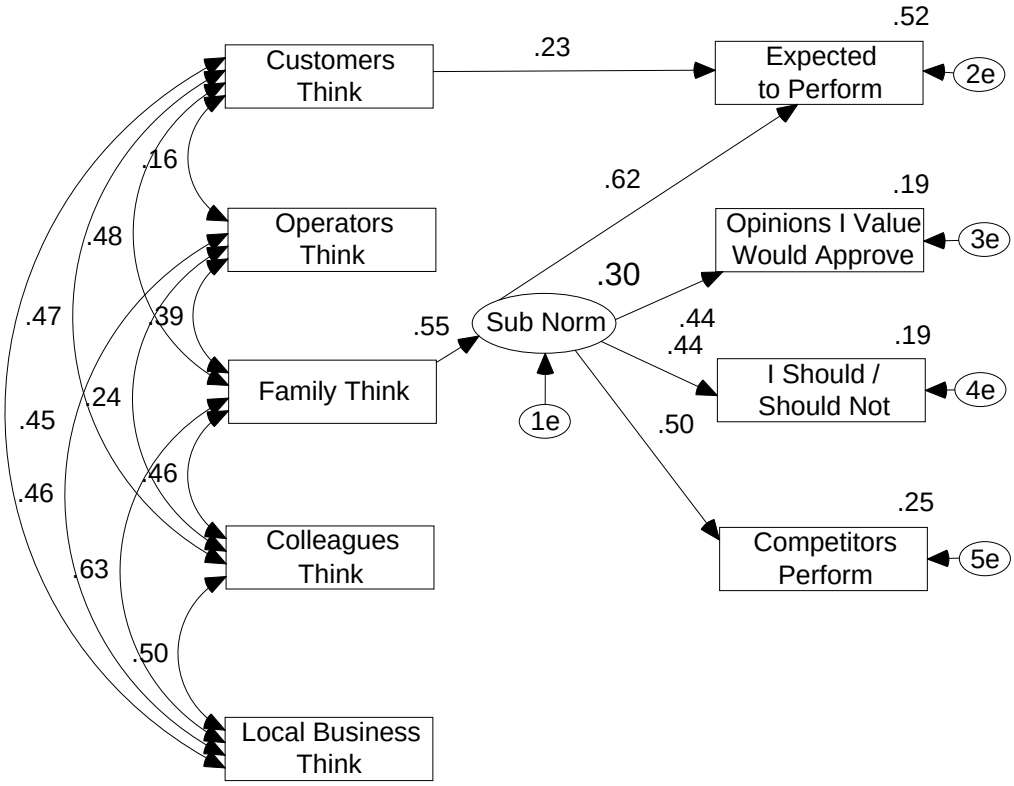

Figure 10.12 Subjective norm with reflective and formative indicators

(Standardised regression weights)

A similar scenario to that for Attitude (only two reflective variables) resulted in competing Structural Equation Models, which is presented in the Structural Equation Modelling section.

10.8.4 PBC and Intention Confirmatory Construct Investigation

As previously mentioned in subsection 10.2.5, a construct with three reflective variables could be identified, but measures of model fit could not be calculated. Therefore, model fit was assessed under Structural Equation Modelling (SEM) with the latent variable having a direct path to the Intention construct.

10.9 Structural Equation Modelling

The relationships of the latent variables to one another were examined. Model fit statistics were calculated to assess the fit of the complete hypothesised model, including both the latent and observed components of the model.

The SEM analyses were undertaken in two steps. Initially each individual latent construct (Attitude, Subjective Norm and PBC) was amalgamated separately with the Intention construct and modifications made.

Finally all the components, that is, Attitude, Subjective Norm, PBC and Intention were linked to form the overall model. Direct links between the latent variables were established in order to assess the overall SEM.

Francis et al. (2004a) advise using measures of internal consistency for direct measures. Their procedure illustrates doing this on an individual construct basis, that is, the internal consistency of direct attitude items first, then subjective norm and then PBC. Under this approach discriminant validity is not adequately assessed and neither is the possibility of latent variable (attitude, subjective norm, PBC and intention) multicollinearity assessed. Therefore the possibility that direct measures are measuring the same construct is not assessed, potentially leading to breaches of validity, in particular discriminant validity.

There is a risk that taking a mean of direct measures (observed variables) to facilitate the application of regression may manipulate the values. The result might look plausible, but, if latent variable multicollinearity exists, taking a

mean or calculating mean-centred variables would appear dubious as an attempt to remove it. In fact it could amount to correlating measures of the same factor. It was beyond the scope of the present study to examine the impact of averaging in comparison to the extraction of common variance through reflective variables. The reader is referred to Echambadi and Hess (2007) for further details on this topic. This present study assumed that the common variance extracted from reflective components of the latent construct through SEM was a superior measure to utilising a mean to develop a crude proxy of the observed variables' common variance.

It is also worthy of noting that if the observed variables that are components of the latent construct have relatively non conspicuous levels of correlation, then this may not necessarily be the case at the latent variable level, as argued by Grewal et al. (2004: 526):

> *"correlations between the observed variables that look innocuous may induce fairly high levels of multicollinearity among the latent constructs"*.

In the present study, the utilisation of Structural Equation Modelling techniques was shown to be useful in assessing the situation described. This is illustrated in Figure 10.13. Essentially, discriminant validity was assessed, comparing the correlations between the latent constructs and performing exploratory factor analysis for <u>all</u> the observed reflective (direct) variables to assess if they loaded on different factors (Mentzer and Flint, 1997; Costello and Osborne, 2005). Hence, the approach was not to assess each construct separately, which tended to be done in many studies.

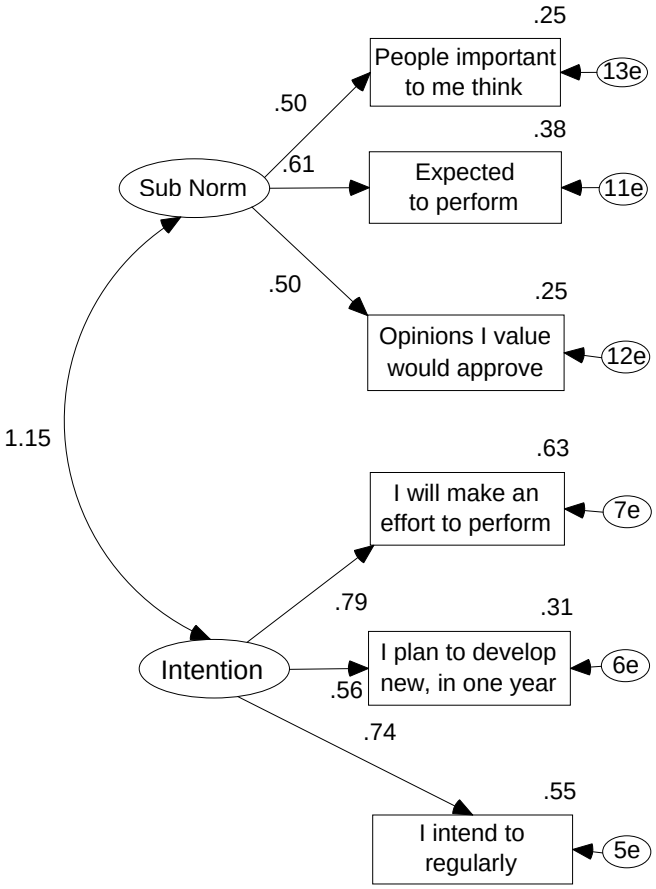

Figure 10.13 Discriminant validity between subjective norm and intention

There was an overly high correlation between latent subjective norm and latent intention. Factor loadings greater than one indicated Heywood cases (Costello and Osborne, 2005). Groups based on the sector of operation in the industry were analysed. The groups General Haulage, Groupage and Tipper all had Subjective Norm to Intention correlations above one. The Refrigeration sector had a correlation below 1 of 0.91. However, there were only 12 respondents in this category. There appeared to be substantial multicollinearity between the two constructs and therefore discriminant validity failed to exist. The discriminant validity of latent constructs should be assessed bivariately (Anderson and Gerbing, 1988), but for conciseness the whole model is presented in Figure 10.14.

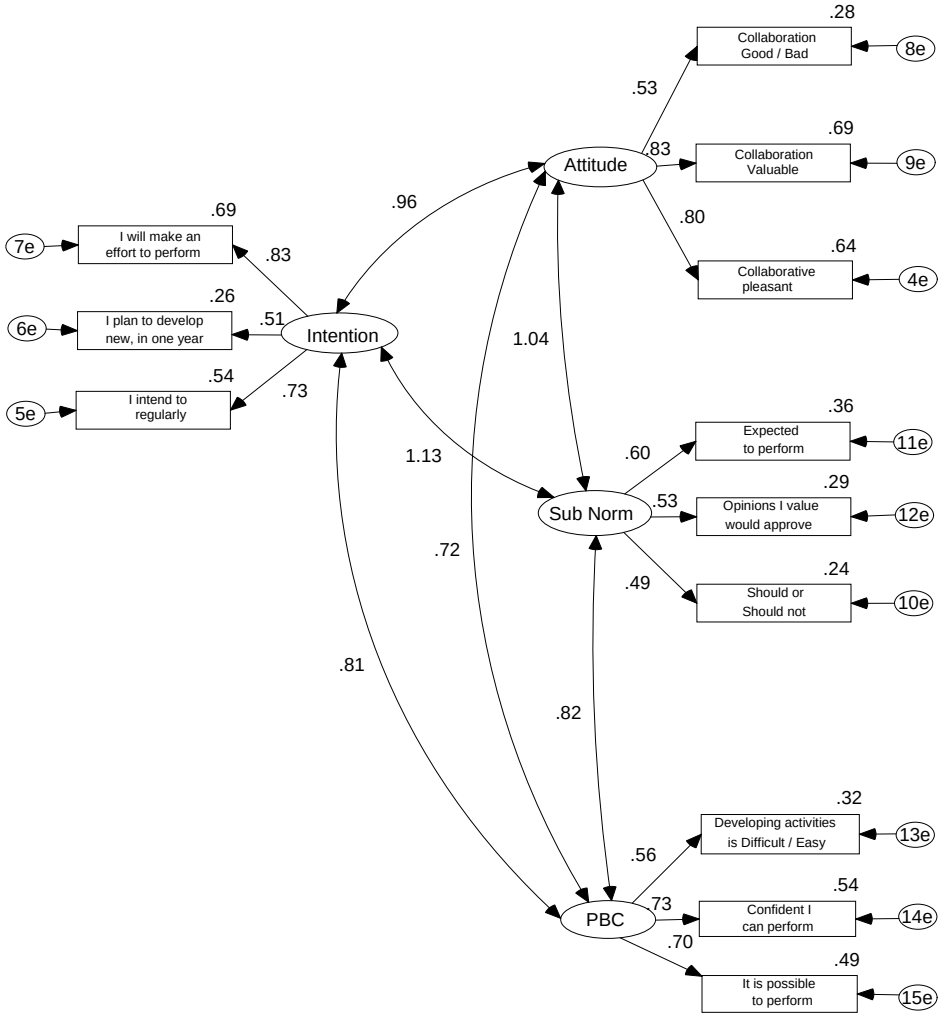

Figure 10.14 Overall TPB model discriminant validity

Table 10.4 Correlations between latent constructs

			Estimate
Intention	<-->	PBC	.809
Intention	<-->	Attitude	.961
Intention	<-->	Sub Norm	1.138
Attitude	<-->	Sub Norm	1.069
PBC	<-->	Attitude	.734
PBC	<-->	Sub Norm	.814

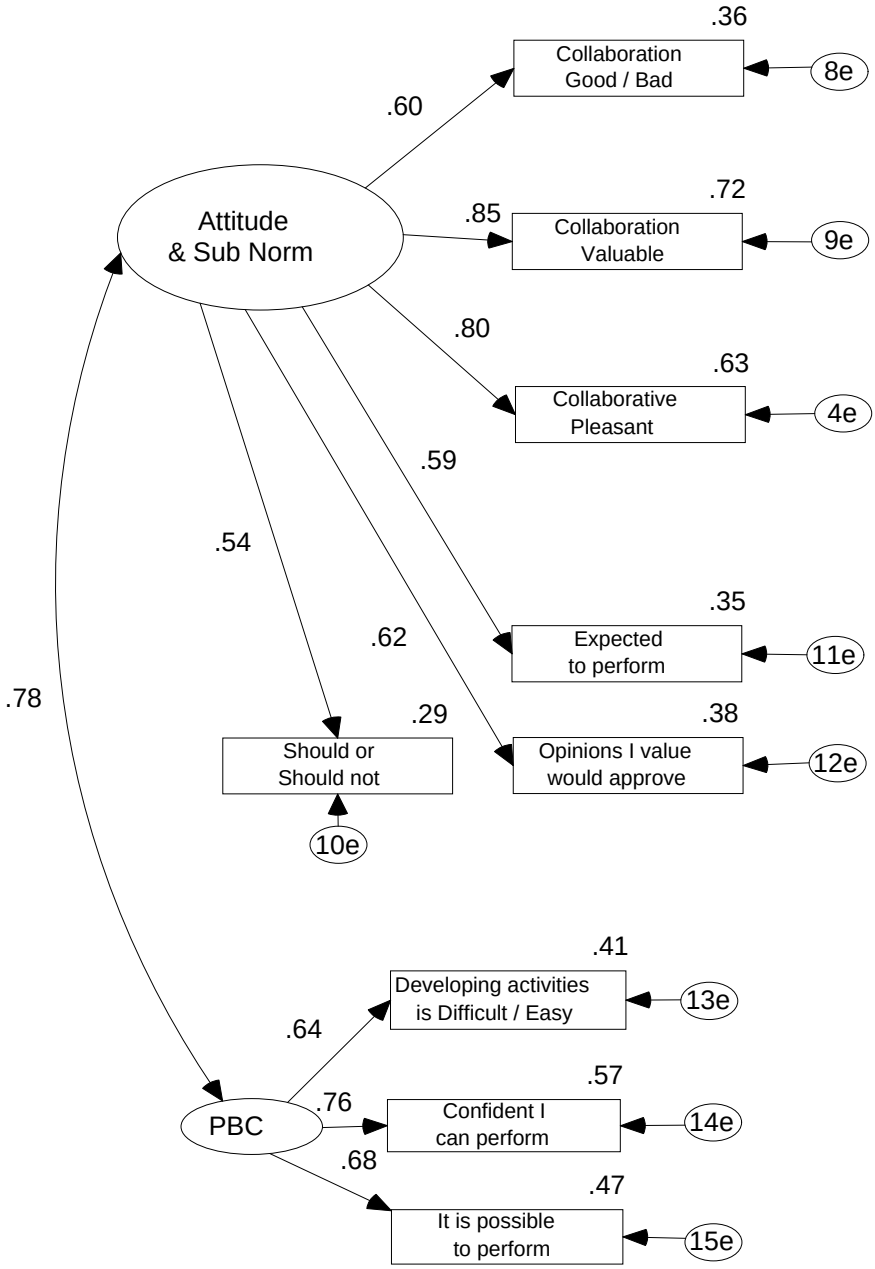

Figure 10.15 Discriminant validity of reflective two factor model

The correlations between the separate latent constructs are presented in Table 10.4. Correlations of approximately 0.85 or above were usually used as the cut off for assessing multicollinearity. As can be seen from Figure 10.15, the latent PBC construct's correlation to 'attitude and subjective norm' was under one, but still quite high (0.78).

An additional method to assess discriminant validity, as recommended by Garver and Mentzer (1999), was utilised. A Chi-square difference test was conducted; firstly correlations were weighted to 1 and secondly they were allowed to load freely between PBC and Subjective Norm. The differences in Chi-square values were then compared between the two. The value was not statistically significant and therefore failed discriminant validity (difference Chi-square 0.2, difference degrees of freedom 1). Therefore PBC and Subjective Norm both appeared to be measuring the same construct. A Chi-square difference test was carried out between PBC and Attitude, discriminant validity was upheld.

Therefore Subjective Norm and Attitude were merged into one factor. A Chi-square difference test was performed between PBC and the newly merged latent factor. Discriminant validity failed (Chi-square difference 3.3, degrees of freedom 1). Hence, this was confirmation of the exploratory factor analysis result that there was only one underlying factor.

Numerous rotation techniques were attempted. There appeared to be just one factor: reflective observed variables were not clumping together under attitude, subjective norm or PBC. This was confirmed via inspection of Scree plots and Parallel Analysis. PBC appeared to be the closest to establishing its own factor.

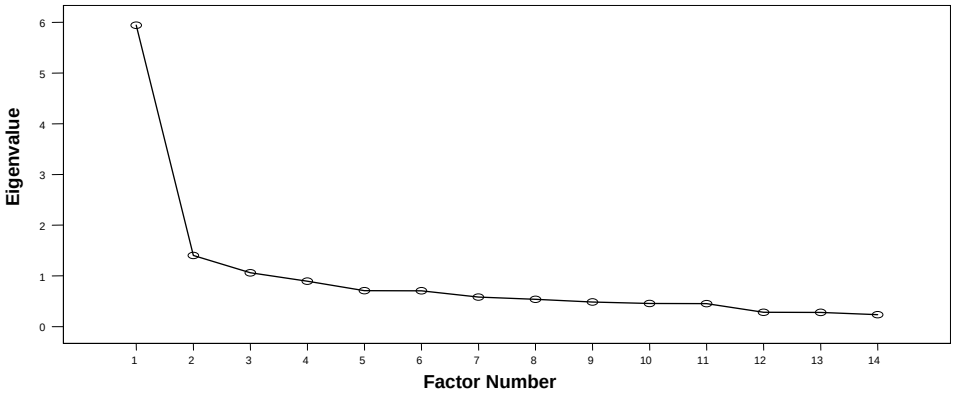

Figure 10.16 Scree plot of eigenvalues

Table 10.5 Rotated factor matrix of reflective variables

(a)	Factor		
	1	2	3
To perform collaborative activities is interesting ATT	.685		
To perform collaborative activities is pleasant ATT	.663	.320	.226
People important to me think SN	.636		
I intend to perform on a regular basis INT	.630	.438	
To perform collaborative activities is valuable ATT	.624	.459	
I will make an effort to perform collaborative activities INT	.608	.501	.244
People's opinions I value would approve SN	.578		.230
Collaborative activities are ATT	.557		
I plan to develop new collaborative in one year INT	.469	.284	
It is expected of me to perform collaborative activities SN	.254	.821	
Confident I can perform collaborative activities PBC	.296	.378	.536
To perform is up to me SN			.515
To perform collaborative activities is possible PBC	.424	.211	.469
Developing collaborative activities PBC		.393	.457

a Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization

Table 10.6 Internal consistency of reflective variables

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.881	.882	14

Deleting one variable ('to perform is up to me') increased Cronbach's alpha level to 0.897. Its deletion would have increased internal consistency and therefore reliability. The EFA confirmed this; it is illustrated in Table 10.7 that the variable in question failed to load on factor 1 (Intention) and appeared to be measuring some other construct.

The model was re-specified based on empirical data and supported by theory in order to ensure substantive validity. Respondents appeared not to distinguish between the constructs and to have only one dependent construct, intention.

Bagozzi et al. (1979) had concerns in regard to the correlation between Subjective Norm and Attitude. A number of other studies found multicollinearity with higher correlations between Subjective Norm and the Attitude constructs rather than with intention (Tarkiainen and Sundqvist, 2005; Chang, 1998; Shepherd and O'Keefe, 1984; Shimp and Kavas, 1984).

The empirical evidence appeared not to distinguish between each of the constructs in the TPB, as only one factor was extracted. The findings pointed to three potential reasons for this result: firstly, the model was not applicable to this context; secondly, that the model was operationalised incorrectly in

this context; thirdly, that the respondents in this study were different to respondents in other studies.

The model appeared to be applicable to many disciplines, as it has been verified over a number of studies. However, Wiklund (2003) assessed attitude in a management setting without clarification as to why the two other components were omitted. Jimmieson et al. (2004) utilised regression analysis and an index calculation for variable measurement of employee intentions. Maurer and Palmer (1999) also utilised a regression approach. Cordano and Frieze (2000) utilised a Structural Equation Modelling approach towards environmental managers' intentions. However, they did not test the theory's tripartite structure. Hence, they did not confirm discriminant validity of the TPB model. These three studies (Jimmieson et al., 2004; Maurer and Palmer, 1999; Cordano and Frieze, 2000) appeared to assume that the TPB structure was correct in a management context, without verification. Many studies utilising TPB as a theoretical framework have applied it to meet the study's needs without verification of the validity of such an approach. Therefore their results could have been biased by 'double counting' and hence could have drawn erroneous conclusions.

The present study's measures were reviewed, with the conclusion that they were operationalised correctly. This was based on operationalisation guidelines in the health science discipline and reviews of other studies in the management discipline were augmented to this context. This left the respondents in the frame in relation to the development of their intention and attitude.

The study by Bagozzi et al. (1979) of the tripartite nature of intention revealed a similar conclusion. Discriminant validity was unable to be confirmed between the three different constructs due to indicators loading on different factors.

> "*The lack of discriminant validity might be a function of the attitudinal object and the degree of knowledge…that well informed attitudes had not developed to the extent that detailed discriminations*" (Bagozzi et al., 1979: 94).

This result of the respondents' lack of discrimination between the indicators was supported by Anderson and Narus' (1990) study, which utilised different indicators and concepts in comparison to this study.

The re-specified model is presented in Figure 10.17. The overall fit measures were Tucker-Lewis Index (TLI) 0.999, above the 0.9 acceptability level; CFI 1.000, above the minimum advised level of 0.9; RMSEA a more appropriate measure, was 0.008, representing an almost perfect fit; Chi-square probability was insignificant at p 0.434 and CMIN/DF was 1.012 indicating an excellent fit.

Overall the final model was a good to perfect fit. All the variables reached statistical significance at the 0.05 level. Financial performance had the largest impact on intention with an increase of 1 unit in financial performance resulting in an increase in intention of 0.07.

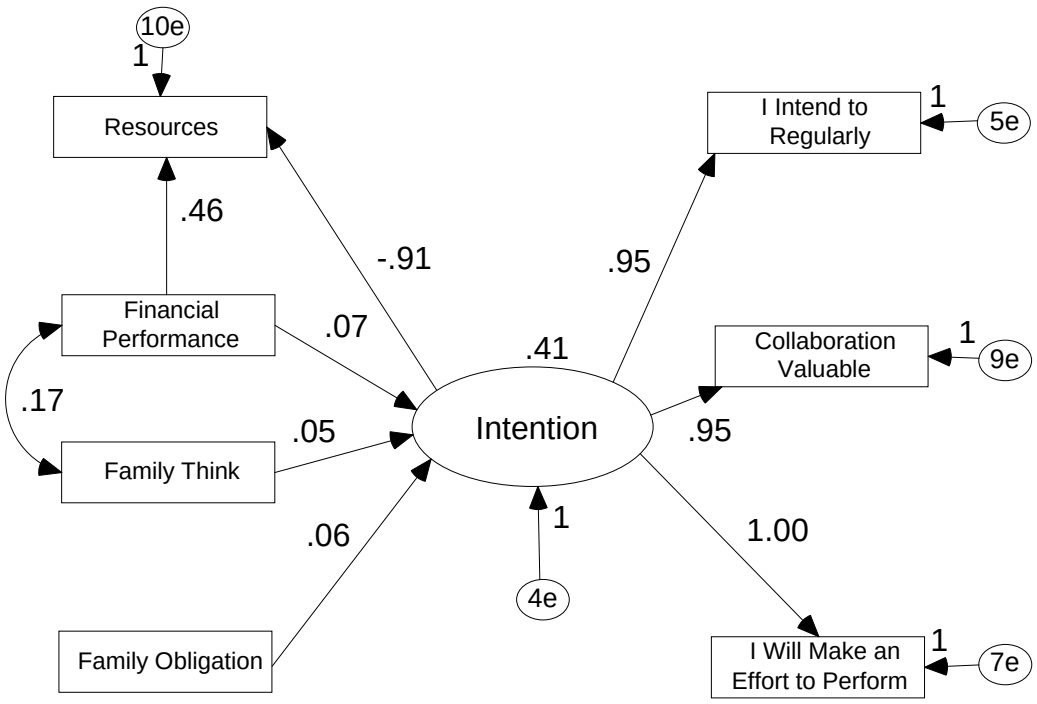

Figure 10.17 Refined model of antecedents to collaborative intent with unstandardised regression weights

The assessment of unidimensionality was carried out by evaluating measurement fit for the complete model and individual model components. The components of the measurement model were evaluated. Variables with parameter estimates below 0.7 for reflective components were deleted to ensure convergent validity (Garver and Mentzer, 1999). No substantial modification indexes were present. The refined model is presented in Figure 10.17 and additional output data are available in Appendix H.

Predictive validity was assessed by measuring the variance in intention explained by the formative variables. The direction and significance of the hypothesised predictor variables were verified. This also supported nomological, content and substantive validity. Therefore the construct validity (internal validity) for the model was strongly supported. Financial

performance had a strong positive impact on resources. However, this was mediated by normative pressures from the family, as the respondents' perceptions of their opinions were negative with regard to collaborative alliances. When the family variables were removed from the model, the intention to resources unstandardised regression weight was −0.94. Therefore intention negatively impacted resources. Model fit under this construct was exceptional: Chi-square was p 0.925, CFI was 1.00, RMSEA was 0.000 and Hoelter's N at 0.05 was 2,014.

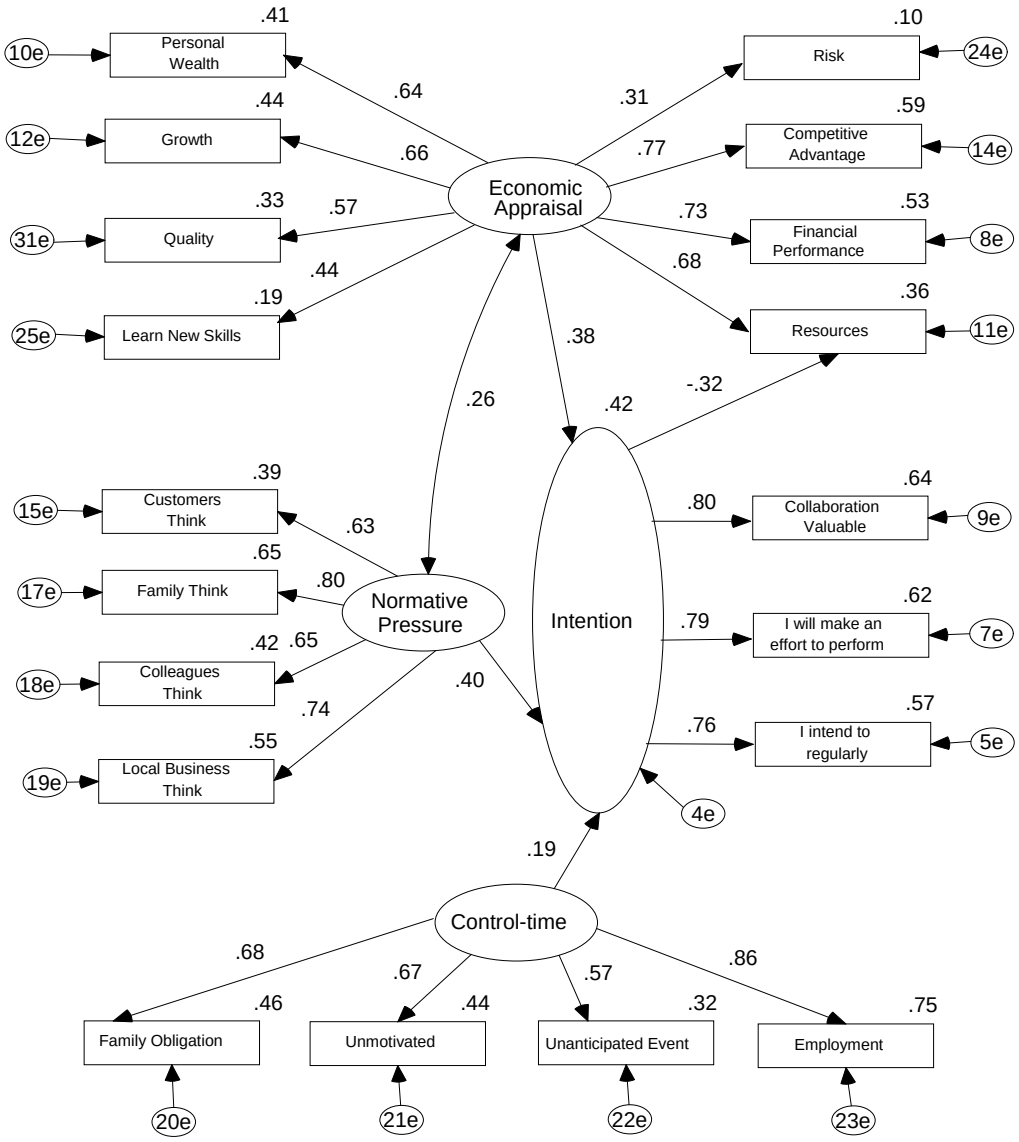

Figure 10.18 Broader model of antecedents

Figure 10.18 displays a broader model with a weaker model fit and lower levels of construct reliability. High levels of correlation between a number of the formative variables were present in the conceptual model. It became clear that they were grouping together to form a latent factor. An Exploratory Factor Analysis was carried out to assess the factor loadings. Figure 10.19 shows a Scree plot and Table 10.7 presents a rotated factor matrix.

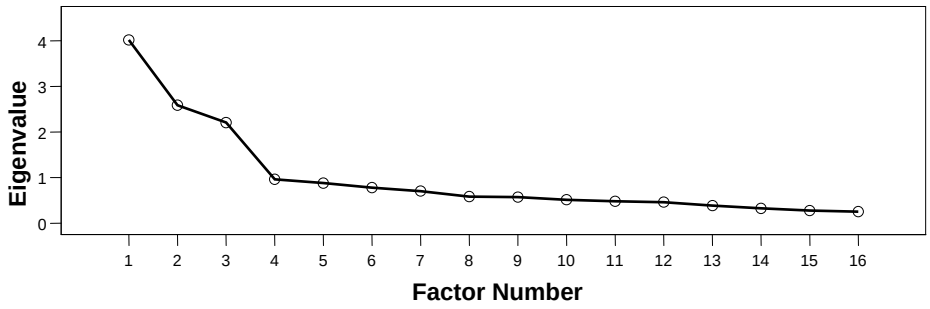

Figure 10.19 Scree plot: exploratory factor analysis of indirect variables

Table 10.7 Rotated factor matrix (a): broader model

	Factor		
	1	2	3
Competitive Advantage	.797		
Financial Performance	.717		
Personal Wealth	.670		
Profit	.634		
Growth	.595		
Quality	.564		
Resources	.510		
Risk	.270		
Employment		.839	
Family Obligation		.691	
Unmotivated		.673	
Unanticipated Event		.559	
Local Business Think			.757
Family Think			.739
Colleagues Think			.667
Customers Think			.642

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 4 iterations.

The model's construct was similar to that of the Theory of Planned Behaviour. The model's discriminant validity was verified by individual latent construct correlations and Chi-square difference tests.

The measurement reliability of the broader model was lower than the refined indicator model. The assessment of unidimensionality was carried out by evaluating overall measurement fit and the model's individual components. The overall fit measures were: Tucker-Lewis Index (TLI) 0.897, slightly below the 0.9 acceptability level; CFI 0.913; RMSEA was 0.068, representing an acceptable fit; Chi-square probability was significant at p. 000 and CMIN/DF was 1.873, indicating a loose fit. Overall, the broader model was an acceptable fit. Individual regression weights below 0.7 were maintained in order to give the reader a broader picture.

The regression weights in Figure 10.18 illustrate the impact that a change of 1 in the independent variable would have on a change of the estimated regression weight in the dependent variable. Knowing which variables had the biggest impact was the first step in addressing change. The second was identifying which variables to target. Table 10.8 presents the means of each of the influential variables in the model.

Table 10.8 Model variables' means

Variable	N	Mean	Std. Deviation
Mean Direct Intention	191	13.408	4.570
Personal Wealth	191	7.901	6.637
Growth	191	7.361	9.301
Quality	191	11.079	7.193
Learn New Skills	191	8.099	8.734
Risk	191	-2.298	8.701
Competitive Advantage	191	9.037	7.227
Financial Performance	191	10.115	7.645
Resources	191	9.513	8.265
Customers Think	191	-4.461	11.479
Family Think	191	-4.827	12.576
Colleagues Think	191	-2.366	9.530
Local Business Think	191	-2.822	8.811
Family Obligation	191	-4.356	7.041
Unmotivated	191	-4.178	7.634
Unanticipated Event	191	-3.853	9.896
Employment	191	-3.618	8.471

The possible range of scores was from −21 to +21. Variables in relation to the economic appraisal (latent variable) were positive with the exception of risk. Normative pressures were negative and therefore had the greatest potential for leverage. As the respondents' perceptions of 'what the family think' and other valued opinions significantly affected their intentions and was negatively scored, it offered the highest potential for change in intentions. Time/Control factors linked to the family were also negative and offered potential for leverage.

10.10 Analysis of Non-response Bias

Unfortunately an analysis to confirm the respondents were representative of the population was not possible, due to insufficient data about the population. However, analysis of systematic non-response bias was undertaken. The respondents were divided into two groups (Lu et al., 2007; Liao et al., 2007),

late and early respondents, and t-tests utilised to analyse if there were significant differences in the means of formative and reflective indicators between these two groups.

Late respondents were classified as those that received a second reminder. The t-tests revealed a number of formative indicators had statistically significant differences in means. These were New Challenges, Growth, Resources and Unmotivated. These variables all had lower means for late respondents, which are presented in Appendix I.

The low number of respondents in the late respondents group (22) had to be considered, as the number of cases effected the ability to reach statistical significance. However, it was an indication of non-response bias and the possibility that those who did not respond would have rated these variables more highly. This needed to be kept in consideration when interpreting the results.

10.11 Hypothesis Testing

As mentioned previously, an advantage of SEM was that it allowed the analysis of the impact of a sub group on not only one variable, but on the overall model. Hence SEM augmented the traditional analytical approach of regression, utilising its power to assess hypotheses alongside parametric statistics, such as t-tests and ANOVAs. This section describes how the hypotheses were operationalised and tested.

Hypothesis 1:

The conceptual model will be of adequate fit in representing the Irish Road Haulage industry's intention towards collaborative alliances.

Operationalisation

The qualitative elicitation element of the research design augmented the literature review concerning the indicators to be included in the conceptual model. This hypothesis was assessed in section 10.9, Structural Equation Modelling, by measures of model fit. Overall, a model indicating acceptable levels of fit and representation was achieved, although it was not based on the originally postulated TPB structure. The discriminant validity of the tripartite Theory of Planned Behaviour, Figure 10.7, was not upheld and the original conceptual model, Figure 9.2, was not supported by the empirical data. Even though the original conceptual model was not upheld with regard to the formative latent variables and discriminant validity, the principal variables influencing collaborative alliances were successfully extracted and a refined model, Figure 10.18, was developed and validated. Thus the hypothesis was upheld.

Hypothesis 2:

Highly educated operators will have a more positive intention to performing collaborative ventures.

Operationalisation

Analysis of variance (ANOVA) was used to compare the mean intention, attitude, subjective norm and perceived behavioural control score of two groups classified by their highest level of general education.

The groups were classed as having standard and high levels of education. Group 1 included the respondents whose highest level of general education ranged from none to Junior Certificate (90 cases). Group 2 included those whose highest level of general education ranged from Leaving Certificate to bachelor and professional qualifications (101 cases). Initial t-tests indicated a statistical difference between the two groups in only one formative indicator (risk).

These groups highlighted key differences in the formative models that affected their attitudes and intentions. However, financial performance was a key influencer for both groups.

An analysis of the mean direct measures revealed that economic appraisal was the key influencer of intention in group one (standard education). The standardised regression weights are presented in Figure 10.14. While economic appraisal was the least influential for respondents in group two. Normative pressure and control were larger influencers in respective order, see Figure 10.15.

Taking a closer look at the model values for each group, it can be seen that the key indicators that reached statistical probability were different between the groups. For the higher education group normative pressure, in particular the family, had a higher influence on their intentions. The regression weight between intention and resources was also increasingly negative.

This model reached a level of fit with of a p value of 0.000, RMSEA of 0.065, TLI of 0.801 and CFI 0.829, indicating a model of reasonable fit.

An ANOVA analysis between the two groups comparing the mean values of the variables quality, resources, competitive advantage, mean direct intention and their individual components did not reach statistical significance.

The model had a higher explanation of the variance in intention in the higher educated group. However, there was no statistical significance in the differences between the means of intention in the two groups. Thus the hypothesis was not upheld.

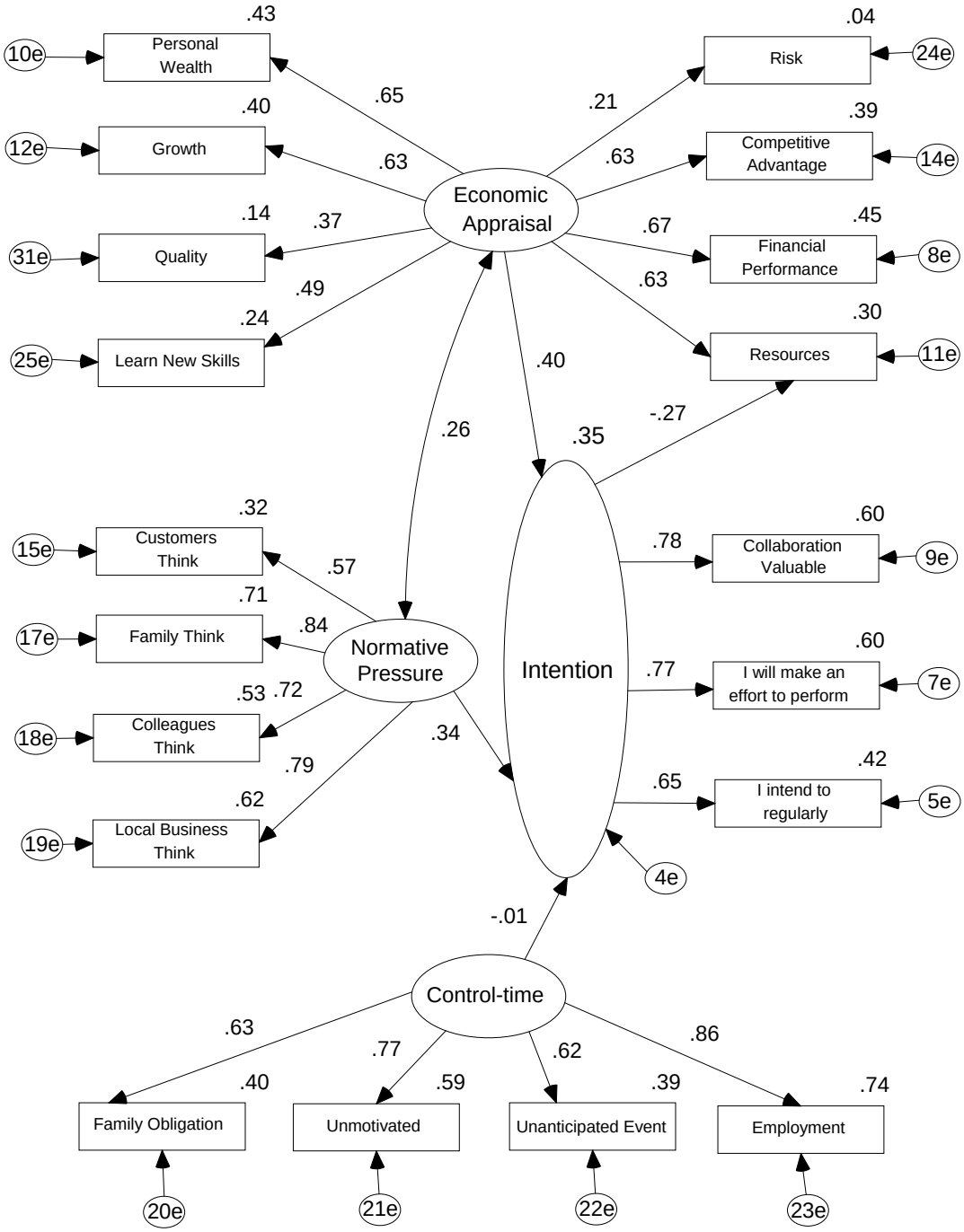

Figure 10.20 Broader model education group one: standard education

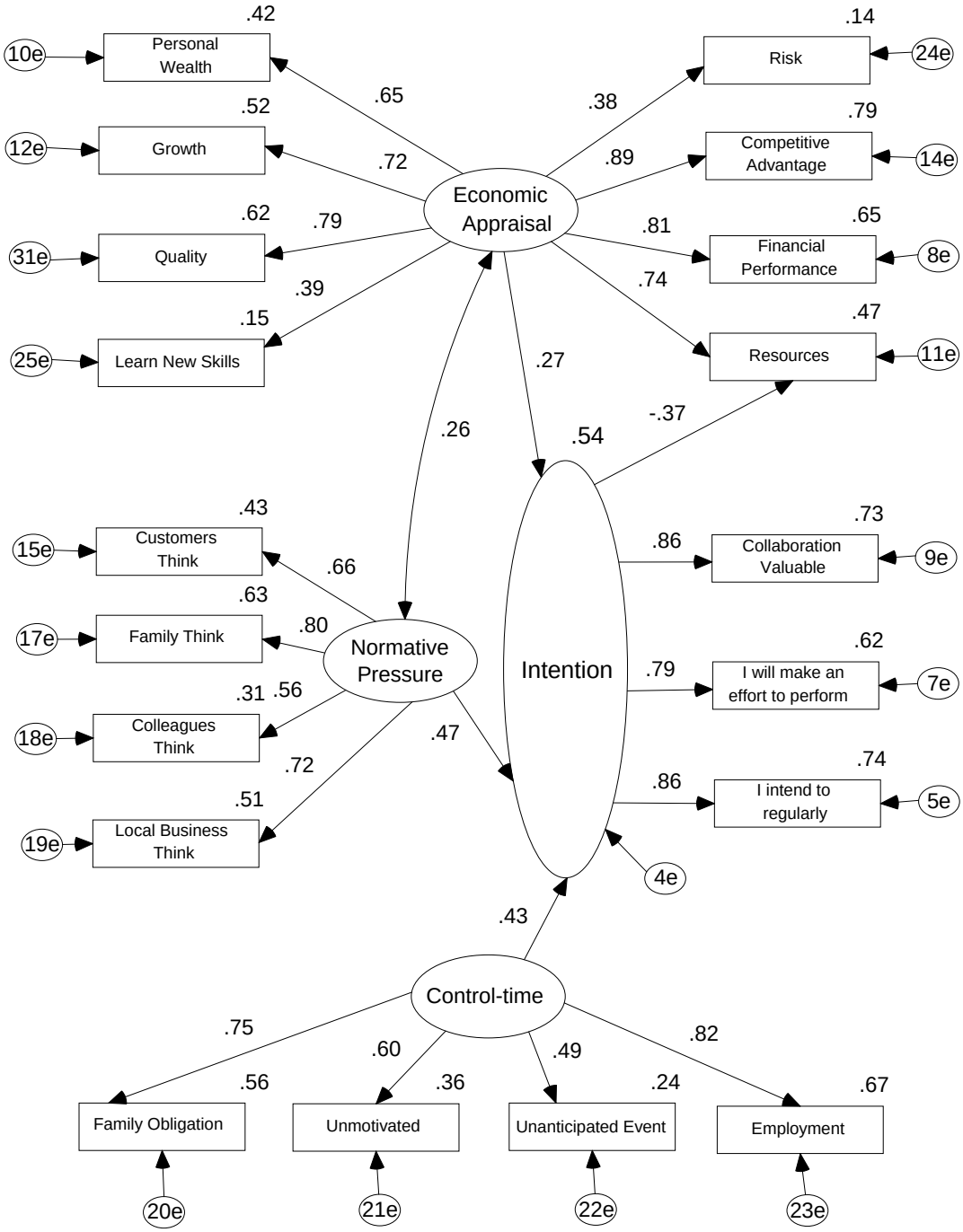

Figure 10.21 Broader model education group two: higher education

Hypothesis 3:

The self-efficacy of managers will act as a moderator to developing collaborative activities.

Operationalisation

The independent measured variable Confidence (or self-efficacy) was measured by question B18 of the self-report questionnaire: 'For me, to perform collaborative activities is impossible/possible'. Pearson's correlation was calculated to establish the relationship between self-efficacy and the latent variable Intention. Sub groups were formed by dividing respondents into those who were negative and those who were positive towards performing collaborative activities. T-tests were performed to analyse statistical differences between the two groups.

Table 10.9 Correlation of self-efficacy to intention

		To perform is possible	Intention
To perform collaborative activities is possible	Pearson Correlation	1	.338(**)
	Sig. (1-tailed)		.000
	N	191	191
Intention	Pearson Correlation	.338(**)	1
	Sig. (1-tailed)	.000	
	N	191	191

** Correlation is significant at the 0.01 level (1-tailed).

A weak to medium strength correlation between self-efficacy and intention was demonstrated without segregation of respondents, as presented in Table 10.9. The respondents were then grouped into positive and negative groups in terms of self-efficacy. Respondents who answered question B18 in the range 1 to 3 were categorised as negative and those who answered in the range 5 to 7 as positive. Indifferent respondents were omitted from the analysis. The groups were compared on the calculation of indirect measure of intention.

Table 10.10 T-test of mean intention index between high and low self-efficacy groups

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
Intention								Lower	Upper
Equal variances assumed	6.028	.015	-4.89	149	.000	-91.64	18.70	-128.60	-54.67
Equal variances not assumed			-5.72	101.74	.000	-91.64	15.99	-123.37	-59.91

Assumptions for parametric statistical analysis methods were verified to hold, that is, level of measurement, sufficiently large random sample and independence of observations. However; the assumption of homogeneity of variance appeared to be violated as Levene's test for equality gave a p value of 0.015. For t-tests this was not an issue, as analysis methods were designed to cope with this violation.

The t-test with equal variances not assumed, in Table 10.10, revealed a significant difference in the value of the means between the two groups. The two-tailed significance statistic was 0.000, indicating that it was highly unlikely that the differences occurred by chance. An Eta squared value was calculated in order to assess the magnitude of the differences between the groups (Pallant, 2001). Eta squared was 0.18, or 18%, which indicated a large effect.

A second t-test comparing the groups to the mean direct intention variable revealed no breach of homogeneity of variance. Statistical significance in the

difference in variables was also revealed. An Eta value of 0.249 or 25% indicated a very high level of effect on the dependent variable.

Table 10.11 T-test of mean direct intention between high and low self-efficacy groups

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Intention								Lower	Upper
Equal variances assumed	3.119	.079	-7.043	149.000	.000	-1.845	.262	-2.363	-1.327
Equal variances not assumed			-7.973	94.013	.000	-1.845	.231	-2.304	-1.385

An independent samples t-test was conducted to compare the indirect measure of intention scores for high and low self-efficacy groups. There were significant differences in scores for high levels of self-efficacy (M = 104, SD = 109) and low levels of self efficacy [(M = 3, SD = 77); t(101) = −5.72, p = 0.000]. The magnitude of the differences in the means was very large (Eta squared = 0.18).

A second independent samples t-test was conducted to compare the direct mean measure of intention scores for high and low self-efficacy groups. There were significant differences in scores for high levels of self-efficacy (M = 4.02, SD = 1.52) and Low levels of self efficacy [(M = 2.18, SD = 1.15); t(149) = −7.043, p = 0.000]. The magnitude of the differences in the means was very large (Eta squared = 0.249). Therefore the hypothesis was upheld.

Utilising the broader SEM, the variance estimation of intention for the negative group was higher, as was normative pressure in their decisions towards collaborative alliances. The impact on resources was also increasingly negative. This indicated that when intention to perform collaborative activities increased, that this has a negative influence on this category of respondents' attitude toward resources. However, the Time/Control and Economic Appraisal latent variables did not reach statistical significance. The number of cases in each group was 110 in the positive group and 41 in the negative group. Therefore, there was an insufficient number of cases in the negative group to analyse the whole model for this category.

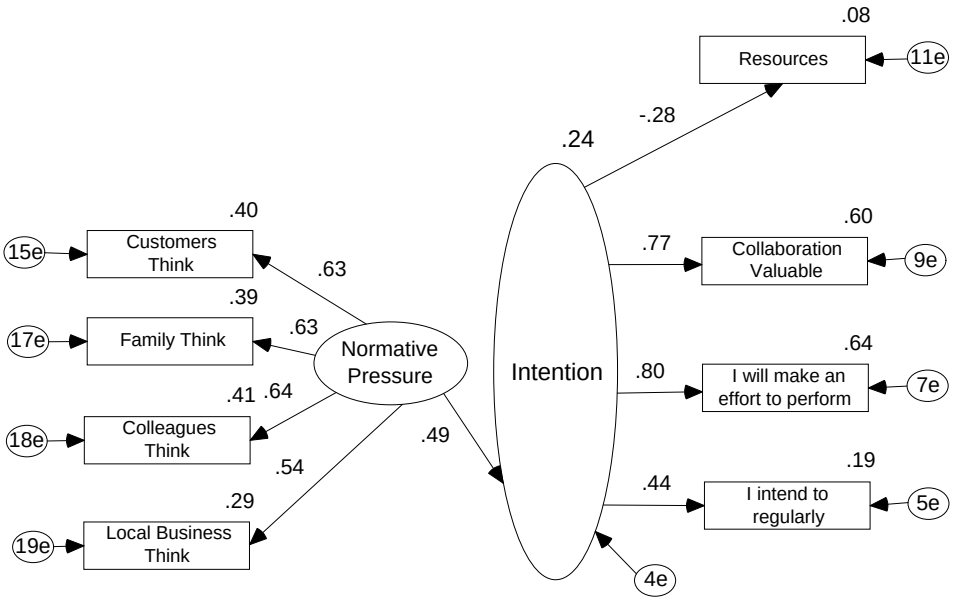

Figure 10.22 Negative self-efficacy group path analysis of standardised estimates of regression weights

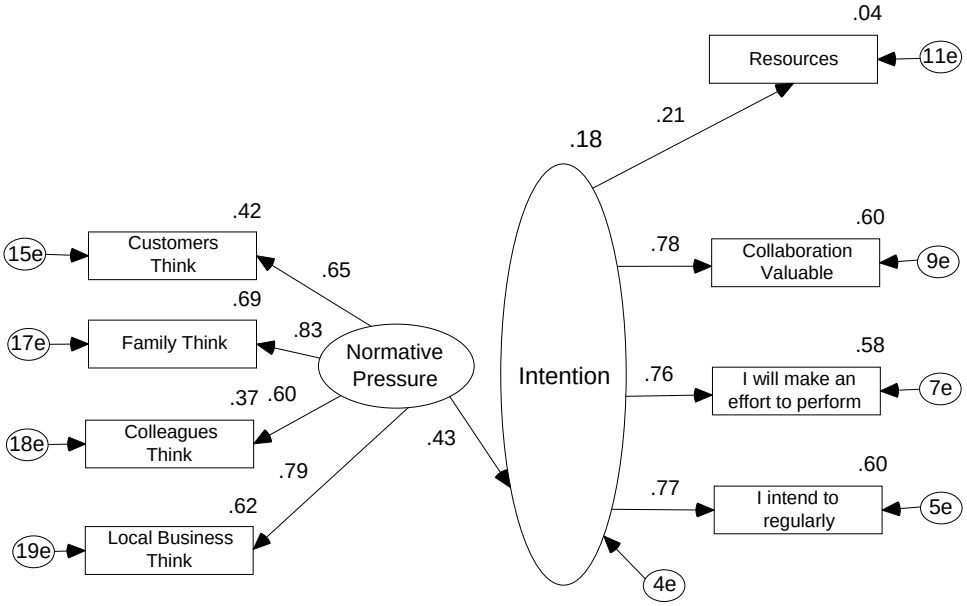

Figure 10.23 Positive self-efficacy group standardised regression

Hypothesis 4:

Past experience of collaborative activities that met expectations will have a positive impact on intention to perform collaborative activities.

Operationalisation

Three t-tests were carried out to test the hypothesis. The first t-test created a group of high and low intenders from the indirectly measured variable Intention (intention index calculation). Scores of 1 and above were classified as high intenders. Scores of zero and below were classified as low intenders. T-tests were utilised to analyse if there was a statistically significant difference between the groups in the mean value of the variable (A6D) 'whether collaborative ventures met their expectations'. There was no statistically significant difference in the mean between these groups. However, only fifty two respondents answered this question.

In the course of the second t-test another group was created based on past experience (A6D). The possible range of responses to this question was from one (indicated negative) to seven (indicated positive). A new variable was created by recoding the variable Past Experience as follows: Those that scored four and lower were seen as not achieving expectations (low) and above four as meeting or surpassing expectations (high). The past experience group was then t-tested to calculate if there was a statistically significant difference in the Intention variable between the members who had achieved expectations and those who had not achieved expectations. T-test three was similar to this, but replaced the indirectly measured intention with the mean direct intention. Mean direct intention was calculated as the mean of the three variables 'intend to regularly' (B21), 'collaboration valuable/worthless' (B13) and 'I will make an effort to perform' (B17).

T-tests two and three did not reach two tailed significance (approximately 0.2). Therefore statistically different means appeared not to be present in these groups. One point to note was that only a small number of the respondents actually did previously perform collaborative ventures.

Pearson's correlation was calculated between 'past experiences that met expectations' (A6D) to mean direct intention, and secondly, 'past experience that met expectations' to indirect intention. Neither test was statistically significant.

As the response to the 'past experience met expectation' question was low, a simplified model reducing the number of parameter calculations was utilised to assess the impact of only one variable, Financial Performance, on the

latent Intention variable. The positive group had an unstandardised regression weight on Intention of 0.113 and an R^2 value of 0.376. Therefore, as financial performance increased by 1, Intention increased by 11 percent and the variable Financial Performance explained 37.6 percent of the variance in Intention, as illustrated in Figure 10.24.

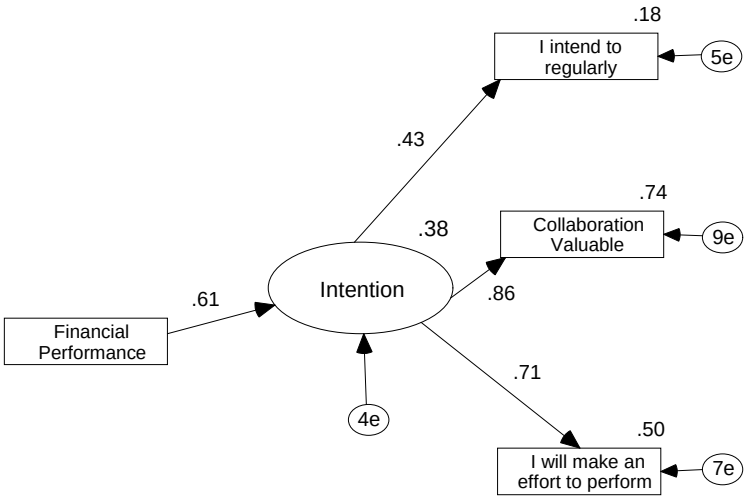

Figure 10.24 Relationship of financial performance to intention for the positive past experience group

The negative group's financial performance variable had an unstandardised regression weight on intention of 0.079 with a p value 0.114 (not significant); intention's R^2 value was 0.171. Therefore, in this group, as financial performance increased by 1, intention increased by approximately 8 percent, but this statistic did not reach significance and therefore could have been due to chance. A t-test of the mean direct intention variable between the two groups did not reach statistical significance. However, this could have been due to the number of cases in each group being small: twenty six in the positive group and only 13 in the negative group. The results of the statistical

tests indicated that hypothesis four was not upheld, but in reality it was more likely inconclusive due to the low number of cases in each category.

Hypothesis 5:

The age profile of owner-managers will act as a moderator of intention to perform collaborative activities.

Operationalisation

Table 10.12 Correlations of age to intention

		Intention	Mean Direct Intention	Age
Intention	Pearson Correlation	1	.481(**)	-.304(**)
	Sig. (2-tailed)		.000	.000
	N	191	191	183
Mean Direct Intention	Pearson Correlation	.481(**)	1	-.144
	Sig. (2-tailed)	.000		.052
	N	191	191	183
Age	Pearson Correlation	-.304(**)	-.144	1
	Sig. (2-tailed)	.000	.052	
	N	183	183	183

** Correlation is significant at the 0.01 level (2-tailed).

Scale data were obtained by asking respondents their age in years in question F7 of the questionnaire: 'What is your age?' The analysis took two forms. Firstly, the correlation between age and intention was examined, as shown in Table 10.12. Secondly, the respondents were divided into low and high intender groups and a t-test was performed, comparing the mean age of the respondents in each group, as shown in Table 10.13.

Table 10.13 T-test of indirect intention means between age groups

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.054	.817	-2.212	181	.028	-4.248	1.921	-8.037	-.458
Equal variances not assumed			-2.175	61.100	.034	-4.248	1.953	-8.153	-.342

There were significant differences between the mean ages of the respondents in the groups with high and low levels of intention (45.55 years and 49.80 years respectively). The hypothesis was upheld.

Hypothesis 6:

Family commitments of owner-managers will act as a moderator on intention to perform collaborative activities.

Operationalisation

Both independent variables used to assess family commitments, that is, obligation and perceptions of the family's opinions were measured through the use of an SD seven point scale. Two groups were created for this analysis—owner-managers and non-owner managers.

Table 10.14 Mean of family obligations

	Owner or Non-owner Managers	N	Mean	Std. Deviation	Std. Error Mean
Family Obligation	Owner Manager	171	-4.520	7.219	.552
	Non-Owner Manager	20	-2.950	5.206	1.164
Family Think	Owner Manager	171	-4.695	12.902	.986
	Non-Owner Manager	20	-5.950	9.506	2.125

The Family Obligation variable was negatively scored by respondents in relation to its influence on intention. A broad model was used to assess the impact of the variables on intention. Figure 10.25 graphically illustrates the unstandardised regression weights. The main predictor variables of intention (Financial Performance, Family Think and Family Obligation) were given direct paths to Intention. However, the direct paths between these variables and intention resulted in the statistical significance of the first order latent variables (Economic Appraisal, Normative Pressure and Time/Control) falling below the 95 per cent confidence level.

If the Family Obligation variable were to change by 1, intention would change by 0.06, or six percent, in the same direction. The unstandardised regression weight was 0.05 for the variable Family Think and 0.07 for Financial Performance. All three variables had high levels of statistical significance.

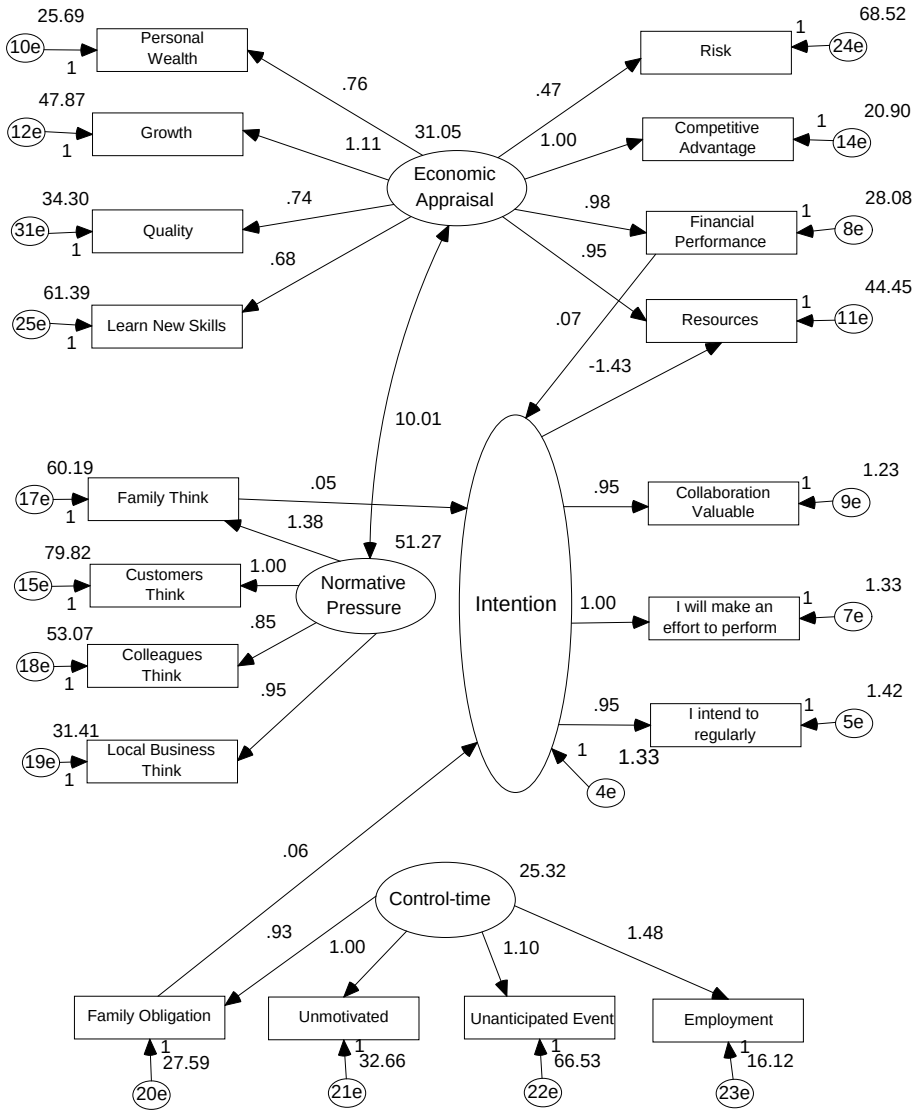

Figure 10.25 Owner-manager structural equation model

A t-test of Family Obligation and Family Think of the two groups revealed no significant differences in the means. However, it should be noted that only 20 respondents were in the non-owner managed group. The hypothesis was upheld, as both variables were negative and had a significant influence on intention.

Hypothesis 7:

The manager's perception of the economic environment will moderate or intensify the intention to perform collaborative activities.

Operationalisation

The respondent's self-report of their perception of the economic conditions (question E5) was expected to have a positive correlation with intention to perform collaborative activities. Both variables were measured through a seven point semantic differential statement analysis. The respondents were classified into two groups, based on positive and negative perceived economic conditions. A t-test analysis was employed comparing the mean scores of the mean intention variable for the two groups.

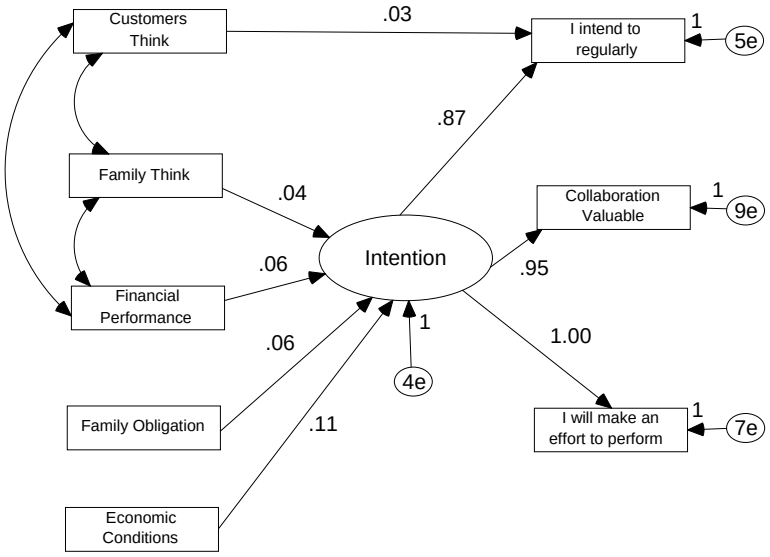

Figure 10.26 Economic conditions SEM

(Unstandardised regression weights)

The model had an acceptable fit with a p value of 0.005, TLI 0.892, CFI 0.949 and RMSEA 0.077. As the respondents' perception of economic conditions changed by 1, intention changed by 0.11, as can be seen in Figure 10.26.

Respondents' views of economic conditions were grouped into positive and negative categories. A T-test of the positive and negative economic conditions groups to compare means of the variables Respondent's Age and Years Experience in Road Haulage showed that the differences between the groups were not statistically significant.

Table 10.15 Mean direct intention scores by economic conditions

	Economic Conditions Group	N	Mean	Std. Deviation
Mean Direct Intention	Positive	64	4.005	1.559
	Negative	75	3.071	1.507

However, the group means of the variables Indirect and Direct Intention reached statistical significance. The hypothesis was upheld, as the perceptions of respondents' economic conditions had a significant statistical impact on their intention to perform collaborative activities.

Hypothesis 8:

Economic conditions and perceived consequences of past behaviour will influence the operator's perception of risk. Therefore, they will act as moderators on intention to perform collaborative activities.

Operationalisation

The respondent's perception of risk was expected to be negatively correlated with intention and economic conditions. Responses were grouped into high and low risk categories to allow a comparison of differences in means.

Table 10.16 Correlations of intention, economic conditions and risk

		Intention	Mean Direct Intention	Economic Conditions	Risk
Intention	Pearson Correlation	1	.481(**)	.247(**)	.373(**)
	Sig. (2-tailed)		.000	.001	.000
	N	191	191	184	191
Mean Direct Intention	Pearson Correlation	.481(**)	1	.310(**)	.253(**)
	Sig. (2-tailed)	.000		.000	.000
	N	191	191	184	191
Economic Conditions	Pearson Correlation	.247(**)	.310(**)	1	-.046
	Sig. (2-tailed)	.001	.000		.536
	N	184	184	184	184
Risk	Pearson Correlation	.373(**)	.253(**)	-.046	1
	Sig. (2-tailed)	.000	.000	.536	
	N	191	191	184	191

** Correlation is significant at the 0.01 level (2-tailed).

The hypothesis did not hold, risk was moderately correlated with intention and insignificantly correlated with economic conditions. T-tests of the respondents' mean risk score were analysed per positive and negative perceptions of economic conditions groupings. The means did not reach significant differences with a p value of 0.4; therefore it was highly probable any differences were by chance. The correlation between Risk and Past Behaviour was low, with a value of 0.189 and did not reach statistical significance.

The refined SEM model was augmented with the aforementioned variables. The model is graphically illustrated in Figure 10.27. The additional variables did not reach statistical significance and, therefore, the hypothesis was rejected. There appeared to be no significant relationship between the variables Perceived Economic Conditions and Risk, or between Past Behaviour and Risk.

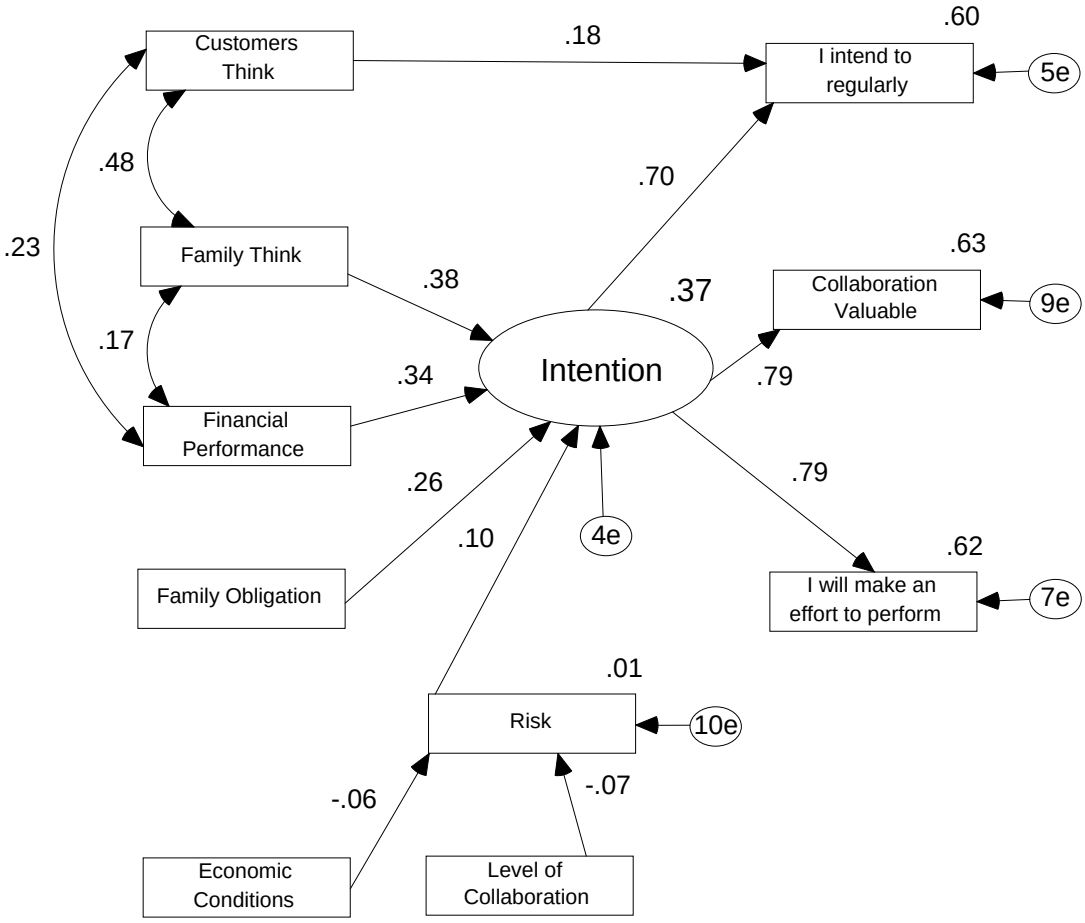

Figure 10.27 Augmented risk model

Hypothesis 9:

Managers who have other business activities will have a higher level of intention to perform collaborative activities.

Operationalisation

The respondents were grouped into having other business activities (47 cases) and not having other business activities (141 cases). A t-test was employed to analyse if there was a significant difference in mean scores of intention between the respondents.

Table 10.17 Means of TPB grouped by other business activities

	Involved in other business activities	N	Mean	Std. Deviation
Mean Direct Intention	Yes	47	3.609	1.426
	No	141	3.536	1.554
Mean Direct Attitude	Yes	47	4.324	1.151
	No	141	4.290	1.401
Mean Direct Subjective Norm	Yes	47	3.776	1.187
	No	141	3.728	1.249
Mean Direct PBC	Yes	47	4.390	1.588
	No	141	4.380	1.478
Intention	Yes	47	83.978	103.025
	No	141	80.390	104.094

Visual inspection of the means in Table 10.17 reveals that there was a slightly higher value for those involved in other business activities. However, when subjected to t-tests no statistically significant differences in means were detected. A number of variables under SEM analysis failed to reach statistical significance for the group which had other businesses. The hypothesis was therefore rejected.

Hypothesis 10:

Personal factors in owner-managed firms have a high degree of influence on intentions to perform collaborative activities.

Operationalisation

T-test statistics analysed whether mean responses between non-owner-managers (20) and owner-managers (171 cases) were statistically significant.

A multiple number of means of variables for two groups, owner and non-owner managers, were analysed through t-tests. The following means of

variables did not reach statistical significance: Years Experience in Transport, Financial Performance, Growth, Personal Wealth (p 0.109), Competitive Advantage, Resources, Family Think, Local Business Think, Family Obligation, Unmotivated, Risk, Level of Competition, Haulage Costs, Number of Vehicles in Own Fleet, Number of Vehicles Subcontracted (p 0.359), Customers Think, Learn New Skills.

Statistical significance was reached for the following variable: Miss Out on Personal Activities (p 0.025) with a mean of 10 for owner managers and 6.6 for non-owners. The hypothesis was partially upheld. However, the small number of cases in the non owner-manager group had repercussions for testing statistical significance.

Hypothesis 11:

Operators concerned with less-than-truckload activities will have higher levels of intention.

Operationalisation

This hypothesis was based upon operators in the LTL sector being able to gain economies of scale through collaboration. Therefore they were expected to have a more positive view towards collaborating in comparison to other sectors.

Two groups were created, LTL was defined as the respondents who indicated that they were involved in the groupage sector; the second group included all other respondents. An independent sample t-test was utilised to compare the mean values of key variables between the two groups. The

following means of variable between the groups reached statistically significant differences: Mean Direct Intention, Financial Performance, Competitive Advantage, Family Obligations and Family Think. Large Contracts and Resources were not statistically different between the groups.

Table 10.18 Key influencer means classified by groupage and non-groupage

	Sector	N	Mean	Std. Deviation
Mean Direct Intention	General Haulage	66	3.348	1.556
	Groupage	17	4.490	1.374
Financial Performance	General Haulage	66	9.848	7.622
	Groupage	17	14.000	6.184
Larger Contracts	General Haulage	66	6.803	8.254
	Groupage	17	8.352	10.240
Competitive Advantage	General Haulage	66	8.318	6.530
	Groupage	17	12.764	7.437
Resources	General Haulage	66	9.136	8.925
	Groupage	17	7.941	8.764
Family Obligation	General Haulage	66	-5.151	7.298
	Groupage	17	-.411	3.808
Family Think	General Haulage	66	-5.621	13.095
	Groupage	17	2.000	12.975
Intention	General Haulage	66	73.651	104.882
	Groupage	17	155.588	114.228

However, when analysed under a different coding scheme, that is, transport and distribution (50% or greater of total journey time spent loading and unloading) as defined by Donselaar and Sharman (1997), none of these variables reached statistical significance between the means of the two groups (transport and distribution).

The refined structural equation model revealed an R^2 of 0.90 for the groupage and 0.36 for the non-groupage category. The unstandardised regression weights for the group models are presented in Figures 10.28 and 10.22. Customer Opinions did not reach statistical significance for the

groupage sector, possibly due to the small number of cases (17). The model was a good fit with the following values: Chi-square p 0.121, TLI 0.959, CFI 0.978 and RMSEA 0.047.

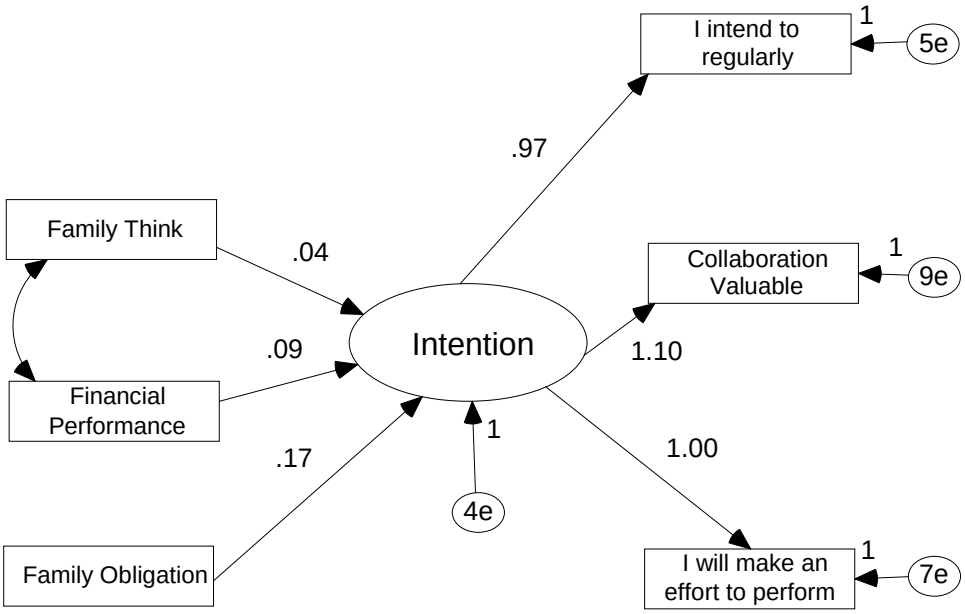

Figure 10.28 Groupage model of unstandardised regression weights

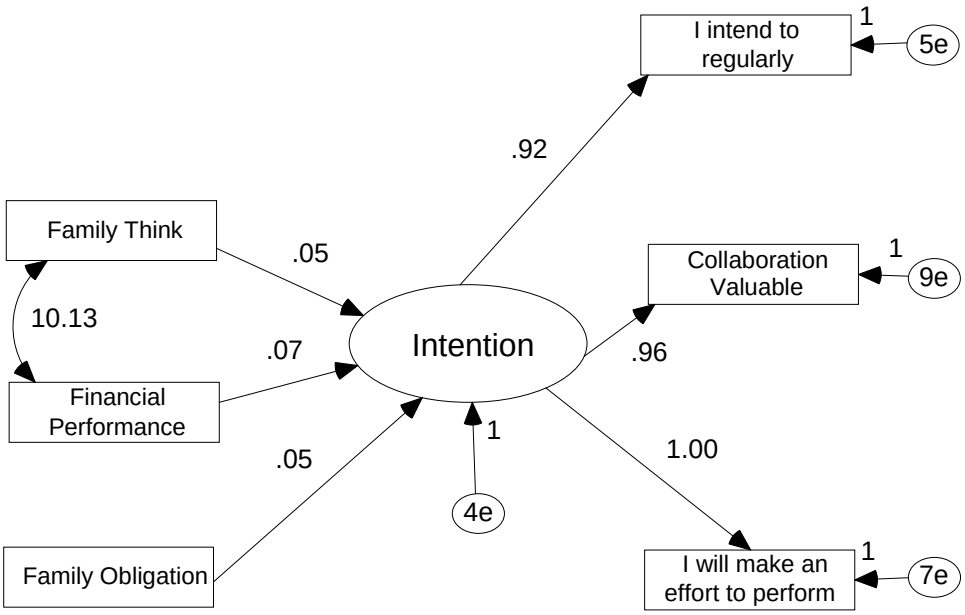

Figure 10.29 Non-groupage model of unstandardised regression weights

The hypothesis was upheld. The main influential difference between the groups on intention based on SEM was family obligation, as it had a substantially greater influence (over three times the influence) in comparison to the non-groupage category. Family obligation was substantially less negative for the groupage category. The standardised regression weight between Resources and the latent Intention variable for the groupage category was 0.691 with a p value of 0.035. However, it did not reach statistical significance for the non-groupage category, with a standardised regression weight of −0.039 and a p value of 0.644. The variable Resources was tried as an addition to the model shown in Figure 10.28. As a result, model fit fell substantially to unacceptable levels and for the non-groupage category statistical significance levels were not reached between the latent Intention variable and the Resources variable.

Considering the variables in the different groups in Table 10.18 and the weighting of these variables in the model, it was apparent that in the overall industry the perceptions of the respondents with regard to the family had a negative impact on intention to engage in collaborative activities. Comparing the groupage to non-groupage sectors it was clear that the respondents' perceptions of the family were less negative towards collaboration in the groupage sector and this was reflected in the higher intention score.

10.12 Reliability and Validity

Formative indicator reliability was a controversial issue, with different authors having various opinions; from no mention of reliability in some cases to arguing that attempts had to be made to assess reliability (Diamantopoulos et al., 2008). As previously mentioned, measures of internal consistency were

irrelevant for testing reliability of formative Structural Equation Models. Therefore, a test-retest approach was proposed and discussed by many authors, such as McArdle and Woodcock (1997), Diamantopoulos and Winklhofer (2001), Jarvis et al. (2003), MacKenzie et al. (2005) and Diamantopoulos et al. (2008).

MacKenzie et al. (2005) advocated that the item validity of formative indicators was reflected in the strength and significance of the path to the latent construct, which underlined the approach taken to model development in the present study, reinforcing the importance of indicator validity. MacKenzie et al. (2005) also advocates the use of nomological validity to assess the overall construct's validity. Nomological validity was assessed in the present study by using groups to test whether hypothesized differences were realised in variables of interest, as in the hypothesis analyses in section 10.11.

The researcher was conscious of various aspects of internal validity while the model was being analysed. Substantive and content validity were maintained at the design stage of the study. Reliability and convergent validity was confirmed with regard to the reflective components of the model through measures of internal consistency. Discriminant validity was assessed and issues were found with the latent TPB constructs. The re-specified model maintained discriminant validity. Nomological validity was verified through theory and groups behaving as anticipated. As a result of the above construct (internal) reliability was supported. However, generalisability (external validity) could only have been established via study replication.

10.13 Summary and Conclusion

This chapter focused on the justification for the analytical method applied. It discussed the approach taken and the steps in the analyses. Exploratory and Confirmatory Factor Analyses were employed to assess model fit. SEM was contrasted with the traditional analysis method of multiple regression and was found to be superior due to its ability to analyse latent constructs and the possibility of rigorous validity assessment.

A model was refined and presented for the overall data. However, subgroups were apparent, which supported similar findings by Golob and Regan (2005) in the United States trucking industry.

Financial performance was the most influential positive formative indicator on intention. Higher intention appeared to have a negative impact on operators' perceptions of the value of resources. A possible interpretation of this was that this was in accordance with resource-advantage theory and that collaboration could reduce the need for physical resources.

The key normative pressure was that of the family. Family opinions carried significant weight in influencing road freight operators' decisions in relation to collaboration.

Control over time appeared to have a key influence over the operator's perception of their ability to perform collaborative activities. The model had a higher non-causal explanation of the variance in the latent intention variable for the groupage sector. Support was found for the theoretical view that the

LTL sector had significant benefits to gain from such collaborative activities. The estimates of the values of the variables in the model for the groupage sector were more positive towards collaboration than for other groups. Also, negative influencers weighed less in the formation of intentions in the groupage sector in comparison to other groups.

This research found that the barriers to performing collaborative activities were:

- Family opinions and time; as business development required time and substantial effort.
- Increasing resources required
- Learning new skills
- Loss of control of the business
- Increased stress

Respondents also recognised the benefits of collaboration in terms of financial performance and competitive advantage. However, Figure 10.17 illustrates the trade-off between the family and financial performance in the development of intentions. The non-economic influences outweighed the influence of increased financial performance.

It was not known for how long the model would continue to hold. Previous attitudinal research indicated that attitudes were transient and changed over time. The external economic and, to a greater degree, social environments would undoubtedly influence road freight firms' attitudes over time. Future environmental issues and the internalisation of externalities could lead to the development of new social pressures and impact firms' profitability.

It has been shown that the application of SEM techniques has considerable advantages over traditional analytical approaches because of increased rigour through validity assessment. Many other studies had used regression in their analysis, but had left the consequences un-assessed.

11 CONCLUSIONS AND RECOMMENDATIONS

11.1 Introduction

This chapter presents a summary of the backdrop, objectives and research process of the study. It draws conclusions and makes recommendations based on the previous chapters and sets out the implications for industry, academics, policy and further research.

11.2 Achieving the Objectives

This thesis began by illustrating the importance of transport in logistics, the broader economy and society; the role of transport had been under-appreciated. While many Irish transport operators were trying to optimise their own operations, opening up to collaboration with others could enable greater optimisation, through increased efficiency.

The desired behaviour being focused on was that of collaboration, such as pallet networks and other forms, as discussed in Chapter 2. An operator's perception of these types of collaboration had a relationship to intention to participate in such ventures.

The main objective of the study was to extract the current key factors influencing collaboration in the Irish road haulage industry. This was achieved by the successful application of the Theory of Planned Behaviour (TPB), in a broad sense, to extract barriers to collaborative activities in the industry and understand owner-managers' attitudes towards performing such activities. Identifying the underlying influencers of decisions related to

change and understanding how the influencers affect future industry direction and development had implications for policy. The results of this study represented a step towards the possibility of optimal intervention.

11.3 Contribution of the Thesis

This thesis developed a theoretical framework and validated a research methodology, while extracting empirical evidence to inform policy towards advancing transport logistics. Throughout the study there was the aim of contributing to the overall body of literature in this field. With regard to the specific contribution, there had not been any previous significant research into the attitudes of transport operators towards collaborative methods of increasing utilisation, the barriers to achieving this goal and the benefits that would occur for the Irish economy and society if the goal were achieved. Also, there had been little previous research that had examined the barriers to the EU's objective of developing a more efficient and advanced logistics sector, a research area that was identified as a development issue by the EU (CEC, 2006).

Various theories of the firm were discussed and compared in Chapters 3 and 4 and the applicability of these theories to the Irish road freight context was considered. While economies of scale had been previously discussed in a traditional context by Kritz (1973) and Bayliss (1986) in the context of the UK industry and, more recently, in the Sornn-Friese (2005) study of the Danish Industry, no such analysis or examination had taken place in a Republic of Ireland context, nor had any previous study attempted to integrate the three broad theoretical areas of Behavioural Economics, Resource-Advantage

Theory and the Theory of Planned Behaviour and apply them to a transport-logistics setting concerning inter-firm linkages.

Stock (1997) previously identified the potential application of Expectancy-value theory to the logistics field. However, the application of the Theory of Planned Behaviour, as presented in Chapter 5, to a transport-logistics setting was a novel approach, as there had been no previous research attempts to apply it to extracting the attitudes of road freight operators and the barriers to collaborative activity.

The appropriate methodology for extracting the key influencers on and motivators of operators in the Irish road freight industry was discussed and assessed along with the most appropriate statistical methods of analysis. While the research approach of TPB had been applied within a small number of studies in a broader logistics context, heretofore it has not been applied to transport-logistics, as described and discussed in Chapter 6.

Chapter 7 developed a research approach wherein the applicability of neo-classical economics to the Irish road haulage industry was considered, discussed and tested. Costing and pricing procedures were analysed to assess whether the assumption of profit maximisation was correct. It was found that profit maximisation did not adequately explain the behaviour of operators in the Irish road haulage industry.

Neo-classical economic theory was refuted in this context, as it failed to represent the industry's behaviour. An alternative motivational approach was developed and applied utilising the Theory of Planned Behaviour. Chapters

8 and 9 presented and discussed the qualitative and quantitative aspects respectively of this approach.

Chapter 10 analysed the results of the primary investigative instrument, a structured postal survey, and extracted the barriers to collaborative activity through SEM and multivariate statistical analysis within a unique application of TPB and a novel methodological approach. In this regard, the study has advanced knowledge and supported the argument of Garver and Mentzer (1999) that the application of SEM can increase scientific rigour in logistics and, more specifically, the study has provided strong support for the use of formative indicators in organisational research. The key influencers on the decisions of Irish road haulage operators were successfully identified and highlighted.

In the present chapter the conclusions and implications of this novel and unique study are discussed. Recommendations are made towards advancing logistics strategy through collaboration and a potential strategy is highlighted to reduce barriers to collaboration by means of intervention. Further research opportunities are outlined.

11.4 Implications for Operators

This research had implications for road freight transport operators, supply chain management and for the broader economy. Supply chains were competing and were attempting to become lean in nature, with increased attention to transport operations. Increased fuel costs, the Irish manufacturing industry's attempts to compete against lower-cost countries, the environmental agenda and the possible, or likely, internalising of external

costs, were just some of the concerns of the multiple stakeholders in road freight transport, each of whom was pushing for their own agenda.

Collaborative approaches to increasing efficiency and utilisation levels would aid the decoupling of the negative externalities of transport activities from economic growth and would contribute significantly towards fulfilling many of the stakeholders' goals. The salient attitudes of road freight operators towards such activities were extracted and links could be seen with the literature review.

The empirical evidence indicated that few operators utilised the approach of collaboration. It was apparent that the opinions of family members were important influencers on this issue and that these opinions were, in general, perceived by owner operators to be negative towards collaboration.

It was also found that the operators were satisfiers, not maximisers. However, they did recognise the potential financial and competitive advantages of collaboration. Overall financial performance was the strongest positive influencer; competitive advantage and growth also played key roles as influencers. However, it was important to recognise that this industry was a heterogeneous one and therefore there were many other variables that influenced certain sectors.

The fact that many operators recognised the key advantages of collaborative approaches to their business operations related well to resource advantage theory, that is, the operators were seeking efficiency, competitive advantage and therefore financial performance. The overall attitude could be

disaggregated into a number of attitudes that related to matters such as: effort in developing new resources, the skills and tacit knowledge required, increased debt, increased stress, risk, input from financial backers and potential loss of control. Management resources were a key issue: principally the lack of available time to commit to additional activities. A negative attitude was also associated with larger contracts; even though growth was seen as a positive attribute, too fast a pace of growth was seen as unsustainable, with possible implications for quality of service and KPIs.

In reality, the additional resources required for collaboration would depend on the activities. However, many of these collaborative activities would not require a substantial financial investment, but rather management time and dedication. Once a collaborative venture had been established, the demand on management resources would have been expected to decrease substantially. Therefore, training/education and a support function for such activities could substantially assist in relieving the anxiety surrounding resources.

Normative pressure played a key role, with the survey respondents' opinions of value principally being those of the family. This was understandable for small owner operators, who would frequently have had family members involved in the day to day running of the business. The attitude and support of family members was a key influencer.

Perceived control over behaviour was not a strong influencer for certain categories of the industry. However, time was commonly highlighted through the time effect of events impacting on operators' control.

Support, advice and assistance could potentially have reduced the perceived barriers and aided stakeholders' agendas. The active promotion of informal networking could have been used as a catalyst for operators to gain opportunities to develop collaboration. The qualitative research indicated that networking allowed operators to gain insights into potential business behaviour and activities, without commitment.

11.5 Implications for Policy

Although competitiveness issues were, in principle, left to market forces, the Irish government had a stakeholder's position in relation to the efficiency of the Irish road freight industry, "Economic efficiency ought to be the primary goal of government transportation policy" (TRB, 2003:6). The industry was exceptionally important to Ireland, considering the country's level of dependency on that particular mode of transport.

It appears as if collaboration can solve some of the problems of road freight. It increases utilisation levels and reduces empty running. This in turn, reduces the number of vehicles on the road and aids in the reduction of negative externalities.

The government already intervened, in co-ordination with the EU, to aid professionalism through qualitative controls on the licensing of operators. The evidence indicated that self-adoption by small and medium operators of more efficient procedures and activities were unlikely without a significant change or stimulus. The evidence presented in this thesis rejects a neo-

classical approach to operators' behaviour. The evidence indicated that operators were satisfiers and not maximisers. Therefore an assumption that many operators (in particular small operators) will naturally evolve to increase their competiveness appears unlikely. The SEM indicated that the operators' perceptions of their family were important to them and they viewed their family's opinion in relation to collaboration as negative. This supports the Social Rationality Model framework, that decision making is affected by social influence.

Operators were aware of the potential positive outcomes from collaboration but few actually did collaborate. Self-efficacy, as tested in hypothesis three appeared to play an important role in the development of managers' intentions. A strategy to address barriers and apprehensions would likely result in optimal benefits. For the majority of operators developing collaboration would require the learning and development of new skills. Therefore, if the government wished to progress the professionalism of operators and thereby aid many stakeholders' objectives, an approach similar to that of the UK was worthy of serious consideration. The UK's Freight Best Practice programme provided free advice and support to operators as a measure to encourage and foster advancements in transport logistics operations. As information is an important antecedent to attitude formation, intentions and behaviour. This programme's online benchmarking facility allowed operators to gain insight into their performance. Many Irish operators had expressed concern over how their performance compared with others who carried out similar operations. A best practice programme would allow comparisons to take place and thereby help pinpoint areas of inefficiency. A best practice approach would aid the fulfilment of the EU's

goals to move towards a sustainable and competitive transport logistics industry (CEC, 2006). The likelihood of transport being included in the ECTS system in 2012 and the negative externalities of road freight on society position the Irish government in a key stakeholder's position.

Previous Irish government policy, such as the height limit on vehicles, had tended not to promote efficiency in transport logistics. While understanding had to be given to the broader social and economic environment, the promotion of advanced transport logistics activities through training/education intervention and a supporting role programme would be a complementary win-win strategy for numerous interest groups.

The research provided evidence of a number of issues in the industry, such as shortcomings in operators' abilities with financial decision-making. As financial decision-making of the majority of small operators appeared to be weak, a support service and template to aid firms in the cost-benefit trade off of collaborating would be beneficial. An attempt to assess operators' profitability was complicated by the potential behaviour of firms to minimise their tax liability. Assessing the impact of collaboration on an operators' profit margin is therefore problematic. In the past regulation attempted to deal with such issues, but potentially interfering with market equilibriums. This was not a viable option in the current European environment due to harmonisation of industry entry requirements, but, there were other methods to assist the advancement of transport logistics. A number of programmes to assist businesses in various industries, such as Skillsnet and Plato Dublin existed. However, the needs of road freight operators were specific. The United Kingdom's Freight Best Practice Programme was one example of a

programme that was specific to the road freight industry. Its recent introduction in Northern Ireland could place southern Irish haulage operators at a disadvantage.

The national skills bulletins (FAS, 2007) demonstrated a shortage of skills in the industry due to the lack of provision for training in this area. This, alongside road transport operatives having the lowest educational profile in the broader transport industry, highlighted a need for further training in the road freight industry beyond collaboration to include other methods to improve utilisation and efficiency, many of which could be practical in nature. While substantial progress had been made on the higher education front, other methods to enhance skills for current operators, as opposed to third level education, appeared warranted, that is, the targeting of owner-operators to enhance their training and skills development. In particular, these operators had reported time as being an impediment; this was also evident in other sectors. Any such programme should take into consideration the limits on the operators' available time.

The Danish Transport and Logistics (DTL) association was playing an important role in pooling SME carrier resources, such as joint purchasing and training, in order to gain economies of scale (Sornn-Friese, 2005). The use of purchasing alliances between firms and educational knowledge networks failed to emerge as a principal theme in the empirical research of the present study. Nonetheless, placing organisations in a learning network would facilitate action-orientated learning, allowing firms to interact with peers and professional advisors, with the benefits of mentoring and information transfer (Foley et al., 2006). This should increase operators' tacit knowledge and

boost their self-efficacy resulting in a positive impact on intentions and overt behaviour.

The benefits of a Republic of Ireland programme along similar lines to the aforementioned Danish and UK programmes would include:

- Increased efficiency of transport.
- Increased efficiency in the broader economy.
- Reduction in freight intensity, aiding the decoupling of freight transport from economic growth.
- Reduction in the negative environmental externalities and future cost mitigation, in light of the EU's move towards internalising such external costs, and the likely extension of the emission trading scheme to surface transport after 2012.
- A move towards a more sustainable Ireland.

11.6 Implications for Academics

The appropriateness of the research approach was verified through validity and reliability analyses. The methodological approach had implications for future research in the area of management science and supply chain management.

The application of TPB in order to extract barriers and elicitate influencers on managers through a mixed-methods approach was, in general, successful. The utilisation of a MIMIC Structural Equation Model was beneficial when contrasted with the traditional analytical method of multiple regression. Caution was required with heterogeneous populations in relation to the

sample size requirement for reliable group analysis and also it was important to specify constructs correctly, that is, not to assume that all indicators were necessarily reflective in nature.

The broader theoretical framework of resource-based theory had a greater explanatory power for the industry, in contrast to neo-classical economics. The negative regression weight that was found between intention and resources gave support for viewing relationships as intangible assets that could bring competitive advantage and increased financial performance.

The use of Subjective Norm was an important characteristic that should be considered in future research. As small firm managers in this study were influenced by peer pressure, future studies should give adequate consideration to incorporating such concepts.

A number of themes in the literature were evidenced in the empirical study. The research findings supported Bagozzi's (1979) lack of discriminant validity between Subjective Norm and Attitude. This was deemed due to an underdevelopment in intention antecedents towards collaboration. However, Structural Equation Modelling facilitated this assessment of validity and validated the view of Garver and Mentzer (1999) that the application of such techniques in logistics increased scientific rigour.

This thesis also moved towards validating the Gammelgaard (2004) actor's school of thought in logistics research, as the Theory of Planned Behaviour, a social-psychology theory, was shown to be applicable to the logistics context.

Links were also seen with entrepreneurial theory. The findings supported Wiklund et al.'s (2003) conclusions that non-economic factors were potentially more important influencers than financial factors.

Support was also found for the findings of Perren (1999) and Liao et al. (2001) in relation to motivational factors having a role to play in firm growth. This study confirmed that motivation factors, in particular other people's opinions that were valued, influenced operators' decisions.

Qualitative evidence from the larger industry players supported Stone's (2001) study that found operators intended following their customers' needs. It also supported Hunt's (1997a) Resource-Advantage theory with regard to the disequilibrium nature of competition. The qualitative interviews revealed that developing through collaboration was a reactive process.

11.7 Hypotheses

A number of hypotheses were proposed in this thesis, based on the literature review in Chapters 2 to 5. The hypotheses were reviewed based on the analyses in Chapters 7 to 10, with particular regard to section 10.12. The majority of the hypotheses were found to hold; a number were found not to hold. The principal hypothesis of this thesis was Hypothesis 1, which was upheld.

Hypothesis 1:

The conceptual model will be of adequate fit in representing the Irish Road Haulage industry's intention towards collaborative alliances.

Principally and at the outset, the hypothesis was concerned with the TPB and whether it could be successfully utilised to extract influencers on road freight operators' attitudes towards collaborative activities: this aspect of the hypothesis was only partially upheld for the original version of the model, as discriminant validity was not achieved for the three proposed formative latent: variables attitude, subjective norm and perceived behavioural control.

Another aspect of the hypothesis was that the formative variables in the model were antecedents to intention in this context. Attitudes were successfully extracted and a re-specified conceptual model was statistically affirmed to have construct validity, Figure 10.17, Chapter 10.

On the basis that the refined model of antecedents to collaborative intent was adjudged to have provided a more complete characterisation of these antecedents in the Irish road freight industry than was achievable by other methods, the hypothesis was considered to be upheld.

As a cautionary note, attitudes tend to be transient over time due to individuals acquiring additional information. Therefore there could be no certainty as to the length of time for which these attitudes would continue to be valid.

The following hypotheses were also upheld:

Hypothesis 3:

The self-efficacy of managers will act as a moderator to developing collaborative activities.

Managers with higher self-reported levels of self-efficacy had a higher level of intention to perform collaborative activities.

Hypothesis 5:

The age profile of owner-managers will act as a moderator of intention to perform collaborative activities.

Hypothesis 6:

Family views with regard to owner-managed operators will act as a moderator on intention to perform collaborative activities.

The hypothesis was upheld as the operators' perceptions of the views of their families had a negative influence on collaborative intention.

Hypothesis 7:

The operator's perception of the economic environment will moderate or intensify the intention to perform collaborative activities.

Respondents who had a positive perception of economic conditions had higher intention to engage in collaborative activity.

Hypothesis 10:

Personal factors in owner-managed firms have a high degree of influence on intentions to perform collaborative activities.

The variable Miss Out on Personal Activities had an influence on the intention of owner managers.

Hypothesis 11:

Operators concerned with less-than-truckload activities will have higher levels of intention.

The following hypotheses were not upheld:

Hypothesis 2:

Highly educated operators will have a more positive intention to performing collaborative ventures.

Although overall intention was not significantly different between more highly and less highly educated respondents, risk did reach a statistical difference between these two groups. Therefore skills development and networking opportunities could potentially influence risk related attitudes that could influence collaborative intent.

The relative influences of the antecedents 'Economic Appraisal' and 'Normative Pressure' also differed between the two groups, as shown in Figures 10.20 and 10.21 in Chapter 10.

Hypothesis 4:

Past experience of collaborative activities that met expectations will have a positive impact on intention to perform collaborative activities.

The fact that the hypothesis was not upheld was potentially due to the low number of respondents that reported having had past experience of collaborative activities.

Hypothesis 8:

Economic conditions and perceived consequences of past behaviour will influence the operator's perception of risk. Therefore, they will act as moderators on intention to perform collaborative activities.

There appeared to be no statistically significant relationship between the variables 'perceived economic conditions' and risk, or between 'past behaviour' and risk.

Hypothesis 9:

Managers who have other business activities will have a higher level of intention to perform collaborative activities

11.8 Limitations of the Study

Even though a rigorous approach was taken to this research, some constraints existed. As with all research studies, limitations applied. The emphasis of this research was not on the overt behaviour of operators. The research examined operators' intentions, an antecedent to overt behaviour.

To assess the relationship between intention and overt behaviour in this study's context would have required a longitudinal design. The available resources in doctoral research strongly impede the feasibility of carrying out such studies. However, Armitage and Connor (2001) meta-analysis of 185 studies that applied a Theory of Planned Behaviour framework concluded with a strong relationship between intention and overt behaviour, correlation of 0.47. Ajzen's (1991) meta-analysis calculated a correlation between intention and overt behaviour of 0.51. A number of factors influence intention to behaviour consistency, the reader is referred to section 5.2.4.

With studies such as this, set in a broad social science context, the research relied to a high degree on the co-operation of the target population. As pointed out in section 10.9, non-response bias, desired responses and error of central tendency had to be kept in consideration when reviewing the results.

The total valid response of 191 to the primary research instrument postal questionnaire was, in general, an acceptable number, as discussed in section 10.5. However, as a result of increasing model complexity and the application of group analysis diluting the sample size, care had to be taken when reviewing the statistics of small sub groups.

11.9 Further Research

As with any thesis the scope of the study was limited by a number of constraints. These constraints were typically resource based and included

time, finance and co-operation of others with regard to responses and access to data.

Further insight would be gained through increasing the depth of analysis by disaggregating and modelling some of the key attitudes; such as breaking down resources and financial performance into their subcomponents and quantifying their impact. The type of model that was developed could also be tested in other markets/industries.

An education based intervention programme appeared warranted, which would potentially be similar to the Freight Best Practice programme in the UK, with an evaluation of its impact on attitudes, intention and overt behaviour. Further investigations were warranted, such as an in-depth examination consisting of a cost-benefit analysis due to increased efficiency and a reduction in emissions under the EU Emissions Trading Scheme and broader economic appraisal. The investigation could potentially be applied beyond the methods highlighted in this study, by including broader best practice methods in all areas of road freight transport operations. Such a study would be time consuming and longitudinal in nature.

The Theory of Planned Behaviour had been applied elsewhere to public transport users' behaviour and car drivers' behaviour. Clearly there was potential for its application to evaluate, for example, HGV drivers' behaviour, with implications for health and safety.

The author of the present study felt that future developments in logistics research were likely to follow the approach of the actors' school of logistics

thought (Gammelgaard, 2004), integrated with Simon's (1976) management science approach.

11.10 Conclusion

The aim of this chapter was to give closure to the thesis and highlight the overall contribution to the literature, policy and industry. Valuable insights were gained into key influencers of Irish road freight operators' decision making.

A mixed-methods research approach was successfully applied. Theories from other disciplines, principally the Theory of Planned Behaviour from social psychology, were successfully utilised within a methodological approach in the organisational context of the Irish road freight industry.

A formative approach to MIMIC Structural Equation Modelling was employed as the analytical strategy; the results obtained supported such an approach to organisational research. The research process and outcomes supported the use and possible extension of attitudinal research in the transport logistics and organisational research domains.

The research identified clear relationships between the operators' attitudes, and collaborative intention. In summary, perceived benefits in the areas of financial performance and competitive advantage positively influenced operators' attitudes towards collaborative activity. Family members' opinions were valued and reflected peer pressure; operators perceived these opinions as negative towards involvement in collaborative activity. Events that impacted on operators' time affected operators' perceived control.

It appeared that a government policy to implement an educational/skills programme would have been the most suitable approach to intervention.

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APPENDIX A: Initial investigation survey and tables

Pricing and Costing Procedures Semi-Structured Questionnaire

Section A:

1. How many people are employed? (Breakdown, drivers, admin., maintenance)

   _____

2. How many lorries has the company at present, 2 years ago, 5 years ago and 10 years ago? (type, categories)

   _____

3. In what year was the firm established?

   _____

4. What percentage of time per average journey is spent loading and unloading?

   _____

5. What is the exact nature of the business? (subcontractor, main goods hauled)
   - Is this a traditional sector, how long is it around?

   _____

6. Approximately how many loads are taken each week?
   - Average weight volume?
   - What is the mix between contract and spot hire?

   _____

7. What is the annual turnover?

   _____

8. Is the owner actively involved in the management of the firm?

   _____

Section B:

Note to interviewer: Remember to expand questions, how calculated, record data, frequency, and obtain documents where possible.

<u>Part 1:</u>

9. How much of an impact does costing information have on rate setting?
   - How expressive do you think costing information is on rate setting?

   _____

10. Can you describe broadly the decision making process for rate calculation?

    _____

11. Is there a specific method (policy) used to calculate costs?
    - Explain in detail?
    - How do you record your costs?
    - Costs considered, factors and why?
    - What percentage does each factor account for?

_____

12. How are wages and depreciation treated (fixed, variable, ABC)?

_____

13. How is depreciation calculated?

_____

14. How is residual value of vehicles calculated?

_____

15. Is inflation taken into account, how?

_____

16. Do you calculate overheads, why?
    - If yes, what do they comprise of? Why?

_____

17. Is maintenance done internally or externally?
    - How is maintenance costs calculated?
    - Do you repair and maintain other company's vehicles?
    - Do you have a maintenance policy?

_____

18. Do you allocate/aggregate costs, on what bases (vehicles)?

_____

19. Is interest on debts included as a cost, why?
    - How calculate the interest rate?

_____

20. Do you obtain a discount on fuel, lubricants and tyres?
    - How do you record and calculate these costs?

_____

21. Do you check that your costs are in control? How?

_____

<u>Part 2:</u>

22. How are rates calculated?
    - Mark-up, based on competitor's price, price taken?
    - Are incentives, discounts or any other means of attracting and maintaining custom used?

_____

23. Is capacity utilisation taken into account, how?
    - How does back haulage affect rate calculation?

_____

24. Are there any other issues in relation to rate calculation, such as charges per number of stops?

_____

25. Do you use any methods to maximise efficiency and/or reduce costs?

_____

26. By what unit are rates charged?
    - Ton, Mile, Pallet

_____

27. Have you recently or in the past changed your rate and cost calculation procedures? If yes why?
    - How has this effected the company (profits, contracts)?

_____

28. Would you reinvest profits into the company (new tractor unit etc.) in order to reduce corp. tax?

_____

Section C:

29. What are your top (5) priorities for customers? What do you think your customers value most?

_____

30. Does the firm set objectives?
    - If yes, what are the top three objectives? How do you plan to meet them?

_____

31. Do you have a mission statement?

_____

32. Is there an official target set for return on investment and so forth?
    - What return on investment is desired and achieved?
    - What gross profit margin is desired and achieved?
    - Have these figures changed over the company's lifetime?

_____

33. Do you have targets for other issues, such as vehicle utilisation, budgets?

_____

34. Do you ever use published tables of operating costs, why and what for?

_____

Section D:

35. Are you involved in groupage? How does this affect your cost and rate setting?

_____

36. How would you rank the level of competition in the industry/your sector?
    - How many competitors would you have for a contract? How compete?
    - Do you know – are you concerned about competitor activities?
    - Do you have a customer database – segmentation?

_____

37. What are the major issues and problems in cost calculation and rate setting in and outside groupage?
    - Training, is CPC enough?

_____

38. Do you have long term contracts/relationships with customers (%)?
    - How has this affected the company?

_____

39. Do you use a computer or software package for any particular business activities, in particular pricing and cost calculation?

_____

40. Who holds the CPC in the business? Are they actively involved? What is their role?

_____

41. Are you happy with your costing system? Explain?
    - Would you increase the level of refinement/costing detail? Why?

_____

42. What are the obstacles to improving it? Explain all?

_____

43. Would you consider implementing an ABC system? Explain?

_____

44. Where are your customers based? % Breakdown?

_____

45. Is there an internal or external accountant? What service/info do they provide? Expand?

_____

46. Do you see costing and rate setting as separate functions?

_____

Section E:

47. What is your job title?

_____

48. At what age did you leave full-time education?

_____

49. How many years' experience do you have in the road haulage industry?

_____

50. Do you have experience outside of the haulage industry? Expand?

_____

Tel. Direct: 01- 4023782
Email: Eoin.Plant@dit.ie

13th November 2002

Dear Sir/Madam,

I am writing to advise you of ongoing research at the Department of Transport Engineering, Dublin Institute of Technology. The aim of this research is to investigating costing and pricing procedures in the Irish Road Haulage Industry. The IRHA (Irish Road Haulage Association), CILT (Chartered Institute of Logistics and Transport in Ireland) and the Department of Transport are supporting this research.

We are currently searching for hauliers to participate in interviews, in order to gain an insight into costing and pricing procedures. There is currently a lack of knowledge on how Irish road hauliers cost and price their contracts. This research aims to fill this gap and establish appropriate best practice. The research will undoubtedly be of enormous benefit to the industry.

I would gratefully appreciate if you would consider participating in this study. The accuracy of the results depends on the number of willing participants, no matter how large or small the operator.

I can assure you that all information will be treated in the strictest confidence and your identity will remain anonymous. In return for your co-operation a report on the principle findings will be forwarded to you.

I will be in contact with you shortly to discuss the research and to answer any questions or queries you may have or if you would prefer to contact me, I will be delighted to speak with you.

Looking forward to speaking with you,

Yours faithfully,

_____

Eoin Plant.
Postgraduate Research.

Tel. Direct: 01- 4023764
Email: Eoin.Plant@dit.ie

20th May 2003

Dear Sir/Madam,

A great deal of publicity has surrounded the Irish road haulage industry recently, with particular reference to costs. What is needed is reliable, objective information that can be used to increase understanding of road haulage costs and rate setting.

The enclosed survey for Irish road haulage hire or reward operators, aims to gather information on costing and price/rate setting. You are one of a large number of hauliers who were randomly selected from several sources to receive this questionnaire. The road haulage sector will benefit from a greater understanding of current practice. The research will undoubtedly be of enormous benefit to the industry.

The Department of Transport Engineering at Dublin Institute of Technology is funding this survey and has been supporting transport research for a number of years. It is also being supported by prominent organisations, such as, the Chartered Institute of Logistics and Transport in Ireland (CILTI), Irish Road Haulage Association (IRHA), National Institute of Transport and Logistics (NITL) and the road haulage section of the Department of Transport.

I can assure you that all information will be treated in the strictest confidence and your identity will remain anonymous. The information obtained will be aggregated for statistical tables. Therefore, it will not be possible to identify responses from any particular firm from the results produced.

I would be grateful if the person responsible for costing and rate setting in your organisation could complete the attached questionnaire and return it in the enclosed stamped addressed envelope. The accuracy of the results depends on the number of responses, no matter how large or small the operator. As a token of my appreciation for your co-operation, I will forward, at your request, a summary of the principal findings of this study.

I would be happy to answer any questions you may have and can be contacted at (01) 4023764.

Yours sincerely,

_____

Eoin Plant.
Researcher, Dept. of Transport Engineering.

Haulage Costs & Rates

Confidential

This survey which is being sponsored by Dublin Institute of Technology, will produce findings about the ability of the Irish Road Haulage Industry to accurately cost and price contracts. This research has the potential to benefit you and others in the industry.

Please complete the following questionnaire. If you wish to comment on any questions or qualify your answers, please use the space provided at the end of the questionnaire.

DUBLIN INSTITUTE of TECHNOLOGY
Institiúid Teicneolaíochta Bhaile Átha Cliath

Eoin Plant
Department of Transport Engineering
Faculty of Engineering
Dublin Institute of Technology
Bolton Street

Id number _____

Section A: Background

A1. How many years is the company established?
(Please write the number in the space provided) ____

A2. What sector of the haulage industry is your principal operation?
(Please tick one box)

Container	☐	**General Haulage**	☐
Groupage	☐	**Tipper/construction**	☐
Livestock	☐	**Refrigeration**	☐
Heavy	☐	**Bulk**	☐
Liquid	☐	**Hazardous**	☐

Other *(please state)* _____

⇒ On what bases?

Regional	**National**	**International**
☐	☐	☐

A3. Do you operate from:
(Please tick one box)

Home?	☐	**Business Premises?**	☐

A4. What per cent of your customer's demand is:
(Please write relevant percentage in space provide)

Contract	____	**Spot hire**	____

A5. On average what per cent of the journey time is spent loading and unloading the vehicle?
(Please write relevant percentage in space provide)

____

Section B: Costing Data

B1. Costing information is valuable for rate setting.
(Please rate your agreement or disagreement by ticking the appropriate box)

Strongly Disagree	**Tend to Disagree**	**Undecided**	**Tend to Agree**	**Strongly Agree**
☐	☐	☐	☐	☐

Please explain your answer?
(Please tick one box)

No influence on the rate which the firm receives from customers ☐

Use costing data to calculate my rates ☐

Other *(please state)* _____

B2. Please rate your opinion of your costing system's effectiveness.
(Please circle your answer, 10 = highest, 1 = lowest)

1 2 3 4 5 6 7 8 9 10

B3. Do you record your costs?
(Please tick one box)

Yes ☐ **No** ☐

If yes, on what bases?
(Please tick one box)

Mentally	**Roughly on Paper**	**In Detail on Paper**	**In Detail Using Spreadsheet/Software**
☐	☐	☐	☐

B4. Do you attempt to analyse costs?
(Please tick one box)

Yes ☐ **No** ☐ (Go to C1)

B5. How do you analyse your costs?
(Please tick one box)

Mentally	**Roughly on Paper**	**In Detail on Paper**	**In Detail Using Spreadsheet/Software**
☐	☐	☐	☐

B6. Please list the costs that you calculate?

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

B7. Do you apportion indirect costs/overheads?
(Please tick one box)

Yes ☐ **No** ☐

If yes, on what bases?
(Please tick one box)

Equally between vehicles ☐ **Vehicle tonnage** ☐

Type of contract ☐

Time analysis of administration staff ..... ☐

Other(s) *(please state)*_____

B8. Do you take inflation into consideration?
(Please tick one box)

No.....☐ **Yes, use estimated figure** ☐

Yes, use consumer price index..... ☐

Other(s) *(please state)*_____

B9. How often would you analyse your costs?
(Please tick one box)

Daily	**Weekly**	**Monthly**	**Quarterly**	**Annually**
☐	☐	☐	☐	☐

B10. Please indicate if you breakdown costs and the most common basis?
(Please tick only one box)

	Total Costs	Distance (miles/km)	Tonnage	Time (day/hours)
Individual vehicle	☐	☐	☐	☐
Average for all vehicles	☐	☐	☐	☐
Vehicle type	☐	☐	☐	☐
Individual contract	☐	☐	☐	☐
Type of contract	☐	☐	☐	☐
Geographical area	☐	☐	☐	☐

Other *(please state)* _____

B11. Do you calculate costs after a contract to see if they matched projections?
(Please tick one box)

Yes ☐ **No** ☐

If yes on what time-scale?

Daily	Weekly	Monthly	Quarterly	Annually
☐	☐	☐	☐	☐

B12. Are you satisfied with your costing procedures?
(Please tick one box)

Yes ☐ (Go to C1) **No** ☐

If no, please indicate why?
(Tick only one box, please)

Unable to calculate costs ..... ☐
Would like to be able to calculate costs in more detail ..... ☐
Unsure if costing correctly (never trained) ..... ☐
Other(s) *(please state)* _____

B13. What is the main obstacle to improving your costing procedures?
(Tick only one box, please)

Training required ..... ☐
Time requirements for training ..... ☐
Lack of courses available ..... ☐
Other *(please state)* _____

Section C: Rate Calculation

C1. Rate setting is of utmost importance if the organisation is to be profitable.
(Please rate your agreement or disagreement with this statement by ticking the appropriate box)

Strongly Disagree	Tend to Disagree	Undecided	Tend to Agree	Strongly Agree
☐	☐	☐	☐	☐

C2. Please rate your opinion on the company's rate calculation methods effectiveness.
(Please circle your answer, 10 = highest, 1 = lowest)

1 2 3 4 5 6 7 8 9 10

C3. Do you calculate rates?
(Please tick one box)

Yes ☐ **No** ☐ (Go to D1)

If yes, on what bases?
(Tick only <u>one</u> box, please)

	Distance (miles/km)	Tonnage	Time (day/hours)	Size (meters sq. etc.)
Individual vehicle	☐	☐	☐	☐
Average for all vehicles	☐	☐	☐	☐
Vehicle type	☐	☐	☐	☐
Individual contract	☐	☐	☐	☐
Type of contract	☐	☐	☐	☐
Geographical area	☐	☐	☐	☐

Other *(please state)* _____

C4. What is the principal influence on your price/rate setting?
(Tick only <u>one</u> box, please)

Suppliers requirements ..... ☐
Contribution to fixed costs ..... ☐
Recovering full costs per unit ..... ☐
Customer demand ..... ☐
Pricing strategy ..... ☐
Product/service attributes ..... ☐
Pricing objectives ..... ☐
Competitor prices ..... ☐
Other *(please state)* _____

C5. What is the most common method you use for calculating standard rate setting/pricing?
(*Tick only <u>one</u> box, please)*

By reference to competitors prices ..... ☐
Full cost plus mark-up ..... ☐
Price as high as customers will pay ..... ☐
Supplier stipulates prices ..... ☐
Follow the market leader ..... ☐
Contribution over direct costs ..... ☐
Other *(please state)* _____

C6. What is the most common rate setting/pricing method you use for backhaulage?
(Tick only <u>one</u> box, please)

By reference to competitors prices ..... ☐
Full cost plus mark-up ..... ☐
Price as high as customers will pay ..... ☐
Supplier stipulates prices ..... ☐
Follow the market leader ..... ☐
Marginal cost plus mark-up ..... ☐
Average costs plus mark-up ..... ☐
Other ***(please state)*** _____

C7. Do you charge customers per number of stops?
(Please tick one box)

Yes, always ☐ **No, never** ☐

Depends on the number of stops\contract ..... ☐
Please state over what number of stops you would commence charging ____

C8. Do you give customers discounts?
(Please tick one box)

Yes we have an official policy ..... ☐

Yes, but no specific policy ..... ☐

No (Go to C11) ..... ☐

Other(s) *(please state)* _____

C9. What percentage of customers receive a discount?
(Please write relevant percentage in space provide)

____

C10. Please state most common type of discount?
(Tick only <u>one</u> box, please)

Regular discounts to keep specific customers ..... ☐

Discounts related to size of order..... ☐

Discounts on individual orders to meet or beat competitors ..... ☐

Discounts for prompt payment ..... ☐

Discounts for special promotions ..... ☐

Other(s) ***(please state)*** _____

C11. Are you involved in groupage?
(Please tick one box)

Yes ☐ **No** ☐

If yes, how do you calculate your rates for groupage?
(Please write answer in space provide)

_____

Section D: Management & Competition

D1. Do you have targets for the following?
(Please tick the appropriate box(s), one per row)

	None	Written Targets (inc. computer)	Non-written Targets
Revenue Budgets	☐	☐	☐
Cash Budgets	☐	☐	☐
Purchase Budget	☐	☐	☐
Operating Budget	☐	☐	☐
Expenditure Budget	☐	☐	☐
Turnover	☐	☐	☐
Utilisation	☐	☐	☐
Return on Capital	☐	☐	☐

(If all are none, please go to question D4)

D2. How often are these reviewed?
(Please tick the appropriate box(s), one per row)

	Monthly	Quarterly	Bi-annually	Annually	Other
Revenue Budgets	☐	☐	☐	☐	____
Cash Budgets	☐	☐	☐	☐	____
Purchase Budget	☐	☐	☐	☐	____
Operating Budget	☐	☐	☐	☐	____
Expenditure Budget	☐	☐	☐	☐	____
Turnover	☐	☐	☐	☐	____
Utilisation	☐	☐	☐	☐	____
Return on Capital	☐	☐	☐	☐	____

D3. Please illustrate the following financial figures for the last financial year?
(Please write your answer in the space provided)

	Desired	Achieved
Gross Profit Margin	_____	_____
Net Profit Margin	_____	_____

D4. How many vehicles over 3.5 tonnes GVW are there?
(Please write your answer in the space provided)
In your fleet ____

D5. How many employees are there?
(Please write your answer in the space provided)
Drivers ____ **Management/Admin.**____

D6. Is this the only depot for the company?
(Please tick one box)
Yes ☐ **No** ☐

If no, is this Head Office?
Yes ☐ **No** ☐

D7. Please indicate the percentage breakdown of demand from the following categories of customers?
(Please write your answer in the space provided)

Manufacturers	____	**Retailers**	____
Third-party Logistics	____	**Other hauliers**	____
Freight Forwarders	____	**Im\export specialists'**	____

Other(s) *(please state)* _____

D8. Please rate the level of competition that you experience?
(Please circle your answer, 10 = highest, 1 = lowest)
1 2 3 4 5 6 7 8 9 10

D9. It is difficult to pass on haulage costs to customers.
(Please rate your agreement or disagreement with this statement by ticking the appropriate box)

Strongly Disagree	Tend to Disagree	Undecided	Tend to Agree	Strongly Agree
☐	☐	☐	☐	☐

If you agree with the previous statement please indicate why?
(Tick only <u>one</u> box, please)

Competition from unlicensed hauliers..... ☐
Other types of unfair competition ..... ☐
Lack of bargaining power..... ☐
Unable to provide value add services..... ☐
High level of competition from licensed hauliers ..... ☐
Other *(please state)* _____

D10. How many competitors are you facing when quoting for a contract?
(Please write the number in the space provided) ____

D11. Please indicated the level of difficulty in negotiating/obtaining acceptable prices from the following categories of customers?
(Please tick the appropriate box(s), one per row)

	V. Difficult	Difficult	Indifferent	Acceptable	V. Acceptable
Manufacturers	☐	☐	☐	☐	☐
Retailers	☐	☐	☐	☐	☐
Third-party logistics	☐	☐	☐	☐	☐
Other Hauliers	☐	☐	☐	☐	☐
Freight Forwarders	☐	☐	☐	☐	☐
Im\Export Specialists	☐	☐	☐	☐	☐

D12. In your opinion what will be the affects of the following on the future conditions in the Irish road haulage industry? *(Please tick the appropriate box(s), one per row)*

	Improve	Same	Deteriorate
Economic Climate	☐	☐	☐
Utilisation	☐	☐	☐
Environment\Social Policy	☐	☐	☐
Computerisation	☐	☐	☐
Legislation (non social/env.)	☐	☐	☐
Overall	☐	☐	☐

D13. Have you considered closing the business?
(Please tick one box)

Yes ☐ **No** ☐ (Go to E1)

If yes, please indicate when this was under consideration?
(Please write your answer in the space provided) _____

D14. Please indicate the principal reason why you decide not to close?
(Tick only <u>one</u> box, please)

Outstanding hire purchase repayments ..... ☐
Family tradition/pride..... ☐
Loyalty to staff/community/customers ..... ☐
Analysed *vigilantly* and forecast future conditions to improve ☐
No other employment options available ..... ☐
Other *(please state)* _____

Section E: Personal Information

E1. What is your position/job title?
(Please tick one box)

Owner/Manager	☐	**General Manager**	☐
Accountant	☐	**Contract Manager**	☐

Other(s) *(please state)* _____

E2. What transport qualifications do you have?
(Please tick the appropriate box(s))

C.P.C...... ☐
Diploma in transport related area..... ☐
Advanced diploma in transport ..... ☐
Degree in transport related area..... ☐

E3. What is your highest level of general education (non transport)?
(Please tick the appropriate box)

Primary School	☐	**Junior/Inter Cert.**	☐
Leaving Cert.	☐	**Cert (higher ed.)**	☐
Diploma (higher ed.)	☐	**Bachelor**	☐
Postgraduate	☐		

Professional qualification equivalent to a bachelor degree ☐

E4. How many years experience do you have in transport?
(Please write the number in the space provided) ____

E5. How many of these are in the road haulage industry?
(Please write the number in the space provided) ____

Section F: Additional Comments

If you would like to make any additional comments about this survey please write them in this section. If you are referring to a particular question, please write the question number beside your comment.

Your contribution to this survey is very greatly appreciated.
Please return your questionnaire in the reply paid envelope provided.
If the envelope has been mislaid please forward to:

Eoin Plant,
Department of Transport Engineering,
Faculty of Engineering,
Dublin Institute of Technology,
Bolton Street,
Dublin 1.

Table A.1 Comparison of target population to respondents

	Freq	Response Percent	Population Percent	Difference	% Difference
Carlow	5	3.8	1.8	1.9	105.0%
Cavan	1	.8	2.1	-1.3	-63.5%
Clare	5	3.8	3.5	0.2	5.7%
Cork	21	16.2	10.0	6.1	61.4%
Donegal	4	3.1	3.1	-0.0	-0.6%
Dublin	20	15.4	15.6	-0.2	-1.6%
Galway	3	2.3	3.9	-1.6	-41.1%
Kerry	3	2.3	3.0	-0.7	-25.1%
Kildare	6	4.6	6.3	-1.7	-27.3%
Kilkenny	7	5.4	3.1	2.2	73.1%
Laois	3	2.3	2.7	-0.4	-17.2%
Leitrim	1	.8	0.7	0.0	4.0%
Limerick	3	2.3	4.4	-2.1	-47.8%
Longford	2	1.5	0.9	0.5	54.3%
Louth	3	2.3	4.1	-1.8	-44.0%
Mayo	4	3.1	2.8	0.2	7.1%
Meath	6	4.6	5.5	-0.9	-17.6%
Monaghan	5	3.8	3.9	-0.1	-3.3%
Offaly	1	.8	1.6	-0.8	-51.5%
Roscommon	5	3.8	1.8	1.9	110.1%
Sligo	1	.8	1.3	-0.5	-41.9%
Tipperary	6	4.6	4.5	0.0	0.7%
Waterford	9	6.9	2.1	4.7	217.9%
Westmeath	1	.8	1.4	-0.6	-42.9%
Wexford	3	2.3	5.2	-2.9	-56.5%
Wicklow	2	1.5	3.3	-1.8	-55.7%
Total	130	100.0	100.0		
Missing	22				
Total	152				

Table A.2 Phase one descriptive statistics (means)

	N	Min	Max	Mean	Std. Deviation
Percentage of time spent loading and unloading	132	1	90	24.25	16.318
Opinion of costing effectiveness	130	1	5	3.51	1.076
Opinion of rate setting	136	1	5	3.52	1.035
Percentage of settlements that receive a discount	29	0	80	13.02	18.920
Years established	147	2	60	13.84	11.142
Number of drivers	146	0	95	4.75	10.468
Number of mngt/admin	146	0	17	1.60	2.540
Vehicles over 3.5 GVW own fleet	146	0	60	4.40	7.599
Vehicles over 3.5 GVW sub-contracted	145	0	20	.69	2.338
Number of depots	143	0	10	.94	1.067
Contract percentage of demand	144	0	100	69.30	38.472
Spot hire percentage of demand	144	0	100	29.42	37.987
Profit/Loss (%)	99	-15	55	14.36	12.11
Breakeven (€)	70	0	50,000,000	1,415,901	6,161,506
Annual turnover (€)	106	35,000	800,000,000	8,259,442	77,649,069
Years experience in road haulage	140	2	46	17.44	10.729

Table A.3 Breakdown of industry structure

(Calculated from phase one respondents)

No. of Vehicles (n)	Firms Count (c)	Per Cent	Cat. Total (n × c)	Per Cent of Total
1	54	37.5%	54	8.4%
2	26	18.1%	52	8.1%
3	21	14.6%	63	9.8%
4	12	8.3%	48	7.5%
5	7	4.9%	35	5.4%
6	2	1.4%	12	1.9%
7	4	2.8%	28	4.4%
8	1	0.7%	8	1.2%
9	3	2.1%	27	4.2%
10	3	2.1%	30	4.7%
12	1	0.7%	12	1.9%
13	1	0.7%	13	2.0%
14	1	0.7%	14	2.2%
18	1	0.7%	18	2.8%
19	1	0.7%	19	3.0%
20	1	0.7%	20	3.1%
21	1	0.7%	21	3.3%
34	1	0.7%	34	5.3%
35	1	0.7%	35	5.4%
40	1	0.7%	40	6.2%
60	1	0.7%	60	9.3%
Total	**144**	**100.0%**	**643**	**100.0%**

Assumptions:

1. All vehicles have equal capacity

2. Response levels are similar for all categories of vehicle size

APPENDIX B: Attitudinal qualitative documents

DUBLIN INSTITUTE of TECHNOLOGY
Institiúid Teicneolaíochta Bhaile Átha Cliath
Dept. of Transport Engineering,
Bolton Street, Dublin 1, Ireland.
Tel: +353 – 1 – 402 3000
Fax: +353 – 1 – 402 3999

Direct: 01- 4022991
Email: Eoin.Plant@dit.ie

17th November 2006

Dear

I am writing to advise you of ongoing research at the Department of Transport Engineering and the National Institute for Transport and Logistics (NITL) at Dublin Institute of Technology. The aim of this research is to investigate the attitudes of the Irish Road Haulage Industry towards development of added value services and collaboration. The Irish Road Haulage Association (IRHA), Chartered Institute of Logistics and Transport in Ireland (CILT) and the Department of Transport are supporting this research.

We are currently searching for hauliers to participate in informal interviews, in order to gain an insight into hauliers' beliefs about the industry. The interviews are a light informal general discussion about principal concerns in the industry and are aimed to provide a foundation for future research.

I would gratefully appreciate if you would consider participating in this study. As we require varying views, we need operators from various sectors, size and geographical locations to participate. The accuracy of the results depends on the willingness of participants to provide their views. The discussion should take approximately 30-45 minutes. I am willing to meet you at a convenient location of your choice.

I can assure you that all information will be treated in the strictest confidence and your identity will remain anonymous. In return for your co-operation a report on the principal findings will be forwarded to you.

I will be in contact with you shortly to discuss the research and to answer any questions or queries you may have. If you would prefer to contact me, I will be delighted to speak with you.

Looking forward to speaking with you,

Yours faithfully,

_____

Eoin Plant, Postgraduate Researcher

Interview Questions

We are conducting a study on the future of the Irish road haulage industry and would appreciate your views. We would value your response to some questions about this. There are no right or wrong answers. Please tell us what you really think. All responses are treated with the strictest confidence.

Please take a few minutes to gather your thoughts about the following questions in relation to your road haulage business.

Section A: Background

1. How long have you been in the haulage business?

2. What sector(s) are you involved in? Regional/national/international?

3. Did you establish the business yourself? Owner-manager/year est./years exp?

4. Why did you get involved in this industry (start-up intention)?

5. Has the business changed since its establishment? How?

Section B: Change

6. What do you believe are the ***advantages*** of change in your road haulage business?

7. What do you believe are the ***disadvantages*** of change in your road haulage business?

8. Is there anything else you associate with your own views about change in your road haulage business?

9. Are there any individual or groups who would ***approve*** of your views on change in your road haulage business?

10. Are there any individual or groups who would ***disapprove*** of your views on change in your road haulage business?

11. Is there anything else you associate with other people's views about change in your road haulage business?

12. What factors or circumstances would enable you to implement change in your road haulage business?

13. What factors or circumstances would make it difficult or impossible for you to implement change in your road haulage business?

14. Are there any other issues that come to mind when you think about change in your road haulage business?

Section C: Growth *(increased activity or new activities)*

15. What do you believe are the ***advantages*** of growth in your road haulage business?

16. What do you believe are the ***disadvantages*** of growth in your road haulage business?

17. Is there anything else you associate with your own views about growth in your road haulage business?

18. Are there any individual or groups who would ***approve*** of your views on growth in your road haulage business?

19. Are there any individual or groups who would ***disapprove*** of your views on growth in your road haulage business?

20. Is there anything else you associate with other people's views about growth in your road haulage business?

21. What factors or circumstances would enable you to implement growth in your road haulage business?

22. What factors or circumstances would make it difficult or impossible for you to implement growth in your road haulage business?

23. Are there any other issues that come to mind when you think about growth in your road haulage business?

Section D: Withdrawal *(leaving the industry; sell, shut down etc)*

24. What do you believe are the ***advantages*** of withdrawing your road haulage business from the industry?

25. What do you believe are the ***disadvantages*** of withdrawing your road haulage business from the industry?

26. Is there anything else you associate with your own views about withdrawing your road haulage business from the industry?

27. Are there any individual or groups who would ***approve*** of your views on withdrawing your road haulage business from the industry?

28. Are there any individual or groups who would ***disapprove*** of your views on withdrawing your road haulage business from the industry?

29. Is there anything else you associate with other people's views about withdrawing your road haulage business from the industry?

30. What factors or circumstances would enable you to implement withdrawing your road haulage business from the industry?

31. What factors or circumstances would make it difficult or impossible for you to implement withdrawing your road haulage business from the industry?

32. Are there any other issues that come to mind when you think about withdrawing your road haulage business from the industry?

Section E: Development *(new business activities)*

33. What do you believe are the ***advantages*** of development in your road haulage business?

34. What do you believe are the ***disadvantages*** of development in your road haulage business?

35. Is there anything else you associate with your own views about development in your road haulage business?

36. Are there any individual or groups who would ***approve*** of your views on development in your road haulage business?

37. Are there any individual or groups who would ***disapprove*** of your views on development in your road haulage business?

38. Is there anything else you associate with other people's views about development in your road haulage business?

39. What factors or circumstances would enable you to implement development in your road haulage business?

40. What factors or circumstances would make it difficult or impossible for you to implement development in your road haulage business?

41. Are there any other issues that come to mind when you think about development in your road haulage business?

Section F: Collaboration *(co-operation with other hauliers)*

42. What do you believe are the ***advantages*** of collaboration in your road haulage business?

43. What do you believe are the ***disadvantages*** of collaboration in your road haulage business?

44. Is there anything else you associate with your own views about collaboration in your road haulage business?

45. Are there any individual or groups who would ***approve*** of your views on collaboration in your road haulage business?

46. Are there any individual or groups who would ***disapprove*** of your views on collaboration in your road haulage business?

47. Is there anything else you associate with other people's views about collaboration in your road haulage business?

48. What factors or circumstances would enable you to implement collaboration in your road haulage business?

49. What factors or circumstances would make it difficult or impossible for you to implement collaboration in your road haulage business?

50. Are there any other issues that come to mind when you think about collaboration in your road haulage business?

Section G: Consortiums *(formal third party business established with other logistic companies)*

51. What do you believe are the ***advantages*** of consortiums in your road haulage business?

---

52. What do you believe are the ***disadvantages*** of consortiums to your road haulage business?

---

53. Is there anything else you associate with your own views about consortiums to your road haulage business?

---

54. Are there any individual or groups who would ***approve*** of your views on consortiums in relation to your road haulage business?

---

55. Are there any individual or groups who would ***disapprove*** of your views on consortiums in relation to your road haulage business?

---

56. Is there anything else you associate with other people's views about consortiums in relation to your road haulage business?

---

57. What factors or circumstances would enable you to implement a consortium in relation to your road haulage business?

---

58. What factors or circumstances would make it difficult or impossible for you to implement consortiums in relation to your road haulage business?

---

59. Are there any other issues that come to mind when you think about consortiums in relation to your road haulage business?

Section H: Specific

60. What do you believe are the advantages (& disadvantages) of change with regard to:

	Advantages	*Disadvantages*
Workload:	_____	_____
Work tasks:	_____	_____
Emp. well-being:	_____	_____
Personal Income:	_____	_____
Control:	_____	_____
Independence:	_____	_____
Survival of crises:	_____	_____
Service/product quality:	_____	_____
Recognition from others:	_____	_____
Resources & opportunities:	_____	_____

61. What do you believe to be the reasons for change in other haulage businesses?

_____

Section I: Personal Details

62. Have you had any experience in the previous areas of change in the Irish road haulage industry? Any other industry? How did you evaluate the decision? (maybe didn't)

---

63. Have you any plans for change, withdrawal, growth, collaboration or consortiums in the next 5 years? If yes, level of planning?

---

64. What are the barriers to change in the Irish road haulage industry? Is there potential demand for growth and development?

---

65. Are you involved in any other business activities outside the Irish road haulage industry?

---

66. Number of vehicles, total tonnage, number of employees, highest level of education & age?

APPENDIX C: Attitudinal quantitative documents

Dept of Transport Engineering,
DIT, Bolton Street,
Dublin 1.

Tel. Direct: 01- 4022991
Email: Eoin.Plant@dit.ie

13th November 2007

«GreetingLine»

Research is currently being carried out at the Department of Transport Engineering at Dublin Institute of Technology in relation to the current challenges and their influence on future developments in the industry. A survey to collect data from Irish road haulage hire or reward operators is enclosed. You are one of a large number of hauliers who were randomly selected from several sources to receive the questionnaire. The road haulage sector will benefit from a greater understanding of current practice, barriers and attitudes to future developments. The research will undoubtedly be of enormous benefit to the industry.

It is also being supported by a number of prominent organisations, such as, the Chartered Institute of Logistics and Transport in Ireland (CILT), the Irish Road Haulage Association (IRHA) and the road haulage section of the Department of Transport.

Every operator's opinion is important, irrespective of their size or whether they provide value-adding services.

I can assure you that all information will be treated in the strictest confidence and your identity will remain anonymous. The information obtained will be aggregated for statistical tables and recommendations on policy development. Therefore, from the results produced, it will not be possible to identify responses from any particular operator.

I would gratefully appreciate if you would consider completing the attached questionnaire and return it in the enclosed FREEPOST envelope. The questionnaire should take approximately 10 minutes to complete. The accuracy of the results depends on the number of responses, no matter how large or small the operator. I would be very happy to answer any questions you may have and can be contacted at (01) 4022991.

Yours sincerely,

_____

Eoin Plant.
Doctoral Researcher, Dept. of Transport Engineering.

Attitudes to Collaborative Ventures

Confidential Survey

This survey, which is sponsored by Dublin Institute of Technology, will produce findings in relation to barriers and the attitudes of industry to forming collaborative ventures and networks in the Irish Road Haulage Industry.

I can assure you that all information will be treated in the strictest confidence and your identity will remain anonymous. The information obtained will be aggregated for statistical tables and recommendations on policy development. Therefore, from the results produced, it will not be possible to identify responses from any particular operator.

It is requested that for owner-managed operators the owner manager should complete the questionnaire and for non-owner-managed operators the general/senior manager should complete the questionnaire.

Please complete the following questions. If you wish to comment on any questions or qualify your answers there is space provided at the end of the questionnaire for this purpose. Please return the questionnaire in the FREEPOST envelope provided.

Many thanks,
Eoin Plant.

Department of Transport Engineering,
DIT,
Bolton Street,
FREEPOST F4460,
Dublin 1.

Section A: Background

A1 How many years is the firm established?
(Please write the number in the space provided) ____

A2 In what sector of the haulage industry is your principal operation?
(Please tick one box)

Container	□	*General Haulage*	□
Groupage	□	*Tipper/construction*	□
Livestock	□	*Refrigeration*	□
Heavy	□	*Bulk*	□
Liquid	□	*Hazardous*	□

Other (please state)

Is your work mostly?

Regional	□	*National*	□	*International*	□

A3 Is your principal base of operation from:
(Please tick one box)

Home?	□	*Business Premises?*	□

*Base county*_____

A4 Please indicate the % of your business that is contract and non-contract (spot hire).
(Please write relevant percentage in space provide)

Contract	____%	*Spot hire*	____%

A5 What per cent of average journey time is spent loading and unloading the vehicle?
(Please write relevant percentage in space provide) ____%

A6 Is your haulage operation involved in any level of collaboration?
(Please tick the relevant boxes)

Yes, within industry	□	*Yes, outside industry*	□	*No*	□

If yes, please tick the relevant types of collaboration.

Pallet Network	□	*Share trailers*	□
Cooperate with backhauling	□	*Consolidation*	□
Transhipment	□		

Other, please briefly explain

If yes, what percentage of your business activity is from these activities?

Within Industry	_____%	*Outside Industry*	_____%

(If yes, please mark X in the appropriate space on the scale, where it best describes your opinion)
Overall, performing collaborative activities has met my expectations
strongly disagree: |——ı——ı——|——|——ı——ı——| *strongly agree*

A7 Do you provide any value-adding services? If yes, please indicate what type of service(s) *(Please tick all relevant boxes)*

None	□	*Consolidation*	□
Customs clearance	□	*Sorting*	□
Warehousing	□		
Sequencing (products are arranged and distributed in a specific order)	□		
Commercialising (products are adjusted for deliver to end-user)	□		
Information Technology:			
RFID	□	*Barcode scanning*	□
Electronic invoice	□	*Web based real-time data*	□
EDI	□	*Other(s) (please state)*	

(If yes, please mark X in the appropriate space on the scale, where it best describes your opinion)
Overall, performing value-adding activities has met my expectations
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

Section B: Attitudes to Collaboration

Please answer each of the following questions by marking X in the appropriate space on the scale, where it best describes your opinion. Some of the questions may appear to be similar, but each address somewhat different issues. Please read each question carefully.

B1. For me, high profitability of the organisation is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B2. For me, providing high quality services to customers is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B3. For me, return from collaborative activities is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B4. For me, recognition as a top industry player is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B5. For me, new challenges are
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B6. For me, learning of new skills is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B7. For me, developing collaborative activities is
extremely difficult: |——ı——ı——|——|——ı——ı——| *extremely easy*

B8. Most people who are important to me think that
I should: |——ı——ı——|——|——ı——ı——| *I should not*
develop collaborative activities

B9. For me, collaborative activities are
extremely good: |——ı——ı——|——|——ı——ı——| *extremely bad*

B10. I plan to develop new collaborative activities within one year
extremely likely: |——ı——ı——|——|——ı——ı——| *extremely unlikely*

B11. Whether or not I perform collaborative activities is up to me
strongly disagree: |——ı——ı——|——|——ı——ı——| *strongly agree*

B12. Most of my competitors perform collaborative activities
definitely true: |——ı——ı——|——|——ı——ı——| *definitely false*

B13. For me, to perform collaborative activities is
very valuable: |——ı——ı——|——|——ı——ı——| *very worthless*

B14. I am confident that if I want I can perform collaborative activities
definitely true: |——ı——ı——|——|——ı——ı——| *definitely false*

B15. It is expected of me to perform collaborative activities
definitely true: |——ı——ı——|——|——ı——ı——| *definitely false*

B16. For me, to perform collaborative activities is
very pleasant: |——ı——ı——|——|——ı——ı——| *very unpleasant*

B17. I will make an effort to perform collaborative activities
definitely will: |——ı——ı——|——|——ı——ı——| *definitely will not*

B18. For me, to perform collaborative activities is
impossible: |——ı——ı——|——|——ı——ı——| *possible*

B19. Most people whose opinions I value would approve of performing collaborative activities
strongly disagree: |——ı——ı——|——|——ı——ı——| *strongly agree*

B20. For me, to perform collaborative activities is
interesting: |——ı——ı——|——|——ı——ı——| *boring*

B21. I intend to perform collaborative activities on a regular basis
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

B22. Generally speaking, how much do you care what your competition thinks you should do?
not at all: |——ı——ı——|——|——ı——ı——| *very much*

B23. Generally speaking, how much do you care what your customers think you should do?
not at all: |——ı——ı——|——|——ı——ı——| *very much*

B24. Generally speaking, how much do you care what your colleagues think you should do?
not at all: |——ı——ı——|——|——ı——ı——| *very much*

B25. For me, increasing the financial performance of the organisation is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B26. For me, obtaining larger contracts is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B27. For me, growing the organisation is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B28. For me, having a competitive firm is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B29. For me, self-satisfaction is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B30. For me, increased stress is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B31. For me, reducing my competitor's advantage is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B32. For me, taking risks is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B33. For me, protecting my personal life is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B34. For me, increasing my personal wealth is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B35. For me, increasing the firms competitive advantage is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B36. For me, tedious tasks are
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B37. For me, control over the firm is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

B38. For me, increasing the firm's resources is
extremely undesirable: |——ı——ı——|——|——ı——ı——| *extremely desirable*

Section C: Attitudes to Outcomes:

Thinking about the outcomes of performing collaborative activities, please answer each of the statements by marking X in the appropriate space, where it best describes your opinion.

C1. Performing collaborative activities will help the firm increase financial performance
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C2. Performing collaborative activities will help the firm to obtain larger contracts
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C3. Performing collaborative activities will cause me increased stress
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C4. Performing collaborative activities will help the firm to grow
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C5. Performing collaborative activities will help the firm to compete
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C6. Performing collaborative activities will help me to develop a feeling of self-satisfaction
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C7. Performing collaborative activities will help the firm to increase profitability
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C8. Performing collaborative activities will give me a good return on my efforts
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C9. Performing collaborative activities will help the firm reduce the advantages of its competitors
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C10. Performing collaborative activities is risky
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C11. Performing collaborative activities will cause me to miss out on personal activities
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C12. Performing collaborative activities will help me to improve my personal wealth
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C13. Performing collaborative activities will help the firm to increase its competitive advantage
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C14. Performing collaborative activities would be tedious and annoying
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C15. Performing collaborative activities would increase the firm's quality of services
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C16. Performing collaborative activities would increase my recognition, as a top industry player
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C17. Performing collaborative activities would require learning new skills
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C18. Performing collaborative activities would be a new challenge
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C19. Performing collaborative activities would cause me to lose control over the firm
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

C20. Performing collaborative activities would require additional resources
extremely unlikely: |——ı——ı——|——|——ı——ı——| *extremely likely*

Section D: Issues with Performance:

Thinking about issues that may obstruct you from performing collaborative activities, please answer each of the following questions by marking X in the appropriate space on the scale, where it best describes your opinion.

D1. How often do you encounter unanticipated events that place demands on your time?
very rarely: |——ı——ı——|——|——ı——ı——| *very frequently*

D2. How often do you feel unmotivated and/or tired?
very rarely: |——ı——ı——|——|——ı——ı——| *very frequently*

D3. How often do family obligations place unanticipated demands on your time?
very rarely: |——ı——ı——|——|——ı——ı——| *very frequently*

D4. How often does work or employment place unanticipated demands on your time?
very rarely: |——ı——ı——|——|——ı——ı——| *very frequently*

D5. In relation to work or employment, how often do you miss deadlines?
very rarely: |——ı——ı——|——|——ı——ı——| *very frequently*

D6. If I encountered unanticipated events that placed demands on my time, it would make it more difficult for me to perform collaborative activities.
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

D7. If I felt unmotivated it would be difficult for me to perform collaborative activities.
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

D8. If I had family obligations that placed unanticipated demands on my time, it would make it more difficult for me to perform collaborative activities.
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

D9. If work or employment placed unanticipated demands on my time, it would make it more difficult for me to perform collaborative activities.
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

D10. If I miss deadlines, it would make it more difficult for me to perform collaborative activities.
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

D11. My customers think I should perform collaborative activities.
extremely likely: |——ı——ı——|——|——ı——ı——| *extremely unlikely*

D12. Generally speaking, how much do you care what your family thinks you should do?
not at all: |——ı——ı——|——|——ı——ı——| *very much*

D13. My colleagues think I should perform collaborative activities.
extremely likely: |——ı——ı——|——|——ı——ı——| *extremely unlikely*

D14. My local business community thinks I should perform collaborative activities.
extremely likely: |——ı——ı——|——|——ı——ı——| *extremely unlikely*

D15. Other haulage operators think I should perform collaborative activities.
extremely likely: |——ı——ı——|——|——ı——ı——| *extremely unlikely*

D16. My family think I should perform collaborative activities.
extremely likely: |——ı——ı——|——|——ı——ı——| *extremely unlikely*

D17. My competition thinks I should perform collaborative activities.
extremely likely: |——ı——ı——|——|——ı——ı——| *extremely unlikely*

D18. I am motivated to perform collaborative activities.
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

D19. Generally speaking, how much do you care what your local business community thinks you should do?
not at all: |——ı——ı——|——|——ı——ı——| *very much*

D20. Generally speaking, how much do you care what other haulage operators' think you should do?
not at all: |——ı——ı——|——|——ı——ı——| *very much*

Section E: Firm Characteristics

E1. How many vehicles over 3.5 tonnes GVW do you have?
(Please write your answer in the space provided)
In your fleet ____ *Subcontracted* ____

E2. How many employees are there?
(Please write your answer in the space provided)
Drivers ____ *Management/Admin.* ____

E3. Please indicate the percentage breakdown of demand from the following categories of customers? *(Please write your answer in the space provided)*

Manufacturers	____	Retailers	____
Third-party Logistics	____	Other hauliers	____
Freight Forwarders	____	Im\export specialists	____

Other(s) (please state)

E4. Please rate the level of competition that you experience?
(Please mark X in the appropriate space on the scale, where it best describes your opinion)
highly competitive*:* |——ı——ı——|——|——ı——ı——| *uncompetitive*

E5. Current economic conditions are favourable with regard to performing collaborative activities. *(Please mark X on the scale where it best describes your opinion)*
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

E6. It is difficult to pass on haulage costs to customers.
(Please mark X in the appropriate space on the scale, where it best describes your opinion)
strongly agree: |——ı——ı——|——|——ı——ı——| *strongly disagree*

Please indicate why?
(Tick only <u>one</u> box, please)
Competition from unlicensed hauliers..... ☐
Other types of unfair competition..... ☐
Lack of bargaining power..... ☐
Unable to provide enhanced services..... ☐
High level of competition from licensed hauliers..... ☐
Other (please state)

E7. Have you ever considered closing the business?
(Please tick one box)
Yes ☐ *No* ☐

If yes, please indicate the principal reason why you decided not to close the firm?
(Tick only <u>one</u> box, please)
Outstanding hire purchase repayments..... ☐
Family tradition/pride ..... ☐
Loyalty to staff/community/customers ..... ☐
Forecast improved future conditions ..... ☐
Lack of alternative employment ..... ☐
Other (please state)

Section F: Demographic Information

F1. What is your position/job title?
(Please tick one box)

Owner-manager	☐	*General Manager*	☐
Accountant	☐	*Contract Manager*	☐

Other(s) (please state)

F2. What transport qualifications, if any, do you have?
(Please tick the appropriate box(s))

None..... ☐
C.P.C..... ☐
Diploma in transport related area ..... ☐
Advanced diploma in transport ..... ☐
Degree in transport related area..... ☐

F3. What is the highest level of general education that you have attained?
(Please tick the appropriate box)

None	☐	*Primary School*	☐
Junior/Inter Cert.	☐	*Leaving Cert.*	☐
Cert (higher ed.)	☐	*Diploma (higher ed*.)	☐
Bachelor	☐	*Prof. qual = degree*	☐
Postgraduate	☐		

F4. How many years experience do you have in transport?
(Please write the number in the space provided) ____

F5. How many of these are in the road haulage industry?
(Please write the number in the space provided) ____

F6. Are you involved in any other business activity?
Yes ☐ *No* ☐
If yes, please expand?

F7. What is your age?
(Please write the number in the space provided) ____

Section G: Additional Comments

If you would like to make any additional comments please write them in this section. If you are referring to a particular question, please write the question number beside your comment.

Your contribution to this survey is very greatly appreciated. Please return your questionnaire in the reply paid envelope provided. If the envelope has been mislaid please forward to:

Eoin Plant,
Department of Transport Engineering,
DIT,
Bolton Street,
FREEPOST F4460,
Dublin 1.

Dept of Transport Engineering,
DIT, Bolton Street,
Dublin 1.

Tel. Direct: 01- 4022991.
Email: Eoin.Plant@dit.ie

27th November 2007.

«GreetingLine»

I recently sent you a questionnaire in relation to the Irish Road Haulage Industry and the industry's attitude to collaboration. If you have completed and returned the questionnaire, I would like to take this opportunity to thank you for your time and effort. Your input is greatly appreciated.

However, as the questionnaire is confidential and anonymous, I have no record of the firms that have responded. If you have not responded to the questionnaire I would like to urge you to please complete the questionnaire as soon as possible and return it in the FREEPOST envelope that was provided.

Every operator's opinion is important, from single vehicle operators to large logistics players.

I can assure you that all information will be treated in the strictest confidence and your identity will remain anonymous. The information obtained will be aggregated for statistical tables and recommendations on policy development. Therefore, from the results produced, it will not be possible to identify responses from any particular operator.

If you have mislaid the survey, a copy is available from the following Internet address http://www.dit.ie/DIT/engineering/mechtransport/sd-questionnaire-r15.pdf .

When you have completed the questionnaire, please return it to the following address (no stamp required).

Eoin Plant
Dept. of Transport Engineering
DIT, Bolton Street
Freepost F4460
Dublin 1

If you have any questions please do not hesitate to contact me by phone or email.

Yours sincerely,

Eoin Plant.
Doctoral Researcher, Dept. of Transport Engineering.

APPENDIX D: Variable values and statistical data

Table D.1 Questionnaire response descriptions

Q's No.	Factor	Response Format	Reverse Scoring	Internal Consist.	Multi-plication	Construct Measured
A1	Length	Num				Exogenous
A2	Sector	Cat				Exogenous
A3	Base	Dichot				Exogenous
A3B	County	Cat				Exogenous
A4	Contract	Num				Exogenous
A5	Distribute	Num				Exogenous
A6	Collab	Cat				Past Behaviour
A6B	Type Collab	Cat				Past Behaviour
A6C	Collab Proportion	Num				Past Behaviour
A6D	Collab Expect	1 to 7				Past Behaviour
A7	Value	Cat				Past Behaviour
A7B	Value Expect	1 to 7	Reverse			Past Behaviour
B1	Profit	-3 to +3			Yes C7	Outcome evaluations
B2	Quality Services	-3 to +3			Yes C15	Outcome evaluation
B3	Return	-3 to +3			Yes C8	Outcome evaluation
B4	Recognition	-3 to +3			Yes C16	Outcome evaluation
B5	New challenges	-3 to +3			Yes C18	Outcome evaluation
B6	Learning skills	-3 to +3			Yes C17	Outcome
B7	Collab activities	1 to 7		Yes		PBC direct
B8	People important	1 to 7	Reverse	Yes		Social direct
B9	Collab activities	1 to 7	Reverse	Yes		Attitude direct
B10	Collab develop	1 to 7	Reverse			Intention direct
B11	Up to me	1 to 7		Yes		Social direct
B12	Compet perform	1 to 7	Reverse	Yes		Normative Belief
B13	Collab develop	1 to 7	Reverse	Yes		Attitude direct
B14	Perform collab	1 to 7	Reverse	Yes		PBC direct
B15	Expected to perform	1 to 7	Reverse	Yes		Social direct
B16	Collab pleasant	1 to 7	Reverse	Yes		Attitude direct

Q's No.	Factor	Response Format	Reverse Scoring	Internal Consist.	Multi-plication	Construct Measured
B17	Collab effort	1 to 7	Reverse			Intention Direct
B18	Perform possible	1 to 7		Yes		PBC Direct
B19	People approve	1 to 7		Yes		Social direct
B20	Collab boring	1 to 7	Reverse	Yes		Attitude direct
B21	Collab intend	1 to 7	Reverse			Intention
B22	Care compete	1 to 7			Yes D17	Motivation to comply
B23	Care customers	1 to 7			Yes D11	Motivation to comply
B24	Care colleagues	1 to 7			Yes D13	Motivation to comply
B25	Financial perform	-3 to +3			Yes C1	Outcome evaluation
B26	Larger Contracts	-3 to +3			Yes C2	Outcome evaluation
B27	Growth	-3 to +3			Yes C4	Outcome evaluation
B28	Compet Firm	-3 to +3			Yes C5	Outcome evaluation
B29	Self satisfact	-3 to +3			Yes C6	Outcome evaluation
B30	Increase Stress	-3 to +3			Yes C3	Outcome evaluation
B31	compete comp adv	-3 to +3			Yes C9	Outcome evaluation
B32	Risks	-3 to +3			Yes C10	Outcome evaluation
B33	Protect Personal	-3 to +3			C11	Outcome evaluation
B34	Personal wealth	-3 to +3			C12	Outcome evaluation
B35	My comp Advantage	-3 to +3			C13	Outcome evaluation
B36	Tedious	-3 to +3			C14	Outcome evaluation
B37	control	-3 to +3			C19	Outcome evaluation
B38	Resources	-3 to + 3			C20	Outcome eval
C1	Financial perform	1 to 7			Yes B25	Behavioural beliefs
C2	Larger contracts	1 to 7			YesB26	Behavioural beliefs
C3	Increased stress	1 to 7			Yes B30	Behavioural beliefs
C4	Grow firm	1 to 7			Yes B27	Behavioural beliefs
C5	Help compete	1 to 7			Yes B28	Behavioural beliefs
C6	self satisfact	1 to 7			Yes B29	Behavioural beliefs
C7	Increase profit	1 to 7			Yes B1	Behavioural beliefs
C8	Return effort	1 to 7			Yes B3	Behavioural beliefs
C9	Reduce compet ad	1 to 7			Yes B31	Behavioural beliefs

Q's No.	Factor	Response Format	Reverse Scoring	Internal Consist.	Multi-plication	Construct Measured
C10	Risky	1 to 7			Yes B32	Behavioural beliefs
C11	Miss personal	1 to 7			Yes B33	Behavioural beliefs
C12	Personal wealth	1 to 7			Yes B34	Behavioural beliefs
C13	Increase comp adv	1 to 7			Yes B35	Behavioural beliefs
C14	Tedious annoying	1 to 7			Yes B36	Behavioural beliefs
C15	Service quality	1 to 7			Yes B2	Behavioural beliefs
C16	Increase recog	1 to 7			Yes B4	Behavioural beliefs
C17	Learn skills	1 to 7			Yes B6	Behavioural beliefs
C18	New challenge	1 to 7			Yes B5	Behavioural beliefs
C19	Lose control	1 to 7			Yes B37	Behavioural beliefs
C20	Additional resources	1 to 7			Yes B38	Behavioural beliefs
D1	Unanticipated event	1 to 7			Yes D6	Control belief strength
D2	Unmotivated	1 to 7			Yes D7	Control belief strength
D3	Family obligation	1 to 7			Yes D8	Control belief strength
D4	Employment	1 to 7			Yes D9	Control belief strength
D5	Work deadlines	1 to 7			Yes D10	Control belief strength
D6	Unanticipated event	1 to 7 -3 to +3			Yes D1	Ctrl belief power
D7	Unmotivated	1 to 7 -3 to +3			Yes D2	Ctrl belief power
D8	Family obligation	1 to 7 -3 to +3			Yes D3	Ctrl belief power
D9	Employment	1 to 7 -3 to +3			Yes D4	Ctrl belief power
D10	Work deadlines	1 to 7 -3 to +3			Yes D5	Ctrl belief power
D11	Customers think	1 to 7 +3 to -3	Reverse		Yes B23	Normative belief
D12	Care family	1 to 7			Yes D16	Motivation to comply
D13	Colleague think	1 to 7 +3 to -3	Reverse		Yes B24	Normative belief
D14	business commun	1 to 7 +3 to -3	Reverse		Yes D19	Normative belief
D15	Other operators	1 to 7 +3 to -3	Reverse		Yes D20	Normative belief
D16	Family	1 to 7 +3 to -3	Reverse		Yes D12	Normative belief
D17	Compete	1 to 7 +3 to -3	Reverse		Yes B22	Normative belief

Q's No.	Factor	Response Format	Reverse Scoring	Internal Consist.	Multi-plication	Construct Measured
D18	Motivated to perform	1 to 7	Reverse			Intention
D19	Care local business	1 to 7			Yes D14	Motivation to comply
D20	Other operators	1 to 7			Yes D15	Motivation to comply
E1A	own vehicles	Numerical				Exogenous
E1B	Sub vehicles	Numerical				Exogenous
E2A	drivers	Numerical				Exogenous
E2B	Admin	Numerical				Exogenous
E3	Customers	Cat				Exogenous
E4	Compete level	1 to 7	Reverse			Exogenous
E5	Economic conditions	1 to 7	Reverse			Exogenous
E6	Haulage costs	1 to 7	Reverse			Exogenous
E6B	Costs reason	Cat				Exogenous
E7A	Close Business	Dicht				Exogenous
E7B	Not close reason	Cat				Exogenous
F1	Position	Cat				Exogenous
F2	Transport Qual	Cat				Exogenous
F3	General Educ	Cat				Exogenous
F4	Years Exp	Numerical				Exogenous
F5	Road Years	Numerical				Exogenous
F6	Other business	Dicht				Exogenous
F7	Type business	Cat				Exogenous
F7	Age	Numerical				Exogenous
G	Additional Comments	Cat				Exogenous

APPENDIX E: Primary instrument univariate statistics

Table E.1 Questionnaire (phase 2) response univariate statistics

	N	Mean	Std. Deviation	Missing		No. of Extremes(a,b)	
	Count	Percent	Low	High	Count	Percent	Low
Years	148	15.44	13.807	43	22.5	0	9
Contract	184	75.29	35.848	7	3.7	20	0
Spot	184	24.71	35.848	7	3.7	0	20
Dist	181	24.89	17.898	10	5.2	0	6
Within	60	50.47	39.330	131	68.6	0	0
Outside	28	10.29	16.584	163	85.3	0	1
Perform	52	4.62	1.751	139	72.8	0	0
V-expec	42	4.55	1.533	149	78.0	3	0
B1	190	1.94	1.426	1	.5	7	0
B2	188	2.48	1.106	3	1.6	12	0
B3	167	.86	1.830	24	12.6	0	0
B4	186	1.20	1.877	5	2.6	0	0
B5	189	1.45	1.658	2	1.0	0	0
B6	189	1.70	1.584	2	1.0	11	0
B7	180	3.96	1.873	11	5.8	0	0
B8	181	3.77	1.850	10	5.2	0	0
B9	178	4.35	1.668	13	6.8	13	0
B10	184	2.95	1.865	7	3.7	0	0
B11	185	5.12	1.833	6	3.1	0	0
B12	184	3.37	1.892	7	3.7	0	0
B13	183	4.09	1.848	8	4.2	0	0
B14	183	4.41	2.014	8	4.2	0	0
B15	182	3.29	1.957	9	4.7	0	0
B16	181	4.17	1.658	10	5.2	0	0
B17	184	4.07	1.915	7	3.7	0	0
B18	185	4.71	1.874	6	3.1	16	0
B19	183	4.43	1.708	8	4.2	18	0
B20	182	4.48	1.694	9	4.7	15	0
B21	184	3.57	1.898	7	3.7	0	0
B22	183	3.11	2.043	8	4.2	0	0
B23	185	5.63	1.746	6	3.1	13	0
B24	186	4.52	2.025	5	2.6	0	0
B25	187	2.13	1.342	4	2.1	22	0
B26	186	1.44	1.822	5	2.6	0	0
B27	188	1.39	1.787	3	1.6	0	0
B28	188	2.02	1.378	3	1.6	6	0
B29	187	2.37	1.111	4	2.1	14	0
B30	188	-2.04	1.486	3	1.6	0	7
B31	187	1.09	1.854	4	2.1	0	0
B32	187	-.54	1.832	4	2.1	0	0
B33	188	2.32	1.150	3	1.6	18	0
B34	188	1.81	1.284	3	1.6	2	0
B35	187	2.02	1.303	4	2.1	4	0
B36	187	-.94	1.638	4	2.1	0	9
B37	188	2.02	1.352	3	1.6	4	0

	N	Mean	Std. Deviation	Missing		No. of Extremes(a,b)	
	Count	Percent	Low	High	Count	Percent	Low
B38	189	1.92	1.336	2	1.0	5	0
C1	189	4.63	1.756	2	1.0	16	0
C2	189	4.49	1.892	2	1.0	24	0
C3	186	4.77	1.875	5	2.6	17	0
C4	188	4.76	1.804	3	1.6	19	0
C5	189	4.76	1.770	2	1.0	18	0
C6	189	4.33	1.824	2	1.0	0	0
C7	187	4.83	1.793	4	2.1	17	0
C8	187	4.59	1.777	4	2.1	18	0
C9	188	4.32	1.793	3	1.6	0	0
C10	188	4.25	1.711	3	1.6	0	0
C11	187	4.35	1.870	4	2.1	0	0
C12	186	4.32	1.738	5	2.6	32	19
C13	188	4.48	1.685	3	1.6	28	23
C14	187	4.05	1.727	4	2.1	0	0
C15	188	4.52	1.775	3	1.6	17	0
C16	188	4.13	1.837	3	1.6	0	0
C17	188	4.76	1.783	3	1.6	19	0
C18	187	4.84	1.821	4	2.1	20	0
C19	188	3.27	1.897	3	1.6	0	0
C20	187	4.98	1.829	4	2.1	0	0
D1	190	4.98	1.750	1	.5	11	0
D2	191	4.04	1.901	0	.0	0	0
D3	189	3.69	1.793	2	1.0	0	0
D4	190	4.76	1.917	1	.5	20	0
D5	190	1.98	1.397	1	.5	0	4
D6	188	-.77	1.815	3	1.6	0	16
D7	189	-.96	1.762	2	1.0	0	14
D8	188	-1.01	1.732	3	1.6	0	11
D9	190	-.73	1.717	1	.5	0	13
D10	189	-1.00	1.891	2	1.0	0	0
D11	189	-.79	1.939	2	1.0	0	0
D12	189	5.85	1.510	2	1.0	8	0
D13	188	-.63	1.878	3	1.6	0	0
D14	187	-1.01	1.923	4	2.1	0	0
D15	187	-1.12	1.798	4	2.1	0	0
D16	187	-.77	2.007	4	2.1	0	0
D17	187	-1.34	1.710	4	2.1	0	0
D18	188	3.97	1.976	3	1.6	0	0
D19	187	3.81	2.181	4	2.1	0	0
D20	186	2.63	1.806	5	2.6	0	0
E1	186	4.30	5.811	5	2.6	0	18
E1B	185	.84	4.221	6	3.1	.	.
E2A	184	4.88	8.131	7	3.7	0	25
E2B	183	1.28	1.744	8	4.2	0	11
E3A	136	34.75	40.558	55	28.8	0	0
E3B	134	9.82	24.380	57	29.8	.	.
E3C	134	6.21	18.946	57	29.8	.	.
E3D	134	8.00	20.256	57	29.8	0	33
E3E	134	12.67	28.209	57	29.8	0	20

	N	Mean	Std. Deviation	Missing		No. of Extremes(a,b)	
	Count	Percent	Low	High	Count	Percent	Low
E3F	134	9.29	25.512	57	29.8	.	.
E3G	137	18.61	36.267	54	28.3	.	.
E4	187	5.46	1.806	4	2.1	20	0
E5	184	3.74	1.869	7	3.7	0	0
E6A	186	6.05	1.526	5	2.6	24	0
F4	186	21.32	9.745	5	2.6	0	0
F5	186	18.88	9.622	5	2.6	0	0
F7	183	46.48	10.852	8	4.2	0	0
Sector	183			8	4.2		
Region	188			3	1.6		
Base	187			4	2.1		
County	94			97	50.8		
Collabor	185			6	3.1		
Pallet	188			3	1.6		
Trailer	188			3	1.6		
Back	188			3	1.6		
Consol	188			3	1.6		
Transhipp	188			3	1.6		
Other	187			4	2.1		
Valuenol	187			4	2.1		
Vconsol	187			4	2.1		
Vcustoms	187			4	2.1		
Vsorting	187			4	2.1		
Vware	187			4	2.1		
Vseq	187			4	2.1		
Vcommer	187			4	2.1		
Vrfid	187			4	2.1		
Vbarcode	187			4	2.1		
Velectr	187			4	2.1		
Vweb	187			4	2.1		
Vedi	187			4	2.1		
Vother	187			4	2.1		
FirstSe	191			0	.0		
E6B	166			25	13.1		
E7	185			6	3.1		
E7B	91			100	52.4		
F1	185			6	3.1		
F2	187			4	2.1		
F3	188			3	1.6		
F6	188			3	1.6		

a Number of cases outside the range (Q1 - 1.5×IQR, Q3 + 1.5×IQR).
b indicates that the inter-quartile range (IQR) is zero.

Table E.2 Cases deleted with high missing values

(above 47%)

11.11 Case Number	11.12 Percent Missing
25	47.4
39	69.4
40	51.4
46	71.7
47	73.4
52	69.4
53	74.6
58	76.9
60	48.6
69	68.2
70	60.7
84	68.8
91	60.1
104	56.6
107	68.2
108	53.2
124	72.8
136	50.3
137	68.2
145	68.2
152	68.8
162	53.2
169	74.6
175	67.6
178	53.2
182	68.2
199	54.9
202	63.0

Table E.3 Crosstab comparing deleted and non-deleted respondents' operating region

			Operating Region			Total
			Regional	National	International	Regional
Deleted 28	no	Count	84	82	22	188
		% within Deleted 28	44.7%	43.6%	11.7%	100.0%
		% within Operating Region	82.4%	89.1%	100.0%	87.0%
		% of Total	38.9%	38.0%	10.2%	87.0%
	yes	Count	18	10	0	28
		% within Deleted 28	64.3%	35.7%	.0%	100.0%
		% within Operating Region	17.6%	10.9%	.0%	13.0%
		% of Total	8.3%	4.6%	.0%	13.0%
Total		Count	102	92	22	216
		% within Deleted 28	47.2%	42.6%	10.2%	100.0%
		% within Operating Region	100.0%	100.0%	100.0%	100.0%
		% of Total	47.2%	42.6%	10.2%	100.0%

Table E.4 Crosstab comparing deleted and non-deleted respondents' collaboration

			Level of Collaboration			Total
			Yes, within industry	Yes, outside industry	None	Yes, within industry
Deleted 28	no	Count	48	2	135	185
		% within Deleted 28	25.9%	1.1%	73.0%	100.0%
		% within Level of Collaboration	98.0%	100.0%	83.3%	86.9%
		% of Total	22.5%	.9%	63.4%	86.9%
	yes	Count	1	0	27	28
		% within Deleted 28	3.6%	.0%	96.4%	100.0%
		% within Level of Collaboration	2.0%	.0%	16.7%	13.1%
		% of Total	.5%	.0%	12.7%	13.1%
Total		Count	49	2	162	213
		% within Deleted 28	23.0%	.9%	76.1%	100.0%
		% within Level of Collaboration	100.0%	100.0%	100.0%	100.0%
		% of Total	23.0%	.9%	76.1%	100.0%

Table E.5 Kurtosis and skewness after regression replacement

	N	Mean	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Years Established	168	16.08	2.348	.187	8.928	.373
Contract activity	212	76.20	-1.299	.167	.073	.333
Spot Activity	212	23.80	1.299	.167	.073	.333
Loading-unloading	208	25.20	1.179	.169	1.667	.336
% of Business Activity from collaboration within industry	63	50.13	.102	.302	-1.702	.595
% of Business Activity from Collaboration with outside	30	11.93	2.008	.427	3.708	.833
Performing Collaborative activities met expectations	53	4.66	-.287	.327	-.732	.644
Performing value-adding has met expectations	43	4.56	-.696	.361	.378	.709
High profitability	203	1.96	-1.497	.171	1.922	.340
High quality services	202	2.44	-2.965	.171	9.471	.341
Outcome of efforts	170	.90	-.542	.186	-.557	.370
Recognition as a top industry player	196	1.19	-.852	.174	-.277	.346
New challenges	199	1.48	-1.056	.172	.402	.343
Learning new skills	199	1.72	-1.308	.172	1.140	.343
Developing collaborative activities	185	3.99	-.011	.179	-.907	.355
People important to me think	188	3.70	.211	.177	-.767	.353
Collaborative activities are	183	4.27	-.133	.180	-.537	.357
I plan to develop new collaborative in one year	188	2.91	.557	.177	-.754	.353
To perform is up to me	190	5.12	-.652	.176	-.608	.351
Competitors perform	188	3.36	.286	.177	-.921	.353
To perform collaborative activities is valuable	186	4.05	-.182	.178	-.872	.355
Confident I can perform collaborative activities	185	4.40	-.204	.179	-1.178	.355
It is expected of me to perform collaborative activities	185	3.25	.332	.179	-1.081	.355
To perform collaborative activities is unpleasant	184	4.11	-.147	.179	-.408	.356
I will make an effort to perform collaborative activities	187	4.04	-.079	.178	-.966	.354
To perform collaborative activities is possible	189	4.72	-.483	.177	-.739	.352
People's opinions I value would approve	183	4.43	-.331	.180	-.314	.357
To perform collaborative activities is interesting	183	4.46	-.293	.180	-.459	.357

	N	Mean	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
I intend to perform on a regular basis	184	3.57	.191	.179	-.970	.356
Care about what competition thinks	187	3.10	.546	.178	-.923	.354
Care about what customers think	188	5.63	-1.265	.177	.770	.353
Care about what Colleagues think	189	4.50	-.450	.177	-.962	.352
Increasing the financial performance of the org	193	2.15	-1.870	.175	3.512	.348
Obtaining larger contracts	192	1.40	-1.030	.175	.052	.349
Growing the organisation	194	1.35	-.950	.175	-.044	.347
Having a competitive firm	194	2.01	-1.617	.175	2.307	.347
Self-satisfaction	194	2.39	-2.341	.175	6.540	.347
Stress	195	-2.02	1.741	.174	2.629	.346
Reducing my competitors advantage	192	1.09	-.667	.175	-.531	.349
Taking risks	194	-.56	.213	.175	-.925	.347
Protecting my personal life	195	2.34	-2.069	.174	4.742	.346
Increasing my personal wealth	195	1.82	-.823	.174	.002	.346
Increasing the firm's competitive advantage	192	2.02	-1.462	.175	1.915	.349
Tedious tasks	193	-.95	.461	.175	-.376	.348
Control over the firm	194	2.05	-1.665	.175	2.788	.347
Increasing the firm's resources	195	1.92	-1.407	.174	1.883	.346
Outcome, increases financial performance	189	4.63	-.441	.177	-.420	.352
Outcome, help obtain larger contracts	189	4.49	-.490	.177	-.706	.352
Outcome, increased stress	186	4.77	-.578	.178	-.638	.355
Outcome, grow the firm	188	4.76	-.705	.177	-.286	.353
Outcome, help the firm compete	189	4.76	-.696	.177	-.252	.352
Outcome, develop a feeling of self-satisfaction	189	4.33	-.353	.177	-.653	.352
Outcome, increase firm profitability	187	4.83	-.710	.178	-.286	.354
Outcome, good outcome for my efforts	187	4.59	-.525	.178	-.466	.354
Outcome, reduce advantage of competitors	188	4.32	-.273	.177	-.719	.353
Outcome, is risky	188	4.25	-.344	.177	-.403	.353
Outcome, miss personal activities	187	4.35	-.337	.178	-.752	.354
Outcome, improve personal wealth	186	4.32	-.501	.178	-.421	.355
Outcome, firm increase competitive advantage	188	4.48	-.569	.177	-.212	.353

	N	Mean	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Outcome, tedious and annoying	187	4.05	-.107	.178	-.604	.354
Outcome, increase quality of services	188	4.52	-.441	.177	-.602	.353
Outcome, increase respondents recognition	188	4.13	-.279	.177	-.893	.353
Outcome, require learning new skills	188	4.76	-.700	.177	-.188	.353
Outcome, a new challenge	187	4.84	-.751	.178	-.179	.354
Outcome, cause loss of control	188	3.27	.344	.177	-1.027	.353
Outcome, additional resources	187	4.98	-.768	.178	-.215	.354
Control, unanticipated events demand on time	199	4.95	-.705	.172	-.399	.343
Control, feel unmotivated/tires	201	4.00	-.050	.172	-1.180	.341
Control, family obligations	198	3.63	.110	.173	-1.014	.344
Control, work/employment demands	199	4.74	-.652	.172	-.706	.343
Control, often miss deadlines	200	1.98	1.522	.172	1.693	.342
Control, more difficult with unanticipated events	194	-.76	.591	.175	-.571	.347
Control, unmotivated, more difficult	194	-.95	.747	.175	-.277	.347
Control, family obligations, more difficult	193	-.99	.683	.175	-.317	.348
Control, work/employment unanticipated, more difficult	196	-.74	.509	.174	-.473	.346
Control, miss deadlines, more difficult	195	-.98	.716	.174	-.503	.346
Normative, Customers think I should	194	-.79	.453	.175	-.859	.347
Motivation, care what family thinks	198	5.81	-1.410	.173	1.424	.344
Normative, my colleagues think I should	194	-.63	.263	.175	-.873	.347
Normative, local business community thinks I should	192	-.97	.506	.175	-.831	.349
Normative, other haulage operators think I should	192	-1.08	.529	.175	-.776	.349
Normative, my family thinks I should	192	-.74	.363	.175	-1.096	.349
Normative, my competition thinks I should	192	-1.30	.662	.175	-.544	.349
Intention, I am motivated to perform	193	3.97	-.063	.175	-1.098	.348

	N	Mean	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Motivation, care about what local business thinks	201	3.79	.066	.172	-1.383	.341
Motivation, Care about other haulage operators	200	2.65	.861	.172	-.289	.342
Vehicles in fleet	211	4.11	3.072	.167	11.805	.333
Vehicles subcontracted	210	.85	9.524	.168	108.679	.334
Number of driver	208	4.61	3.887	.169	19.323	.336
Number of administrators/mngt	207	1.23	2.152	.169	5.766	.337
Percentage demand from customer; manufacturers	149	34.33	.614	.199	-1.371	.395
Percentage demand from customer; retailers	147	10.38	2.825	.200	6.874	.397
Percentage demand from customer; 3pls	147	5.66	3.936	.200	15.995	.397
Percentage demand from customer; other hauliers	147	8.66	3.143	.200	9.426	.397
Percentage demand from customer; freight forwarders	147	11.55	2.552	.200	5.296	.397
Percentage demand from customer; im/export specialists	147	8.47	3.154	.200	8.746	.397
Percentage demand from customer; other	150	20.33	1.471	.198	.312	.394
Level of competition	209	5.45	-1.169	.168	.292	.335
Current economic conditions	191	3.66	.065	.176	-.984	.350
Difficulty passing on haulage costs	204	6.02	-1.931	.170	3.247	.339
Years experience in transport	214	21.71	.540	.166	-.415	.331
Years experience in road haulage	211	19.14	.622	.167	-.187	.333
Age	209	47.15	.220	.168	-.755	.335
Valid N (listwise)	6					

APPENDIX F: Reliability of indicators

Attitude Construct with Four Reflective Indicators:

Table F.1 Reliability statistics for latent attitude's four reflective indicators

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.804	.803	4

Table F.2 Item-total statistics for attitude's four reflective indicators

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Collaborative activities are good/bad	12.77	19.831	.462	.221	.825
To perform collaborative activities is valuable	12.99	15.710	.706	.519	.710
To perform collaborative activities is pleasant	12.91	16.945	.702	.523	.715
To perform collaborative activities is interesting	12.58	17.656	.619	.415	.755

Table F.3 Factor matrix for attitude's four reflective indicators

(a)	Factor 1
To perform collaborative activities is valuable	.823
To perform collaborative activities is unpleasant	.821
To perform collaborative activities is interesting	.707
Collaborative activities are good/bad	.507

Extraction Method: Principal Axis Factoring.
a 1 factors extracted. 7 iterations required.

Table F.4 Correlations of TBP mean direct measures

		Mean Direct Intention	Mean Direct Attitude	Mean Direct Subjective Norm	Mean Direct PBC
Pearson Correlation	Mean Direct Intention	1.000	.742	.781	.575
	Mean Direct Attitude	.742	1.000	.711	.553
	Mean Direct Subjective Norm	.781	.711	1.000	.517
	Mean Direct PBC	.575	.553	.517	1.000
Sig. (1-tailed)	Mean Direct Intention	.	.000	.000	.000
	Mean Direct Attitude	.000	.	.000	.000
	Mean Direct Subjective Norm	.000	.000	.	.000
	Mean Direct PBC	.000	.000	.000	.
N	Mean Direct Intention	191	191	191	191
	Mean Direct Attitude	191	191	191	191
	Mean Direct Subjective Norm	191	191	191	191
	Mean Direct PBC	191	191	191	191

Table F.5 Multiple regression model summary: TBP mean direct measures

(b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.834(a)	.696	.691	.84672	.696	142.664	3	187	.000	2.032

a Predictors: (Constant), Mean Direct PBC, Mean Direct Subjective Norm, Mean Direct Attitude
b Dependent Variable: Mean Direct Intention

Table F.6 Beta coefficients: TBP mean direct measures

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations		
(a)	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
(Constant)	-.858	.226		-3.798	.000	-1.303	-.412			
Mean Direct Attitude	.361	.068	.321	5.322	.000	.227	.495	.742	.363	.215
Mean Direct Subjective Norm	.583	.072	.474	8.084	.000	.441	.725	.781	.509	.326
Mean Direct PBC	.154	.050	.153	3.086	.002	.056	.252	.575	.220	.124

a Dependent Variable: Mean Direct Intention

Table F.7 Correlations of formative indicators to mean direct attitude

		Mean Direct Attitude	Financial Performance	Growth	Personal Wealth	Competitive Advantage	Resources
Pearson Correlat-ion	Mean Direct Attitude	1.000	.447	.368	.364	.382	.050
	Financial Performance	.447	1.000	.504	.550	.506	.354
	Growth	.368	.504	1.000	.389	.494	.372
	Personal Wealth	.364	.550	.389	1.000	.492	.352
	Competitive Advantage	.382	.506	.494	.492	1.000	.410
	Resources	.050	.354	.372	.352	.410	1.000
Sig. (1-tailed)	Mean Direct Attitude	.	.000	.000	.000	.000	.248
	Financial Performance	.000	.	.000	.000	.000	.000
	Growth	.000	.000	.	.000	.000	.000
	Personal Wealth	.000	.000	.000	.	.000	.000
	Competitive Advantage	.000	.000	.000	.000	.	.000
	Resources	.248	.000	.000	.000	.000	.
N	Mean Direct Attitude	191	191	191	191	191	191
	Financial Performance	191	191	191	191	191	191
	Growth	191	191	191	191	191	191
	Personal Wealth	191	191	191	191	191	191
	Competitive Advantage	191	191	191	191	191	191
	Resources	191	191	191	191	191	191

Table F.8 Multiple regression model summary: formative indicators of mean direct attitude

(b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.544(a)	.296	.277	1.15038	.296	15.523	5	185	.000	1.997

a Predictors: (Constant), Resources, Personal Wealth, Growth, Competitive Advantage, Financial Performance
b Dependent Variable: Mean Direct Attitude

Table F.9 Beta coefficients for formative indicators of mean direct attitude

(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	3.427	.159		21.526	.000					
	Financial Performance	.048	.014	.273	3.338	.001	.447	.238	.206	.569	1.759
	Growth	.025	.011	.172	2.246	.026	.368	.163	.139	.650	1.539
	Personal Wealth	.028	.016	.138	1.764	.079	.364	.129	.109	.624	1.602
	Competitive Advantage	.035	.015	.188	2.355	.020	.382	.171	.145	.598	1.672
	Resources	-.039	.012	-.237	-3.368	.001	.050	-.240	-.208	.771	1.297

a Dependent Variable: Mean Direct Attitude

APPENDIX G: Confirmatory factor analysis statistics

Table G.1 Attitude refined CFA MIMIC model fit statistics

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Refined Attitude CFA MIMIC Model	37	24.492	29	.704	.845
Model Number 2	37	24.492	29	.704	.845
Saturated model	66	.000	0		
Independence model	11	676.028	55	.000	12.291

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Refined Attitude CFA MIMIC Model	1.015	.977	.948	.429
Model Number 2	1.015	.977	.948	.429
Saturated model	.000	1.000		
Independence model	12.061	.491	.390	.410

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Refined Attitude CFA MIMIC Model	.964	.931	1.007	1.014	1.000
Model Number 2	.964	.931	1.007	1.014	1.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Refined Attitude CFA MIMIC Model	.527	.508	.527
Model Number 2	.527	.508	.527
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Refined Attitude CFA MIMIC Model	.000	.000	10.430
Model Number 2	.000	.000	10.430
Saturated model	.000	.000	.000
Independence model	621.028	540.935	708.564

FMIN

Model	FMIN	F0	LO 90	HI 90
Refined Attitude CFA MIMIC Model	.129	.000	.000	.055
Model Number 2	.129	.000	.000	.055
Saturated model	.000	.000	.000	.000
Independence model	3.558	3.269	2.847	3.729

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Refined Attitude CFA MIMIC Model	.000	.000	.044	.974
Model Number 2	.000	.000	.044	.974
Independence model	.244	.228	.260	.000

AIC

Model	AIC	BCC	BIC	CAIC
Refined Attitude CFA MIMIC Model	98.492	103.481	218.826	255.826
Model Number 2	98.492	103.481	218.826	255.826
Saturated model	132.000	140.899	346.650	412.650
Independence model	698.028	699.511	733.803	744.803

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Refined Attitude CFA MIMIC Model	.518	.542	.597	.545
Model Number 2	.518	.542	.597	.545
Saturated model	.695	.695	.695	.742
Independence model	3.674	3.252	4.135	3.682

HOELTER

Model	HOELTER .05	HOELTER .01
Refined Attitude CFA MIMIC Model	331	385
Model Number 2	331	385
Independence model	21	24

Table G.2 Attitude refined CFA MIMIC model Maximum Likelihood estimates

Regression Weights: (Group number 1 - Refined Attitude CFA MIMIC Model)

			Estimate	S.E.	C.R.	P	Label
LAttitude	<---	CB35c13	.031	.011	2.918	.004	par_18
LAttitude	<---	FB25C1	.037	.010	3.540	***	par_19
LAttitude	<---	GB27c4	.017	.008	2.206	.027	par_21
LAttitude	<---	RB38c20	-.026	.008	-3.045	.002	par_22
B20	<---	LAttitude	1.416	.216	6.548	***	par_23
B16	<---	LAttitude	1.594	.230	6.936	***	par_24
B13	<---	LAttitude	1.744	.252	6.919	***	par_25
B9	<---	LAttitude	1.000				

Standardized Regression Weights: (Group number 1 - Refined Attitude CFA MIMIC Model)

			Estimate
LAttitude	<---	CB35c13	.265
LAttitude	<---	FB25C1	.329
LAttitude	<---	GB27c4	.191
LAttitude	<---	RB38c20	-.249
B20	<---	LAttitude	.715
B16	<---	LAttitude	.820
B13	<---	LAttitude	.813
B9	<---	LAttitude	.519

Covariances: (Group number 1 - Refined Attitude CFA MIMIC Model)

			Estimate	S.E.	C.R.	P	Label
RB32c10	<-->	GB27c4	22.378	5.987	3.738	***	par_1
RB32c10	<-->	FB25C1	11.223	4.731	2.372	.018	par_2
GB27c4	<-->	FB25C1	35.738	5.646	6.330	***	par_3
SB30c3	<-->	RB38c20	-12.782	4.855	-2.633	.008	par_4
RB32c10	<-->	RB38c20	10.546	5.232	2.015	.044	par_5
FB25C1	<-->	RB38c20	22.174	4.752	4.667	***	par_6
FB25C1	<-->	CB35c13	27.786	4.468	6.220	***	par_7
FB25C1	<-->	WB34c12	27.771	4.179	6.645	***	par_8
CB35c13	<-->	WB34c12	23.485	3.858	6.087	***	par_9
GB27c4	<-->	SB30c3	19.837	5.132	3.865	***	par_10
RB32c10	<-->	SB30c3	19.915	5.607	3.552	***	par_11
RB38c20	<-->	WB34c12	18.341	4.103	4.470	***	par_12
RB38c20	<-->	CB35c13	23.873	4.568	5.226	***	par_13
RB32c10	<-->	CB35c13	18.244	4.600	3.966	***	par_14
RB32c10	<-->	WB34c12	9.955	4.110	2.422	.015	par_15
GB27c4	<-->	WB34c12	25.209	4.722	5.338	***	par_16
GB27c4	<-->	CB35c13	33.803	5.338	6.333	***	par_17
GB27c4	<-->	RB38c20	28.585	5.931	4.820	***	par_20

Correlations: (Group number 1 - Refined Attitude CFA MIMIC Model)

			Estimate
RB32c10	<-->	GB27c4	.275
RB32c10	<-->	FB25C1	.169
GB27c4	<-->	FB25C1	.502
SB30c3	<-->	RB38c20	-.174
RB32c10	<-->	RB38c20	.147
FB25C1	<-->	RB38c20	.354
FB25C1	<-->	CB35c13	.506
FB25C1	<-->	WB34c12	.550
CB35c13	<-->	WB34c12	.492
GB27c4	<-->	SB30c3	.237
RB32c10	<-->	SB30c3	.255
RB38c20	<-->	WB34c12	.338
RB38c20	<-->	CB35c13	.404
RB32c10	<-->	CB35c13	.290
RB32c10	<-->	WB34c12	.173
GB27c4	<-->	WB34c12	.408
GB27c4	<-->	CB35c13	.503
GB27c4	<-->	RB38c20	.373

Variances: (Group number 1 - Refined Attitude CFA MIMIC Model)

	Estimate	S.E.	C.R.	P	Label
RB32c10	75.925	7.746	9.802	***	par_26
GB27c4	87.096	8.763	9.939	***	par_27
FB25C1	58.133	5.964	9.747	***	par_28
SB30c3	80.334	8.242	9.747	***	par_29
RB38c20	67.368	6.869	9.807	***	par_30
CB35c13	51.952	5.330	9.747	***	par_31
WB34c12	43.817	4.496	9.747	***	par_32
1e	.483	.137	3.523	***	par_33
2e	1.955	.214	9.129	***	par_34
3e	1.125	.179	6.276	***	par_35
5e	1.381	.174	7.941	***	par_36
4e	.897	.147	6.123	***	par_37

Squared Multiple Correlations: (Group number 1 - Refined Attitude CFA MIMIC Model)

	Estimate
LAttitude	.332
B16	.672
B20	.512
B13	.661
B9	.270

Matrices (Group number 1 - Refined Attitude CFA MIMIC Model)

Factor Score Weights (Group number 1 - Refined Attitude CFA MIMIC Model)

	WB34 c12	CB35 c13	RB38 c20	SB3 0c3	FB25 C1	GB2 7c4	RB32 c10	B1 6	B2 0	B1 3	B9
LAttit ude	.000	.007	-.006	.000	.008	.004	.000	.1 86	.1 07	.1 62	.0 53

Total Effects (Group number 1 - Refined Attitude CFA MIMIC Model)

	CB35c13	RB38c20	FB25C1	GB27c4	LAttitude
LAttitude	.031	-.026	.037	.017	.000
B16	.050	-.041	.058	.028	1.594
B20	.044	-.037	.052	.025	1.416
B13	.054	-.045	.064	.030	1.744
B9	.031	-.026	.037	.017	1.000

Standardized Total Effects (Group number 1 - Refined Attitude CFA MIMIC Model)

	CB35c13	RB38c20	FB25C1	GB27c4	LAttitude
LAttitude	.265	-.249	.329	.191	.000
B16	.217	-.204	.269	.157	.820
B20	.189	-.178	.235	.137	.715
B13	.215	-.203	.267	.156	.813
B9	.138	-.130	.171	.099	.519

Direct Effects (Group number 1 - Refined Attitude CFA MIMIC Model)

	CB35c13	RB38c20	FB25C1	GB27c4	LAttitude
LAttitude	.031	-.026	.037	.017	.000
B16	.000	.000	.000	.000	1.594
B20	.000	.000	.000	.000	1.416
B13	.000	.000	.000	.000	1.744
B9	.000	.000	.000	.000	1.000

Standardized Direct Effects (Group number 1 - Refined Attitude CFA MIMIC Model)

	CB35c13	RB38c20	FB25C1	GB27c4	LAttitude
LAttitude	.265	-.249	.329	.191	.000
B16	.000	.000	.000	.000	.820
B20	.000	.000	.000	.000	.715
B13	.000	.000	.000	.000	.813
B9	.000	.000	.000	.000	.519

Indirect Effects (Group number 1 - Refined Attitude CFA MIMIC Model)

	CB35c13	RB38c20	FB25C1	GB27c4	LAttitude
LAttitude	.000	.000	.000	.000	.000
B16	.050	-.041	.058	.028	.000
B20	.044	-.037	.052	.025	.000
B13	.054	-.045	.064	.030	.000
B9	.031	-.026	.037	.017	.000

Standardized Indirect Effects (Group number 1 - Refined Attitude CFA MIMIC Model)

	CB35c13	RB38c20	FB25C1	GB27c4	LAttitude
LAttitude	.000	.000	.000	.000	.000
B16	.217	-.204	.269	.157	.000
B20	.189	-.178	.235	.137	.000
B13	.215	-.203	.267	.156	.000
B9	.138	-.130	.171	.099	.000

APPENDIX H: Structural equation modelling

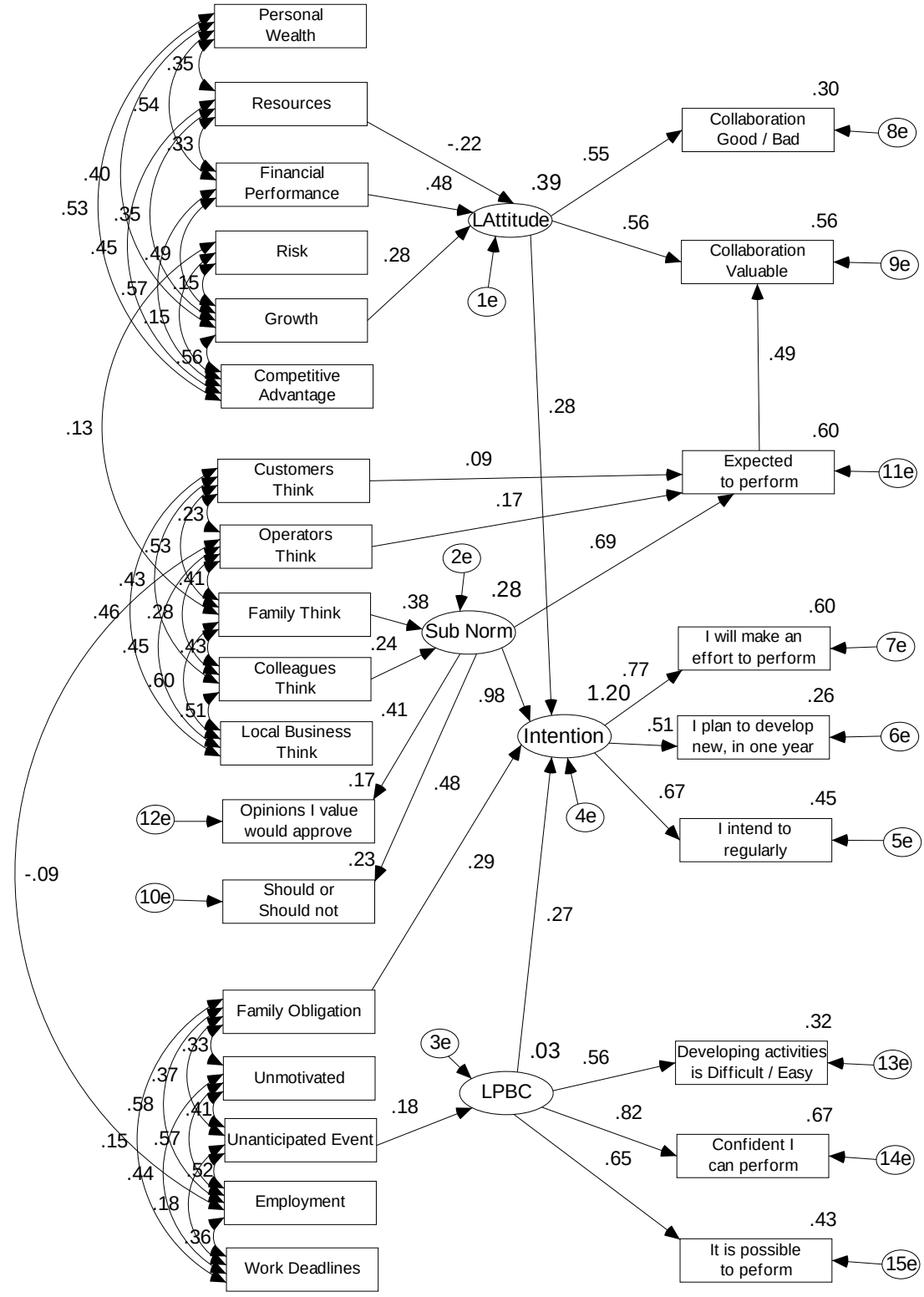

Figure H.1 Initial full TPB MIMIC model

Table H.1 Initial full TPB MIMIC model fit statistics

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Full MIMIC Model First Issue	85	610.970	293	.000	2.085
Model Number 2	85	610.970	293	.000	2.085
Saturated model	378	.000	0		
Independence model	27	1807.966	351	.000	5.151

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Full MIMIC Model First Issue	4.819	.757	.687	.587
Model Number 2	4.819	.757	.687	.587
Saturated model	.000	1.000		
Independence model	11.056	.345	.294	.320

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Full MIMIC Model First Issue	.662	.595	.790	.739	.782
Model Number 2	.662	.595	.790	.739	.782
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Full MIMIC Model First Issue	.835	.553	.653
Model Number 2	.835	.553	.653
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Full MIMIC Model First Issue	317.970	250.917	392.783
Model Number 2	317.970	250.917	392.783
Saturated model	.000	.000	.000
Independence model	1456.966	1327.748	1593.664

FMIN

Model	FMIN	F0	LO 90	HI 90
Full MIMIC Model First Issue	4.492	2.338	1.845	2.888
Model Number 2	4.492	2.338	1.845	2.888
Saturated model	.000	.000	.000	.000
Independence model	13.294	10.713	9.763	11.718

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Full MIMIC Model First Issue	.089	.079	.099	.000
Model Number 2	.089	.079	.099	.000
Independence model	.175	.167	.183	.000

AIC

Model	AIC	BCC	BIC	CAIC
Full MIMIC Model First Issue	780.970	825.044	1029.169	1114.169
Model Number 2	780.970	825.044	1029.169	1114.169
Saturated model	756.000	952.000	1859.753	2237.753
Independence model	1861.966	1875.966	1940.805	1967.805

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Full MIMIC Model First Issue	5.742	5.249	6.293	6.067
Model Number 2	5.742	5.249	6.293	6.067
Saturated model	5.559	5.559	5.559	7.000
Independence model	13.691	12.741	14.696	13.794

HOELTER

Model	HOELTER .05	HOELTER .01
Full MIMIC Model First Issue	75	79
Model Number 2	75	79
Independence model	30	32

Table H.2 Initial full TPB MIMIC model maximum likelihood estimates

Regression Weights:

			Estimate	S.E.	C.R.	P	Label
Sub Norm	<---	CFD12D16	.026	.007	3.586	***	par_29
LPBC	<---	UD1D6	.004	.003	1.600	.110	par_35
Sub Norm	<---	CB24D13	.020	.008	2.507	.012	par_44
LAttitude	<---	RB38c20	-.006	.004	-1.717	.086	par_50
LAttitude	<---	FB25C1	.015	.006	2.574	.010	par_51
LAttitude	<---	GB27c4	.007	.004	1.937	.053	par_52
Intention	<---	Sub Norm	1.000				
Intention	<---	LPBC	1.000				
Intention	<---	FD3D8	.036	.009	3.872	***	par_46
B15	<---	CB23D11	.015	.011	1.321	.186	par_47
B15	<---	Sub Norm	1.622	.332	4.892	***	par_48
B15	<---	C0D15D20	.060	.022	2.732	.006	par_49
Intention	<---	LAttitude	1.000				
B9	<---	LAttitude	3.866	1.392	2.777	.005	par_4
B13	<---	LAttitude	4.100	1.445	2.837	.005	par_5
B7	<---	LPBC	4.687	1.582	2.963	.003	par_15
B18	<---	LPBC	5.442	1.779	3.058	.002	par_32
B14	<---	LPBC	7.317	2.391	3.060	.002	par_33
B13	<---	B15	.432	.059	7.373	***	par_34
B8	<---	Sub Norm	1.080	.260	4.151	***	par_43
B19	<---	Sub Norm	.847	.224	3.784	***	par_45
B17	<---	Intention	1.510	.262	5.755	***	par_53
B21	<---	Intention	1.360	.252	5.387	***	par_54
B10	<---	Intention	1.000				

Standardized Regression Weights:

			Estimate
Sub Norm	<---	CFD12D16	.380
LPBC	<---	UD1D6	.177
Sub Norm	<---	CB24D13	.242
LAttitude	<---	RB38c20	-.220
LAttitude	<---	FB25C1	.483
LAttitude	<---	GB27c4	.285
Intention	<---	Sub Norm	.978
Intention	<---	LPBC	.267
Intention	<---	FD3D8	.294
B15	<---	CB23D11	.087
B15	<---	Sub Norm	.686
B15	<---	C0D15D20	.171
Intention	<---	LAttitude	.281
B9	<---	LAttitude	.551
B13	<---	LAttitude	.563
B7	<---	LPBC	.564
B18	<---	LPBC	.654
B14	<---	LPBC	.817
B13	<---	B15	.489
B8	<---	Sub Norm	.476
B19	<---	Sub Norm	.414
B17	<---	Intention	.771
B21	<---	Intention	.672
B10	<---	Intention	.506

Covariances:

			Estimate	S.E.	C.R.	P	Label
RB32c10	<-->	GB27c4	12.460	5.811	2.144	.032	par_1
GB27c4	<-->	FB25C1	36.056	6.907	5.220	***	par_2

CB23D11	<-->	C0D15D20	14.815	5.575	2.657	.008	par_3
UD1D6	<-->	ED4D9	41.461	7.626	5.437	***	par_6
UD1D6	<-->	UD2D7	31.088	6.990	4.448	***	par_7
ED4D9	<-->	UD2D7	35.501	6.109	5.811	***	par_8
UD1D6	<-->	FD3D8	25.152	6.241	4.031	***	par_9
UD2D7	<-->	FD3D8	17.705	4.842	3.657	***	par_10
ED4D9	<-->	WD5D10	12.834	3.216	3.991	***	par_11
UD1D6	<-->	WD5D10	7.792	3.747	2.080	.038	par_12
UD2D7	<-->	WD5D10	14.922	3.164	4.715	***	par_13
FD3D8	<-->	WD5D10	4.712	2.654	1.775	.076	par_14
FB25C1	<-->	RB38c20	21.376	5.924	3.609	***	par_16
GB27c4	<-->	RB38c20	28.064	7.175	3.912	***	par_17
RB32c10	<-->	CFD12D16	13.154	6.335	2.076	.038	par_18
GB27c4	<-->	CB35c13	35.612	6.168	5.773	***	par_19
RB32c10	<-->	CB35c13	8.991	3.720	2.417	.016	par_20
FB25C1	<-->	CB35c13	29.816	5.122	5.822	***	par_21
RB38c20	<-->	CB35c13	26.076	5.346	4.878	***	par_22
CB35c13	<-->	WB34c12	23.306	4.224	5.518	***	par_23
GB27c4	<-->	WB34c12	24.414	5.586	4.370	***	par_24
RB38c20	<-->	WB34c12	19.260	5.003	3.849	***	par_25
CB23D11	<-->	CFD12D16	74.215	13.406	5.536	***	par_26
C0D15D20	<-->	CFD12D16	27.431	6.054	4.531	***	par_27
FB25C1	<-->	WB34c12	27.050	4.900	5.520	***	par_28
ED4D9	<-->	FD3D8	32.791	5.563	5.894	***	par_30
C0D15D20	<-->	ED4D9	-4.134	2.240	-1.845	.065	par_31
CFD12D16	<-->	CLD14D19	62.002	10.289	6.026	***	par_36
C0D15D20	<-->	CLD14D19	21.625	4.457	4.852	***	par_37
CB23D11	<-->	CLD14D19	46.479	9.453	4.917	***	par_38
CLD14D19	<-->	CB24D13	43.290	8.126	5.327	***	par_39
CFD12D16	<-->	CB24D13	50.834	10.864	4.679	***	par_40
C0D15D20	<-->	CB24D13	15.217	4.760	3.197	.001	par_41
CB23D11	<-->	CB24D13	48.823	10.549	4.628	***	par_42

Correlations:

			Estimate
RB32c10	<-->	GB27c4	.154
GB27c4	<-->	FB25C1	.494
CB23D11	<-->	C0D15D20	.232
UD1D6	<-->	ED4D9	.524
UD1D6	<-->	UD2D7	.413
ED4D9	<-->	UD2D7	.571
UD1D6	<-->	FD3D8	.368
UD2D7	<-->	FD3D8	.330
ED4D9	<-->	WD5D10	.362
UD1D6	<-->	WD5D10	.181
UD2D7	<-->	WD5D10	.442
FD3D8	<-->	WD5D10	.154
FB25C1	<-->	RB38c20	.325
GB27c4	<-->	RB38c20	.352
RB32c10	<-->	CFD12D16	.128
GB27c4	<-->	CB35c13	.559
RB32c10	<-->	CB35c13	.155
FB25C1	<-->	CB35c13	.569
RB38c20	<-->	CB35c13	.455
CB35c13	<-->	WB34c12	.530
GB27c4	<-->	WB34c12	.399
RB38c20	<-->	WB34c12	.350
CB23D11	<-->	CFD12D16	.535
C0D15D20	<-->	CFD12D16	.414
FB25C1	<-->	WB34c12	.537
ED4D9	<-->	FD3D8	.582
C0D15D20	<-->	ED4D9	-.093
CFD12D16	<-->	CLD14D19	.598
C0D15D20	<-->	CLD14D19	.453
CB23D11	<-->	CLD14D19	.465

CLD14D19	<-->	CB24D13	.514
CFD12D16	<-->	CB24D13	.434
C0D15D20	<-->	CB24D13	.282
CB23D11	<-->	CB24D13	.432

Variances:

	Estimate	S.E.	C.R.	P	Label
RB32c10	73.688	8.920	8.261	***	par_55
GB27c4	88.607	10.666	8.307	***	par_56
FB25C1	60.030	7.280	8.246	***	par_57
CB23D11	133.893	16.237	8.246	***	par_58
C0D15D20	30.523	3.684	8.285	***	par_59
UD1D6	95.980	11.639	8.246	***	par_60
ED4D9	65.229	7.860	8.299	***	par_61
UD2D7	59.159	7.174	8.246	***	par_62
FD3D8	48.591	5.892	8.246	***	par_63
WD5D10	19.257	2.335	8.246	***	par_64
RB38c20	71.882	8.717	8.246	***	par_65
CFD12D16	143.908	17.308	8.314	***	par_66
CB35c13	45.748	5.486	8.339	***	par_67
WB34c12	42.204	5.118	8.246	***	par_68
CLD14D19	74.626	9.050	8.246	***	par_69
CB24D13	95.230	11.548	8.246	***	par_70
3e	.049	.030	1.615	.106	par_71
2e	.488	.172	2.834	.005	par_72
1e	.034	.023	1.526	.127	par_73
11e	1.506	.263	5.725	***	par_74
4e	-.144	.090	-1.604	.109	par_75
5e	1.597	.223	7.172	***	par_76
7e	1.105	.185	5.976	***	par_77
6e	2.068	.263	7.859	***	par_78
8e	1.926	.307	6.267	***	par_79
15e	2.011	.344	5.854	***	par_80
13e	2.391	.346	6.908	***	par_81
14e	1.356	.455	2.982	.003	par_82
9e	1.321	.267	4.942	***	par_83
10e	2.720	.348	7.820	***	par_84
12e	2.358	.296	7.954	***	par_85

Squared Multiple Correlations:

	Estimate
LAttitude	.386
LPBC	.031
Sub Norm	.283
B15	.604
Intention	1.203
B19	.172
B8	.226
B14	.667
B7	.318
B18	.428
B13	.556
B9	.303
B10	.256
B17	.595
B21	.452

Table H.3 SEM discriminant model maximum likelihood estimates

Regression Weights:

			Estimate	S.E.	C.R.	P	Label
B7	<---	L PBC	1.000				
B18	<---	L PBC	1.245	.192	6.497	***	par_3
B8	<---	L Sub Norm	.773	.120	6.436	***	par_4
B15	<---	L Sub Norm	1.000				
B19	<---	L Sub Norm	.780	.113	6.919	***	par_5
B9	<---	L Attitude	1.000				
B13	<---	L Attitude	1.737	.235	7.381	***	par_6
B14	<---	L PBC	1.417	.213	6.641	***	par_7
B21	<---	L Intention	1.456	.212	6.871	***	par_8
B17	<---	L Intention	1.678	.231	7.267	***	par_9
B10	<---	L Intention	1.000				
B16	<---	L Attitude	1.523	.209	7.272	***	par_13

Standardized Regression Weights:

			Estimate
B7	<---	L PBC	.564
B18	<---	L PBC	.697
B8	<---	L Sub Norm	.490
B15	<---	L Sub Norm	.600
B19	<---	L Sub Norm	.535
B9	<---	L Attitude	.531
B13	<---	L Attitude	.829
B14	<---	L PBC	.734
B21	<---	L Intention	.734
B17	<---	L Intention	.829
B10	<---	L Intention	.510
B16	<---	L Attitude	.801

Covariances:

			Estimate	S.E.	C.R.	P	Label
L Intention	<-->	L PBC	.795	.172	4.614	***	par_1
L Intention	<-->	L Attitude	.789	.163	4.829	***	par_2
L Intention	<-->	L Sub Norm	1.238	.229	5.409	***	par_10
L PBC	<-->	L Attitude	.650	.145	4.493	***	par_11
L PBC	<-->	L Sub Norm	.989	.204	4.854	***	par_12
L Attitude	<-->	L Sub Norm	1.045	.195	5.353	***	par_14

Correlations:

			Estimate
L Intention	<-->	L PBC	.810
L Intention	<-->	L Attitude	.964
L Intention	<-->	L Sub Norm	1.131
L PBC	<-->	L Attitude	.718
L PBC	<-->	L Sub Norm	.818
L Attitude	<-->	L Sub Norm	1.036

Variances:

	Estimate	S.E.	C.R.	P	Label
L Intention	.887	.245	3.628	***	par_15
L PBC	1.085	.288	3.762	***	par_16
L Attitude	.754	.202	3.737	***	par_17
L Sub Norm	1.349	.320	4.223	***	par_18
5e	1.611	.189	8.518	***	par_19
7e	1.133	.164	6.891	***	par_20
6e	2.528	.268	9.449	***	par_21
11e	2.400	.275	8.741	***	par_22
10e	2.557	.270	9.454	***	par_23
12e	2.053	.222	9.237	***	par_24
13e	2.321	.273	8.506	***	par_25
14e	1.861	.285	6.522	***	par_26
15e	1.775	.248	7.156	***	par_27
8e	1.922	.208	9.255	***	par_28
9e	1.040	.155	6.697	***	par_29
4e	.980	.134	7.331	***	par_30

Squared Multiple Correlations:

	Estimate
B16	.641
B14	.539
B13	.687
B9	.282
B18	.486
B7	.318
B19	.286
B8	.240
B15	.360
B10	.260
B17	.688
B21	.539

Total Effects

	L Sub Norm	L Attitude	L PBC	L Intention
B16	.000	1.523	.000	.000
B14	.000	.000	1.417	.000
B13	.000	1.737	.000	.000
B9	.000	1.000	.000	.000
B18	.000	.000	1.245	.000
B7	.000	.000	1.000	.000
B19	.780	.000	.000	.000
B8	.773	.000	.000	.000
B15	1.000	.000	.000	.000
B10	.000	.000	.000	1.000
B17	.000	.000	.000	1.678
B21	.000	.000	.000	1.456

Standardized Total Effects B16	.000	.801	.000	.000
B14	.000	.000	.734	.000
B13	.000	.829	.000	.000
B9	.000	.531	.000	.000
B18	.000	.000	.697	.000
B7	.000	.000	.564	.000
B19	.535	.000	.000	.000
B8	.490	.000	.000	.000
B15	.600	.000	.000	.000
B10	.000	.000	.000	.510
B17	.000	.000	.000	.829
B21	.000	.000	.000	.734

Direct Effects

	L Sub Norm	L Attitude	L PBC	L Intention
B16	.000	1.523	.000	.000
B14	.000	.000	1.417	.000
B13	.000	1.737	.000	.000
B9	.000	1.000	.000	.000
B18	.000	.000	1.245	.000
B7	.000	.000	1.000	.000
B19	.780	.000	.000	.000
B8	.773	.000	.000	.000
B15	1.000	.000	.000	.000
B10	.000	.000	.000	1.000
B17	.000	.000	.000	1.678
B21	.000	.000	.000	1.456

Standardized Direct Effects

	L Sub Norm	L Attitude	L PBC	L Intention
B16	.000	.801	.000	.000
B14	.000	.000	.734	.000
B13	.000	.829	.000	.000
B9	.000	.531	.000	.000
B18	.000	.000	.697	.000
B7	.000	.000	.564	.000
B19	.535	.000	.000	.000
B8	.490	.000	.000	.000
B15	.600	.000	.000	.000
B10	.000	.000	.000	.510
B17	.000	.000	.000	.829
B21	.000	.000	.000	.734

Indirect Effects

	L Sub Norm	L Attitude	L PBC	L Intention
B16	.000	.000	.000	.000
B14	.000	.000	.000	.000
B13	.000	.000	.000	.000
B9	.000	.000	.000	.000
B18	.000	.000	.000	.000
B7	.000	.000	.000	.000
B19	.000	.000	.000	.000
B8	.000	.000	.000	.000
B15	.000	.000	.000	.000
B10	.000	.000	.000	.000
B17	.000	.000	.000	.000
B21	.000	.000	.000	.000

EFA, Refined One Factor Reflective Model:

Table H.4 Eigenvalues and total variance: refined one factor model

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.114	51.899	51.899	2.580	42.992	42.992
2	.831	13.851	65.751			
3	.711	11.849	77.599			
4	.553	9.211	86.811			
5	.426	7.104	93.914			
6	.365	6.086	100.000			

Extraction Method: Principal Axis Factoring.

Table H.5 Parallel analysis: refined one factor model

```
Number of subjects:   191
++++++++++++++++++++++++++++++++++++++++++++++++
Eigenvalue #     Random Eigenvalue        Standard Error
++++++++++++++++++++++++++++++++++++++++++++++++
    1                1.2459                  .0055
    2                1.1198                  .0041
    3                1.0278                  .0030
    4                0.9462                  .0037
    5                0.8440                  .0046
++++++++++++++++++++++++++++++++++++++++++++++++
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Table H.6 Communalities of relevant indirect measures: refined single factor (intention) model

	Initial	Extraction
Customers Think	.392	.422
Colleagues Think	.410	.457
Financial Performance	.511	.552
Growth	.449	.477
Risk	.205	.135
Personal Wealth	.441	.456
Competitive Advantage	.584	.639
Resources	.296	.265
Unanticipated Event	.337	.360
Unmotivated	.413	.453
Family Obligation	.426	.480
Employment	.575	.711
Family Think	.527	.574
Local Business Think	.499	.577
Profit	.403	.417
Quality	.382	.323

Extraction Method: Principal Axis Factoring.

Table H.7 Eigenvalues and total variance explained: broad refined model

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.018	25.113	25.113	3.498	21.862	21.862	3.028	18.924	18.924
2	2.588	16.175	41.288	2.094	13.085	34.946	2.155	13.470	32.393
3	2.207	13.792	55.079	1.707	10.670	45.616	2.116	13.223	45.616
4	.964	6.025	61.104						
5	.880	5.500	66.604						
6	.780	4.878	71.482						
7	.704	4.401	75.883						
8	.584	3.649	79.531						
9	.573	3.581	83.113						
10	.513	3.208	86.321						
11	.481	3.004	89.325						
12	.461	2.882	92.207						
13	.387	2.421	94.627						
14	.326	2.040	96.667						
15	.279	1.741	98.408						
16	.255	1.592	100.000						

Table H.8 Parallel analysis of the broader refined model of antecedents

Number of variables: 16; Number of subjects: 191

Eigenvalue #	Random Eigenvalue	Standard Error
1	1.5377	.0066
2	1.4179	.0051
3	1.3255	.0040
4	1.2506	.0034
5	1.1821	.0031
6	1.1138	.0028
7	1.0568	.0026
8	1.0026	.0028

Table H.9 Refined MIMIC model measures of fit

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Refined MIMIC Model	16	12.140	12	.434	1.012
Model Number 2	16	12.140	12	.434	1.012
Saturated model	28	.000	0		
Independence model	7	342.374	21	.000	16.304

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Refined MIMIC Model	1.584	.983	.960	.421
Model Number 2	1.584	.983	.960	.421
Saturated model	.000	1.000		
Independence model	6.448	.606	.474	.454

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Refined MIMIC Model	.965	.938	1.000	.999	1.000
Model Number 2	.965	.938	1.000	.999	1.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Refined MIMIC Model	.571	.551	.571
Model Number 2	.571	.551	.571
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Refined MIMIC Model	.140	.000	12.665
Model Number 2	.140	.000	12.665
Saturated model	.000	.000	.000
Independence model	321.374	265.114	385.070

FMIN

Model	FMIN	F0	LO 90	HI 90
Refined MIMIC Model	.064	.001	.000	.067
Model Number 2	.064	.001	.000	.067
Saturated model	.000	.000	.000	.000
Independence model	1.802	1.691	1.395	2.027

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Refined MIMIC Model	.008	.000	.075	.783
Model Number 2	.008	.000	.075	.783
Independence model	.284	.258	.311	.000

AIC

Model	AIC	BCC	BIC	CAIC
Refined MIMIC Model	44.140	45.547	96.177	112.177
Model Number 2	44.140	45.547	96.177	112.177
Saturated model	56.000	58.462	147.064	175.064
Independence model	356.374	356.989	379.140	386.140

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Refined MIMIC Model	.232	.232	.298	.240
Model Number 2	.232	.232	.298	.240
Saturated model	.295	.295	.295	.308
Independence model	1.876	1.580	2.211	1.879

HOELTER

Model	HOELTER .05	HOELTER .01
Refined MIMIC Model	330	411
Model Number 2	330	411
Independence model	19	22

Table H.10 Refined MIMIC model Maximum Likelihood estimates

Regression Weights: (No groups - Refined MIMIC Model)

			Estimate	S.E.	C.R.	P	Label
Intention	<---	FB25C1	.068	.013	5.072	***	par_3
Intention	<---	CFD12D16	.049	.008	5.911	***	par_4
Intention	<---	FD3D8	.056	.014	3.940	***	par_6
B17	<---	Intention	1.000				
B21	<---	Intention	.949	.093	10.168	***	par_1
B13	<---	Intention	.945	.091	10.350	***	par_2
RB38c20	<---	Intention	-.908	.454	-1.999	.046	par_7
RB38c20	<---	FB25C1	.460	.082	5.649	***	par_8

Standardized Regression Weights: (No groups - Refined MIMIC Model)

			Estimate
Intention	<---	FB25C1	.348
Intention	<---	CFD12D16	.411
Intention	<---	FD3D8	.262
B17	<---	Intention	.794
B21	<---	Intention	.767
B13	<---	Intention	.785
RB38c20	<---	Intention	-.165
RB38c20	<---	FB25C1	.426

Covariances: (No groups - Refined MIMIC Model)

			Estimate	S.E.	C.R.	P	Label
FB25C1	<-->	CFD12D16	15.970	7.034	2.270	.023	par_5

Correlations: (No groups - Refined MIMIC Model)

			Estimate
FB25C1	<-->	CFD12D16	.167

Variances: (No groups - Refined MIMIC Model)

	Estimate	S.E.	C.R.	P	Label
FB25C1	58.133	5.964	9.747	***	par_9
CFD12D16	157.316	16.140	9.747	***	par_10
FD3D8	49.318	5.060	9.747	***	par_11
4e	1.334	.238	5.608	***	par_12
5e	1.412	.201	7.037	***	par_13
7e	1.319	.203	6.512	***	par_14
9e	1.252	.187	6.702	***	par_15
10e	57.880	5.975	9.687	***	par_16

Squared Multiple Correlations: (No groups - Refined MIMIC Model)

	Estimate
Intention	.407
RB38c20	.150
B13	.616
B17	.630
B21	.589

Matrices (No groups - Refined MIMIC Model)

Residual Covariances (No groups - Refined MIMIC Model)

	FD3D8	CFD12D16	FB25C1	RB38c20	B13	B17	B21
FD3D8	.000						
CFD12D16	6.260	.000					
FB25C1	3.957	.000	.000				
RB38c20	2.861	-1.274	-.201	-.132			
B13	-.283	-.887	.584	.015	.058		
B17	1.000	.785	-.133	.253	.125	.065	
B21	1.042	1.188	.188	-.212	.072	-.025	.058

Standardized Residual Covariances (No groups - Refined MIMIC Model)

	FD3D8	CFD12D16	FB25C1	RB38c20	B13	B17	B21
FD3D8	.000						
CFD12D16	.980	.000					
FB25C1	1.019	.000	.000				
RB38c20	.680	-.170	-.041	-.019			
B13	-.302	-.507	.556	.014	.173		
B17	1.017	.428	-.121	.224	.428	.177	
B21	1.082	.663	.175	-.191	.253	-.083	.165

Factor Score Weights (No groups - Refined MIMIC Model)

	FD3D8	CFD12D16	FB25C1	RB38c20	B13	B17	B21
Intention	.015	.013	.020	-.005	.263	.264	.234

Total Effects (No groups - Refined MIMIC Model)

	FD3D8	CFD12D16	FB25C1	Intention
Intention	.056	.049	.068	.000
RB38c20	-.051	-.045	.398	-.908
B13	.053	.046	.065	.945
B17	.056	.049	.068	1.000
B21	.053	.047	.065	.949

Standardized Total Effects (No groups - Refined MIMIC Model)

	FD3D8	CFD12D16	FB25C1	Intention
Intention	.262	.411	.348	.000
RB38c20	-.043	-.068	.368	-.165
B13	.206	.323	.273	.785
B17	.208	.326	.276	.794
B21	.201	.315	.267	.767

Direct Effects (No groups - Refined MIMIC Model)

	FD3D8	CFD12D16	FB25C1	Intention
Intention	.056	.049	.068	.000
RB38c20	.000	.000	.460	-.908
B13	.000	.000	.000	.945
B17	.000	.000	.000	1.000
B21	.000	.000	.000	.949

Standardized Direct Effects (No groups - Refined MIMIC Model)

	FD3D8	CFD12D16	FB25C1	Intention
Intention	.262	.411	.348	.000
RB38c20	.000	.000	.426	-.165
B13	.000	.000	.000	.785
B17	.000	.000	.000	.794
B21	.000	.000	.000	.767

Indirect Effects (No groups - Refined MIMIC Model)

	FD3D8	CFD12D16	FB25C1	Intention
Intention	.000	.000	.000	.000
RB38c20	-.051	-.045	-.062	.000
B13	.053	.046	.065	.000
B17	.056	.049	.068	.000
B21	.053	.047	.065	.000

Standardized Indirect Effects (No groups - Refined MIMIC Model)

	FD3D8	CFD12D16	FB25C1	Intention
Intention	.000	.000	.000	.000
RB38c20	-.043	-.068	-.057	.000
B13	.206	.323	.273	.000
B17	.208	.326	.276	.000
B21	.201	.315	.267	.000

APPENDIX I: Analysis of non-response bias

Table I.1 Non-response bias relevant descriptive statistics: early to late respondents

	First, First after Reminder or Second Issue of Questionnaire	N	Mean	Std. Deviation	Std. Error Mean
New Challenges	First	66	8.4697	8.45298	1.04049
	First, after second reminder	22	2.7727	11.69832	2.49409
Growth	First	66	9.0909	8.97300	1.10450
	First after second reminder	22	3.0909	10.63646	2.26770
Resources	First	66	10.9848	8.27135	1.01813
	First after second reminder	22	5.3182	10.78088	2.29849
Unmotivated	First	66	-5.8788	7.14146	.87905
	First after second reminder	22	-1.9091	8.62946	1.83981

Table I.2 Non-response bias: T-tests of relevant variables comparing early and late response

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
New Challenges	Equal variances assumed	2.124	.149	2.475	86	.015	5.69697	2.30181	1.12113	10.27281
	Equal variances not assumed			2.108	28.665	.044	5.69697	2.70243	.16708	11.22686
Growth	Equal variances assumed	.335	.564	2.591	86	.011	6.00000	2.31569	1.39656	10.60344
	Equal variances not assumed			2.379	31.571	.024	6.00000	2.52238	.85935	11.14065
Resources	Equal variances assumed	1.385	.242	2.572	86	.012	5.66667	2.20317	1.28691	10.04642
	Equal variances not assumed			2.254	29.680	.032	5.66667	2.51389	.53029	10.80304
Unmotivated	Equal variances assumed	.328	.568	-2.141	86	.035	-3.96970	1.85425	-7.65582	-.28358
	Equal variances not assumed			-1.947	31.158	.061	-3.96970	2.03902	-8.12746	.18807

APPENDIX J: Hypothesis statistics

Hypothesis 2:

Table J.1 Hypothesis two T-tests of difference between means for high and standard levels of education groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Profit	Equal variances assumed	1.001	.318	.496	185	.620	.60584	1.22107	-1.80317	3.01485
	Equal variances not assumed			.495	181.037	.621	.60584	1.22442	-1.81013	3.02181
Quality	Equal variances assumed	6.316	.013	-1.410	185	.160	-1.47950	1.04912	-3.54928	.59029
	Equal variances not assumed			-1.392	156.792	.166	-1.47950	1.06318	-3.57951	.62051
Outcome	Equal variances assumed	4.417	.037	-1.498	185	.136	-2.08648	1.39319	-4.83508	.66211
	Equal variances not assumed			-1.484	168.525	.140	-2.08648	1.40582	-4.86176	.68880
Recognition	Equal variances assumed	3.116	.079	-.343	185	.732	-.43952	1.27999	-2.96477	2.08573
	Equal variances not assumed			-.341	170.269	.734	-.43952	1.29067	-2.98729	2.10825

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
New Challenges	Equal variances assumed	.034	.855	-1.333	185	.184	-1.74215	1.30733	-4.32134	.83703
	Equal variances not assumed			-1.329	180.727	.186	-1.74215	1.31121	-4.32939	.84509
Learn New Skills	Equal variances assumed	5.957	.016	-1.327	185	.186	-1.66667	1.25616	-4.14490	.81157
	Equal variances not assumed			-1.311	160.161	.192	-1.66667	1.27150	-4.17774	.84440
Competition Thinks	Equal variances assumed	6.561	.011	-1.397	185	.164	-1.38889	.99401	-3.34993	.57215
	Equal variances not assumed			-1.384	167.785	.168	-1.38889	1.00331	-3.36962	.59184
Customers Think	Equal variances assumed	.440	.508	.487	185	.627	.82543	1.69619	-2.52094	4.17180
	Equal variances not assumed			.486	182.741	.628	.82543	1.69849	-2.52574	4.17660
Colleagues Think	Equal variances assumed	1.119	.291	-.457	185	.648	-.64376	1.40738	-3.42034	2.13283
	Equal variances not assumed			-.455	178.561	.649	-.64376	1.41350	-3.43306	2.14555
Financial Performance	Equal variances assumed	5.509	.020	-1.858	185	.065	-2.06976	1.11378	-4.26711	.12759
	Equal variances not assumed			-1.844	171.261	.067	-2.06976	1.12261	-4.28569	.14617

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Larger Contracts	Equal variances assumed	.800	.372	-.870	185	.385	-1.12245	1.28998	-3.66741	1.42251
	Equal variances not assumed			-.867	179.745	.387	-1.12245	1.29465	-3.67712	1.43222
Growth	Equal variances assumed	1.639	.202	-.796	185	.427	-1.08660	1.36458	-3.77874	1.60555
	Equal variances not assumed			-.793	179.211	.429	-1.08660	1.36998	-3.78997	1.61677
Competitive	Equal variances assumed	4.758	.030	-1.114	185	.267	-1.28935	1.15693	-3.57182	.99313
	Equal variances not assumed			-1.107	174.682	.270	-1.28935	1.16431	-3.58727	1.00858
Self-satisfaction	Equal variances assumed	6.773	.010	-.359	185	.720	-.35865	.99835	-2.32826	1.61096
	Equal variances not assumed			-.355	164.405	.723	-.35865	1.00899	-2.35090	1.63360
Stress	Equal variances assumed	2.425	.121	.036	185	.972	.04708	1.32576	-2.56847	2.66262
	Equal variances not assumed			.035	173.376	.972	.04708	1.33502	-2.58790	2.68206
Reduce Competitors	Equal variances assumed	.090	.764	-.863	185	.389	-1.11420	1.29115	-3.66148	1.43308
	Equal variances not assumed			-.860	179.946	.391	-1.11420	1.29566	-3.67086	1.44245

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Risk	Equal variances assumed	1.451	.230	-2.454	185	.015	-3.09347	1.26045	-5.58018	-.60676
	Equal variances not assumed			-2.444	178.627	.016	-3.09347	1.26588	-5.59148	-.59547
Miss Out on Personal Activities	Equal variances assumed	1.618	.205	.160	185	.873	.16747	1.04460	-1.89339	2.22832
	Equal variances not assumed			.159	176.996	.873	.16747	1.05004	-1.90474	2.23968
Personal Wealth	Equal variances assumed	5.664	.018	-.218	185	.827	-.21340	.97723	-2.14136	1.71455
	Equal variances not assumed			-.217	171.053	.829	-.21340	.98506	-2.15785	1.73104
Competitive Advantage	Equal variances assumed	2.708	.102	-.830	185	.407	-.87262	1.05086	-2.94582	1.20058
	Equal variances not assumed			-.826	176.308	.410	-.87262	1.05671	-2.95805	1.21281
Tedious	Equal variances assumed	.088	.767	.125	185	.901	.13792	1.10766	-2.04735	2.32318
	Equal variances not assumed			.124	183.740	.901	.13792	1.10797	-2.04806	2.32389
Control	Equal variances assumed	.600	.439	-.639	185	.523	-.57721	.90301	-2.35873	1.20432
	Equal variances not assumed			-.642	184.472	.521	-.57721	.89866	-2.35019	1.19578

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Resources	Equal variances assumed	1.218	.271	.298	185	.766	.35109	1.17986	-1.97661	2.67879
	Equal variances not assumed			.297	179.849	.767	.35109	1.18405	-1.98533	2.68751
Unanticipated Event	Equal variances assumed	.089	.766	.327	185	.744	.47457	1.45157	-2.38919	3.33834
	Equal variances not assumed			.327	182.987	.744	.47457	1.45319	-2.39260	3.34174
Unmotivated	Equal variances assumed	1.767	.185	.063	185	.950	.07045	1.11494	-2.12918	2.27007
	Equal variances not assumed			.063	172.117	.950	.07045	1.12336	-2.14688	2.28777
Family Obligation	Equal variances assumed	4.528	.035	.232	185	.817	.24009	1.03629	-1.80437	2.28456
	Equal variances not assumed			.233	184.057	.816	.24009	1.03060	-1.79322	2.27341
Employment	Equal variances assumed	.098	.755	.487	185	.627	.60802	1.24772	-1.85356	3.06960
	Equal variances not assumed			.487	183.536	.627	.60802	1.24837	-1.85499	3.07103
Work Deadlines	Equal variances assumed	4.748	.031	.570	185	.569	.34868	.61127	-.85727	1.55463
	Equal variances not assumed			.560	143.342	.576	.34868	.62223	-.88125	1.57862

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Family Think	Equal variances assumed	.211	.647	-1.407	185	.161	-2.59966	1.84729	-6.24412	1.04481
	Equal variances not assumed			-1.407	183.919	.161	-2.59966	1.84738	-6.24444	1.04513
Local Business Think	Equal variances assumed	.203	.653	-.018	185	.986	-.02279	1.29163	-2.57102	2.52543
	Equal variances not assumed			-.018	183.191	.986	-.02279	1.29280	-2.57349	2.52790
Operators Think	Equal variances assumed	.015	.902	.785	185	.433	.60229	.76680	-.91051	2.11510
	Equal variances not assumed			.784	181.587	.434	.60229	.76859	-.91423	2.11881
Mean Direct Intention	Equal variances assumed	.203	.653	-.199	185	.843	-.04452	.22393	-.48631	.39727
	Equal variances not assumed			-.199	184.959	.842	-.04452	.22343	-.48531	.39627
Mean Direct Attitude	Equal variances assumed	1.408	.237	.128	185	.898	.02523	.19749	-.36440	.41486
	Equal variances not assumed			.127	178.822	.899	.02523	.19832	-.36612	.41658
Mean Direct Subjective Norm	Equal variances assumed	.001	.978	1.235	185	.219	.22234	.18010	-.13297	.57765
	Equal variances not assumed			1.234	183.553	.219	.22234	.18019	-.13317	.57784

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Mean Direct PBC	Equal variances assumed	.756	.386	.208	185	.835	.04605	.22087	-.38971	.48180
	Equal variances not assumed			.208	183.610	.835	.04605	.22097	-.38992	.48201

Hypothesis 3:

Table J.2 Hypothesis three descriptive statistics: positive and negative groups towards collaborative activities

	Self-Efficacy groups	N	Mean	Std. Deviation	Std. Error Mean
Intention	Negative	41	12.8293	77.36307	12.08208
	Positive	110	104.4727	109.95668	10.48396

Table J.3 Hypothesis three T-test of positive and negative groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Intention	Equal variances assumed	6.028	.015	-4.899	149	.000	-91.64346	18.70631	-128.60737	-54.67955
	Equal variances not assumed			-5.729	101.745	.000	-91.64346	15.99656	-123.37352	-59.91340

Table J.4 Descriptive statistics for high and low self-efficacy groups

	Self-Efficacy groups	N	Mean	Std. Deviation	Std. Error Mean
Mean Direct Intention	Negative	41	2.1789	1.15494	.18037
	Positive	110	4.0242	1.52098	.14502

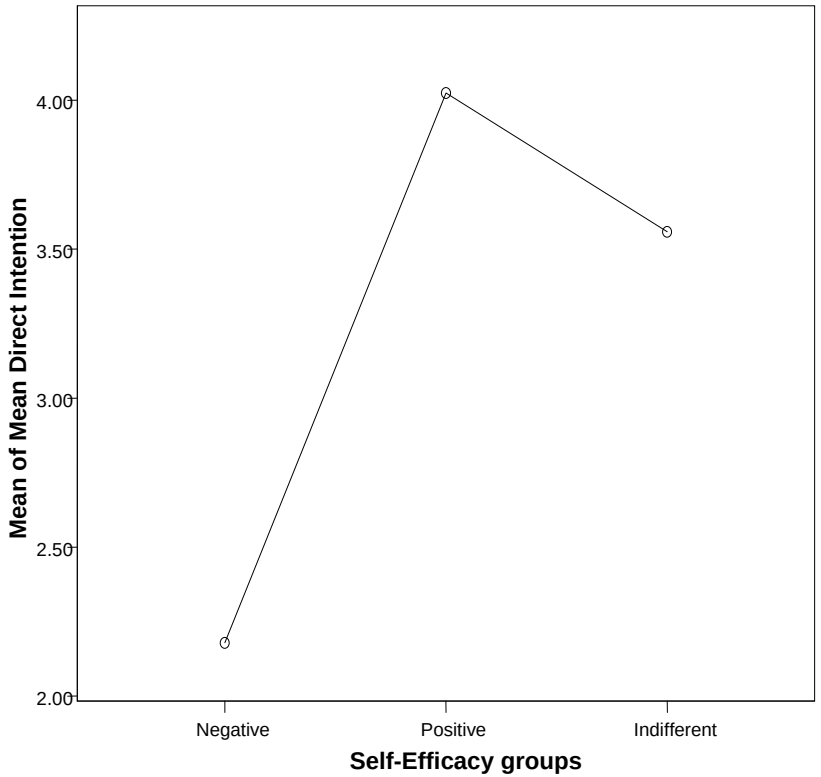

Figure J.1 Line graph of positive and negative self-efficacy groups to mean direct intention

Hypothesis 4:

Table J.5 Hypothesis four descriptive group statistics for high and low intender

	Grouped high low past expectations	N	Mean	Std. Deviation	Std. Error Mean
Intention	high	26	150.38	109.139	21.403
	low	13	105.00	100.651	27.915

Table J.6 Hypothesis four T-test grouped high-low intenders to indirect intention

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Intention	Equal variances assumed	1.147	.291	1.255	37	.217	45.384	36.162	-27.888	118.657
	Equal variances not assumed			1.290	25.951	.208	45.384	35.176	-26.929	117.698

Hypothesis 5:

Tables available in the thesis main body, section 10.11

Hypothesis 6:

Table J.7 Hypothesis six: correlations between family think and family obligation

Model			Family Think	Family Obligation
1	Correlations	Family Think	1.000	-.071
		Family Obligation	-.071	1.000
	Covariances	Family Think	.244	-.031
		Family Obligation	-.031	.780

Table J.8 Hypothesis six T-tests of owner-managers to non-owner-managers groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Family Think	Equal variances assumed	3.211	.075	.421	189	.674	1.254	2.97832	-4.620	7.129
	Equal variances not assumed			.535	27.925	.597	1.254	2.34348	-3.546	6.055
Family Obligation	Equal variances assumed	1.391	.240	-.944	189	.347	-1.570	1.66446	-4.853	1.712
	Equal variances not assumed			-1.219	28.348	.233	-1.570	1.28839	-4.208	1.067

Hypothesis 7:

Table J.9 Hypothesis seven: descriptive statistics of the groups' positive and negative economic conditions

	Economic Conditions Group	N	Mean	Std. Deviation	Std. Error Mean
Mean Direct Intention	Positive	64	4.0052	1.55951	.19494
	Negative	75	3.0711	1.50703	.17402
Intention	Positive	64	104.9219	119.94646	14.99331
	Negative	75	58.4533	98.31352	11.35227
Age	Positive	60	48.37	10.827	1.398
	Negative	72	45.15	11.369	1.340
Years experience in road haulage	Positive	63	19.37	9.182	1.157
	Negative	71	18.93	9.346	1.109

Table J.10 Hypothesis seven T-tests of the groups' positive and negative economic conditions

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Mean Direct Intention	Equal variances assumed	.000	.992	3.584	137	.000	.934	.260	.418	1.449
	Equal variances not assumed			3.575	132.033	.000	.934	.261	.417	1.450

Intention	Equal variances assumed	2.401	.124	2.510	137	.013	46.468	18.514	9.858	83.079
	Equal variances not assumed			2.471	121.846	.015	46.468	18.806	9.239	83.697
Age	Equal variances assumed	.256	.614	1.652	130	.101	3.214	1.945	-.634	7.062
	Equal variances not assumed			1.660	127.668	.099	3.214	1.936	-.617	7.045
Years experience in road haulage	Equal variances assumed	.011	.915	.271	132	.786	.436	1.604	-2.738	3.609
	Equal variances not assumed			.272	130.621	.786	.436	1.603	-2.735	3.606

Hypothesis 8:

Table J.11 Hypothesis eight: descriptive statistics of high and low economic conditions groups

	Economic Conditions Group	N	Mean	Std. Deviation	Std. Error Mean
Risk	Positive	64	-3.6719	8.87489	1.10936
	Negative	75	-2.3467	9.33968	1.07845
Resources	Positive	64	9.2031	8.15170	1.01896
	Negative	75	10.0000	8.84094	1.02086

Table J.12 Hypothesis eight: T-tests of difference between means for high and low economic conditions groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Risk	Equal variances assumed	.034	.854	-.853	137	.395	-1.32521	1.553	-4.397	1.746
	Equal variances not assumed			-.857	135.395	.393	-1.32521	1.547	-4.384	1.734
Resources	Equal variances assumed	.220	.640	-.549	137	.584	-.79688	1.451	-3.667	2.073
	Equal variances not assumed			-.552	136.157	.582	-.79688	1.442	-3.649	2.055

Table J.13 Hypothesis eight descriptive statistics of high and low risk groups

	Attitude Towards Risk Group High, Low	N	Mean	Std. Deviation	Std. Error Mean
Economic Conditions	Positive	49	3.63	1.716	.245
	Negative	135	3.79	1.925	.166
Intention	Positive	52	135.8077	97.22463	13.48263
	Negative	139	59.1799	99.05534	8.40176
Attitude	Positive	52	169.5577	77.48306	10.74497
	Negative	139	104.8921	81.05837	6.87528
Mean Direct Intention	Positive	52	3.9423	1.26063	.17482
	Negative	139	3.3765	1.58741	.13464
PBC	Positive	52	-9.2308	25.77475	3.57432
	Negative	139	-20.5612	27.52920	2.33500
Sub Norm	Positive	52	-17.4423	37.10473	5.14550
	Negative	139	-21.0000	39.90478	3.38468

Table J.14 Hypothesis eight: T-tests of difference between means for high and low risk groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Economic Conditions	Equal variances assumed	.771	.381	-.488	182	.626	-.153	.312	-.769	.464
	Equal variances not assumed			-.515	94.786	.607	-.153	.296	-.740	.435
Intention	Equal variances assumed	.010	.921	4.783	189	.000	76.627	16.022	45.022	108.233
	Equal variances not assumed			4.824	93.110	.000	76.627	15.886	45.081	108.174
Attitude	Equal variances assumed	.162	.687	4.966	189	.000	64.665	13.022	38.977	90.353
	Equal variances not assumed			5.069	95.400	.000	64.665	12.756	39.342	89.988
Mean Direct Intention	Equal variances assumed	5.923	.016	2.311	189	.022	.565	.244	.082	1.048
	Equal variances not assumed			2.564	114.553	.012	.565	.220	.128	1.002
PBC	Equal variances assumed	.187	.666	2.575	189	.011	11.330	4.399	2.651	20.009
	Equal variances not assumed			2.654	97.271	.009	11.330	4.269	2.857	19.803

Sub Norm	Equal variances assumed	.425	.515	.559	189	.577	3.557	6.367	-9.002	16.117
	Equal variances not assumed			.578	97.909	.565	3.557	6.158	-8.664	15.780

Table J.15 Hypothesis eight correlations

		Risk	Economic Conditions	Performing Collaborative activities met expectations
Risk	Pearson Correlation	1	-.046	.189
	Sig. (2-tailed)		.536	.179
	N	191	184	52
Economic Conditions	Pearson Correlation	-.046	1	.072
	Sig. (2-tailed)	.536		.612
	N	184	184	52
Performing Collaborative activities met expectations	Pearson Correlation	.189	.072	1
	Sig. (2-tailed)	.179	.612	
	N	52	52	52

Hypothesis 9:

Table J.16 Hypothesis nine: T-tests for having and not having other business activities groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Mean Direct Intention	Equal variances assumed	.447	.505	.285	186	.776	.073	.256	-.433	.579
	Equal variances not assumed			.298	85.238	.766	.073	.245	-.415	.562
Mean Direct Attitude	Equal variances assumed	2.120	.147	.149	186	.882	.033	.226	-.412	.480
	Equal variances not assumed			.164	95.028	.870	.033	.205	-.373	.441
Mean Direct Subjective Norm	Equal variances assumed	.427	.514	.230	186	.818	.047	.207	-.362	.457
	Equal variances not assumed			.236	82.479	.814	.047	.202	-.355	.451
Mean Direct PBC	Equal variances assumed	.008	.929	.037	186	.970	.009	.253	-.491	.509
	Equal variances not assumed			.036	74.353	.971	.009	.263	-.514	.533
Intention	Equal variances assumed	.015	.901	.205	186	.838	3.588	17.488	-30.912	38.089
	Equal variances not assumed			.206	79.604	.837	3.588	17.397	-31.036	38.213

Hypothesis 10:

Table J.17 Hypothesis ten: descriptive statistics for owner and non-owner managed groups

	Owner or Non-owner Managers	N	Mean	Std. Deviation	Std. Error Mean
Years experience in transport	Owner Manager	169	21.75	9.786	.753
	Non-Owner Manager	17	17.06	8.437	2.046
Financial Performance	Owner Manager	171	10.3801	7.61511	.58234
	Non-Owner Manager	20	7.8500	7.71379	1.72486
Growth	Owner Manager	171	7.4912	9.38670	.71782
	Non-Owner Manager	20	6.2500	8.68074	1.94107
Personal Wealth	Owner Manager	171	8.1637	6.68071	.51089
	Non-Owner Manager	20	5.6500	5.93185	1.32640
Competitive Advantage	Owner Manager	171	9.1696	7.05444	.53947
	Non-Owner Manager	20	7.9000	8.68695	1.94246
Resources	Owner Manager	171	9.7485	8.03162	.61419
	Non-Owner Manager	20	7.5000	10.05511	2.24839
Family Think	Owner Manager	171	-4.6959	12.90285	.98671
	Non-Owner Manager	20	-5.9500	9.50609	2.12563
Local Business Think	Owner Manager	171	-2.7485	8.84646	.67651
	Non-Owner Manager	20	-3.4500	8.69649	1.94459
Family Obligation	Owner Manager	171	-4.5205	7.21953	.55209
	Non-Owner Manager	20	-2.9500	5.20602	1.16410
Unmotivated	Owner Manager	171	-4.1345	7.82000	.59801
	Non-Owner Manager	20	-4.5500	5.96017	1.33274
Risk	Owner Manager	171	-2.4620	8.84790	.67662
	Non-Owner Manager	20	-.9000	7.37635	1.64940
Level of Competition	Owner Manager	168	5.49	1.808	.140
	Non-Owner Manager	19	5.16	1.803	.414
Difficulty passing on haulage costs	Owner Manager	166	6.09	1.472	.114
	Non-Owner Manager	20	5.70	1.922	.430

	Owner or Non-owner Managers	N	Mean	Std. Deviation	Std. Error Mean
Vehicles in fleet	Owner Manager	167	4.12	5.898	.456
	Non-Owner Manager	19	5.84	4.845	1.112
Vehicles subcontracted	Owner Manager	166	.59	2.247	.174
	Non-Owner Manager	19	3.05	11.404	2.616
Customers Think	Owner Manager	171	-4.3392	11.90806	.91063
	Non-Owner Manager	20	-5.5000	6.90919	1.54494
Miss Out on Personal Activities	Owner Manager	171	10.3509	7.20496	.55098
	Non-Owner Manager	20	6.6000	5.28553	1.18188
Learn New Skills	Owner Manager	171	8.0994	8.67156	.66313
	Non-Owner Manager	20	8.1000	9.49182	2.12244

Table J.18 Hypothesis ten: T-tests for owner and non-owner managed groups

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Years experience in transport	Equal variances assumed	.064	.801	1.905	184	.058	4.690	2.462
	Equal variances not assumed			2.151	20.588	.044	4.690	2.180
Financial Performance	Equal variances assumed	.007	.934	1.404	189	.162	2.53012	1.80197
	Equal variances not assumed			1.390	23.544	.178	2.53012	1.82051
Growth	Equal variances assumed	.336	.563	.564	189	.574	1.24123	2.20208
	Equal variances not assumed			.600	24.501	.554	1.24123	2.06955
Personal Wealth	Equal variances assumed	1.603	.207	1.609	189	.109	2.51374	1.56191
	Equal variances not assumed			1.769	24.994	.089	2.51374	1.42139
Competitive Advantage	Equal variances assumed	2.635	.106	.743	189	.459	1.26959	1.70984
	Equal variances not assumed			.630	22.029	.535	1.26959	2.01598
Resources	Equal variances assumed	1.428	.234	1.152	189	.251	2.24854	1.95142
	Equal variances not assumed			.965	21.928	.345	2.24854	2.33077

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Family Think	Equal variances assumed	3.211	.075	.421	189	.674	1.25409	2.97832
	Equal variances not assumed			.535	27.925	.597	1.25409	2.34348
Local Business Think	Equal variances assumed	.006	.936	.336	189	.737	.70146	2.08708
	Equal variances not assumed			.341	23.838	.736	.70146	2.05891
Family Obligation	Equal variances assumed	1.391	.240	-.944	189	.347	-1.57047	1.66446
	Equal variances not assumed			-1.219	28.348	.233	-1.57047	1.28839
Unmotivated	Equal variances assumed	.642	.424	.230	189	.819	.41550	1.80869
	Equal variances not assumed			.284	27.297	.778	.41550	1.46075
Risk	Equal variances assumed	.358	.551	-.759	189	.449	-1.56199	2.05865
	Equal variances not assumed			-.876	25.851	.389	-1.56199	1.78279
Level of Competition	Equal variances assumed	.026	.873	.768	185	.443	.336	.438
	Equal variances not assumed			.770	22.296	.449	.336	.437
Difficulty passing on haulage costs	Equal variances assumed	1.919	.168	1.082	184	.281	.390	.361
	Equal variances not assumed			.878	21.768	.390	.390	.445

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Vehicles in fleet	Equal variances assumed	.003	.957	-1.226	184	.222	-1.722	1.405
	Equal variances not assumed			-1.433	24.505	.164	-1.722	1.202
Vehicles subcontracted	Equal variances assumed	19.072	.000	-2.444	183	.015	-2.465	1.009
	Equal variances not assumed			-.940	18.160	.359	-2.465	2.622
Customers Think	Equal variances assumed	8.536	.004	.427	189	.670	1.16082	2.71868
	Equal variances not assumed			.647	34.036	.522	1.16082	1.79335
Miss Out on Personal Activities	Equal variances assumed	2.666	.104	2.256	189	.025	3.75088	1.66269
	Equal variances not assumed			2.876	28.008	.008	3.75088	1.30400
Learn New Skills	Equal variances assumed	.123	.726	.000	189	1.000	-.00058	2.06959
	Equal variances not assumed			.000	22.866	1.000	-.00058	2.22362

Hypothesis 11:

Table J.19 Hypothesis eleven: T-tests for LTL and non LTL groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Mean Direct Intention	Equal variances assumed	.497	.483	-2.758	81	.007	-1.14171	.41401	-1.96545	-.31797
	Equal variances not assumed			-2.969	27.563	.006	-1.14171	.38458	-1.93006	-.35337
Financial Performance	Equal variances assumed	2.546	.114	-2.074	81	.041	-4.15152	2.00197	-8.13481	-.16822
	Equal variances not assumed			-2.346	29.844	.026	-4.15152	1.76927	-7.76563	-.53740
Larger Contracts	Equal variances assumed	.131	.718	-.656	81	.513	-1.54991	2.36151	-6.24858	3.14876
	Equal variances not assumed			-.578	21.654	.570	-1.54991	2.68346	-7.12023	4.02041
Competitive Advantage	Equal variances assumed	.262	.610	-2.433	81	.017	-4.44652	1.82762	-8.08291	-.81014
	Equal variances not assumed			-2.252	22.765	.034	-4.44652	1.97487	-8.53419	-.35886
Resources	Equal variances assumed	.043	.836	.494	81	.623	1.19519	2.41890	-3.61766	6.00804
	Equal variances not assumed			.500	25.246	.622	1.19519	2.39272	-3.73027	6.12065
Family Obligation	Equal variances assumed	4.977	.028	-2.580	81	.012	-4.73975	1.83689	-8.39459	-1.08491
	Equal variances not assumed			-3.678	49.646	.001	-4.73975	1.28860	-7.32843	-2.15107

Family Think	Equal variances assumed	.119	.731	-2.144	81	.035	-7.62121	3.55543	-14.69540	-.54702
	Equal variances not assumed			-2.155	25.072	.041	-7.62121	3.53594	-14.90257	-.33986
Intention	Equal variances assumed	.590	.445	-2.821	81	.006	-81.93672	29.04617	-139.72949	-24.14395
	Equal variances not assumed			-2.681	23.431	.013	-81.93672	30.56497	-145.10084	-18.77260

APPENDIX K: List of publications

Peer reviewed conference papers:

- Plant, E. and McGovern, J. (2007) "Behavioural Decision Making of Owner-managers and the Development of Transport Logistics Value Adding Services", *The 12th International Symposium on Logistics, Developing Sustainable Collaborative Supply Chains*, pp. 539–545, July, Budapest, Hungary.
- Plant, E. and McGovern, J. (2007) "Rationales for Collaboration; Implications for the Irish Road Freight Industry", *the 19th Annual NOFOMA Conference*, pp. 895–906, 7–8th June, University of Iceland, Reykjavik.
- Plant, E. (2003) "An Examination of EU Directive 98/76/EC in Regards to the Irish Road Haulage Industry", *Irish Academy of Management Conference*, Sept., Smurfit Graduate School of Business, Dublin.
- Plant, E., Allen, D. and Sweeney, E. (2003) "An Investigation of the Irish Road Haulage Industry's External Environment", *8th Annual Logistics Research Network Conference*, 10th – 12th Sept., CASS Business School, City University, London, pp. 372–376.
- Plant, E. (2002) "An Analysis of the Irish Road Haulage Industry's Competitive Environment", *Irish Academy of Management Conference*, Sept., Waterford Institute of Technology.

Professional magazines:

- Plant, E. (2005) "Road Freight Collaboration, The Road Ahead?", *Logistics Solutions*, Vol. 8, pp. 26–29.

Non-peer reviewed publications:

- Plant, E. (2003) “An Investigation of the Irish Road Haulage Industry’s Competitive Environment*”, Fleet Management*, Dec. 2003.
- Plant, E. (2002) “Pricing Procedures in the Road Freight Industry: With a view to establishing best practice”, *Linkline*, March 2002, CILT, p. 12
- Plant, E. (2002) “Irish Road Haulage Costing and Pricing Procedures*”, Knights of the Road*, Oct. 2002.