ROBERT GORDON UNIVERSITY ABERDEEN

**FACULTY OF MANAGEMENT**

Aberdeen Business School

The impact of Brexit on United Kingdom small and medium enterprises, operating in the regulated industry of structural steel fabrication

**Name:** Mark Dinnes

Matriculation Number: 1511417

Submission Date: *03-05-2018*

**Supervisor:** Raymond Davies

**Aim:** To analyse the details of European Regulations and the impact that may arise on SME organisations manufacturing steel structures after the United Kingdom withdraws from the European Union

Objectives:

**1.** Identify the potential regulatory and legal changes of the industry sector.

**2.** Produce data from surveys and assess the impact on the United Kingdom structural steel manufacturing sector of leaving the European Union

**3.** Analyse the trade conducted by the UK SME organisations that manufacture structural steel within the United Kingdom market and European Union.

**4.** Produce a risk assessment model that analyses the industry sector after the UK withdrawal from the EU.

Signed: 

- Total word count (excluding acknowledgements, diagrams, references, bibliography and appendices) 21,448
- A Dissertation submitted in partial fulfilment of the requirements

for the Postgraduate MSc Degree in Quality Management

ABERDEEN BUSINESS SCHOOL

Copyright Declaration Form

| | |
|---|---|
| Name | Mark Dinnes |
| Email/contact tel no.: | mark.dinnes@btinternet.com 07791059597 |
| Course: | MSc Quality Management (DL) |
| Module: | BSM581 |
| Dissertation Title: | The impact of Brexit on small and medium enterprises operating in the regulated industry of structural steel fabrication |
| Supervisor/Tutor: | Raymond Davies |

Before submitting confirm:

a) that the work undertaken for this assignment is entirely my own and that I have not made use of any unauthorised assistance
b) that the sources of all reference material have been properly acknowledged
c) that, where necessary, I have obtained permission from the owners of third party copyrighted material to include this material in my dissertation.

I have read and agree to comply with the requirements for submitting the dissertation as an electronic document.

**I agree**:

- That an electronic copy of the dissertation may be held and made available on restricted access for a period of 3 or more years to students and staff of the University through The Robert Gordon University Moodle.

- That during the period that it is accessible on Moodle the work shall be licensed under the Creative Commons *Attribution-Non Commercial-Share Alike 2.5 Licence* to the end-user - http://creativecommons.org/licenses/by-nc-sa/2.5/


The impact of Brexit on small and medium enterprises operating in the regulated industry of structural steel fabrication

Mark Dinnes

The Robert Gordon University, Aberdeen, UK

Aberdeen Business School

MSc Quality Management (DL)

Submission Date: 03-05-2018

Abstract

The aim of this dissertation is to analyse the impact of exiting the European Union on small and medium enterprises which manufacture within a regulated industry. These organisations manufacture fabricated steel components under European regulation.

The regulations that are specifically applied to this subject matter were introduced to allow free movement of goods between the 28-member states of the European Union. To facilitate this, the system of CE marking was introduced through directives which were more recently changed to Regulations to make compliance a legal requirement in the member states.

The regulations were adopted by the member states of the European Union and transcribed in to national laws. Following the separation of the United Kingdom from the European Union, there are several points that must be considered including but not limited to:

potential geo-political issues.

Future international trade agreements,

The future of European harmonised standards,

The free movement of materials and skilled labour.

The focus of this research will be on how small and medium enterprises which manufacture within the constructional steel products industry will be affected. This research will investigate the potential outcomes of the UK leaving the European Union by using known analytical methods such as PESTEL and SWOT, by conducting a representative survey of the UK manufacturers and reviewing the industry as a as a single entity.

Keywords: Brexit, Regulation, Threats, Opportunities, Outcomes.

**Glossary**

UK, United Kingdom

EU, European Union

UKAS, United Kingdom Accreditation Service

NoBo, Notified Body

RTPO, Recognised Third Party Organisation

CE, Conformite Europenne or European Conformity

TEU, Treaty on European Union

CPR, Construction Products Regulation

NANDO, New Approach and Designated Organisations

EEA, European Economic Area

SI, Statutory Instrument

BEIS, Government Department for Business Energy & Industrial Strategy

BS, British Standard

EN, European Norm or European Standard

ISO, International Standards Organisation

CEN, European Committee for Standardisation

HENs, Harmonised European Normative Standards

EC, European Commission

BSI, British Standards Institute

SME, Small and Medium Enterprises

PESTEL, Political, Economic, Social, Technology, Environmental and Legal

SWOT, Strengths, Weaknesses, Opportunities and Threats

**Acknowledgements**

R. J. Davies for the mentoring and guidance during the dissertation process.

I. Botcherby for peer review and proof reading.

J. Ladlow for the help with decoding Microsoft Word

Dr G. Doo for proof reading the final dissertation

To all my colleagues and industry contacts especially the manufacturing companies who promoted this work being undertaken.

Lastly but by no means last my wife and children for giving me the motivation and support during my studies.

**Table of Contents**

## 1. List of Figures

## 2. List of Tables

## 3. Introduction

The European Union began as a trading bloc known as the European Economic Community (Common Market). The United Kingdom became a member of this trading bloc in 1973. Membership of this common market removed trade barriers and tariffs on goods between the member nations.

The Treaty on European Union (TEU) which is better known as the Maastricht treaty was signed on the 7th of February 1992 and is a direct revision of the 1973 treaty. The TEU treaty was ratified by the United Kingdom Government in July 1993.

Membership of the new European Union has provided greater integration both politically and financially of the member states through common legal instruments.

Today the European Union is comprised of 28-member states and is governed by standards and regulations which are mandatory for all member states to comply with.

Compliance with the Directives and Regulation allows the free movement of goods and services within the 28-member states. The membership of the European Union has grown significantly during its history and to date no member state has left the European Union. The European Union is founded on what are known as the four pillars, these are stated in TEU(92/C191/01):

"Free movement of goods, persons, services and capital between member states"

"The approximation of relevant laws, regulations and administrative provisions between member states"

"EU-wide competition policy, administered by the commission"

"A system of common external tariffs (CET - also known as the common customs tariff)"

Prior to the referendum vote on the 23rd of June 2016 the United Kingdom Government produced a research and analysis document titled "*Why the government believes that voting to remain in the EU is the best decision for the UK".* This publication was produced for the whole of the United Kingdom population prior to the referendum vote.

According to the Cabinet Office (2016) "Voting to leave the EU would create years of uncertainty and potential economic disruption. This would reduce investment and cost jobs. The government judges it could result in 10 years or more of uncertainty as the UK unpicks our relationship with the EU and renegotiates new arrangements with the EU and over 50 other countries around the world."

The outcome of the Brexit referendum held on the 23rd of June 2016 has created a great deal of uncertainty within the United Kingdom economy, to date there has been very little information provided by the Government on the consequences of the decision to leave the European Union.

It is the intention that this research will be conducted and presented without a political bias. The aim will be to refer to documents containing objective information, and the possible direct outcomes of the withdrawal process. The report will only refer to factual documents and the possible outcomes that directly influence the withdrawal process as written in the relevant treaties. Secondary terminology such as hard and soft Brexit will not be used as they imply aspirational outcomes based on political opinion and ambition.

### 3.1. The importance of the research

The intention is to produce a piece of non-political research based on the current position of the United Kingdom in relation to the withdrawal from the European Union. The results of this work are expected to establish the potential outcomes that small and medium enterprises operating in the constructional steelwork industry sector will face after the withdrawal.

This research will look in detail at the constructional steelwork industry sector that is controlled by European regulation. This report examines the number of manufacturing organisations engaged in this sector. The research has identified that this industry sector is predominantly made up from Small and Medium Enterprises. This research will identify the potential impact of leaving the European Union on SME's who manufacture structural steel.

The European regulation related to this subject matter is the Construction Products Regulation (EU 305/2011), which replaced the Construction Products Directive 89/106/EC. This regulation was transcribed into UK law under a statutory instrument 2013No.1387 BUILDING and BUILDINGS the Construction Products Regulations 2013.

The implementation of the European Regulation in June 2013 placed a mandatory requirement on all manufacturers of construction products
to place the CE mark on items being placed on the market throughout the European Union.

The CE marking is a passport for goods that conform to a set of prescribed requirements as mandated in the applicable harmonised European standards. These standards are referenced within the regulation. This mandatory requirement for manufacturers is to obtain verification from a recognised independent certification body listed on the European Union website known as the New Approach Notified and Designated Organisations (NANDO).

Political change has a potential to introduce instability, business is sensitive to change and prefers to operate in a stable environment. The withdrawal from the European Union will end a period of 45 years where trade has been conducted within the free market under common rules and regulation.
There may be an element of risk that will have a direct effect on UK manufacturers who export into the European Union.

This risk will not be immediate as there will be a two-year period which started in March 2017 for the United Kingdom to arrange new trade agreement with the European Union (Rhodes, 2016). Failure to reach trade arrangements will then have a direct impact on UK manufacturers should they export goods to the EU.

This research will provide a risk assessment against the changes created by the withdrawal of the European Union on the chosen industry sector and provide impartial information designed to mitigate the risks and potential impacts.

### 3.2. Research aims

It is expected that by focusing on a regulated industry sector and applying academic analytical models, a profile of the impact on the chosen industry sector can be produced. This research is expected to identify the potential disadvantages or advantages that may influence the chosen industry sector.
The work will rationalise the content of the governing regulations and identify where compliance already exists within the United Kingdom legal framework. The results of the work are expected to provide accurate guidance to the constructional steelwork manufacturing industry.

### 3.3. Objectives

a. Identify the potential regulatory and legal changes for the structural steel industry sector.

b. Perform a sample survey of the United Kingdom steel manufacturing sector that will allow analysis and presentation of findings to be discussed

c. Analyse the trade conducted by the UK SME organisations within the United Kingdom market and European Union.

d. Produce a risk assessment model that analyses the steel manufacturing industry sector after the EU withdrawal

e. Provide conclusions and recommendations from the research findings to inform industry.

f. Investigate the impact that will be placed on the remaining 27-member states of the European Union who export structural steel products into the United Kingdom. Although the European legal framework is adopted into UK law there may be a position where the UK may impose additional restrictions on imported goods and become protectionist and restrict imported products.

# 4. Literature Review

## 4.1. The European Union in a global context

To begin the research, it has been important to understand the context in which the European Union exists. We often hear of the term globalisation being used to describe the expansive markets that all nations trade in.
Gavin (2001 pg 3) states that the classical definition of globalisation is related to the integration of national economies through trade, finance, technology and lastly the ability of labour to move freely.

The definition given by Gavin aligns directly with the first of the four pillars of the TEU, which indicates that the European Union uses the model of globalisation in a macro environment based within the membership of the union. Globalisation however, is not a new concept. Trade has been conducted in one form or another for as long as records have existed.

Gavin (2001 pg11) further describes the European Union as a regional trading bloc that discriminates in favour of its membership which ultimately undermines the concept of globalisation.

Porter (1998 pg 63) describes globalisation and how industry has "internationalised". Within this context Porter also describes the formation of alliances between organisations in a global market to gain advantage.

The benefit of global trade is obvious as the potential to buy materials and services from a larger market leads to competitive pricing. It is also worth noting that developments in transportation technology have reduced the time it takes to move products around the globe and competition promotes a reduction in costs.

TEU(92/C191/01) which is more commonly known as the Maastricht Treaty states the rules of European Union. The common terms of the treaty are based on four principles that are better known as the four pillars which regulate the single market. The four pillars are:

- "Free movement of goods, persons, services and capital between member states"
- "The approximation of relevant laws, regulations and administrative provisions between member states"
- "EU-wide competition policy, administered by the commission"
- "A system of common external tariffs (CET - also known as the common customs tariff)"

The European Union is set up as a free trading group of 28 nations the 28-member states trade under a common set of rules and regulations, Porter describes this configuration of trade as a cluster.

The European Union operates the CET or common customs tariff which is one of the four pillars of the TEU, Since the completion of the internal market, goods can circulate freely between Member States. The 'Common Customs Tariff' (CCT) therefore applies to the import of goods across the external borders of the EU.

The tariff is common to all EU member states; however, the rates of duty vary between products and services depending on what they are and where they come from. The rates depend on the economic sensitivity of products.

The tariff is therefore the name given to the classification of goods and the duty rates which apply to each class of goods. In addition, the tariff contains all other Community legislation that influences the level of customs duty payable on an import depending on the source of origin.

Through the tariff, the Community applies the principle that domestic producers should be able to compete fairly and equally on the internal market with manufacturers exporting from other countries.
The common tariff therefore offers a level of competitive protection for the members of the European Union when trading in the global market.

(Porter 1998 pg 292) uses the term declustering in which he describes the loss of national advantage. The United Kingdom's separation from the existing 27-member states of the European Union is the point where national advantage on the part of the United Kingdom may be lost. This will be due to the perceived protection on tariffs that is given by the common customs tariff agreement.
In effect the United Kingdom will be trading independently in the global market after the withdrawal from the European Union.

The research for this project has identified that within the United Kingdom there are approximately 3035 steel fabrication companies that are bound by the same regulation as those in the 27 other trading countries within the European Union.

The impact on United Kingdom manufacturers will not be known until after the leave date, however, the assumption is that the United Kingdom internal market will potentially be open to global competition due to the loss of protection of trading in the EU bloc. The discussion section of this report will identify the risk to UK industry.

## 4.2. Analysis of the changes

The purpose of this work is to evaluate the potential effects and outcomes of Brexit or the withdrawal from the European Union. For this project the structural steelwork manufacturing sector in the United Kingdom has been grouped together and will be considered as a single manufacturing entity that trades in both domestic and external markets.

The relationship with the European Union has existed since the early 1970s and there exists a common set of rules, regulations and financial controls.
The changes are on multiple levels and will influence both the United Kingdom internal and external markets.

The greatest change will be the relationship with the European Union after over 40 years of trading within a protected bloc. To start to analyse the impact of the change it is important to consider other elements that are integral within the context of this work. There are recognised academic elements that dictate how change is managed these include but are not limited to the following:

- Leadership
- Mission
- Strategy
- Culture

The four areas of change management identified above will need to be applied at two levels, the first is at national level with leadership being provided by the Government the second level of management leadership will be with the

companies that have to adapt to the changes brought about by withdrawal from the European Union.
The mission statement may be incorporated into an organisation that will satisfy the needs of both stakeholders and employees.

A mission statement can also be focused towards the customer and provide assurances of the organisations best intentions, to provide products and services within a prescribed set of measurable values and serve as a guarantee.

A mission statement can also be considered as a guidance document or route map that gives an organisation direction. (Mullins 2008) "if you do not know where you are going how do you know when you have arrived?".

Strategy is again directed on different levels by both the Government and manufacturers. The Government has developed a strategy which has been applied to the negotiation of future trade arrangements. After the conclusion of the article 50 period the second tier of strategy management will then have to be adopted by the manufacturing industry that is affected by the outcome of the negotiations.

According to the world atlas there are 194 countries on the planet. This figure does not include disputed states or partly recognised states. Each country has a national identity and therefore a different culture. It is important for any trading nation to recognise culture as an important factor for building relationships. Even more so when the possibility of the United Kingdom trading on a global scale outside of the European Union becomes a reality.

The United Kingdom Government is led by a Prime Minister supported by a cabinet of individuals with separate responsibilities. We can assume that a collective top down leadership approach is in place.

The top down approach is also known as autocratic leadership. (Filev 2008) This style of leadership is reliant on someone in a senior position for example a Chief Executive Officer or in this case the Prime Minister and the cabinet making decisions and forming conclusions that determine how an organisation operates. In the case of this work the organisation in question is the United Kingdom.

David Cameron supported by his cabinet office (the team leader and the team) gave the population of the United Kingdom a referendum on the continued membership of the European Union. By giving the referendum, the leadership model changed to a bottom up approach where the decision was taken by the population and not the established leadership.
(Mullins 2007 pg 332) states the following; "The team leader is responsible for seeing that sufficient alternatives and their predicted consequences have been developed for evaluation by the team".

"The team leader will thus ask, 'What are our alternatives?' – and not just, 'What is the answer?'"

"The team leader also recognises that it is wiser to seek and listen to the ideas of the team before expressing his or her own ideas and preferences".

The points raised by Mullins were not it appears considered by Cameron as the immediate period following the referendum result was chaotic to say the least. The referendum result of 52% in favour of leaving against 48% wishing to remain in the European Union created a divide in the United Kingdom demographic. This divide has created an unstable political environment.

The democratic process that decided the referendum may prove to be deeply flawed. The leadership role reverted to a top down approach after the referendum result was concluded as the Government accepted the result and began the process of withdrawing from the European Union.

There was a change in the conservative party leadership with David Cameron resigning and being replaced by Theresa May, and a new cabinet office.
The future direction of the United Kingdom was then to be re-defined as Brexit was a step into the unknown, the following quote seems appropriate to describe the UK position after the referendum result.

"When you can measure what you are speaking about, and express it in numbers, you know something about it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts advanced to the stage of science." (William Thomson, 1st Baron Kelvin undated)

The United Kingdom Government after June 2016 has had to consider the strategy that the nation will adopt for the future position outside of the European Union.

(Johnson et al 2008) defines strategy as "the direction of an organisation over the long term, which achieves advantage in a changing environment through its configuration of resources and competences with the aim of fulfilling stakeholder expectations".

The organisation in the context of this report is the United Kingdom. The UK Government published a white paper in 2017 called "Industrial Strategy Building a Britain fit for the future"

This publication identifies five key areas where the Government will develop the United Kingdom. The strategy paper offers very positive messages from both the Prime Minister and the Secretary of State for Business Energy and Industrial Strategy.

(May 2017) says "Two centuries ago it was our industrial revolution which led the world. Thirty years ago, it was our bold, pro-market reforms which set an example for others to follow. Today, our ambition is just as high. As we leave the European Union and forge a new path for ourselves, so we will build a Britain fit for the future and fulfil the mission that I set on my first day as Prime Minister: to make our United Kingdom a country that truly works for everyone".

(Clark 2017) says "Our Industrial Strategy will inform decisions now, and in the future. Other countries have benefited from establishing policies and institutions which endure. That is our aim. Through the consultation on our Green Paper, over 2,000 organisations from all parts of the United Kingdom have helped shape this strategy. That partnership with innovators, inventors, job creators, local leaders, the devolved administrations, workers and consumers will continue as we work together to make our country fit for the future".

(Naim 2007) argues that free trade agreements are irrelevant. In his article it is stated that free trade deals are crashing, and that trade is still increasing on a global scale. In the text of the publication it states that trade deals are "politically radioactive" and that countries that have economic activity related to exports are growing at 1.5 times faster than countries that have stagnant exports. The UK Government statistics indicate that United Kingdom export figures to the European Union have not grown for many years, there may well be a case for withdrawing from the European Union trade bloc to seek a more global trading system under World Trading Organisation rules.

### 4.3. Business Population Estimates for the UK AND Regions 2016

#### 4.3.1. Statistical Release (BEIS 2016) Who is affected?

To justify the research, it was important to establish the extent of businesses that will be impacted by the withdrawal from the European Union. From the statistical release produced by BEIS it was found that small and medium enterprises account for 99.3% of all private sector businesses in the United Kingdom.

The report also concludes that these businesses contribute £ 1.8 Trillion to the UK economy and are responsible for 60% of all private sector employment or 15.7 million people (BEIS 2016 Pg1).

The area of interest for this research is focused on the construction industry which according to the report is statistically the second largest business type in the United Kingdom.

The construction industry however, is made up from multiple sectors and the specific sector of this research into the constructional steel work sector makes up a relatively small proportion of the construction industry. What is important to note is that the whole of construction industry is regulated by the same directives and legal requirements.

The British Standards Institute published a report in 2014 called the UK SME Landscape and Standardisation Research the results published in this report uses the data produced by BEIS.

By reviewing the data from this report, the number of businesses in the steel fabrication industry sector directly impacted can be stated as approximately 3,000 companies. (BSI 2014 Pg 70 SIC code 2511).

The number of companies is consistent with the research data obtained in the secondary research for this work which will be detailed in further sections.

The impact of withdrawal from the European Union and the trading arrangements on this industry sector are yet to be defined. The initial risk to this industry sector is the ability to purchase raw materials without trade tariffs and the ability to sell goods and products within the existing trading bloc. There is also the possibility of restriction of movement of skilled workers which may lead to a reduction in productivity in the industry sector.

### 4.4. UK Steel Industry

In the study conducted by (Rhodes 2016) the status of the United Kingdom steel manufacturing was reviewed. The study identifies that there has been a vast reduction in this manufacturing sector. The study reports that the number of employees has fallen by 289,000 over a period of 45 years.

This decline can be attributed to many factors, but the significant factor is the emergence of globalisation and the manufacturing bases that have emerged in countries that have less overheads and lower labour costs. This in turn has meant that steel products can be produced at more competitive prices abroad.

The most prolific of the new manufacturing nations is China which is now the global leader in steel production with 50% of the steel in the world being manufactured there.

The United Kingdom steel industry is bound by European Regulation and is controlled in the European Union trade treaty of the single market. When the import and export figures are reviewed it can be observed that the import and export values with the EU have been relatively static over the last two decades.

The statistics published by (Rhodes 2016 pg 10) show that the United Kingdom exports 52% of its manufactured steel to the European Union and imports 69% of steel from the European Union, this shows that the United Kingdom steel industry trades at a deficit with the European Union for steel products.

The status of the global steel industry represents one of the significant factors for this work as it may provide advantages to UK businesses after the withdrawal from the EU due to the removal of trade tariffs and conversely a threat to the UK market due to the ability to import at costs lower than the domestic market. This point will be considered in the risk evaluation models.

### 4.5. European harmonised standards

**European Committee for Standardisation (CEN)**

The standardisation system in Europe is based on the national pillars, which are the National Standardisation Bodies or the members of CEN. The national standard body for the United Kingdom is the British Standards Institute who represent the United Kingdom on the CEN committee.
National Members are obligated to implement European Standards as national standards. Any existing National standards which were previously in force in the member country are required to be withdrawn.

The topic of standardisation within the European Union presents an area where the devil will be in the detail in relation to the United Kingdom withdrawal from the European Union.

Regulated products are manufactured to approved harmonised standards, the standards used throughout the European Economic Area are adopted by 34 members. The adoption and implementation of a harmonised standard will give the manufacturer in the customs union trading area a presumption of conformity to the governing regulation or directive.

This then allows the passport for goods which will carry the European CE marking and will therefore be allowed onto the market of any member state.

One area of standardisation that is not widely understood is that several non-European Union countries also have an involvement with harmonised standards and are known as a Companion Standardisation Bodies (CSB).

Status is open to a National Standardisation Bodies (NSB), which is a member or corresponding member of the International Organization for Standardisation (ISO). Interested NSBs work closely with CEN to achieve technical harmonisation and contribute to the removal of technical barriers to trade between their country and Europe.

Article 189 of the TEU required all member states to transpose European Directives into the National legal systems of the member states and that the European Directives would become the governing legal authority for all member states.

The UK leaving the European Union will require the framework of TEU(92/C191/01) to be reviewed and where necessary changes to United Kingdom laws and Regulations may be made.

The consequence of withdrawal on manufacturers in the United Kingdom will need to be assessed on a sector by sector basis. This work will focus on one specific industry sector which is steel fabrication in the regulated construction industry.

### 4.6. Article 50 TEU

Withdrawal of a Member State from the EU

The ability of a member state of the European Union to leave was considered and written in to the Lisbon Treaty in 2007 as article 50. To date no member of the European Union has withdrawn.

(Poptcheva 2016) identifies key areas that will impact the United Kingdom in a briefing document which was published in February 2016. The withdrawal process steps are shown in three stages below.


**Figure 1; Brexit Withdrawal Process (Source: Poptcheva, 2016)**

The first section of this literature review identified that there are four pillars of the TEU treaty, the article 50 process will result in the end of the application of the Treaties and the Protocols in the United Kingdom from that point on.
The future relationship of the United Kingdom and the European Union after the end of the withdrawal process (and any transitional arrangement period) will rely on the terms of new negotiations between the United Kingdom Government and the representatives of the European Union.

The UK Government introduced a Great Repeal Bill white paper in March 2017 which intends to adopt all EU legislation into UK law. This, when implemented will maintain the status quo with the requirements to meet European standards after the UK leaves the EU for a nominal period.

The key aims as reported throughout the news and media of the UK negotiations are to maintain a free trade agreement and the rules of the

customs union. The outcome of these negotiations will not be known at the time of completion of this dissertation however, the possible outcomes of the negotiations will be a consideration of the discussion and conclusion sections of this work.

### 4.7. European Union (Withdrawal) Bill July 2017

This white paper outlines how the United Kingdom will repeal the European Communities Act of 1972. The full effect of this document will not come into force until the day before the United Kingdom officially leaves the European Union in March 2019.

This Bill document outlines how regulations and laws will be transcribed into United Kingdom law but does not cover the key area of impact that will affect the subject matter of this work, the Customs Union which allows the passport and free movement of goods will still need to be negotiated between the United Kingdom and the remaining 27 members of the European Union.

In schedule 7 of the Withdrawal Bill it states that the European Regulations will become Statutory Instruments under United Kingdom law.
The researcher has identified in previous research that in some of the cases this undertaking has been completed at the time new European Regulation has been published.

The Government has emphasised the point that the transcription of the European regulations in to United Kingdom law will be a complex task however, in some cases the requirements of European Regulation are already on the United Kingdom statute book (note to self-inform HM Government of this fact).

The United Kingdom Government has at the time of writing concluded the first round of negotiations and secured a transition period of a further 2 years to

conclude arrangements with the European Union. The European Union has outlined the general principles of the transition that are shown below.
Transition - General principles TF50 (2018) 29 - Commission to EU 27

General obligation on the UK to ensure the integrity of the EU Customs Union and Single Market:

- Compliance with all Single Market acquis, including supervision and enforcement
- Alignment on EU trade policy — UK authorities continue to act in accordance with the mission of EU customs authorities (e.g. collecting EU customs tariffs and performing checks)
- No UK participation in EU institutional bodies, but could be invited to attend without voting rights exceptionally on a case-by-case basis — The UK remains bound by the obligations stemming from the agreements concluded by the EU —
- The UK may not become bound by international agreements entered in its own capacity in fields of EU competence, unless authorised by the EU.

**Summary of the findings from the literature review**

The researcher has concluded from the literature review that there are several areas where the constructional steel products industry will be impacted. The research has also identified the stakeholders who will be impacted.

The current legal position of the construction products industry is bound by overarching European Regulation which is the Construction Products Regulation (EU 305/2011). The European Regulation has been transposed into United Kingdom law as a statutory instrument 2013No.1387 BUILDING and BUILDINGS the Construction Products Regulations 2013.

The status of both regulations means that at the time of writing there is regulatory alignment between the European Union and The United Kingdom. The risk to the United Kingdom constructional products stakeholders is because of the regulatory alignment and the technical implications related to the CE marking of products.

The impacts are due to the United Kingdom law stating that products shall be CE marked in the regulations. After the 29th of March 2019 the United Kingdom will no longer be a member of the European Union, as such the control of regulated products will lie solely with the European Union in both the United Kingdom and European market.

The European Commission has issued a statement that after the withdrawal date United Kingdom Notified Bodies will no longer have recognition within the European framework. This means that all certification of United Kingdom manufacturers in a regulated industry will have to be undertaken by a Notified Body registered in one of the 27 existing member states, or a party recognised under a mutual recognition agreement.

So even after leaving the European Union United Kingdom manufacturers will remain under European Union control.

## 5. Research Methodology

(Saunders et al 2007, p. 602) describes methodology as "The theory of how research should be undertaken, including the theoretical and philosophical assumptions upon which research is based and the implications of these for method or methods adopted"
In nearly all cases quantitative research identifies three primary methods of research which are:

**Exploratory**: Where research of a concept relates to people or a topic that the researcher has limited knowledge.

**Descriptive**: Where research is conducted on people or a situation in which the researcher has a limited understanding and wants to describe findings or observations.

**Explanatory**: This method involves the testing of a hypothesis and evaluating the hypothesis from available theory.

These types of study form the basis of qualitative and quantitative research.

Biggam (2008) Identifies that researchers can become confused by academic terminology and that the terms *quantitative* and *qualitative* are often substituted by *positivism* and *phenomenology*. The requirement to obtain quantifiable data is why positivists' research is equated with quantitative research. Both approaches although similar, are not the same, because the introduction of a questionnaire to obtain quantifiable results is dependent on participation and hence human influence which counter to the positivists' philosophy.

The Saunders et al (2007) research 'onion' model Figure 2 provided the researcher with a guideline to appreciate research philosophy. The research knowledge should be developed to answer the research question. Each layer of the research 'onion' provides the researcher with options to develop the question and consequently provide the answer to the perceived problem.

Illustration based on Saunders et al (2007, p. 132)

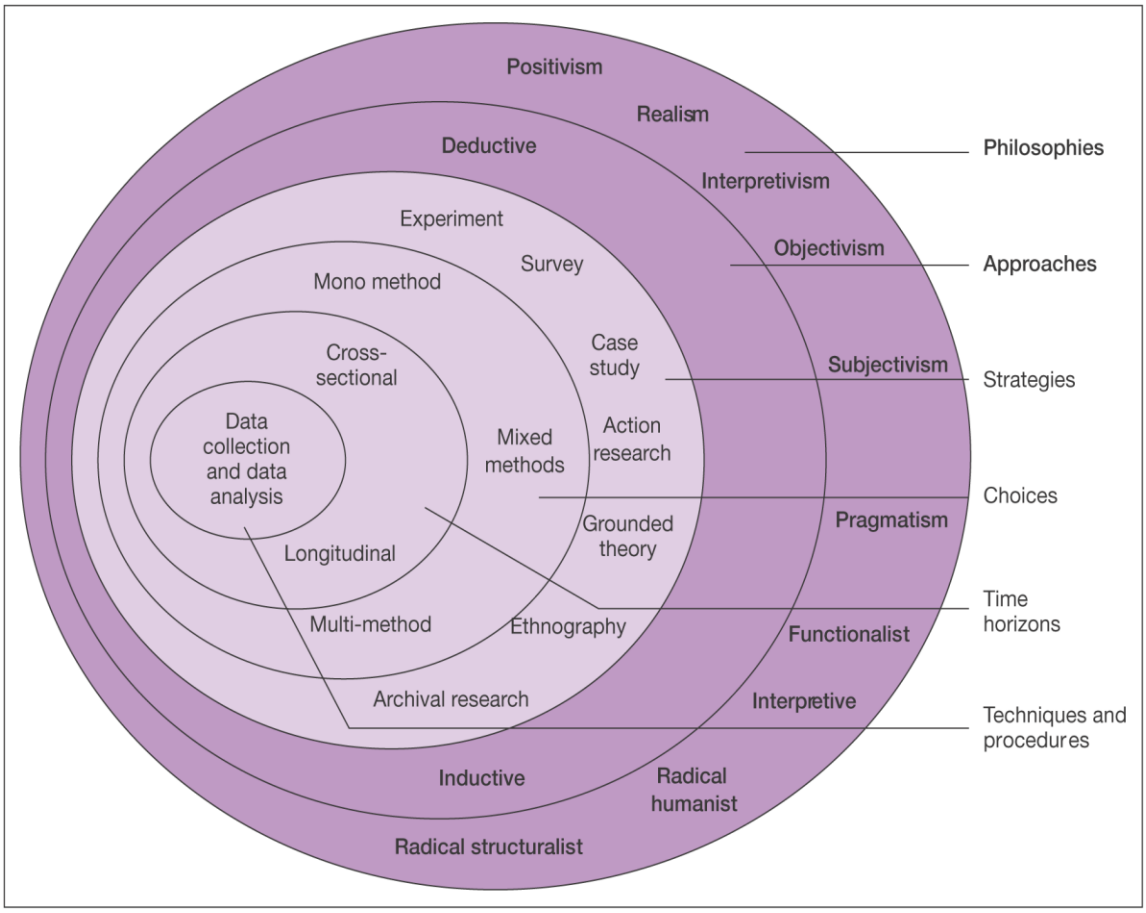



**Figure 2; Research Onion (Source: Saunders et al.,2007)**

### 5.1. Research route map

The methodology for this dissertation has identified a route to establish how the research question is to be answered. There are six sections of Saunders Onion that can be applied to a research problem.

For this project the researcher chose the following route to answer the research question. The route taken is shown in Green text.

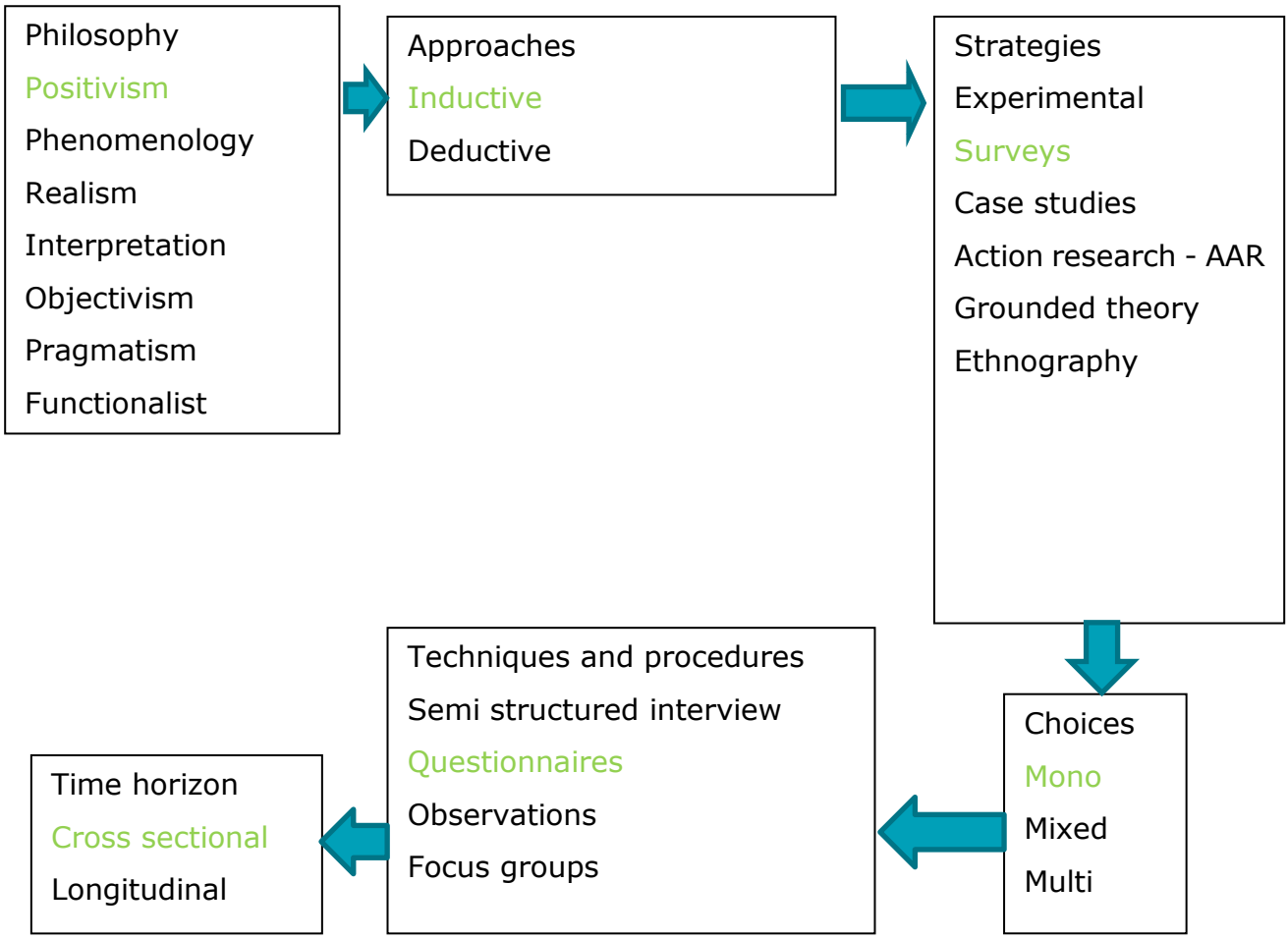



**Figure 3; Methodology Route Map (Source Author)**

## 5.2. Positivism

Ethridge (2004) states that positivism views factual knowledge which can be gained via observation (the senses), including measurement. Saunders (2007) suggests that researchers work to a highly structured methodology to allow repetition of quantifiable observations by others.
These observations allow statistical analysis. The researcher should then become an objective analyst, making impartial interpretations about the data collected.

This view is also supported by Easterby-Smith et al (1991) and Grix (2004) who propose that positivism is directly linked with objectivity:
"properties should be measured through objective methods, rather than being inferred subjectively through sensation, reflection or intuition" (Easterby-Smith et al, 1992, p. 22)

Jonker et al (2010) states reservations relating to the effectiveness of positivism-based results as the subjects involved in the research may be resistant to change and that the researcher should also review the implementation of the research results to gain a fuller and more concise research picture.

"By remaining objective the researcher is independent of and neither affects nor is affected by the subject of the research" (Remenyi et al, 1998 cited in Saunders et al 2007, p. 103).

## 5.3. Inductive approach

Gabriel (2013) states that the differences between inductive and deductive approaches to research is that the deductive approach is aimed at testing theory, the inductive approach produces new theory from the review of data.

Saunders et al (2012) identifies that the inductive approach generates findings from the data collected which identifies trends and relationships to allow a theory to be established. The inductive approach does not restrict the researcher from using existing theories to produce the research question to be studied.

The researcher decided that the inductive approach would be best suited to this dissertation as the United Kingdom withdrawal from the European Union is a future event and there is very little academic data or research in the subject matter.

The researcher has also identified that the data collected from the survey demographic is influenced by human interaction with the survey questions.
Saunders et al (2007) suggests that the research is about the theory at the beginning of a project. Given that there is no clear hypothesis relating to the dissertation topic at the time of writing, the inductive approach to the research question is the most appropriate method of forming the research output.

Saunders et al (2007) also identifies that using a deductive approach is more generally associated with positivist and quantitative research. The inductive approach, will develop theory after the result of the researcher's data analysis.

### 5.4. Strategies Survey

Surveys represent one of the most common types of quantitative, social science research. In the case of this project the researcher has selected a sample of respondents from a population. The decision to use the survey method is because questions can be distributed to many respondents and collected and analysed with a high degree of consistency.
(Angus and Katona 1953 p16) state "It is this capacity for wide application and broad coverage which gives the survey technique its great usefulness".

Aliaga and Gunderson (2000) and cited by Muijs (2011, p. 1) describes quantitative research as "Quantitative research is explaining phenomena by collecting numerical data that are analysed using mathematically based methods (statistics)"

Strengths and weaknesses of contact methods table 1

| | Mail | Telephone | Personal | Online |
|---|---|---|---|---|
| Flexible | Poor | Good | Excellent | Good |
| Quality of data | Good | Fair | Excellent | Good |
| Control of interviewer effects | Excellent | Fair | Poor | Fair |
| Control of sample | Fair | Excellent | Good | Excellent |
| Speed of data collection | Poor | Excellent | Good | Excellent |
| Response rate | Poor | Poor | Good | Good |
| Cost | Good | Fair | Poor | Excellent |

**Table 1; Strengths and Weaknesses of Contact Methods**

**(Source:Kotler et al,2010, p.135)**

Issues with the data collection during the initial gathering exercise became apparent at an early stage. A list of contact details was populated, and respondents were contacted via email. The response rate was less than expected with a 0.7% return rate. This response rate created pressure on the research as without representative data the research would fail.

It was then decided to put the survey on to a social media platform with specific groups who operate in the structural steel manufacturing sector, again the response rate was comparable to the contact via email.

To increase the response rate, the method of collection for survey data was changed to direct contact via telephone from the list of potential respondents. This method of contact returned more positive feedback. This would support the theory of horizontal communication as described by Guffey et al (2009 p.18) where,
"Horizontal communications take place through personal contact, telephone, email, memos, voice mail and meetings"

The final response to the survey returned approximately 30.2% of the contacted manufacturers. A valuable lesson was taken from the experience of collecting data in that the assumption of the researcher that the topic would generate a positive response was not realised.

To evaluate the findings of the survey the formula provided by
Saunders et al (2007, p. 213) was used this describes the active response rate as:
Total number in sample= 380
Total responses=115
Active response rate = (115/380) X 100% =30.2 %

For this study, all questionnaire responses were eligible. Therefore, calculating the active response rate, is stated as 30.2%

### 5.5. Choices Mono method

The objective of this research is to ascertain the potential impact on United Kingdom manufacturers of structural steel after the United Kingdom withdraws from the European Union trading bloc and prescribed regulatory requirements and trading agreements.

The first stage of the work is to recognise what the problem is and what the potential consequences of the problem are. Barker (1997) proposes that the researcher should investigate the root cause of the subject to identify the complexity and potential outcomes.

"Only by enriching our perception of it can we begin to generate genuine alternatives for action" Barker (1997 p.32)

Peter Drucker produced work in 1954 where the acronym SMART was promoted as a management tool for the evaluation of a problem, Grote (2002) questioned what the SMART objectives were and later defined five components that lead to an effective goal.

Hale and Whitlam (1997) stated that the objectives should be able to determine that the research is achievable and measurable to facilitate the success or failure of the outcome.

The combination of points identified in the research onion and deliverables promoted in table 1, lead to a conclusive point that this research will be qualitative as the assessment of data will produce answers to the question posed by the topic.

(Jankowicz 1995) describes methodology as "The analysis of, and rationale for, the particular method or methods used in each study, and in that type of study in general"

| SMART objective: | Table 2 |
|---|---|
| Key Component | Objective |
| **S**pecific - What is the specific task? | To identify potential impacts on the UK steelwork manufacturing sector after Brexit |
| **M**easurable - What are the standards or parameters? | Evaluation of the number of UK manufacturers who rely on trade exports to the European Union and the employment of European skilled migrant workers and the impact of divergence from current European regulation |
| **A**chievable - Is the task feasible? | Sufficient time has been allocated to conduct research and gather survey response and write the dissertation |
| **R**ealistic - Are sufficient resources available? | Resources were considered before the start of the project with no issues foreseen |
| **T**ime-Bound - What are the start and end dates? | The work is restricted to the timeframe determined by the university and will be submitted in May 2018 |

**Table 2; SMART Analysis: (Source: London South Bank University)**

### 5.6. Cross sectional study

As part of the research a survey has been conducted to establish a representative proportion of manufacturers that manufacture steel products in the United Kingdom. The data from this survey has identified a representative number of manufacturers in this industry sector that will be directly affected by the United Kingdom withdrawal from the European Union with regards to regulation and standards.

The method used for gaining information from the manufacturers was conducted via a questionnaire format on survey monkey using the theory provided by Brace (2008) which explains the purpose of the questionnaire is

to “illicit information that will allow the researcher to answer the objectives of a survey”.
To rationalise the extent of the subject the first exercise was to identify and link the relevant information and structure it in such a way to allow it to be logically collected and analysed. For this work a mind map based on the work of Buzan (2006) was used to develop the project framework.

A mind map is a graphical method of taking notes. The visual format of the mind map creates the structure of the problem being investigated. For this work, colours based on the Red, Amber and Green of a traffic light system were used this then identified areas of risk and opportunity.

The central area for this project was Brexit, from which branches are drawn off the main topic which represents different parts or aspects of that main topic. The mind map was also essential for the final development of the survey questionnaire that has been used for data gathering.

The work by Saunders (Saunders et al 2012 pg 428) identifies the importance of the questionnaire design. A pilot survey was designed and conducted prior to this work starting and the preliminary results were analysed against the research objectives of the dissertation.

The output identified certain areas where ambiguity arose within the question set. The final survey questions were refined and sent for peer review to several industry bodies associated with the constructional steelwork sector prior to general release.

The revised survey now provides “predictive validity” in line with the points offered by (Saunders et al 2012)

(Martin & Bridgmon 2012 ch 13 pg 446) define the requirement to identify the population under study. The industry sector at the centre of this research is the manufacture of a common product type under a regulated sector.
The development of the survey questions has been developed to give consistent outputs based on 10 single headline questions and 3 variants in the answer. The outputs from the questions are readily presented in graphical form to allow a statistical analysis of the results across the respondents.

## 5.7. Justification of the baseline questions

The question set produced for the survey was limited to 10 key questions. These questions are intended to establish a baseline that is applicable to all respondents, however, the answers that are provided in the survey identify the perceived risks and opportunities that the manufacturers face after the withdrawal from the European Union.

The questions are listed below with an explanation of the research intent.

**Q 1, Is your company certified to BS EN 1090-1?**
Question 1, establishes that the respondent is complying with the legal requirement placed on the industry through certification to the Construction Products Regulation. The data output will also give an indication as to the proportion of manufacturers directly affected by the withdrawal from the EU.

**Q 2, Does your company export structural steel products outside of the United Kingdom?**
Question 2, will provide data that identifies if the withdrawal from the EU will impact on the current level of trade conducted by the manufacturer both domestically and externally from the UK.

**Q 3, Where do you source your manufacturing materials?**

Question 3, will identify where manufacturers source raw construction materials, the data from this question will indicate if there is a risk or opportunity in the supply chain that may influence manufacturing in the UK.

**Q 4, If your trade is in the UK only, do you expect certification to BS EN 1090-1 to be a mandatory requirement after the UK leaves the EU?**

Question 4, will establish if the manufacturing industry believes that alignment with the EU regulation is still required after withdrawal from the EU.

**Q 5, Has the Brexit referendum had a negative impact on your business to date?**

Question 5, will establish if the manufacturing outputs have been adversely affected in the period following the referendum. The data will indicate a percentile figure of the current impact.

**Q 6, Does your company rely on the employment of European migrant skilled labour?**

Question 6, aims to investigate the level of reliance on migrant skilled labour in the constructional steelwork sector. The number of skilled workers in the UK has the potential to impact productivity.

**Q 7, After the UK leaves the EU would you prefer to revert to British Standards?**

Question 7, is aimed at measuring the wish to implement change in the use of standards. The result from this question will identify the potential for the UK to introduce an internal protectionist market by placing specific UK requirements on imported products.

**Q 8, Do you feel that you have been adequately informed of the impacts on your business when we leave the EU by the Government department for business (BEIS)?**

Question 8, is designed to measure the level of understanding of the current and future situation of the steelwork manufacturing sector. The baseline data from this question will be used to measure reaction to other questions in the survey.

**Q 9, Do you feel that the Government should continue to regulate the structural steelwork manufacturing industry after the UK leaves the EU?**

Question 9, will determine if the industry wishes to have regulatory alignment with the EU after withdrawal or if divergence from European regulations and standards is a future course for the UK manufacturing sector.

**Q 10, Are you confident that the future of the structural steelwork manufacturing is secure after the UK leaves the EU?**

Question 10, is intended to provide a measurement of the anticipated impact that the manufacturers perceive because of the withdrawal from the EU.

### 5.8. Analysis methods PESTEL

The methodology has identified the questions that need to be addressed in the research. The methods of evaluation that have been considered for this work are based on known academic models. The initial model considered was Porters five forces of competition. This model is based on:

- Competitive Rivalry
- Buyer Power
- Products and Technology
- Supplier Power
- New Market Entrants

Each of the questions in Porters model have been considered in the research however when the research problem is reviewed in the context of multiple companies manufacturing in a single market sector, the output from Porters model will not consider the diversity of each single manufacturer.

The aim of the research is to group manufacturers and risk assess the overall impact on the United Kingdom internal market for the constructional steelwork sector after the United Kingdom withdrawal from the European Union. After careful consideration it has been decided to use a PESTEL model and supplement the findings by using a SWOT analysis as the inputs are more aligned with the research problem.

This approach will look at a wider question set and then condense the findings into four simpler evaluation outputs this theory for evaluation is supported by Gray (2016).

Gray (2016) States "PESTEL and SWOT are highly effective analysis tools to help you during the process of developing a strategic plan for business.
They can be used in isolation, however they become significantly more effective when used in combination".

Gray (2016) also describes the usefulness of each process as:

- **PESTEL** analysis considers the broad environmental context that affects the business and the changes that occur in this context.
- **SWOT** analysis then interprets these findings for the business to determine the strengths and weaknesses, and opportunities and threats.

"If combined, PESTEL analysis is usually completed first to provide a context for the SWOT analysis".
PESTEL looks at the following aspects related to the work these are:

- Political impacts associated to the topic
- Economic factors
- Social effects on the industry
- Technological considerations
- Environmental issues
- Legislative and legal consequences

The question set in the PESTEL model addresses four key elements related to the research problem the technological and environmental aspects are relevant and have been considered but do not require significant evaluation in this report.

### 5.9. SWOT analysis

Once the PESTEL evaluation has been completed the addition of a SWOT analysis allows the evaluation of a new dynamic in the research problem.
SWOT is the acronym for measuring:

- Strengths of the business
- Weaknesses of the business
- Opportunities the business may take
- Threats the areas of risk that face the business

BusinessEssays.net. (2018) identify the value of a SWOT analysis as "The application of SWOT analysis is applicable to various contexts because by listing down in detail about the strengths and weaknesses, it will enable and guide the researcher to investigate the dimensions of various opportunities and the potential impact of threats. SWOT analysis is simply a powerful planning tool".

BusinessEssays.net. (2018) also state that "The SWOT model is powerful and valuable because the model can provide insight into the direction that a business can focus on growth. The outcome from the model can be used to define and formulate business goals and milestones. Besides, as the results

from the model are forward looking, completion of such analysis will also enable management to focus on areas that give them a competitive advantage in the marketplace. On the other hand, besides suggesting and charting a strategic direction for a company, the model also enhances the management foresight to see looming threats and react proactively".

The selected methods of PESTEL and SWOT analysis however, have limitations. BusinessEssays.net. (2018) "PESTEL inevitably possess several disadvantages and limitations. Once the company has adopted PESTEL to do analysis, the data collection and process must be subject to regular accumulation of data".

The researcher has considered the point above and realises that this work will only be valid as a onetime assessment for this topic, should the subject be researched further then new data will need to be collected.

BusinessEssays.net. (2018) "There are arguments stating that a SWOT model is an expert's monophonic analysis (A monophonic SWOT model means that there is just one voice, one expert's view).

This argument infers that a SWOT model is often just a simple interview with a CEO or a focus group with a few players (where many stakeholders are not involved). Reasonably speaking, it is argued that for a more comprehensive analysis many stakeholders (customers, vendors, competitors, and employees) should be involved in providing the input".

The researcher believes that as the data collected from the survey of United Kingdom steelwork manufacturers was representative from a sample of many businesses the risk of a single point of view has been removed from the outcomes of the analysis.

### 5.9.1. Data collection and data analysis

Bogdan et al (1982, p. 145) describe the process of evaluating research findings as "working with data, organising it, breaking it into manageable units, synthesising it, searching for patterns, discovering what is important and what is to be learned, and deciding what to tell others".

Martin & Bridgmon (2012 ch 4 pg 71) describe the *"relationship of participants"* where the scores across the group are compared. The answers generated for this survey are independent and apply to each respondent. This process as stated by Martin and Bridgmon is also known as "between-group design"

The first survey was performed on the United Kingdom Notified Bodies the second survey was then carried out on a group of manufacturers who all produce the same product type under the same standards and regulation Martin & Bridgmon (2012 ch 4 pg 72) identify that the results can be related. The results are based on the outcome of the answered questions and as such are considered as within group statistical design.

The data recording method applied to the research was conducted with the online survey program called "survey monkey", this program presents the results in a graphical format and scores the answers as a percentage value.

To remove ambiguity from the responses the answers were kept very short and direct. Within the survey the largest number of possible responses is 4 answers. The survey data presents two different findings. The first is evidence that gives a basis for assessing risk due to withdrawal from the European Union. The second measures the opinion of the respondents.

When the data is reviewed and correlated in line with the process and expected outcomes of leaving the European Union, a profile of the potential impact on the industry sector will be presented.

### 5.9.2. Identification of stakeholders

To establish the scope of the research it is important to identify where the changes that occur after withdrawal from the European Union will impact different sectors of the United Kingdom. Firstly, it is obvious that the changes will affect the whole of the United Kingdom as the relationship with the European Union will undergo a radical change.

The change will be directly related to the way regulatory frameworks that govern business and trade between United Kingdom and the European Union are either aligned or diverged from. This research will focus on the impact on the industry sector for construction steel manufacture and the areas of risk.

The primary Government department involved will be BEIS, Government Department for Business Energy & Industrial Strategy.
The second body affected will be UKAS, United Kingdom Accreditation Service.
The third organisation will be the United Kingdom Notified Bodies
The fourth will be the manufacturers and their supply chain.

During the research for this project several areas of information that would be required to complete this work was identified. Research included a survey of United Kingdom Notified Bodies which are listed on the NANDO website. This would establish exactly how many certification bodies were certifying manufacturers within the United Kingdom.

It was found that there were 12 Notified Bodies listed to certify manufacturers to the European regulation related to this research, however, the number of active Notified Bodies at the time of the survey was 10. (valid at 09-01-2017

## 6. Ethical consideration

This research relies on quantitative data collection in the form of a survey. All respondents have provided information on a voluntary basis. Wells (1994) defines ethics *"in terms of a code of behaviour appropriate to academics and the conduct of research"* (p. 284),

The ability to gather relevant information from the industry sector required careful consideration as there are elements relating to manufacturers that may be trading illegally. Anonymity had to be put in place as data collection could be flawed if the participants felt threatened by divulging information that implicated them in illegal activity.

The preliminary method for the collection of manufacturers information was intended to be via online sources such as industry discussion forums and professional social media. The responses from this approach did not return a suitable representative survey sample and has been discounted as the primary information source. Data collection has subsequently been conducted by telephone interview and has provided more positive participation in the survey. Due to the number of manufacturers identified in the research the methods for collecting information had to be considered, the confidentiality for data collection has been verbally assured to all survey respondents involved in the research. The list of respondents in the annex of this report will need to be removed should the work be published.

Data collected from the Notified Bodies involved in this research is also required to be protected as there may be a competitive advantage gained from the data produced in identifying the number of clients contracted by each Notified Body. Should this work be published at a future date a redaction will be required in section 5 table 3 where the number of certified manufacturers is disclosed.

## 7. Survey results

From the survey of the Notified Bodies, it was identified that approximately 2339 certified manufacturing companies produce structural steel fabrications or constructional components in the United Kingdom. Table 3 below lists the Notified Bodies and the number of certified companies that will be impacted by the withdrawal from the European Union.

The Notified Body organisations shaded in Red are subject to risks that will be identified in the discussion section of this work.

| Notified Body | Total clients |
|---|---|
| SCCS | 563 |
| Alcumus Isoquar | 378 |
| BM Trada | 350 |
| BSI | 300 |
| BBA | 283 |
| CFA | 250 |
| Lloyds Register | 71 |
| SGS | 59 |
| TUV UK | 45 |
| TWI | 40 |
| BES | 0 |
| CEM | 0 |
| Total | 2339 |

**Table 3; Survey of Notified Bodies (Source: Author)**

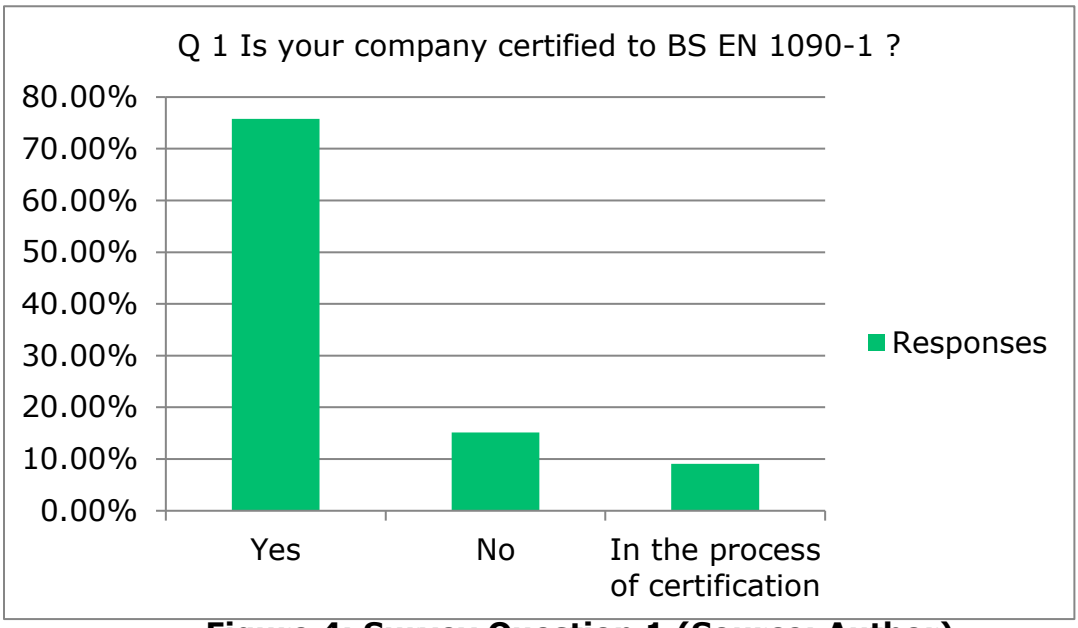



**Figure 4; Survey Question 1 (Source: Author)**

| Answer Choices | Responses |
|---|---|
| Yes | 75.76% |
| No | 15.15% |
| In the process of certification | 9.09% |

The data provided by the British Standards Institute in March 2014 page 70 SIC code 2511 established that there are 3035 manufacturers of metal structures and parts of structures these manufacturers are required to conform to the Construction Products Regulation and BS EN 1090 this is detailed in the extract below:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2511 | Construction | 25110 Manufacture of metal structures and parts of structures | 3,050 | 3,070 | 3,035 | -0.5% |

**Figure 5; Number of manufacturers (Source: BEIS, 2016)**

The survey of the Notified Bodies in table 2 identified that there were 2339 certified companies in the United Kingdom in January 2017. The survey data indicates that 24.24% of manufactures are not certified under the regulatory requirements in the United Kingdom.

When compared to the detailed figures presented by the British Standards Institute it has been established that 22.9% of manufacturers are operating without certification this produces a variance of 0.66% between the published data and the survey response which indicates a high level of accuracy in the survey data.


**Figure 6; Survey Question 2 (Source: Author)**

| Answer Choices | Responses |
|---|---|
| Yes | 32.00% |
| No | 68.00% |

The result of this question indicates that the predominant amount of trade conducted by United Kingdom constructional steelwork manufacturers is in the domestic market (UK only).

This question does not differentiate between trade with the European Union and the rest of the global market. To establish the exact amount of trade with the EU a further survey may be of benefit later.

Research of the import and export statistics issued by the Department for Business Innovation and Skills in January 2016 indicate that structural steel and Aluminium products are exported to both EU countries and Non-EU countries. These statistics are taken from 2014 so there may be some variance in the data for 2018. The statistics are shown in table 4 and 5.

Statistics for Building materials and Components source Office for National Statistics published by the Department for Business Innovation and Skills January 2016

External trade figures 2014

| EU value | Non-EU value | Trade type | Product |
|---|---|---|---|
| £209,811 Million | £55,437 Million | Import | Structural units Steel |
| £110,173 Million | £102,778 Million | Exports | |

**Table 4; Balance of Trade (Source: BEIS, 2016)**

| EU value | Non-EU value | Trade type | Product |
|---|---|---|---|
| £232,703 Million | £42,707 Million | Import | Structural units Aluminium |
| £27,203 Million | £50,179 Million | Exports | |

**Table 5; Balance of Trade (Source: BEIS, 2016)**

The researcher is unable to conclude where United Kingdom manufacturers export to with any certainty however, by taking the figures provided by the office of national statistics an approximation can be made that the exports to EU and non-EU countries could be around 15% to each market.

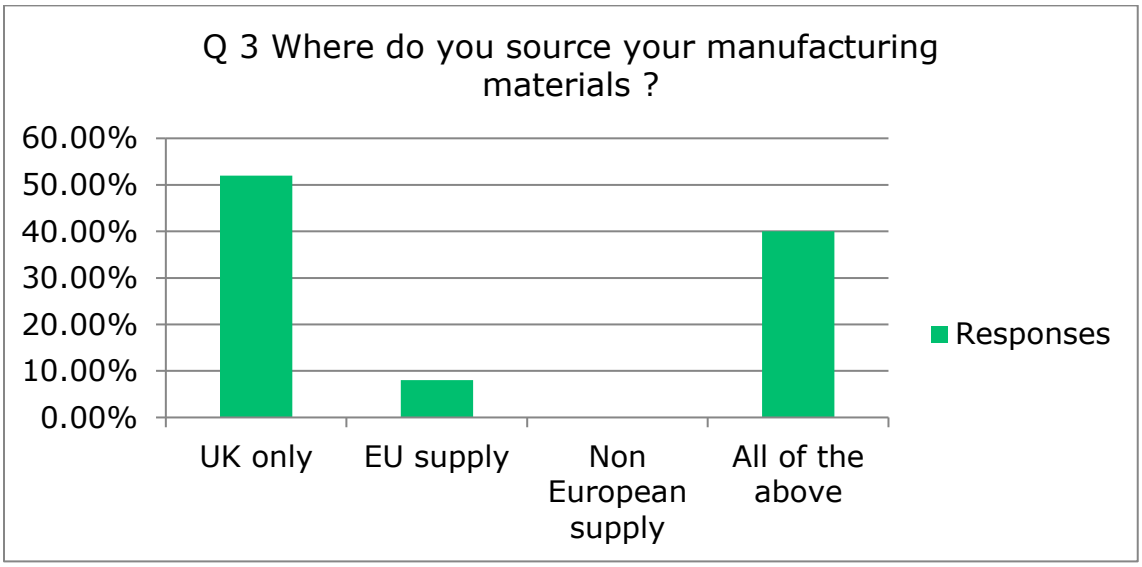



**Figure 7; Survey Question 3 (Source: Author)**

Where do you source your manufacturing materials?

| Answer Choices | Responses |
|---|---|
| UK only | 52.00% |
| EU supply | 8.00% |
| Non-European supply | 0.00% |
| All the above | 40.00% |

The research question related to the procurement of materials for the manufacture of products indicates that materials are mainly sourced from United Kingdom suppliers.

The researcher has identified an error in this question as secondary information related to where the suppliers and distributers procured material would have provided more reliable data on domestically produced materials or imported materials. The intent of the question to identify a risk to the manufacturers will need to be evaluated in further sections of this report when trade arrangements are discussed.

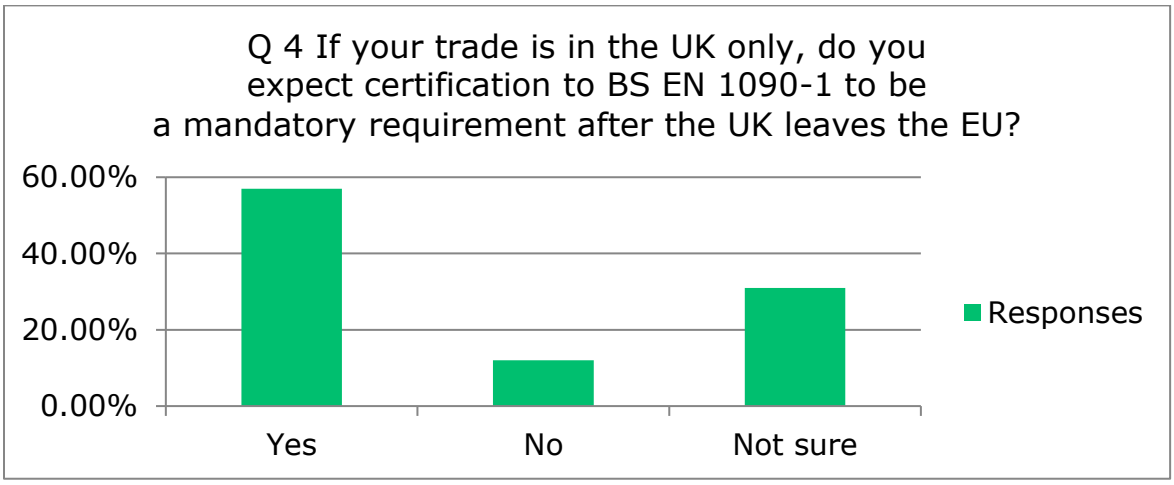



**Figure 8; Survey Question 4 (Source: Author)**

| Answer Choices | Responses |
|---|---|
| Yes | 57.00% |
| No | 12.00% |
| Not sure | 31.00% |

Question 4 was produced before information from the United Kingdom Government was published stating that the use of BS EN 1090 will become a mandatory requirement in section A of the Building Regulations.
The requirement that is now mandated will to some extent allow alignment with the existing European Regulation and United Kingdom Statutory Instrument 2013 No 1387.

This alignment however will not clarify the requirements of CE marking manufactured products related to the Construction Products Regulation EU 305/2011. As of the 30th of March 2019, the United Kingdom will no longer be a member of the European Union therefore CE marking will no longer be a vehicle for United Kingdom manufacturers to freely export into the European Union.

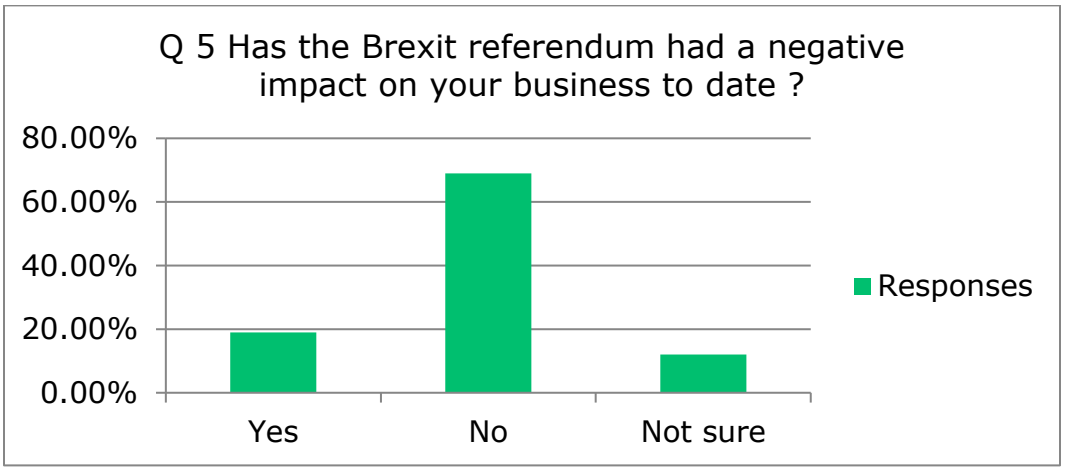



**Figure 9 Survey Question 5 (Source: Author)**

| Answer Choices | Responses |
|---|---|
| Yes | 19.00% |
| No | 69.00% |
| Not sure | 12.00% |

Question 2 figure 3 identified that 68% of the respondents traded within the United Kingdom only, this figure correlates directly with the findings from this question in which 69% stated that there had been no impact to their business.

The respondents that stated that their business had been affected is shown as 19% again by referring to the results of question 2 and the assumption made by the researcher that 15% of manufacturers exported to the European Union a variance of 4% between the survey response would indicate that the findings can be considered as relatively accurate.

The potential impacts that 19% of the respondents will be discussed in detail when the risk assessment is produced for this subject.

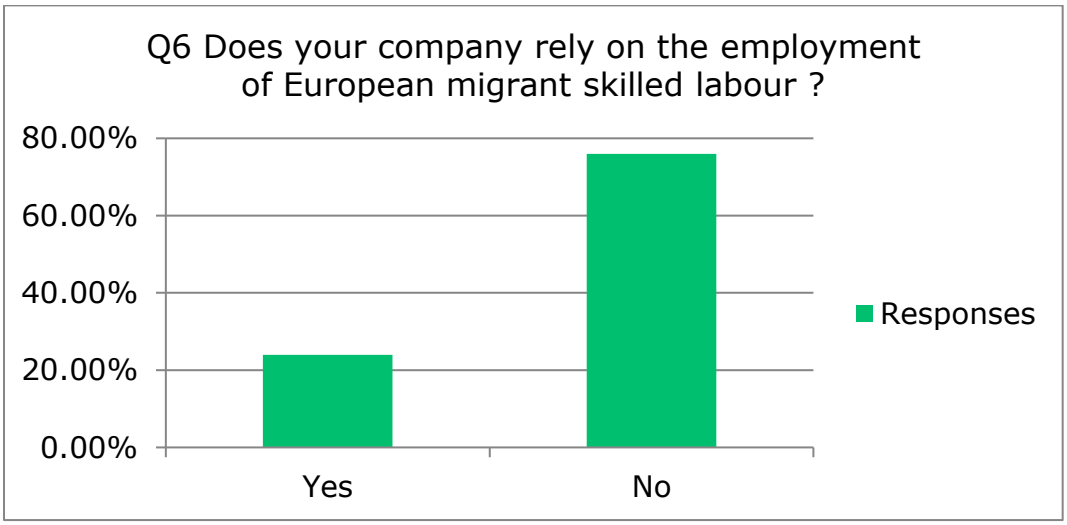



**Figure 10; Survey Question 6 (Source: Author)**

| Answer Choices | Responses |
|---|---|
| Yes | 24.00% |
| No | 76.00% |

Within the TEU(92/C191/01) Treaty, one of the principles is the free movement of people between the 28-member states. The survey indicates that 76% of manufacturers employ skilled United Kingdom nationals and 24% employ migrant workers from the 27 European Union countries.

With the uncertainty surrounding the United Kingdom withdrawal from the European Union the status of migrant workers cannot be quantified despite assurances from the UK Government that migrant workers that were in the United Kingdom before the referendum will be able to stay.

The survey question response aligns with earlier findings and can be related directly with question 5. The data suggests that the 19% of businesses that have stated that Brexit has had an impact can be related to the 24% of manufacturers that employ migrant workers.

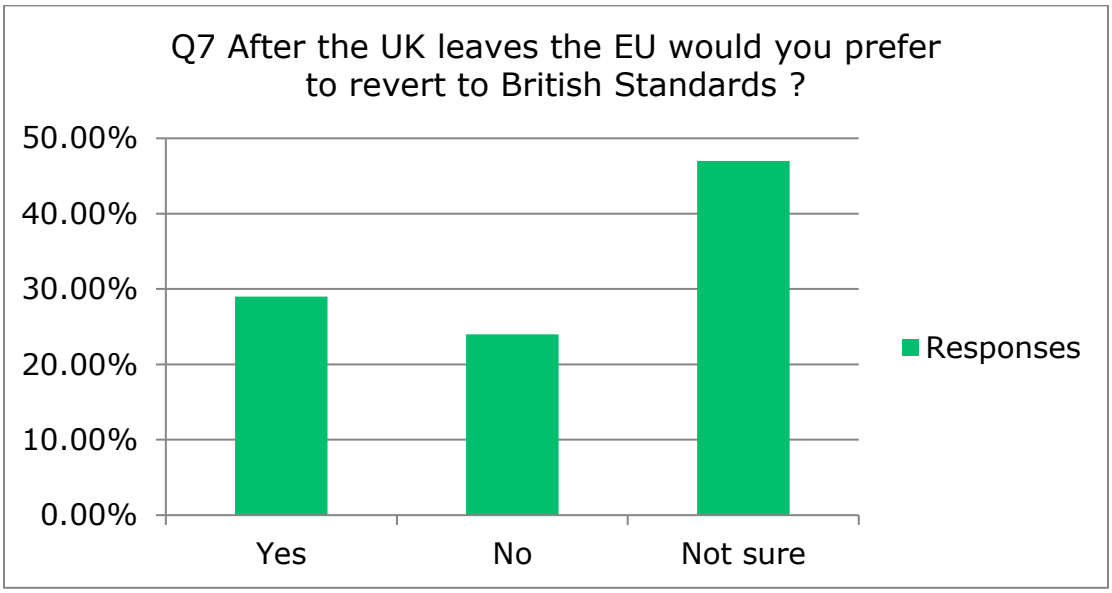



**Figure 11; Survey Question 7 (Source: Author)**

| Answer Choices | Responses |
|---|---|
| Yes | 29.00% |
| No | 24.00% |
| Not sure | 47.00% |

Question 7 identifies the first part of the technical impact of Brexit. All products manufactured under European Regulation must conform to harmonised standards to allow a presumption of conformity and therefore free movement and the ability to place the product on the market of the member states of the European Union.

Given that on the 30th of March 2019 the United Kingdom will no longer be bound by the existing regulations unless exporting specific products into the European Union. Trading arrangements in place will be dependent on the current negotiations between the United Kingdom and the European Union.

The possibility for United Kingdom manufactures to revert to British Standards and adhere to United Kingdom regulation could potentially create a protectionist market and exporters to the United Kingdom could be forced to meet the requirements of new or revised national regulation. This issue will be discussed in further sections of this work.

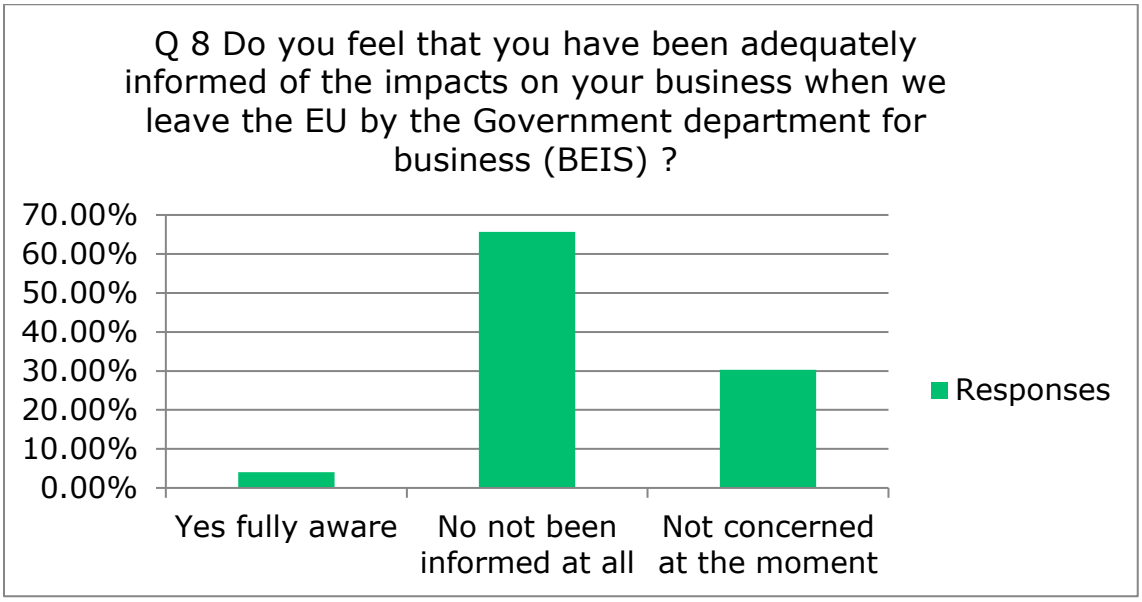



**Figure 12; Survey Question 8 (Source: Author)**

| Answer Choices | Responses |
|---|---|
| Yes, fully aware | 4.04% |
| No not been informed at all | 65.66% |
| Not concerned now | 30.30% |

This question identifies the current understanding of manufacturers of construction products in the United Kingdom as of the survey date. The survey data indicates that most manufacturers are not aware of the changes in legislation that will occur on the 30th of March 2019 after the United Kingdom leaves the European Union.

The most significant impact will be that the certification issued by United Kingdom Notified Bodies that allows certification of the manufactured products

will no longer be recognised by the European Union. For a United Kingdom manufacturer to continue to export into the European Union after the leaving date certification of the manufacturers certification scheme will have to be transferred to a Notified Body operating in one of the existing 27-member states of the European Union.

The status for manufacturers who produce solely for the United Kingdom market will no longer be obliged to CE mark the product before placing it on the market. This data identifies that 95.96% of United Kingdom manufacturers are exposed to the potential additional cost of re-certifying their management systems should they wish to export to the European Union.

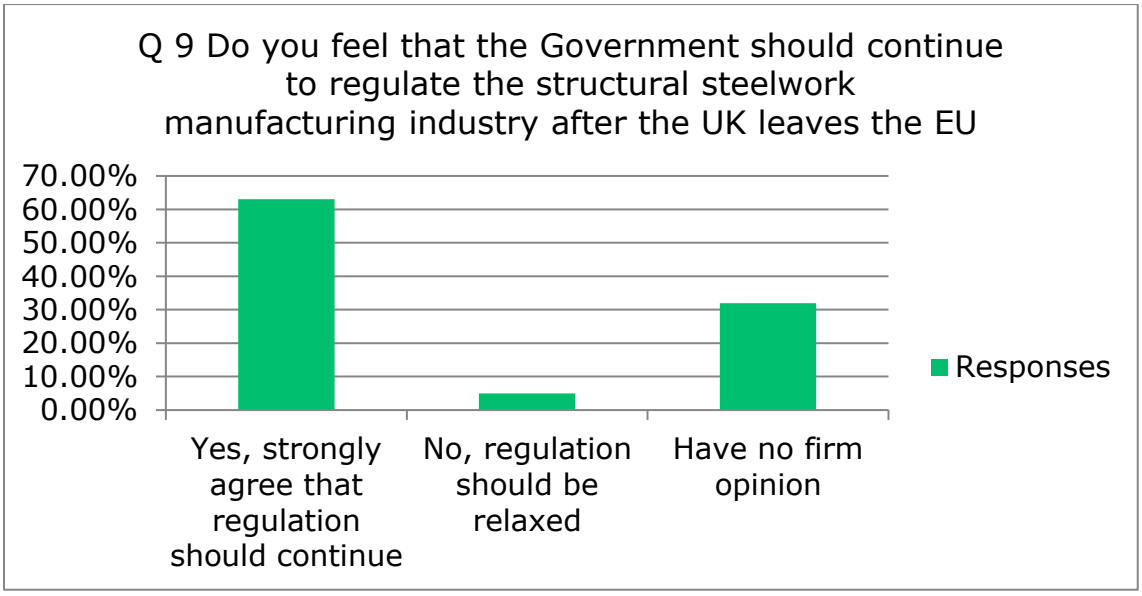



**Figure 13; Survey Question 9 (Source: Author)**

| Answer Choices | Responses |
|---|---|
| Yes, strongly agree that regulation should continue | 63.00% |
| No, regulation should be relaxed | 5.00% |
| Have no firm opinion | 32.00% |

Product regulation is one area where there are considerable issues for United Kingdom manufacturers at the time of leaving the European Union.

The regulations and directives will be transcribed into United Kingdom law under the European Union (withdrawal) Bill, however, the regulations will no longer infer conformity to products placed on the market in the European Union.

From the survey data collected 63% indicated that the structural steelwork sector should continue to be regulated. The regulation currently in force Construction Products Regulation Statutory Instrument 2013 No 1387 still requires manufacturers to CE mark products before being placed on the market.

The United Kingdom Government will need to consider amending the regulation to remove the requirement for CE marking for the United Kingdom internal market, failure to do so will still oblige manufacturers to follow European law after the leaving date.

The mechanism for certification of manufacturers in the United Kingdom will need to be addressed to prevent confusion and potential additional costs of engaging a Notified Body from one of the 27-member states.

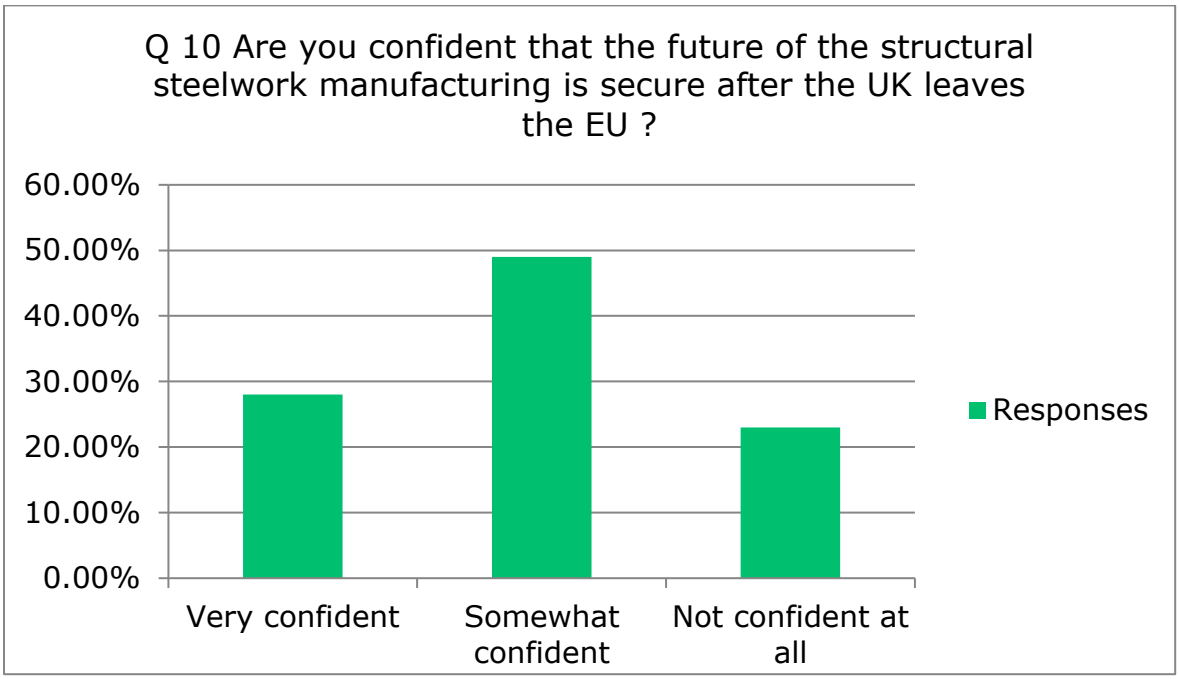



**Figure 14; Survey Question 10 (Source: Author)**

| Answer Choices | Responses |
|---|---|
| Very confident | 28.00% |
| Somewhat confident | 49.00% |
| Not confident at all | 23.00% |

The United Kingdom internal market is supplied by 68% of the survey respondents as identified in question 2. The threat to this market would become apparent if market restrictions such as trade tariffs were lifted to allow cheaper imports from non-European manufacturers which is currently controlled by the common external tariffs (CET).

Imports from countries such as China and India could seriously damage the United Kingdom internal market as the cost of manufacture is significantly cheaper in these emerging economies. The global transportation systems also provide the ability to move products at realistic costs. The United Kingdom through regulation should be able to place restrictions on imported products to ensure that quality and safety requirements meet the existing standards.

Rhodes (2016) provides one example of an event was the saturation of the steel market in 2014 by China which resulted in the closure of the SSI manufacturing plant in Teesside. The United Kingdom Government will need to consider protecting the structural steelwork manufacturing sector by imposing restrictive trade tariffs on imported products.

# 8. Discussion

## 8.1. Analytical models

## 8.2. ISO 31000 Risk Management Principles and guidelines

The aim of this research is to analyse the impact of Brexit on the constructional steelwork sector and to rationalise the areas that should be considered.
A review of ISO 31000 has been undertaken. The review identified several key sections of the standard that provide descriptions for how the impacts on steelwork manufacturers after Brexit can be measured and assessed.
ISO 31000 uses specific terms and definitions which will be quoted directly from the standard.

**"risk effect of uncertainty on objectives"**

"NOTE 4 Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood (2.19) of occurrence." The likelihood of the UK leaving the EU is definite as article 50 has been triggered however, the consequences of leaving the EU have yet to be established.
"NOTE 5 Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of an event, its consequence, or likelihood."

Within section 2 of the ISO 31000 standard the text explains the situation that the United Kingdom is experiencing at the time of writing, the Government has yet to define the possible outcomes of the UK withdrawal from the EU. Clarity will only emerge from negotiated settlements on the planned trade deals.

Gavin (2001 pg 3) describes the European Union as a regional trading bloc that discriminates in favour of its membership. The United Kingdom steelwork manufacturers will become exposed to a more competitive global market after the withdrawal date in 2019. This point is discussed further in the SWOT analysis.

Section 2.10 page 3 defines some of the external context:
"NOTE External context can include:
– the cultural, social, political, legal, regulatory, financial, technological, economic, natural and competitive environment,
whether international, national, regional or local;
– key drivers and trends having impact on the objectives of the organization; and
– relationships with, and perceptions and values of external stakeholders (2.13)."

It is within section 2.10 of the standard that a PESTEL analysis of Brexit would be a useful exercise to conduct. The key areas of risk to UK manufacturers will be identified and assessed for potential impact.

The following sections of the ISO 31000 standard identify areas that will be investigated in greater detail in further sections of this work.

**stakeholder**

"person or organization that can affect, be affected by, or perceive themselves to be affected by a decision or activity."

This report has identified the stakeholders as the manufacturing companies, sub-contract supply chain, end users and purchasers and the regulatory bodies such as the Notified Body organisations and Government departments.

**risk assessment**

"overall process of risk identification (2.15), risk analysis (2.21) and risk evaluation (2.24)"

The ISO 31000 standard can identify the key areas that have an impact on this research, by reviewing the sections of the standard in line with the context of the subject matter it is expected that a comprehensive risk evaluation can be conducted by using known academic models.

**risk identification**

"process of finding, recognizing and describing risks (2.1)"

"NOTE 1 Risk identification involves the identification of risk sources (2.16), events (2.17), their causes and their potential consequences (2.18)."

"NOTE 2 Risk identification can involve historical data, theoretical analysis, informed and expert opinions, and stakeholder's (2.13) needs."

The research has identified the initial risk to the United Kingdom manufacturers, the greatest risk is associated with the possible implications related to the trade of goods and services after the withdrawal from the single market and customs union.

**risk source**

"element which alone or in combination has the intrinsic potential to give rise to risk (2.1)

NOTE A risk source can be tangible or intangible."

As the article 50 process of leaving the European Union has been undertaken by the United Kingdom Government. The risk source is now tangible.

**event**

"occurrence or change of a set of circumstances"

For this work it is understood that the referendum and subsequent invocation of article 50 has led to planned negotiations in the withdrawal process these are all individual events. The outcomes of each element of the negotiation process will have the ability to impact the circumstances of withdrawal from the European Union.

**consequence**

"outcome of an event (2.17) affecting objectives

NOTE 1 An event can lead to a range of consequences.

NOTE 2 A consequence can be certain or uncertain and can have positive or negative effects on objectives.

NOTE 3 Consequences can be expressed qualitatively or quantitatively.

NOTE 4 Initial consequences can escalate through knock-on effects."

As it has been established there will be many events in the withdrawal process. The full consequence of the United Kingdom leaving the European Union will not be known until the full leaving process has been concluded and possibly the effects of leaving the European Union will still be evaluated long after the conclusion of Brexit.

(Porter 1998 pg 292) uses the term declustering in which he describes the loss of national advantage, the United Kingdom's separation from the existing 27-member states of the European Union is the point where national advantage on the part of the United Kingdom may be lost.

**likelihood**

"chance of something happening"

The status of the withdrawal from the European Union indicates that elements of the process have happened. So, the likelihood becomes somewhat past tense as it is now a real-time event. However, there are still terms to be negotiated between the United Kingdom and European Union before the chance of something else happening can be discounted.

During the research, a large amount of information has been gathered which relates to multiple aspects of a single problem. The researcher has reviewed several recognised academic modelling tools that would enable the research problem to be investigated.

The researcher chose the PESTEL method of analysing the research project. The researcher has also identified that a second analytical model known as a SWOT analysis will provide a partial risk assessment when added to the end of the discussion section.

The research has also identified that elements of Porters five forces of competitive advantage provides information that is relevant to the content of the SWOT analysis. The elements from Porter will be referenced but not described in detail

The PESTEL model allows complex business issues to be broken down into macro-environmental factors. The six areas that PESTEL model analyses aligns with the research problem. The researcher will use elements of the discussion that were produced by Porters model in the discussion.

The mind map that was produced to support this work was reviewed to ensure that the new analysis model would meet the requirements of the research.

The PESTEL model details the areas of discussion that produces the questions and answers in the research.

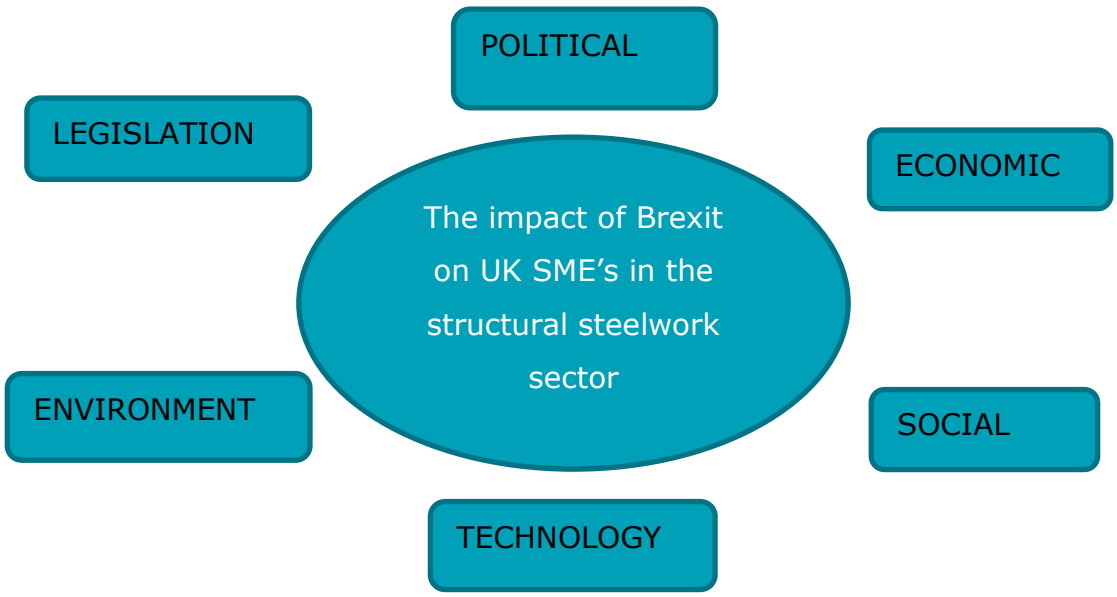



**Figure 15; PESTEL model adapted (Source: Barrows, E, Neely, A, 2012)**

### 8.3. Political

The political implications related to this work cannot be attributed to any single United Kingdom political party.

The research investigates the issues that will affect a single market sector in the United Kingdom, these implications will mainly be caused by legislation and regulation associated with a single market and customs union

arrangements that currently exists with the United Kingdom currently being a member of the European Union. The focus of this work is on the United Kingdom manufacturers of structural steel products in a regulated industry.

The European Union began as a trading bloc known as the European Economic Community (Common Market). The United Kingdom became a member of this trading bloc in 1973.

Membership of this common market removed trade barriers and tariffs on goods between the member nations. The Treaty on European Union (TEU) which is better known as the Maastricht treaty was signed on the 7th of February 1992 and is a direct revision of the 1973 treaty. The TEU was ratified by the United Kingdom Government in July 1993.

Membership of the new European Union has provided greater integration both politically and financially of the member states through common legal instruments. Today the European Union is comprised of 28-member states and is governed by standards and regulations which are mandatory for all member states to comply with.

On the 23rd of June 2016 the United Kingdom held a referendum which offered the voters a simple in or out choice. The result of the referendum indicated that the majority wished to leave the European Union.
The process for withdrawing from the European Union is known as article 50.
The notice to leave the European Union was officially issued to the European Union in March 2017.

The invocation of article 50 started the 2-year long process for negotiations to be conducted to settle the leaving arrangements.

At the time of writing this work there have been negotiations held which have identified that the United Kingdom will not remain in the Customs Union or have access to the tariff free European market.

The United Kingdom Government after June 2016 has had to consider the strategy that the nation will adopt for the future position outside of the European Union.

(Johnson et al 2008) defines strategy as "the direction of an organisation over the long term, which achieves advantage in a changing environment through its configuration of resources and competences with the aim of fulfilling stakeholder expectations".

The organisation in the context of this report is the United Kingdom Government and the stakeholders are the United Kingdom population.

The UK Government published a white paper in 2017 called "Industrial Strategy Building a Britain fit for the future"

This publication identifies five key areas where the Government will develop the United Kingdom. The strategy paper offers very positive messages from both the Prime Minister and the Secretary of State for Business Energy and Industrial Strategy.

The outcome of the trade negotiations will not be known at the time this work is completed. The fact that there are no negotiated outcomes at the time of writing this work presents one of the areas of risk that United Kingdom manufacturers that produce goods in a regulated industry face.

The relationship with the European Union has existed since the early 1970s and there exists a common set of rules, regulations and financial controls.

The changes are on multiple levels and will influence both the United Kingdom internal and external markets. The greatest change will be the relationship with the European Union after over 40 years of trading within a protected bloc. The challenge for the United Kingdom Government will be to negotiate trade arrangements with the European Union and the rest of the world to reduce any potential negative impact on the United Kingdom import and export markets after the leave date in March 2019.

The result in the survey figures question 2 figure 6 indicate that most manufacturers have not seen a significant change to their business since the Brexit referendum. The lack of change stated by the survey respondents reflects the fact that the United Kingdom internal market for steel construction products has not been adversely influenced by political change.

The emphasis placed on the withdrawal negotiations by most political figures is that the new trading arrangements with the European Union should be in line with the status quo. The United Kingdom Government has stated that the United Kingdom will leave the customs union and free trade arrangements which allow free movement of goods.

(Naim 2007) argues that free trade agreements are irrelevant. In his article it is stated that free trade deals are crashing, and that trade is still increasing on a global scale.

In the text of the publication it states that trade deals are "politically radioactive" and that countries that have economic activity related to exports are growing at 1.5 times faster than countries that have stagnant exports. The UK Government statistics indicate that United Kingdom export figures to the European Union have not grown for many years, there may well be a case for withdrawing from the European Union trade bloc to seek a more global trading system under World Trading Organisation rules.

The United Kingdom Government has until March 2019 to plan and restructure the future trading arrangements of the country.

### 8.4. Economic

The United Kingdom steelwork manufacturers have operated within a regulated market since the TEU treaty was ratified by the United Kingdom Government in July 1993. The signing of the treaty meant that the United Kingdom entered a trading bloc of European members with market protection through the application of Common External Tariffs on imported goods and products. The TEU treaty created an economic model that can be considered favourable or protectionist for member states.

(Porter 1998 pg 63) describes globalisation and how industry has "internationalised". Within this context Porter also describes the formation of alliances between organisations in a global market to gain advantage.

Gavin (2001 pg 3) states that the classical definition of globalisation is related to the integration of national economies through trade, finance, technology and lastly the ability of labour to move freely.
The definition given by Gavin aligns directly with the first of the four pillars of the TEU, which indicates that the European Union uses the model of globalisation in a macro environment based within the membership of the European Union.

From the research conducted for this study the data provided by BEIS (2017 pg 16) state that "Construction is the largest industrial sector in terms of SME numbers" in the United Kingdom representing 12% of all listed companies.

The British Standards Institute (2014 page 70 SIC code 2511), established that there are 3035 manufacturing Small and Medium Enterprises (SME)

companies that produce structural steel and Aluminium products in the United Kingdom. The construction sector is shown in figure 14 F.

BEIS (2017 pg 1) state that "Small businesses accounted for 99.3% of private sector businesses at the start of 2017 and 99.9% were small or medium-sized (SMEs). Total employment in SMEs was 16.1 million; 60% of all private sector employment in the UK.

The combined annual turnover of SMEs was £1.9 trillion, 51% of all private sector turnover in the UK". Nearly a fifth of all SMEs operate in the Construction industry.

The United Kingdom Small and Medium enterprises have increased in number annually since 2013. This is shown in figure 13. BEIS (2017 pg 6). After the leaving date United Kingdom manufacturers will no longer be trading in a competitive European market and will be exposed to a global market.

The results from the survey in figure 6 undertaken to support the research indicates that 68% of steelwork manufacturers operate within the internal United Kingdom market, the survey also indicates that 32% of the survey respondents operate in a wider export market.

The data provided in table 4 and 5 taken from the Office of National Statistics suggest that 32% of United Kingdom structural steel manufacturers generate £ 290.3 million (figure rounded down) from exported products. The export value to the European Union is £137.3 Million and to the wider global market the export value is £152.9 Million.

Department for Business Innovation and Skills January 2016 (source External trade figures 2014)

| EU value | Non-EU value | Trade type | Product |
|---|---|---|---|
| £209,811 Million | £55,437 Million | Import | Structural units Steel |
| £110,173 Million | £102,778 Million | Exports | |

| EU value | Non-EU value | Trade type | Product |
|---|---|---|---|
| £232,703 Million | £42,707 Million | Import | Structural units Aluminium |
| £27,203 Million | £50,179 Million | Exports | |

In contrast to the export value from United Kingdom manufacturers the import value for comparative product types from the European Union is £442.5 Million and from the rest of the world £98.1 Million.

The financial values stated show that the United Kingdom trade is negative at £305.2 Million with the European Union and a positive at £54.8 Million with the rest of the global market.

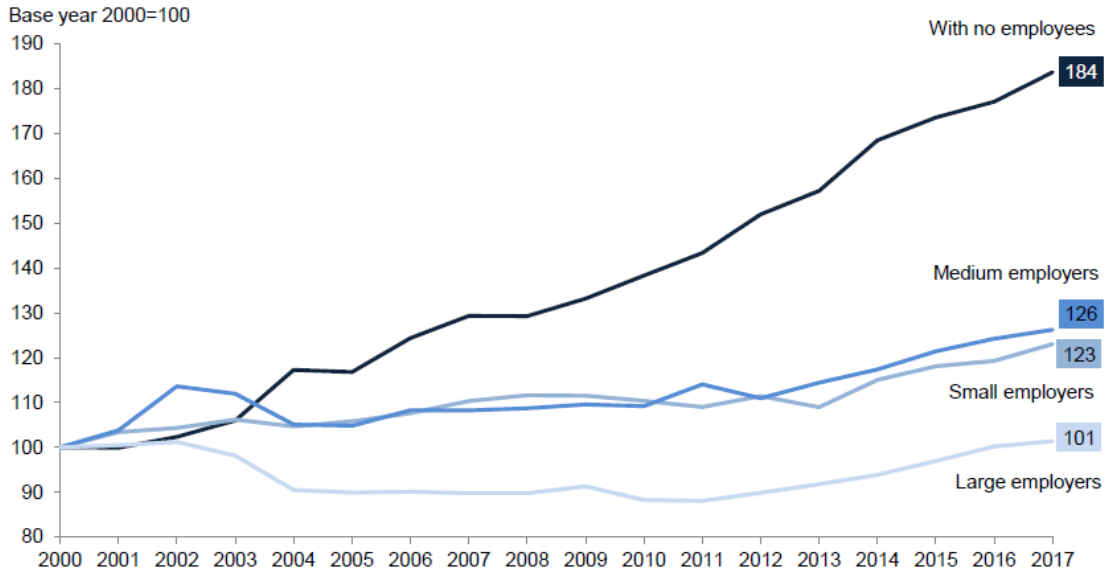



**Figure 16; Growth in the number of UK private sector businesses by size band, 2000 to 2017 (index; base year=1000)**

Figure 16 above identifies that Small and Medium enterprises make up a significant number of businesses in the United Kingdom economy the current figures published by the Department for Business Energy & Industrial Strategy (2017 pg1) states, SME's account for 99.3% of all private sector business in the United Kingdom. The annual turnover from SME's in the United Kingdom was £1.9 trillion or 51% of the private sector turnover.

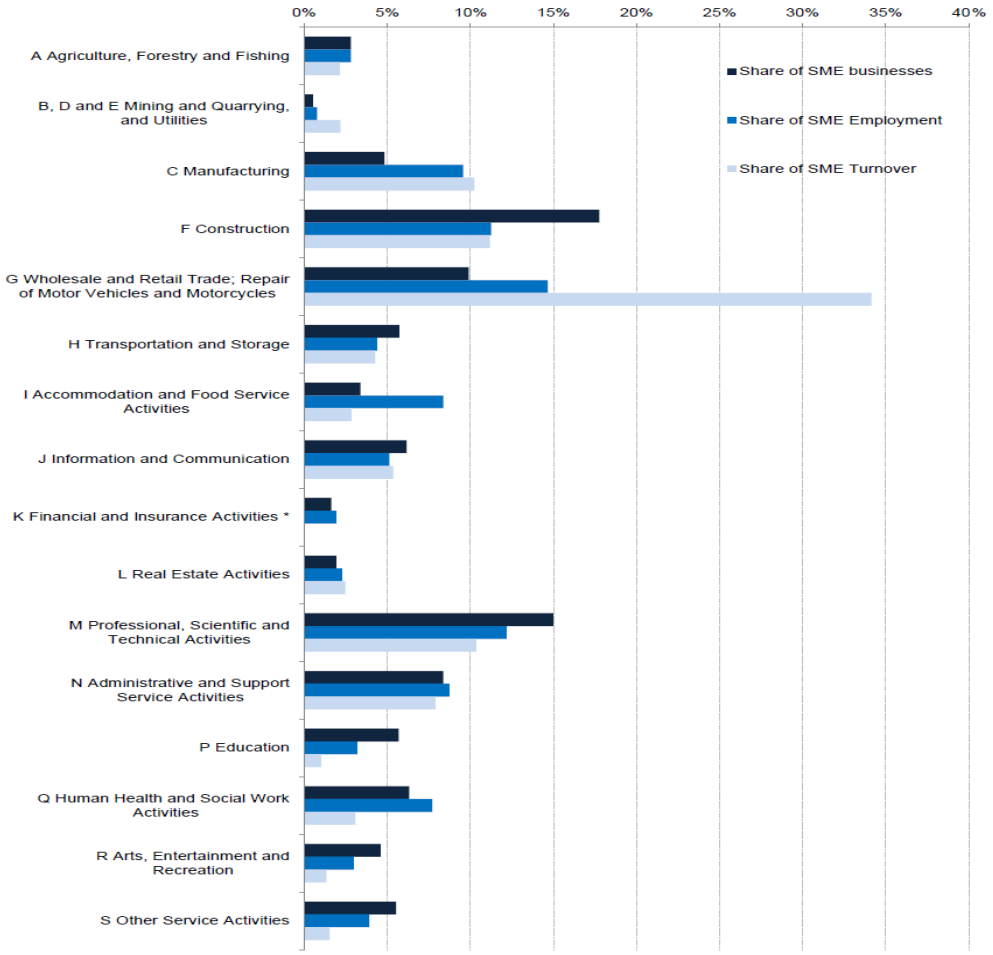



**Figure 17; Share of SME numbers, SME employment and SME turnover by industrial sector, start of 2017, (Source: BEIS, 2017)**

The result in the survey figures indicate that 68% of manufacturers have not seen a significant change to their business since the Brexit referendum. The lack of change stated by the survey respondents reflects the fact that the United Kingdom internal market for steel construction products has not been influenced by political change or economic disruption.

In contrast to the 68% of the survey 32% of respondents have noted a negative effect on their business. The research survey did not interrogate the

detail of the negative effects, no assumptions will be made as to what the negative impacts have been.

The economy of the United Kingdom has seen some variation since the Brexit referendum. The value of sterling has fluctuated which has brought about benefits and disadvantages to the economy.

Pettinger (2018) identifies winners and losers when the value of the Pound is low. The survey data indicated four areas where the impacts of Brexit will be relevant in this study, these are:

- 19% of the survey respondents stated that Brexit had a negative impact on their business. The survey did not analyse specific points.
- 32% of respondent's state that they export products. The benefit of a weaker pound makes United Kingdom products more attractive to the global market and is therefore an advantage.
- 40% of the survey respondents state that they purchase raw materials from outside of the United Kingdom. The weaker pound makes the purchase of these materials more expensive and is therefore a disadvantage.
- 24% of the survey respondents state that they employ European skilled migrant workers. The weaker value of the pound may make working in the United Kingdom less attractive. The risk to United Kingdom manufacturers is the potential loss of labour which is a disadvantage.

### 8.5. Social

The United Kingdom withdrawal from the European Union will cause significant social disruption on numerous levels. During the time that the United Kingdom has been a member of the European Union there has been a great degree of social integration between the 28-member states.

Membership of the European Union has provided greater integration both politically, culturally and financially between the member states through common legal instruments. Today the European Union is comprised of 28-member states and is governed by standards and regulations which are mandatory for all member states to comply with.

The social impact in this section will look at the United Kingdom stakeholders who will be affected by the withdrawal from the European Union.
Riebergen-McCraken and Narayan (1998 pg 67) identify the need to identify the stakeholders.
The research has identified that the impacted parties of the withdrawal from the European Union will be:

- United Kingdom Notified Bodies
- Owners of manufacturing businesses
- The employees of the manufacturing businesses
- The supply chain servicing the manufacturers

**United Kingdom Notified Bodies**

Within the summary of the literature review it was identified that the Notified Bodies operating in the United Kingdom will no longer be recognised to certify regulated products that are produced by United Kingdom manufacturers.
This issue presents a risk to the business conducted by the Notified Bodies as they will no longer be able to service the manufacturing companies which will result in the loss of income and may lead to unemployment.
Although the assessment for this work is only focused on the structural steelwork manufacturing sector, the implications will affect all regulated products.

United Kingdom manufacturers are legally required to hold certification for the manufacture of their product type when the product is controlled by European regulation. The research identified that there are approximately 2339 certified

manufacturers in the United Kingdom who have had to invest significant amounts of money for the implementation of management systems.

**Impact on United Kingdom manufacturers**

Research of the structural steelwork fabrication sector has identified that most manufacturers are Small and Medium sized enterprises. These manufacturers are sensitive to unplanned or additional costs.

Should trade negotiations between the United Kingdom and the European Union fail to achieve a position where trade is conducted on a mutual recognition basis then the impact on manufacturers is twofold.

Firstly, manufacturers that export to the European Union will no longer have the ability to CE mark the product which allows the free movement of the goods to the existing 27 member states of the European Union. This is due to the fact that the certification issued by the United Kingdom body will no longer be considered valid and secondly in order to continue to export products the manufacturers will have to have their management systems re-certified by a Notified Body registered in one of the existing 27-member states of the European Union.

The requirement to re-certify the management system will create an unknown additional expense to the business owner. The change in certification body will also have a potential time impact on the ability of the manufacturer to trade, until such a time as a new management system which is verified by a European Notified Body is integrated by the manufacturer.

This could lead to a reduction in the manufacturers productivity and profit which could then lead to the company closing and creating unemployment. The

risk of the events identified will remain until clarification of the United Kingdom position on trade is finalised with the European Union.

Manufacturers who trade solely within the United Kingdom market will also need to re-certify their management system even though they do not export to the European Union. Within the United Kingdom Construction Products Regulations 2013 SI 1387 there is a legal requirement for all United Kingdom manufacturers of structural steel products to place CE marking on their products.

The requirement to CE mark products even though European regulations will not be legally binding after the United Kingdom leaves on March the 29th 2019 puts manufacturers who trade domestically in the same position as manufacturers who export.

The social impact due to the regulatory requirements are again associated with costs that the manufacturers will have to meet to continue trading legally. In the worst cases again, there may be a restriction placed on productivity and a reduction in profit which could lead to businesses closing creating unemployment.

**Workers in the structural steel fabrication industry**

The research for this work did not identify the number of people that are directly employed in the structural steel fabrication industry, the study of employment numbers would be better suited to a further survey. Unfortunately, there is not enough time to create and distribute another survey to support this work.

The free movement of people to work and live within the European Union is one of the key elements of the Treaty of European Union. Within the survey conducted for this dissertation it was identified that 24% of the respondents employ European skilled migrant labour.

The withdrawal from the European Union by the United Kingdom will revoke the right of free movement of people. The consequence of this could lead to manufacturers losing skilled labour if they return home and the inability to recruit labour from outside of the United Kingdom.

The potential risk to workers can be linked directly to the risks faced by the business owners as the steel fabrication industry could reduce in size due to the inability to trade or closure due to higher costs which could lead to high levels of unemployment of skilled workers and associated staff within the businesses.

There is further potential social impact in that the families of the workers will have a reduction in income and a lower standard of living, a secondary impact will be on the retail sector as the lack of income to purchase food, clothing, holidays and domestic goods may become an issue.
Unemployment will also create a burden at a national level as there will be a reduction on income tax received by HMRC and benefit payments will increase.

**Impact on the supply chain**

Industry at all levels will have a supply chain that provides goods and services. The social impact is consistent throughout the Stakeholders identified in that a loss of business in the first tier will filter down and affect all parties associated with the impact on the structural steel fabrication industry.

To summarise, the social impacts on the structural steel industry sector and the associated supply chain are a credible risk given the current position of the United Kingdom Government and the European Union in the trade negotiations.

### 8.6. Technology

Technology plays a significant part on social and economic aspects of business. Within the context of this dissertation the impact of technology on the structural steelwork fabrication industry will be reviewed.

The global construction industry relies on structural steel for the building of large structures such as offices, sports stadia and bridges as examples. Steel structures can also be found in heavy industry such as oil refineries and power stations.

Within the European Union the production and secondary fabrication of structural steelwork is governed by regulation. The product types are consistent in nature as steel is manufactured to meet specified grades and sizes.

The design of the manufactured structures will create the only difference in how the final product placed on the market will look and perform.

The products related to structural steel fabrications are generally consistent in the manufacturing process all involve cutting, shaping, drilling of holes and welding.

Over recent years a level of automation has been introduced in the larger companies with a production line approach being implemented. To a large extent especially in the smaller manufacturers the processes used still rely on skilled manual labour to fabricate products.

Porter (1998 pg 285) states that “technological change is often a trigger for shifts in national competitive advantage”. The United Kingdom manufacturers

of structural steel products will no longer be governed by the protectionist aspects of the common external tariffs so will therefore be exposed to a more competitive market.

The question could therefore be asked will the withdrawal from the European Union promote investment in new technology in the United Kingdom to provide a competitive advantage when operating in a global market?

From the survey conducted question 2 figure 3 identifies that the main market sector for United Kingdom manufacturers is in the United Kingdom domestic market. The risk after the withdrawal from the European Union is that the manufacturers in the domestic market do not consider the wider threat posed by a global manufacturing base that may have free access to the United Kingdom internal market.

The global business environment will allow manufacturers with higher productivity and lower overhead costs to compete within the United Kingdom internal market after trade negotiations with the European Union are concluded and the final position of the United Kingdom is known.

## 8.7. Environmental

This dissertation is focussed on the steel fabrication industry in the United Kingdom and the possible outcomes that will emerge after the United Kingdom withdraws from the European Union on the 29th of March 2019.

One of the considerations in the PESTEL model is the environmental impact that this industry has. According to greenspec (2018) "Steel production has several impacts on the environment, including air emissions (CO, SOx, NOx,

PM2), wastewater contaminants, hazardous wastes, and solid wastes. The major environmental impacts from integrated steel mills are from coking and iron-making."

The environmental impacts are common in all steel producing nations, the United Kingdom has a steel manufacturing industry although this has seen a decline in size since 1970. In 2016 the United Kingdom was 7th largest producer of steel in the world according to Rhodes (2018 pg 9).
Sperle et al (2013 pg 73) provides a summary of the impact that steel manufacture creates, this is shown in figure 18.

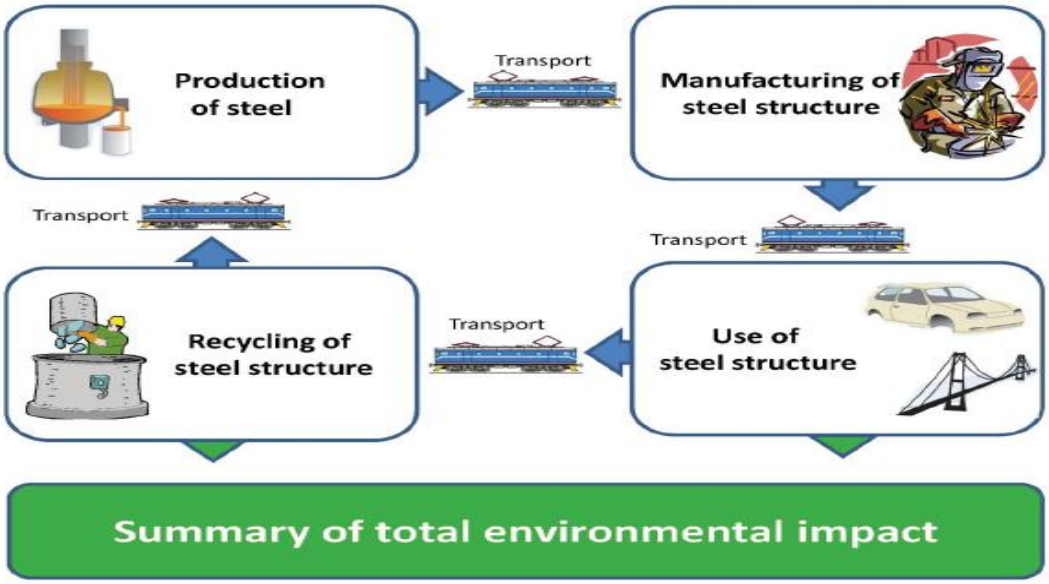



**Figure 18; summary of the impact that steel manufacture creates (Source: Sperle et al, 2013 pg 73)**

In more recent year's society has become sensitive to the environmental damage caused by industry. This includes global warming due to "greenhouse gases". The United Kingdom impose what is known as "carbon tax" on industries that pollute the environment the steel manufacturing process relies heavily on the use of fossil fuels.

From manufacture of the raw steel products additional environmental impacts follow. These are associated with the transport of raw materials to the locations

where secondary works are undertaken. In the context of this report these will be the steel fabricators.

The initial environmental issue related to the fabrication of steel products will be the emissions from the transport method use to move the steel from the manufacturing location to the fabrication facility, this would be via road or rail in the United Kingdom. Transport companies are taxed on vehicle emissions based on the amount of pollution emitted. The secondary environmental consideration from the manufacture of structural steel products is the amount of energy used in the manufacturing process. Most engineering processes rely on electricity to power the equipment, the electricity demand will depend on the scale of the manufacturing process.

In the United Kingdom there is a diverse range of electricity generation with a mix of nuclear, fossil, and renewable sources. The fossil fuel used for generation of electricity is also subjected to carbon emission taxes. The United Kingdom has the highest energy costs in the European Union according to statistics published by Warren (2016). These costs are shown in figure 16.

The energy cost is disproportionate with other major energy users in the European Union and demonstrate the costs placed on United Kingdom industrial users.

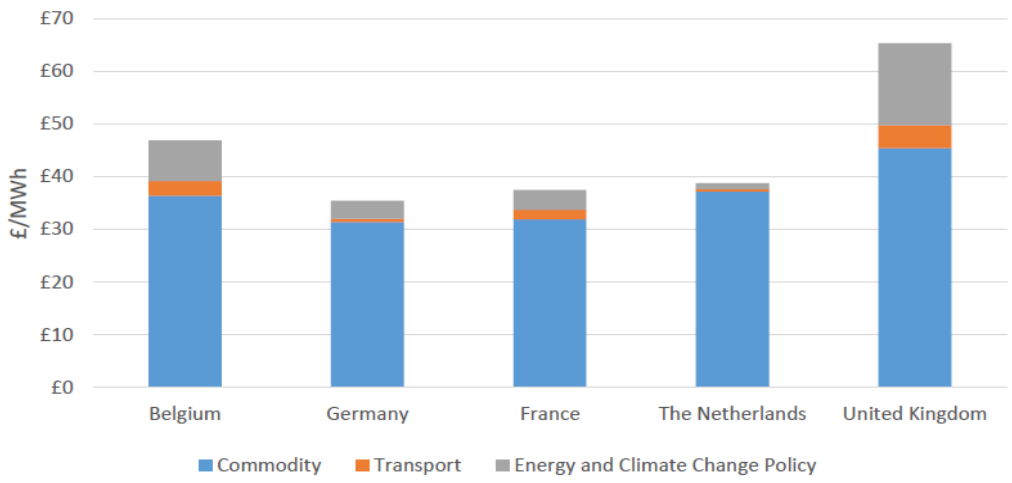



**Figure 19; Comparative breakdown of EU Industrial electricity prices by component - Oct 2014 (Source: PWC, 2015)**

Warren (2016) also notes that the "Climate change policy costs have grown significantly in recent years across the EU, driven by both EU directives and domestic policy in individual member states. UK industry has fared particularly badly in this area, both due to the imposition of unilateral measures, like the Carbon Price Floor, but also because the UK Government has historically failed to consider the industrial impact when devising and implementing climate change policy".

The environmental costs associated for the United Kingdom manufacturers creates a disadvantage with European competition, the withdrawal from the European Union may create an opportunity for a reduction in costs through Government subsidy and relaxation of current regulation.

Sperle et al (2013 pg 43) identifies that used steel products can be re-cycled. It is widely recognised that re-cycling is a benefit to the environment. The re-cycling of steel removes the need for mining and processing of the raw constituent products such as iron ore and other elements, there is also a reduction in the transport impact on the environment as shipment to the steel

producers is removed from the carbon footprint as well as the manufacturing energy usage.

Re-cycling however, still has an environmental impact as the scrap material needs to be processed. The environmental cost saving is calculated by the difference between steel produced from iron ore and steel scrap. Sperle quotes figures from the world steel association where the yield from scrap steel re-processing is stated as 95%. This figure identifies the environmental saving.
The United Kingdom Government whilst a member of the European Union has committed to meet targets set in the Kyoto protocol in which emission levels has been set. Collectively the European Union has exceeded the reduction levels agreed by the Kyoto protocol, however, United Kingdom figures published by the Energy and Climate Change Committee from the second report 2016-17 suggest that the individual target for the United Kingdom will not be met.

After the United Kingdom leaves the European Union in March 2019 the issue of the regulations currently in force relating to emissions and the environment will still be legally binding, given the costs of energy and taxation levels placed on United Kingdom manufacturing there may be a significant disadvantage that will prevent United Kingdom manufacturers trading competitively in a wider market area.

## 8.8. Legislation

This section of the dissertation covers the subject matter that will have the greatest impact on the United Kingdom after the withdrawal from the European Union on the 29th of March 2019.
Since the ratification of the TEU by the United Kingdom Government all directives and legislative instruments formulated in the European Commission have been adopted in to United Kingdom law.

Research conducted for this dissertation has identified that regulated industry sectors present the greatest challenge to the United Kingdom moving forward once outside the European Union.

The basis for all European regulation is based on four key areas which are known as the four pillars of European Union, these are listed below.

- Free movement of goods, persons, services and capital between member states
- The approximation of relevant laws, regulations and administrative provisions between member states
- EU-wide competition policy, administered by the commission
- A system of common external tariffs (CET - also known as the common customs tariff)

The focus of this work is on the constructional steel manufacturing sector which is controlled under the Construction Products Regulation 305/2011.

The regulation outlines the requirements for all European member states placing constructional products on the market the United Kingdom has transposed this regulation into law under a statutory instrument 2013 No 1387 BUILDING AND BUILDINGS. Within these two regulatory documents the impact for United Kingdom manufacturers is identified.

## 8.9. Free movement of goods

Products manufactured under European regulation and standards under the new approach directive are required to carry the CE mark. The CE mark verifies that a product meets safety, health and environmental protection requirements. These products once marked can be traded freely throughout what is known as the European Economic Area. The regulation is also intended

to promote fair competition as all manufacturers are obliged to meet the same mandatory rules and requirements for a product type.
The two stated benefits of CE marking are that:

- "Businesses know that products bearing the CE marking can be traded in the EEA without restrictions".
- "Consumers enjoy the same level of health, safety, and environmental protection throughout the entire EEA".

Conformity to the regulations is verified when the conditions in the harmonised product standards are met. The predominant standards associated with constructional steel work are "Eurocodes" which cover the design and safety aspects of the building or structure, the second standard that is most common for the validation of a product is the EN 1090 suite of standards.

All harmonised standards are produced by a technical group which is known as CEN or the European Committee for Standardisation. The standardisation system in Europe is based on national pillars which are the National Standardisation bodies the United Kingdom representative is the British Standards Institute.

Once a European standard has been produced and ratified by the CEN members this is adopted by all member states and previous national standards covering the same scope of product must be withdrawn.

The United Kingdom has a second tier of national regulation which is overseen by local government or council authorities these national regulations are known as the Building Regulations. The harmonised standard BS EN 1090 has recently been included as a mandatory requirement in the Building Regulations.

Within the first part of this section it has been identified that the United Kingdom has adopted the European Construction Products Regulation as a United Kingdom statutory instrument, within both regulations the requirement for manufacturing products to harmonised standards is implemented by the fact that CE marking is mandatory in both documents.

The reader may think that this regulatory alignment is a benefit to United Kingdom manufacturers. In fact is that this alignment in the current form creates a significant risk to United Kingdom manufacturers after the withdrawal from the European Union.

The survey conducted to support this research identified that 68% of United Kingdom steel fabricators trade within the domestic market. The manufacturers that export was shown to be 32% however, due to a flaw in the survey question the exact number of manufacturers who export to the European Union was not quantified.

The researcher assumes that the number of United Kingdom manufacturers who export to the European Union is significantly less than the total number of businesses exporting, as exports to the global market were not identified accurately.

The regulatory alignment enforces the requirement to CE mark products that are placed on the European market, after the withdrawal from the European Union this requirement becomes void for products placed on the United Kingdom internal market.

### 8.10. Manufacturers verification of conformity

Manufacturers of construction products are required by law to have their manufacturing process certified by what is known as a Notified Body. The most common certification route is in accordance with the BS EN 1090 standard where a quality system known as the Factory Production Control syst,em is audited and certified by the Notified Body.

Notified Bodies are entered on to the European list of bodies by the United Kingdom secretary of state after verification of competence by the United Kingdom Accreditation Service. The European Commission issued a Notice to Stakeholders on the 22nd of January 2018 this notification is titled:
"WITHDRAWAL OF THE UNITED KINGDOM AND EU RULES IN THE FIELD OF INDUSTRIAL PRODUCTS".

Within section 2 of this notification, the European Commission outline the position of United Kingdom Notified Bodies after the United Kingdom leaves the European Union.

European Commission (2018) "Union product legislation requires Notified Bodies to be established in a Member State and be designated by a Member State notifying authority for performing the conformity assessment tasks set out in the relevant act of Union product legislation. Therefore, as from the withdrawal date, UK Notified Bodies will lose their status as EU Notified Bodies and will be removed from the Commission's information system on notified organisations (NANDO database). As such, UK bodies will not be in a position to perform conformity assessment tasks pursuant to Union product legislation as from the withdrawal date".

This statement means that the certification currently held by United Kingdom manufacturers of constructional steel products will no longer be recognised

within the European Union. The statement goes further in describing the requirements for United Kingdom manufacturers after the withdrawal date.
European Commission (2018) "Economic operators are advised to take the necessary steps to ensure that, where the applicable conformity assessment procedures require the intervention of a Notified Body, they will hold certificates issued by an EU-27 Notified Body to demonstrate compliance for their products placed on the market as from the withdrawal date".

European Commission (2018) "Where economic operators hold certificates issued by a UK Notified Body prior to the withdrawal date and plan to continue placing the product concerned on the EU-27 market as from the withdrawal date, they are advised to consider either applying for a new certificate issued by an EU-27 Notified Body or arranging for a transfer".

This notification has three potential impacts on United Kingdom manufacturers of constructional steel products these are:

- United Kingdom manufacturers who export to the European Union will need to have their management systems re-certified by a Notified Body from an existing member state this will create additional costs.
- United Kingdom Notified Bodies will no longer be recognised in the European Union and will cease to have any competence to certify management systems for regulated products.
- United Kingdom manufacturers who trade within the internal domestic market may by default have to change their certification body since the United Kingdom regulation stipulates that CE marking will remain a mandatory requirement.
-

The researcher has identified that the potential impacts will be common to all manufactured products in the United Kingdom covered by other European regulations.

## 9. SWOT analysis

The PESTEL analysis has identified the key areas where the withdrawal from the European Union may impact United Kingdom manufacturers of constructional steel products. To evaluate the issue in a business risk context a SWOT analysis compliments the PESTEL exercise. The SWOT analysis is produced by reviewing four areas of interest to a business and is shown in the figure below. The key areas in this analysis will be related to the opportunities and threats sections.


**Figure 20; Generic SWOT mode (Source: Author)**

### 9.1. Strengths

According to Clark (2017) "The strengths of the manufacturing industry are that it is relatively stable. Although the demand for manufacturing tends to fluctuate with the ups and downs of the economy, it is characterised by regular periods of recovery following any downturns. Moreover, manufacturing has become highly efficient over the last century, with the ability to maximize both the productivity of the workers and machines to maximize profits."

The United Kingdom manufacturers of constructional steel products are currently working within a period of uncertainty due to the withdrawal from the European Union trading bloc in 2019.

The survey produced for this report (figure 5) has identified that a significant amount of United Kingdom constructional steelwork manufacturers supplies only to the internal market. According to the Department for Business, Energy & Industry Strategy (2017 pg 7) the United Kingdom has seen the number of small and medium sized enterprises grow steadily since 2008.

This statistic suggests that the internal market is stable and therefore more resilient to the changes that may follow the withdrawal from the European Union.

The role of Small and Medium Enterprises in the United Kingdom structural steelwork sector is predominantly as a second-tier supplier to first tier organisations or principal contractors. As has been identified in previous sections of this report there are 3035 manufacturers of constructional steel products in the United Kingdom. Trading Economics. (2018) state that the United Kingdom economy has also experienced growth since the referendum vote in June 2016. This is demonstrated in figure 21.


**Figure 21; UK GDP Growth Rate (Source: Trading Economics, 2018)**

The fact that the United Kingdom economy has shown growth indicates that the internal market for constructional steel products should remain stable which places United Kingdom manufacturers operating in the domestic market in a strong position after the withdrawal from the European Union.

It is also worth noting that the lower value of the pound has made exported products more attractive to the external markets, however, given the number of manufacturers identified as exporting products, the benefits of a lower value in the pound would not have a significant impact on the constructional steel products sector at the current time.

The United Kingdom has a mature steel manufacturing industry which supplies both the United Kingdom domestic market and the global market. The sale of steel materials is subject to trade tariffs under the European Union Customs External Tariff. Withdrawal from the European Union would remove the obligation for United Kingdom steel manufacturers to remove the trade tariffs for the export of steel. This has the potential to increase the ability to sell to a wider market at more competitive prices. There is also a significant advantage to the United Kingdom manufacturers of constructional steel products in that the purchase of raw construction materials could be from United Kingdom producers. This would shorten the supply chain delivery times and possibly increase productivity.

The global construction industry relies on structural steel for the building of large structures such as offices, sports stadia and bridges. Steel
structures can also be found in heavy industry such as oil refineries and power stations.

Within the European Union the production and secondary fabrication of structural steelwork is governed by regulation. The product types are consistent in nature as steel is manufactured by grade and standard sizes.

The design of the structure will create the only difference in how the final product placed on the market will look and perform.

The products related to structural steel fabrications are generally consistent in that manufacturing process involves cutting, shaping, drilling of holes and welding. Over recent years a level of automation has been introduced in the larger companies with a production line approach being implemented.
To large extent especially in the smaller manufacturers the processes used still rely on skilled manual labour to fabricate products.

The development of new technology to remain competitive will require investment. At the time of writing this dissertation the reliance on technological advances does not appear to be an issue that will affect the United Kingdom internal market.

### 9.2. Weaknesses

According to Clark (2017) "A weakness of the manufacturing industry is that much of it is built on the production of non-essential goods. This means that a severe downturn in the economy can have a crippling effect on it. Another weakness is that it is a mature industry. This means that there is heavy competition and little room for growth. Clark identifies that one weakness is that the manufacturing industry is sensitive to economic impacts as the future of the economy is unknown after the withdrawal from the European Union this area of discussion will be reviewed in the threats section of this analysis.

From the research conducted for this study, BEIS (2017 pg 16) state that "Construction is the largest industrial sector in terms of SME numbers" in the United Kingdom representing 12% of all listed companies.
The British Standards Institute (2014 page 70 SIC code 2511), established that there are 3035 manufacturing Small and Medium Enterprises (SME)

companies that produce structural steel and Aluminium products in the United Kingdom. The construction sector is shown in figure 17 F.

BEIS (2017 pg 1) state that "Small businesses accounted for 99.3% of private sector businesses at the start of 2017 and 99.9% were small or medium-sized (SMEs). Total employment in SMEs was 16.1 million; 60% of all private sector employment in the UK. The combined annual turnover of SMEs was £1.9 trillion, 51% of all private sector turnover in the UK".
Nearly a fifth of all SMEs operate in the Construction industry.

The United Kingdom internal constructional steel market has seen a level of stability in recent years. This statement is supported in both the BEIS (2017) business landscape report and the British Standards Institute. (2014) report.
The current constructional steel manufacturers operating in the United Kingdom are competing in a limited internal market place.

The results from the survey in figure 5 undertaken to support the research indicates that 68% of steelwork manufacturers operate within the internal United Kingdom market, the survey also indicates that 32% of the survey respondents operate in a wider export market.

The possibility of growth for 68% United Kingdom manufacturers would appear to be unlikely should the ability to expand and export to a global market be unachievable. This represents a weakness in the United Kingdom structural steel manufacturing sector.

There is also the consideration that exporting to a wider global market would expose United Kingdom manufacturers to a more competitive environment as there are emerging economies such as China for example that can produce comparative products at significantly lower costs. The fact that wider global

competition would become a factor for the United Kingdom after the withdrawal from the European Union also becomes a threat.

### 9.3. Opportunities

This section of the work will produce an overview of the opportunities that United Kingdom manufacturers of constructional steel products may realise after the withdrawal from the European Union. Previous sections of this dissertation have identified that the steel fabrication industry is governed by European regulation.

Although secondary United Kingdom regulations exist in parallel with the European regulation, the restrictions placed on United Kingdom manufacturers remains the same as the other 27-member states. After the United Kingdom withdraws from European regulatory control, the requirements placed on manufacturers could be adjusted to better suit the internal United Kingdom market.

Should the United Kingdom government choose to implement national regulation that does not align directly with the existing European regulation there is the potential to create a protectionist United Kingdom market.

Up until the leave date of the 29th of March 2019 there are 28-member states with the ability to trade freely in a wider market under common regulation and legislation. Once the United Kingdom has left the European Union the ability to trade with the remaining 27-member states technically ends. This means that there is the potential for the end of imports and exports between the United Kingdom and the European Union.

By reducing imported products, the United Kingdom steel fabrication sector could experience growth since new orders for construction steel fabrications could be sourced solely in the domestic internal market. Tables 4 and 5 show the trade balances for import and export. It could be considered that the import values could be absorbed by the domestic market.

Further benefits from the withdrawal from the European Union is that it would enable United Kingdom manufacturers to purchase materials from a wider global market. Depending on subsequent trade arrangements and tariffs, materials could be bought at lower costs than those currently set by the European Union Common External Tariffs.

Globalisation has a significant impact on business as selection from a wider market creates competition. Porter (1998 pg 63) describes globalisation and how industry has "internationalised". Within this context Porter also describes the formation of alliances between organisations in a global market to gain advantage.

The United Kingdom manufacturers by having access to a wider market could therefore gain a competitive advantage that is not held whilst the United Kingdom is a member of the European Union.

Wilkinson (2013) states that Porter's Five Forces of buyer power identifies the leverage purchasers can exert on suppliers to provide better quality products, customer service, and competitive prices. According to Porter's 5 forces industry analysis framework, buyer power is one of the forces that dictate the competitive nature of an industry.

The bargaining power of purchasers in an industry drives the competitive environment for the manufacturer and influences the manufacturers ability to create a profitable business.

Further opportunities for United Kingdom manufacturers would emerge if the system of product standardisation that is currently in place across the 28-member states of the European Union is changed back to the United Kingdom national standards that existed before the United Kingdom became a member of the European trading bloc.

As identified in the earlier part of this section the potential to change regulation could provide a protectionist market. The adoption of United Kingdom national standards would also create a second potential barrier from imported products. Section 6.9 of this work identifies that United Kingdom Notified Bodies that certify the conformity of manufacturers under the Construction Products Regulation will lose their status after the withdrawal from the European Union.

This then means that after the United Kingdom leaves the European market the United Kingdom regulations will still require supervision from a national body. Under the current system the United Kingdom Accreditation Service verifies the competence of bodies who are then nominated to the European Union by the Secretary of State of the United Kingdom government.

As the United Kingdom regulations will remain in place after the withdrawal from the European Union and without a mutual recognition agreement being made between the United Kingdom government and the European Union, there is a potential third barrier to imports as manufacturers from outside of the United Kingdom would be obliged to undergo certification by the United Kingdom assessment bodies. This will mean that importers to the United Kingdom will have to maintain dual certification systems, for both the European Union and the United Kingdom which would have unknown cost implications.

### 9.4. Threats

The greatest threat to United Kingdom manufacturers of constructional steel products is the withdrawal from the European Union and the unknown consequences that will follow.
Based on the findings from the research for this dissertation, the risk is associated with the European regulations that govern trade, manufacture and the free movement of people.

The European Union has established a trading bloc that has tariff protections on products from outside of the union. These tariffs place restrictions on imported goods from the wider global manufacturing sector.

According to Clark (2017) "The largest threats to the manufacturing industry for developed nations are from low wage countries"
Once the United Kingdom has withdrawn from the European Union, the market protections currently in place could be compromised by cheaper imports from emerging economies such as China and India.

Although the United Kingdom government has stated in the withdrawal bill that regulatory alignment with the European Union will be adopted, this will only serve the number of United Kingdom manufacturers that export to the European Union. The ambition to form trade agreements with the wider global market has the potential to undermine the current internal domestic market through lower prices, which is a major consideration for all buying organisations. The exposure to a wider global market will give buyers more power and potentially drive down United Kingdom internal trade.

The analysis of buyer power is demonstrated in the following table

| **Strong buyer power** | **Weak buyer power** |
|---|---|
| Higher number of buyers as opposed to suppliers | The number of manufacturers is higher than the purchaser numbers |
| Cost of changing supplier is low | The cost of changing supplier is high |
| Purchaser is informed and aware of product type | The purchaser has little or no knowledge of the product |
| The product type is common | The product type is uncommon |
| The buyer purchases large volume orders | The buyer purchases in low volumes |
| Multiple product alternatives are available | The manufacturer is unique |
| The manufacturer is reliant on the purchaser's business | The manufacturer is not reliant on the sales to a single purchaser |

**Table 6; Example of Porter's Buyer Power (Source: Porter)**

Further threats are related to the current regulations within both the European Union and United Kingdom versions of the Construction Products Regulation. Both regulations state that it is mandatory to place CE marking on all constructional steel products.

As has been identified in the opportunities section of this analysis, the mechanism for CE marking is controlled by European registered Notified Bodies. After the withdrawal date the United Kingdom will no longer have certification bodies with the ability to provide certification to United Kingdom manufacturers.

The issue relating certification under the current conditions infers that all certification and validation activities will need to be conducted by a Notified Body from one of the 27 European Union member states. This will create significant additional costs to United Kingdom manufacturers to maintain the ability to certify products.

Should the United Kingdom government fail to amend the current Construction Product Regulations in force, by default the United Kingdom manufacturers of construction steel products could still be under the control of the European Union with no ability to take advantage of other national certification mechanisms.

In all advanced manufacturing nations there is a requirement for highly skilled workers. The European Union treaties enable the free movement of people between the current 28-member states. The survey data produced for this work identifies that 24% of United Kingdom manufactures of constructional steel product rely on migrant skilled labour from the European Union.

The significant threat to the manufacturers who rely on migrant workers is the uncertainty that is related to the status of these workers after the withdrawal from the European Union as the free movement of people will cease. There will be a potential for the loss of skilled workers which will damage the ability of manufacturers to maintain production outputs due to labour shortages.

## 10. Conclusion

The aim of this work was to evaluate the potential impacts that the United Kingdom withdrawal from the European Union on the 29th of March 2019 will have on United Kingdom manufacturers of constructional steel products.

As the United Kingdom withdrawal from the European Union is a future event and the fact that the outcomes of trade agreements which are ongoing at the time this work has been produced are not fully known, this conclusion to the dissertation can only provide considered assumptions based on the findings from the analysis models used to investigate the research problem.

The key findings from the research and literature review has identified that the United Kingdom withdrawal from the European Union has numerous complexities relating to the Treaty of European Union and the subsequent regulations that have been adopted as national laws throughout the 28-member states of the Union.

The political status of the United Kingdom at the time of writing is in a state of flux as there are still clear divisions between the political parties that govern the country.

The decision by the incumbent government to retain European regulations in the United Kingdom legal framework is intended to allow alignment with the European Union, this action is intended to create the potential for unrestricted trade to continue between the United Kingdom and the European Union after the leave date.

The survey data provides vital information to allow the assessment for the industry after the withdrawal date.
Question 1 of the survey identified that 75.75% of the respondents are compliant with the current legal requirements for the manufacture of constructional steel products, this legal requirement will remain in the United Kingdom after the leave date as the manufacturing standard known as BS EN 1090 has been incorporated into the United Kingdom Building Regulations.
The companies that believed that the requirement for conformity to European legislations would become defunct after the leave date will still be mandated to hold the necessary certification under United Kingdom regulations.

The result of Question 2 is flawed and cannot be stated as valid data with regards to the number of manufacturers that export products outside of the United Kingdom. The question should have asked respondents to identify the destination of their products to either the European or the global market.

There is however a significant number of manufacturers that state that they only manufacture products for the internal United Kingdom market, this finding allows the researcher to evaluate the number of manufacturers that may be impacted by the changes after the withdrawal date from the European union.

Question 3 of the survey has also been identified as flawed as the researcher did not consider that manufacturers purchase materials from stockholders the question therefore should have been aimed at stockholders and distributers. There will however, be an impact on manufacturers for the purchase of material as prices will be determined by future trade deals and tariffs that are placed on raw materials. The impact cannot be assessed at this time and is an unquantified risk.

Question 4 has become irrelevant as the situation relating to the implementation of the regulation and manufacturing standard have been mandated into United Kingdom law after the survey question was circulated. There is however, 33% of the survey respondents that will need to be informed of the requirements.

The data return for question 5 indicates that the impact after the referendum result has had no negative impact on the domestic market. The figures are consistent with the number of manufacturers that have indicated that their trade is in the United Kingdom only.

The survey response to question 6 indicates that there are 24% of manufacturers that employ European migrant workers, as the outcome of the withdrawal from the European Union is still unknown this issue will remain as an unquantified risk to these manufacturers.

Question 7 of the survey presents an interesting finding in that the potential opportunity of creating a protectionist internal market as identified in the SWOT analysis would benefit 66% of the respondents. This figure correlates with the number of manufacturers that have stated that they only trade in the United Kingdom internal market.

The response to question 8 is one of the main drivers for the researcher to produce this work, the survey response identified that 65.66% of manufacturers were unaware of the potential impacts and that 30.30 % were not concerned. The subject matter contains several complex issues that may impact United Kingdom manufacturers of constructional steel products the researcher believes that the outcome of the PESTEL and SWOT analysis may offer guidance on the possible outcomes of the withdrawal from the European Union.

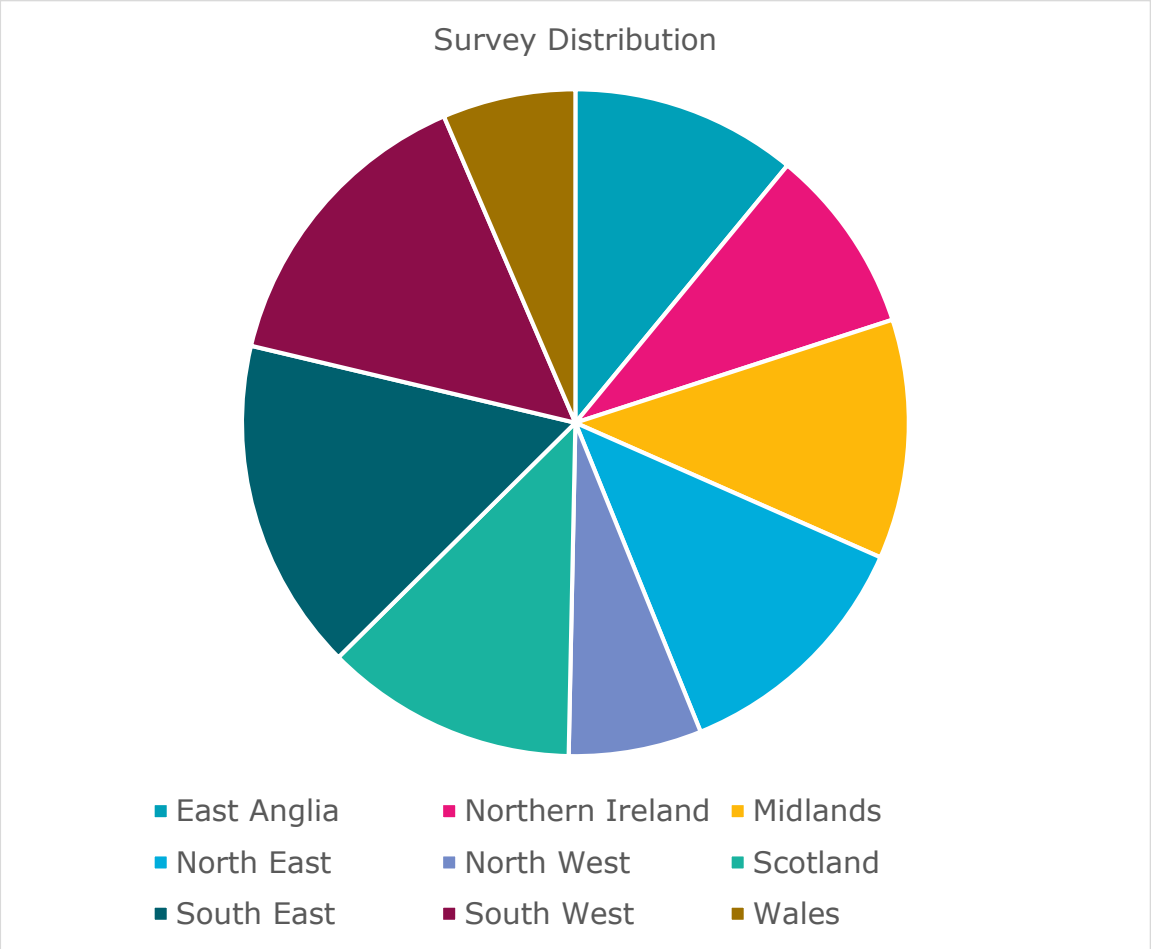
Question 9 of the survey has also become irrelevant as the United Kingdom government has stipulated that the existing European regulations will be adopted as United Kingdom laws. The SWOT analysis has identified that the adoption of the regulations in the current form present a significant risk to United Kingdom Notified Bodies and manufacturers of constructional steel products.

Question 10 of the survey was intended to test the confidence of United Kingdom manufacturers of constructional steel products given the findings of the SWOT analysis the researcher would suggest that there are both benefits and risks to the United Kingdom manufacturers however, the final outcomes cannot be determined until the conclusion to trade agreements between the United Kingdom government and the European Union have been completed.

To summarise this work, the researcher has discovered that the issue of European regulation does not affect the structural steelwork fabrication sector in isolation. There may be a case for all other industry sectors that are currently operating under European regulation to conduct a similar assessment to the one undertaken for this dissertation.

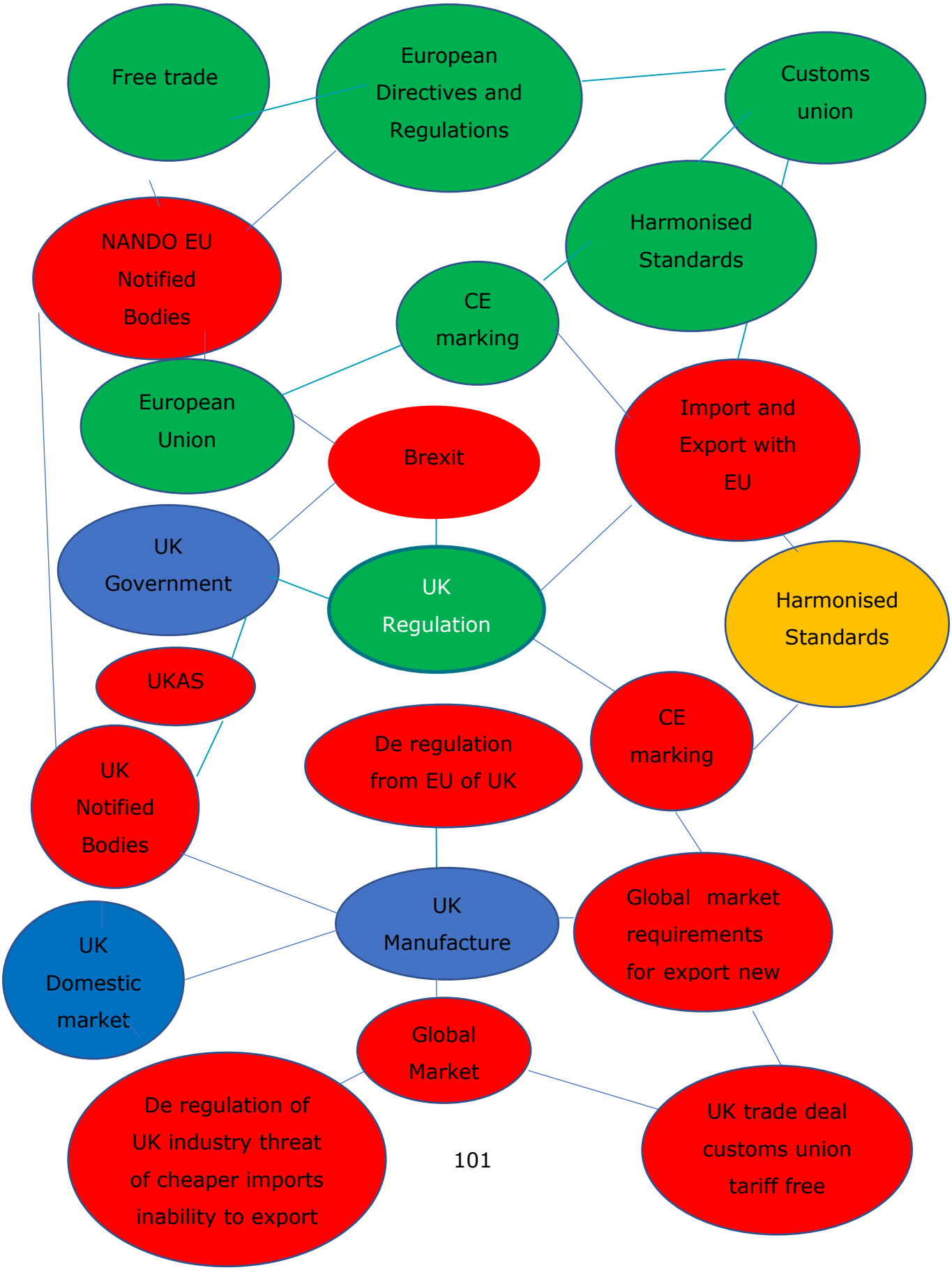
## 11. Appendices

### 11.1. Appendix 1 – Survey Distribution




| | |
|---|---|
| East Anglia | 17 |
| Northern Ireland | 14 |
| Midlands | 18 |
| North East | 19 |
| North West | 10 |
| Scotland | 19 |
| South East | 25 |
| South West | 23 |
| Wales | 10 |
| total | 155 |

## 11.2. Appendix 2 – Brexit Mind Map



### 11.3. Appendix 3 – Survey Population

The companies listed were contacted to undertake the survey as shown in section 5 of this dissertation. It is important to note that this is the survey population and not a list of respondents as this information is confidential.

| COMPANY NAME | COMPANY NAME |
|---|---|
| ADI Mechanical Ltd | Icamsteel Ltd |
| A E Stevenson Fabrication Ltd | I M Murray Engineering Ltd |
| Alba Systems Ltd | Ivorybridge Ltd |
| AQ Engineering Ltd | J A C Construction Ltd |
| AJS Construction (SW) Ltd | J M Acto t/a Acton Engineering |
| Almacit Engineering Ltd | JMR Section Benders Ltd |
| A N Fabrications | Joss Engineering Services Ltd |
| A & S Barnes & Sons | J P Fabrication & Design Ltd |
| Barton Fabrications Ltd | Long Engineering Ltd |
| Black Cat Ironwork | Lovie Construction Ltd |
| Blackwater Fabrications Ltd | McCalls Special Prods t/a Macalloy |
| Booth & Son Ltd | M Construction Services Ltd |
| B R Hodgson Ltd | Mc Cormick Metal Fabrications |
| Brookeson Material Handling | MacPhersons Weld & Eng Services |
| Broomhill Fabrications Ltd | MK Welding Ltd (New Cample) |
| Broxap Ltd | M & M Architectural Ltd |
| B S Steels Ltd | M & M Metalwork Ltd |
| Burmar Fabrications Ltd | MHM Fabrications Ltd |
| Castletech Fabrications Ltd | Metalfab Engineering Ltd |
| Centristic Ltd | Met-Fab Scotland Ltd |
| CETO Engineering Ltd | Minear Engineering Ltd |
| Cirencester Fabrication Services Ltd | NB Fabrication Ltd |
| C L Fabrications Ltd | Needham Fabrications Ltd |
| Croob Engineering Ltd | Newnham Structures Ltd |
| Crosskill Ventilation Ltd | Northbourne Engineering Ltd |
| D Copeland Engineering Ltd | Phoenix 4 Fabrication Ltd |
| David H Ross | PSJ Fabrications Ltd |
| D F Miller Construction Ltd | Q R Engineering Ltd |
| D M Fabrication Ltd | RAB Fabrication & Blacksmith Serv |
| D M Steelworks Ltd | R.A.D. Engineering Ltd |
| Dollcast Ltd | Ray Chapman Fabrications Ltd |
| Douglas Engineers Ltd | Rayward Installations |

| | |
|---|---|
| Eastnor Ltd | R & J Alexander t/a Redland & Son |
| Eastern Structures Ltd | Reekie Steeltec Ltd |
| Elite Steel Services Ltd | Robert Millar Blacksmith Ltd |
| ES Engineering Solutions | R M Fabrications Ltd |
| Fabrication Solutions Ltd | S & D Fabrications Ltd |
| Fabrication Specialists Ltd | ScotSteel Buildings Ltd |
| Filshie Fabrications Ltd | Sheet Metal Fabrications 2013 Ltd |
| Flo Steel Ltd | Simmers Contracts Ltd |
| FSK Solutions Ltd | South West Steel Construction Ltd |
| F W Hall & Son Ltd | Specialised Fabrications Ltd |
| G & A Webster | Stag Steel |
| G M Fabrication | Steelmaster (Norwich) Ltd |
| GSD Fabrication Welders | Steven A Bell Blacksmiths Ltd |
| Gap-Metal Ltd | TCL Structures Ltd |
| G Fitzsimmons & Son Ltd | TMS Construction Engineers Ltd |
| Glenrothes Fabrications Ltd | Taylor Engineering (Services) Ltd |
| Gomac Ltd | Travers Steel Ltd |
| Gordon Wyllie Steel Structures Ltd | Vision Modular Systems UK Ltd |
| Greys Hall Fabrications Ltd | W M Ironwork Ltd |
| G Parish Engineering Ltd | WM Services (Scotland) Ltd |
| ICTS Havant Ltd | Wise Steelwork Ltd |
| 3D Construction (UK) Ltd | Wray Engineering |
| A & J Stead Ltd | John Gibson & Sons Ltd |
| A C Bacon Engineering Ltd | Keeble Brothers (Agricultural) Ltd |
| A Markham & Sons Ltd | KL Designs (Architectural Metalwork) Ltd |
| A&J Fabtech Ltd | Lanarkshire Welding Company Ltd |
| Able Engineering Ltd | Legge Steel (Fabrications) Ltd |
| Access Design & Engineering | Leyletts Engineering Co Ltd |
| Adstone Construction Ltd | LSJ Engineering Ltd |
| Advanced Fabrications Poyle Ltd | M D Collins Steel Buildings Ltd |
| AIG Fabrications Ltd | M J Patch Structures Ltd |
| AJ Engineering & Construction Services Ltd | M&S Engineering Ltd |
| A-MET Engineering | Marshfield Crosskeys (Hereford) Ltd |
| Angle Ring Company Ltd | MCJ Fabrications Ltd |
| Apex Steel Structures Ltd | Metal Aspects Ltd |
| Arc Welding Ltd | Millar Callaghan Engineering Services Ltd |
| Arromax Structures Ltd | Newbridge Engineering Ltd |
| ASME Engineering Ltd | Nusteel Structures Ltd |
| Austin-Divall Fabrications Ltd | Olympic Welding Ltd |
| Ballykine Structural Engineers Ltd | Peter Marshall (Steel Stairs) Ltd |

| | |
|---|---|
| Border Steelwork Structures Ltd | PK Fabrications Ltd |
| Bourne Construction Engineering Ltd | PMS Fabrications Ltd |
| Briton Fabricators Ltd | Portasilo Bulk Handling Systems |
| CMF Ltd | Proweld Fabrication (Wales) Ltd |
| Cook Fabrications Ltd | Realm Engineering (Central) Ltd |
| D H Structures Ltd | ReidSteel |
| EvadX Ltd | Rippin Ltd |
| Four Bay Structures Ltd | S H Structures Ltd |
| Gorge Fabrications Ltd | S Koronka (Manufacturing) Ltd |
| Gregg & Patterson (Engineers) Ltd | Saxon Fabrications Ltd |
| H Young Structures Ltd | Scott Engineering Services Ltd |
| Harry Marsh (Engineers) Ltd | SDM Fabrication Ltd |
| Shipley Structures Ltd | Senior Steel Ltd |

## 12. References and Bibliography

Andrew Filev. (2008). Top-down and Bottom-up Project Management: Leveraging the Advantages of the Two Approaches. Available: https://www.wrike.com/blog/top-down-and-bottom-up-project-management-leveraging-the-advantages-of-the-two-approaches/. Last accessed 16th January 2018.

Angus, A., Katona, G. (1953), The Sample Survey. New York: Dryden press

Barker, A. (1997), *How to be a Better Decision Maker*. London: Kogan Page Ltd

BELL, E. and BRYMAN, A., 2007. The ethics of management research: an exploratory content analysis. British Journal of Management. 18, pp.63-77

Department for Business, Energy Industrial Strategy. (2016). Statistical Release. *Business Population Estimates for the UK and Regions 2016*. NA (All), 1-16.

Brace, I. 2008. Questionnaire Design: how to plan, structure and write survey material for effective market research. Kogan Page

Brigid Gavin (2001). *The European Union and Globalisation*. Cheltenham: Edward Elgar. -.

British Standards Institute. (2014). UK SME Landscape and Standardisation Research. *UK SME Landscape and Standardisation Research*. 1 (1)

British Standards Institute. (2016). European standards and the UK. How are business and industry standards developed and used in the European Single

Market? What would be the impact of a UK exit from the EU on the UK's participation and influence in the European standards.

Byron Gray. (2016). *How to Effectively Conduct a PESTEL & SWOT Analysis.* Available: https://www.linkedin.com/pulse/how-conduct-pestel-swot-analysis-byron-gray/. Last accessed 20-03-2018.

BusinessEssays.net. (2018). *A Critical Review of PESTEL, Porter Five Forces and SWOT Analysis Frameworks.* Available: http://businessessays.net/strategic-management/a-critical-review-of-pestel-porter-five-forces-and-swot-analysis-frameworks/. Last accessed 20-03-2018.

Cabinet Office. (2016). Research and analysis. Why the government believes that voting to remain in the EU is the best decision for the UK - with references. - (-), -.

CEN. (2017). *CEN COMMUNITY.* Available: https://standards.cen.eu. Last accessed 09-12-2017.

Dan Davis. (2013). Structural steel automation at the end of the line. *The Fabricator*. - (-), -.

Dean Anderson and Linda Akerman Anderson (2010). *Beyond Change Management*. San Francisco: Centre for Creative Leadership. -.

Deborah Gabriel. (2013). *Inductive and Deductive approaches to research.* Available: http://deborahgabriel.com/2013/03/17/inductive-and-deductive-approaches-to-research/. Last accessed 22-03-2018.

Dobbs, Michael E. (2014) "Guidelines for applying Porter's five forces framework: a set of industry analysis templates", Competitiveness Review, Vol. 24 Iss: 1, pp.32 – 45
EPRS | European Parliamentary Research Service Author: Eva-Maria Poptcheva Members' Research Service PE 577.971

Easterby-Smith, M., Thorpe, R., Lowe, A. (1991), *Management research*. London: Sage Publications Ltd
EPRS | European Parliamentary Research Service Author: Eva-Maria Poptcheva Members' Research Service PE 577.971

European Commission. (2018). Notice to Stakeholders. WITHDRAWAL OF THE UNITED KINGDOM AND EU RULES IN THE FIELD OF INDUSTRIAL PRODUCTS1. - (-), -.

European Commission. (). *Internal Market, Industry, Entrepreneurship and SMEs.* Available:https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/construction-products_en. Last accessed 30-12-2016

EUROPEAN COMMISSION DIRECTORATE-GENERAL FOR INTERNAL MARKET, INDUSTRY, ENTREPRENEURSHIP AND SMEs. (2018). NOTICE TO STAKEHOLDERS. *WITHDRAWAL OF THE UNITED KINGDOM AND EU RULES IN THE FIELD OF INDUSTRIAL PRODUCTS1*. - (-), -.

European Union. (2011). REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011. laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC (Text with EEA relevance)

Ethridge, D.E. (2004) *Research Methodology in Applied Economics*. 2nd Edition. Oxford: Blackwell

Guffey, E.M., Rogin, P., Rhodes, K., (2009). *Business Communication*. Toronto: Nelson Education Ltd.

greenspec. (2018). *Steel production & environmental impact.* Available: http://www.greenspec.co.uk/building-design/steel-products-and-environmental-impact/. Last accessed 14-03-2018.

Grote, D., Grote R.C. (2002). The Performance Appraisal Question and Answer Book. New York: AMACON

Hans-Günther Vieweg et al. (2012). An introduction to Mechanical Engineering: Study on the Competitiveness of the EU Mechanical Engineering Industry. *Within the Framework Contract of Sectoral Competitiveness Studies – ENTR/06/054*. Final report (1)

HM Government. (2013). The construction Products Regulations 2013. Building and Buildings 2013 No.1387.

HM Government. (2013). The Building Regulations 2010. *Materials and Workmanship Regulation 7*. 2013 edition

HM Government. (2017). Repeal Bill. *European Union (withdrawal) Bill*.

HM Government (2017). Industrial Strategy Building a Britain fit for the future. London: BEIS. -.

Hopwood, N (2004): Research design and methods of data collection and analysis: researching students' conceptions in a multiple-method case study, Journal of Geography in Higher Education, 28:2, 347-353

Internal EU27 preparatory discussions on the framework for the future relationship: "International Agreements"

ISO (2009). *Risk management-Principles and guidelines*. Switzerland: International Standards Organisation. 0.

James Wilkinson. (2013). Buyer Bargaining Power (one of Porter's Five Forces). *Buyer Power Definition*. - (-), -.

Jankowicz, A. F. (1995, *Business research projects*. 2nd Edition. London: Thompson Business Press

Jan-Olof Sperle, Lisa Hallberg, Mats Almemark , Lars-Gunnar Lindfors, Göran Andersson,Åsa Ekdahl,Jonas Larsson,Bengt Johansson, Håkan Johansson, Ahrena Media; Camilla Kaplin and Erik Schedin (2013). *Environmental evaluation of steel and steel structures*. Stockholm: Jernkontoret. -.

Johnson, Scholes,(2008) Whittington exploring corporate strategy 8th edition
Jonker, J., Pennink, B. (2010) *The essence of research methodology*. London: Springer Heidelberg

Kotler, P. Armstrong, G. (2010) *Principles of Marketing*. 13th Edition. New Jersey: Pearson Education

London South Bank University. (Undated). *Setting SMART Objectives. Available*:
http://www1.lsbu.ac.uk/osdt/appraisal/settingsmartobjectives.htm. Last accessed 03-04-2018.

McKinsey and Company. (2010). The next environmental issue for business. *McKinsey global survey results*. - (-), -.

Michael E Porter (1998). *Competitive Advantage of Nations*. New York: The Free Press. -.

Michael E Porter (1998). *Competitive Strategy*. 2nd ed. New York: The Free Press. -.

Moises Naim. (2007). The Free Trade Paradox. *Foreign Policy*. (ISSN 0015-7228) (-), -.

Muijs, D. (2011) Doing Quantitative Research in Education with SPSS. 2nd Edition. London: Sage Publications.

Mullins L J 2007 Management and organisational behaviour Eighth Edition FT Prentice Hall

Official Journal of the European Communities (29-07-1992). No C 191/1 TREATY ON EUROPEAN UNION (92/C 191/01)

Philip Inman. (2018). *UK exporters have 'hoarded' gains from fall in sterling, ONS.* Available:https://www.theguardian.com/business/2017/sep/15/uk-exporters-have-hoarded-gains-from-fall-in-sterling-says-ons. Last accessed 27-03-2018.

Richard Warren. (2016). *Energy costs and the steel sector: A UK steel briefing.* Available: https://www.eef.org.uk/uk-steel. Last accessed 14-03-2018.

Rietbergen-McCracken, J. and Narayan, D. (1998): *Participation and Social Assessment: Tools and Techniques*, The World Bank, Washington DC.

Rhodes. Chris (2016). UK steel industry Statistics and policy. *Briefing paper*. 07317 (0), 7.

Rhodes. Chris (2018). UK steel industry Statistics and policy. *Briefing paper*. 07317 (2), 7.

Royal Academy of Engineering. (2016). Engineering a future outside the EU. *securing the best outcome for the UK*.

Saunders, M. Lewis, P. Thornhill, A. (2009). Research Methods for Business Students. Pearson Education, England.

Saunders, M., Lewis, P. & Thornhill, A. (2012) "Research Methods for Business Students" 6th edition, Pearson Education Limited

Mark Saunders. Phillip Lewis. Adrian Thornhill (2012). *Research Methods for Business Students*. 6th ed. Essex England: Pearson Education Ltd. -.

Team FME. (2013). *PESTEL Analysis Strategy Skills.* Available: http://www.free-management-ebooks.com/dldebk/dlst-pestel.htm. Last accessed 07-01-2017.

Tejvan Pettinger. (2017). *Customs Union-advantages and disadvantages.* Available:https://www.economicshelp.org/blog/138713/economics/customs-union/. Last accessed 04-03-2018.

The Construction Index. (2017). *Top 100 Construction companies.* Available: http://www.theconstructionindex.co.uk/market-data/top-100-construction-companies/2017. Last accessed 25-02-2018.

Trading Economics. (2018). *United Kingdom GDP Growth Rate.*Available: https://tradingeconomics.com/united-kingdom/gdp-growth. Last accessed 27-03-2018.

Tom Lupton, (1971) "Organisational Change: "Top-Down" or "Bottom-Up" Management?", Personnel Review, Vol. 1 Issue: 1, pp.22-28, https://doi.org/10.1108/eb055191

Sabatier, P. (1986). Top-Down and Bottom-Up Approaches to Implementation Research: A Critical Analysis and Suggested Synthesis. *Journal of Public Policy, 6*(1), 21-48. doi:10.1017/S0143814X00003846

Wells, P. (1994), Ethics in Business and Management Research. Aldershot: Dartmouth

Wendel Clark. (2017). *SWOT Analysis of Manufacturing Industry.*Available: https://bizfluent.com/about-6767951-swot-analysis-manufacturing-industry.html. Last accessed 20-03-2018.

William E. Martin. KristaD.Bridgmon (2012). *Quantitative and Statistical Research Methods*. San Francisco: Jossey-Bass. -.

Yin, K. 1989. Case Study research. Sage Publications, New York