UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

GORDON INSTITUTE
OF BUSINESS SCIENCE

University of Pretoria

Perceptions of middle managers on corporate entrepreneurship: A comparative analysis in four different industries

Nithia Reddy

12366189

A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of

Master of Business Administration.

10 November 2014

Abstract

Organisations need to foster continuous innovation in order to effectively compete in today's global marketplace. Corporate Entrepreneurship (CE) can be seen as an effective strategy in ensuring organisation performance and sustained competitiveness. It is common understanding that top management guide and shape strategy however very little understanding exists on the role that middle managers play in its execution.

The aim of this study was to investigate the differences/similarities in middle management perceptions of the internal CE environment within four South African industry sectors. A further aim was to identify the effect of biographical variables within the middle management level on the perception of CE. The eight-factor 34-item solution for the Corporate Entrepreneurship Assessment Instrument (van Wyk & Adonisi, 2011) was used to collect data from 172 respondents.

This study identified significant differences and similarities in middle manager perceptions on CE within the four industries. It becomes evident that understanding the economic sector constraints on organisational culture plays a crucial role in determining organisational CE environment. It was also discovered that biographic variables such as age, tenure and gender play no signifficant role in determining middle manager perceptions of CE.

Key Words

Corporate entrepreneurship, CEAI, innovation, Intrapreneurship, middle manager

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

_____ _____

N Reddy Date

Acknowledgements

I would like to thank my research supervisor Dr Mandla Adonisi for his valuable guidance during this research process. Thanks to all researchers before me that have built a body of knowledge for me to draw on. My learnings from this have been invaluable. Thanks to my loving and supportive wife Kimmy and my baby boy Liam. Your sacrifices will never be forgotten and I will forever be indebted to you.

Table of Contents

List of Tables

List of Figures

1 Introduction into Research Problem

1.1 Poverty reduction through growth

Emerging economies are becoming major role-players in the global platform and entrepreneurial activities play an important role in this process (Bruton, Filatotchev, Si, & Wright, 2013). Brazil, Russia, India, China and South Africa (BRICS) economies need to re-evaluate the conventional manner of maintaining competitive advantage and seek new ways of developing an entrepreneurial mind-set (Haynie, Shepherd, Mosakowski, & Early, 2010).

Goldman Sachs International (2013) reported that unemployment and inequality remain South Africa's biggest hurdles:

- Unemployment remains stagnant at 25% from 23% inherited in 1994. Employment has grown over this period but at an insufficient rate to bring the aggregate percentage unemployment rate down. (see appendix A1)
- 70% of the unemployed are young people, aged between 15 and 34.
- The contribution of mining and manufacturing to GDP has fallen to 23% from 38% in 1986.
- The mining and labour uncertainties are unsettling the market.

Goldman Sachs International (2013) further specifies that Sub-Saharan African region has grown at a 2.4% real GDP average growth rate from 1980 to 2000. However this has now changed to 5.6% average growth rate in the last 13 years. This growth rate ranks the region as one of the fastest growing in the world. South Africa and its companies are ideally positioned to take advantage of this continued growth potential of the region but can only be successful if certain competitive advantages are realised.

Net Foreign Direct Investment (FDI) has lagged the rest of the BRICS countries (appendix A1) and requires that South African companies foster a better climate to aggressively compete globally for FDI.

The level of established businesses has a direct bearing on the level of unemployment, as people will choose employment over starting a new business in societies where industrialism and institutionalism is prevalent (Herrington & Kew, 2013). The level of established business rate in Sub-Saharan Africa (16%) is much higher when compared to South Africa (2%) including an ever increasing discontinuance rate (Herrington et al., 2013). Sustainability of entrepreneurship within an economy requires business to move

past the nascent and new business phase where they are able to contribute to the economy through the on-going introduction of new products and processes (i.e. innovation phase) with a stable employment base (Herrington et al., 2013). Multinational Corporations are in a unique position to alleviate poverty and innovate on business models although certain elements of their existing structures, such as short term profit seeking, silo based incentive structures and uncertainty avoidance prove to be obstacles in this regard (Halme, Lindeman, & Linna, 2012).

It is a requirement to pass through the early entrepreneurial stages from a factor-driven economy to efficiency-driven and finally to innovation driven (Herrington et al., 2013). Corporate Entrepreneurship (CE) seeks to renew established organizations, thereby ensuring their competitive advantage through the use of various innovation-based initiatives (Corbett, Covin, O'Connor, & Tucci, 2013). CE can also provide an organisation, which is progressing through the entrepreneurial stages with the necessary framework to ensure that resources are organised in a manner to efficiently identify and exploit opportunities (Kyrgidou & Hughes, 2010).

Sustained competitive advantage is driven by CE which is built from the knowledge, skills, and abilities of individuals (Corbett et al., 2013). It has been recognised that competitive advantage is not sustainable over time without some form of consistent renewal or regeneration (Covin & Slevin, 2002). The realisation is that in the face of globalisation and therefore increasing levels of competitiveness, CE may be the most effective method to achieve high levels of organisational performance and becomes an imperative growth strategy (Garvin & Levesqu, 2006; Goodale, Kuratko, Hornsby, & Covin, 2011; Kuratko D. F., 2009; Lin & Lee, 2011).

1.2 The changing face of competition

History has shown rapid innovation delivering proprietary intellectual property rights over the last few decades but many large corporations are experiencing challenges to maintain advantage. As legitimate competitors enter the market and technology develops at a rapid pace, these large organisations experience difficulty in maintaining their high innovation levels. Size, legacy, budgets, and a host of other factors hinder their corporate entrepreneurship levels and their ability to adapt effectively. This effect has not had major consequences in the past as all these organisations played in the same marketplace and all exposed to the same rules of engagement. Large organisations had the protection of significant barriers to entry by quick, nimble

competitors due to the time and budget required to setup engineering departments, testing labs, and manufacturing facilities.

The pace of technological advancements over the last decade has continued to remove many of the barriers to entry into the marketplace. Industrial capabilities in terms of design, testing and full production can now be outsourced and even rented out on a short term basis. This has given rise to the individual manufacturer or "maker movement" (Goldense, 2013), which has challenged the very foundation of large organisations and organisational ability to adapt or innovate. The very factors that gave rise to competitive advantage for large corporations such as global spread, economies of scale in supply and distribution channels, and size of human resources structure are threatening to become impediments to innovation and adaptability.

Economists observed that the significant advances in economies are most often preceded and accompanied by a process of creative destruction which has the capability of shifting profit pools, rearranging industry structures and replaces incumbent businesses (Manyika, et al., 2013). This process is most often driven by innovative technologies in the hands of entrepreneurship. Manyika, et al. (2013) further postulate that important transformative technologies can come from any industry, field or scientific discipline but they share four common characteristics namely:

- **The technology is experiencing a high rate of change of advancement or breakthroughs:** Disruptive technologies typically demonstrate an exponential rate of change in capabilities in terms of price to performance relative to market substitutes and alternative approaches or products. They also experience breakthroughs that drive accelerated rates of change or disjointed capability improvements.
- **Broad potential scope of impact:** To be economically disruptive, a technology must have a broad enough reach in order to affect companies, industries and countries.
- **Large economic value that could be affected:** An economically disruptive technology that has the potential to create massive economic disruption. The value at stake must be large in terms of profit pools that might be disrupted, additions to GDP, and capital investments that may become wasted.
- **Substantial potential for disruptive economic impact**: Technologies have the potential to dramatically change the present circumstances. They can

create new opportunities, drive growth, transform how people live and work, or change competitive advantage for nations.

Potential benefits of disruptive technologies are monumental, but so too are the challenges of adequately preparing for their impact. Leaders of business and government institutions should not wait until these technologies are exerting their full influence on the economy, as it will be too late to ensure survival as a minimum. Those that take cognisance of these potential effects and make plans accordingly will ensure sustained competitive advantage. Business strategy and organisational strategy needs to continuously evolve and innovate in the face of these disruptive technologies to ensure improved internal performance.

1.3 Innovation through leadership

To generate new ideas and ensure that they are brought to life, innovative leaders are required to continuously connect and engage with a diverse set of opinions, perspectives and idea sets. According to (Farmer & Butte, 2014), two fundamental areas that require focused attention by leaders are:

- Building people capabilities, and
- Building organisational capabilities

Building people capabilities through:

Acknowledgement:

- Clear understanding through analysis of their current circumstances, including both positive and negative sides,
- Identification of all the stakeholders involved in these circumstances,
- Identification of the root causes and consequences of their current obstacles, including knock on effects on others around them.

Reframing:

Innovators seek to create through reframing current circumstances in the perspective of desired outcomes. Innovators do realise that problems exist in the real situation, but do not make it the hub of focus. Problems are addressed only in the broader environment of generating desired outcomes.

Building organisational capabilities through:

Infrastructure: Understanding the processes, platforms and tools required to support innovative activities.

Talent management: This is the people processes that support and deliver performance

Leadership: This is representative of the leadership behaviours required on a daily basis to support, nurture and inspire everyday innovation.

Culture: Although culture is in part an outcome of various other factors, it can be changed and affected through proper and consistent communication on innovation initiatives and requirements.

Performance differences between organisations have been generally attributed to larger organisational factors instead of differences amongst individuals that make up the organisation. Organisational composition in industries with high rates of entrepreneurship or with few economies of scale may account for the varying levels of organisational performance (Mollick, 2012). Despite the importance of individuals in explaining performance differences in organisations, very little research has been done on exploring individual differences versus organisational factors (Mollick, 2012). Little understanding exists of the impact of variation of individuals who fill less formally powerful roles, such as those at a middle management level (Mollick, 2012). Mollick (2012) argues that due to middle manager actions being bounded by the organisation, existing literature expects that the majority of the impact on performance can be attributed to organisational factors rather than individual factors. Mollick (2012) studies indicate that the variation among individuals has significant importance in organisational performance and that variation among middle managers has by far the largest impact. Leadership behaviour of middle managers have a direct and profound influence on their direct subordinates and lower levels of the organisation thus organisational performance (Yang, Zhang, & Tsui, 2010).

In order to make informed strategic choices for a corporation, a manager must understand when certain practices/behaviours are likely to be successful and the best way to organise to become successful as a whole (Corbett et al., 2013).

Corbett et al. (2013) further propose that since there are limits to corporate entrepreneurship adoption and usefulness, it is imperative to explain and predict how it

evolves, is adopted and what makes it successful. Hornsby J. S., Kuratko, Shepherd, & Bott (2009) stipulate that there are still areas that require understanding on how CE as a strategy is enacted in the organisation and that heterogeneity in the motivation for entrepreneurial action across managerial levels has not been fully examined. Middle managers play a critical role in organisational performance even in highly innovative industries, and as such there exists a need for further research into the mechanisms by which middle managers influence organisational performance (Mollick, 2012).

The role of the middle manager within the organisation is instrumental in terms of the need for them to behave innovatively themselves and the requirement for them to create and sustain the environment for others to do so for themselves (Ren & Guo, 2011). Without a clear, sustained and strong commitment from all levels within the organisation, entrepreneurial behaviour may never become a defined characteristic of the innovation seeking organisation (Kuratko, Covin, & Hornsby, 2014).

The economic and political environment of late has warranted quick organisational change management in order to meet demand and remain competitive. It may seem that a number of large public and private companies have chosen cost cutting as a primary means of remaining competitive (Kew, 2014; Mathews, 2013; Mochiko, 2014; Spillane & Burkhardt, 2014). Continuous innovation in terms of products, processes, administration and structure is required to compete effectively in the global market place (Kuratko, Hornsby, & Covin, 2014). The literature review will focus on the various elements of corporate entrepreneurship and seek to highlight how it can be understood, measured and controlled.

Prior research on the topic of corporate entrepreneurship and the level of management support is reviewed in order to ascertain shortcomings and limitations within the existing literature. It is the aim of this study to test the eight factor solution (van Wyk & Adonisi, 2011) in the four industries mentioned above. This study will replicate the study questionnaire of Adonisi & van Wyk (2012) in these additional economic sectors with the hope of validating existing and uncovering additional variables/antecedents to high levels of corporate entrepreneurship. The aim of this study is to investigate the differences/similarities in middle management perceptions of the internal CE environment within four South African industry sectors. A further aim is to identify the effect of biographical variables within the middle management level on the perception of CE.

2 Theory and Literature Review

2.1 Introduction

A funnel approach will be utilised in the literature review below by beginning with the broad factors that seek to solve the previously identified business problem. As the funnel narrows, the literature review focuses on the middle management level itself and the various individual factors as a departure point. The requirement for innovation through effective leadership, as touched on in the previous section could be seen as an imperative starting point. The need for innovation and the ability of corporate entrepreneurship to fulfil this need makes it the next logical category for discussion. CE is then defined and the various elements mapped, with an intention to set the scene for an effective means of measuring and controlling them.

The literature review then proceeds to uncover existing knowledge on organisational structures and the role of human capital. This seeks to point out that limited existing research exists regarding the influence of the middle management level. It also highlights the elements of the current organisational structures that influence corporate entrepreneurship and innovation. Organisational and sector factors are then addressed to ascertain what factors determine differences within different industries. The middle management level is next to be unpacked with the literature review ending on individual factors that may contribute to understanding the middle manager in greater detail. Understanding the middle manager filters back up the funnel through effectively championing and sustaining CE initiatives thereby fostering innovation and ultimately company and country performance.

2.2 Innovation

It can be seen that continuous innovation is imperative for effective competitive advantage in the global marketplace (Kuratko et al., 2014). Rapid technological change, restrained economic growth and increasing international competition has made it imperative that organisations have the abilities to improve and create new value (Rigtering & Weitzel, 2013).

de Jong, Parker, Wennekers, & Wu (2011); Hsu, Tan, Jayaram, & Laosirihongthong (2014) propose that innovation is the development of new value through more efficient and effective products and services namely:

- Product innovation: focus on the creation of new products or services or the improvement of existing products and services,

- Process innovation: focus on the implementation of new production or delivery methodologies or the improvement of existing ones.

Corporate Entrepreneurship can be seen as innovation and renewal within an organisation (van Wyk & Adonisi, 2012). There exists a positive relationship between the CE factors as elaborated on in section 2.3 below and more specifically management's influence (when viewed from an internal perspective) and organisation financial performance (Goosen, Coning, & Smit, 2002). It is also a perspective that effective organisational management practices can promote, stimulate and support employees' innovative behaviour thereby work performance (Burroughs, Dahl, Moreau, Chattopadhyay, & Gorn, 2011; Bysted & Jespersen, 2014; Tuominen & Toivonen, 2011).

Innovative investments to ensure future profits for the organisation are not only through technology and research and development investments but also involve sustainable human, social, environmental, technical, and economic investments (Kim, Brodhag, & Mebratu, 2014). The definition of innovation can further be extended to encompass knowledge based processes to create new ideas, markets, products and services toward overall operational improvement (Yousif Al-Hakim & Hassan, 2011).

Behram & Özdemirci (2014) propose a research model below highlighting the empirical link between environmental conditions, organisational culture, corporate entrepreneurship and firm performance.

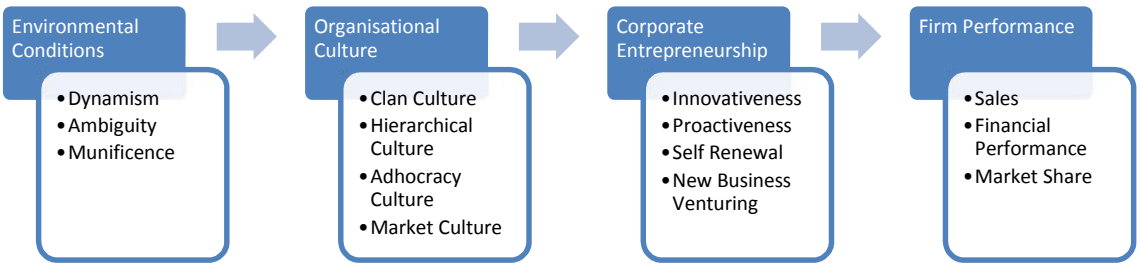


Figure 2-1: Behram & Özdemirci (2014) research model

The study indicates a clear relationship between the various blocks in the model above with the underpinning that corporate entrepreneurship is a crucial link in the chain, playing a mediator/facilitator role in achieving firm performance. The role of innovation

within CE is also indicated. It should also be noted that organisational culture feeds and is the foundation to CE.

2.3 Corporate Entrepreneurship

CE has in some instances been labelled as corporate venturing or Intrapreneurship (Hornsby, Kuratko, & Zahra, 2002). CE can be defined as the process whereby an individual or group of individuals, in an association with an existing organisation, create a new organisation or instigate renewal or innovation within that organisation (Sharma & Chrisman, 1999). CE can also be perceived as a tool or set of activities to enhance an organisations ability to foster innovation, take risk and seize opportunities that are available to it on the market (Rigtering & Weitzel, 2013; Zahra, 1991).

The evolution of CE has followed numerous paths during the last decade. Some elements have followed the path of "the effect of intellectual capital and Human Resources Management (HRM) policies on CE" (Schmelter, Mauer, Borsch, & Brettel, 2010; Zhang & Jia, 2010), and other elements along the effects of CE on company performance (Hajipour & Mas'oomi, 2012; Li & Zahra, 2012). The inherent value of entrepreneurial actions and activities of long established organisations have been investigated (Kuratko D. F., 2012; Morris, Kuratko, & Covin, 2011), yet there exists limited knowledge on how CE is enacted in the organisation settings (Kuratko & Audretsch, 2013). CE can only contribute to organisational renewal, business venturing, flexibility and profitability when projects are innovative and move beyond an idea generation phase to have measurable impact within the organisation (Wales, Monsen, & Mckelvie, 2011).

Further definitions by Covin & Lumpkin (2011); Narayanan, Yang, & Zahra (2009) and Phan, Wright, Ucbasaran, & Tan (2009) and allow CE to be conceptualised in the structure below (Fig2-2) with added definitions following:

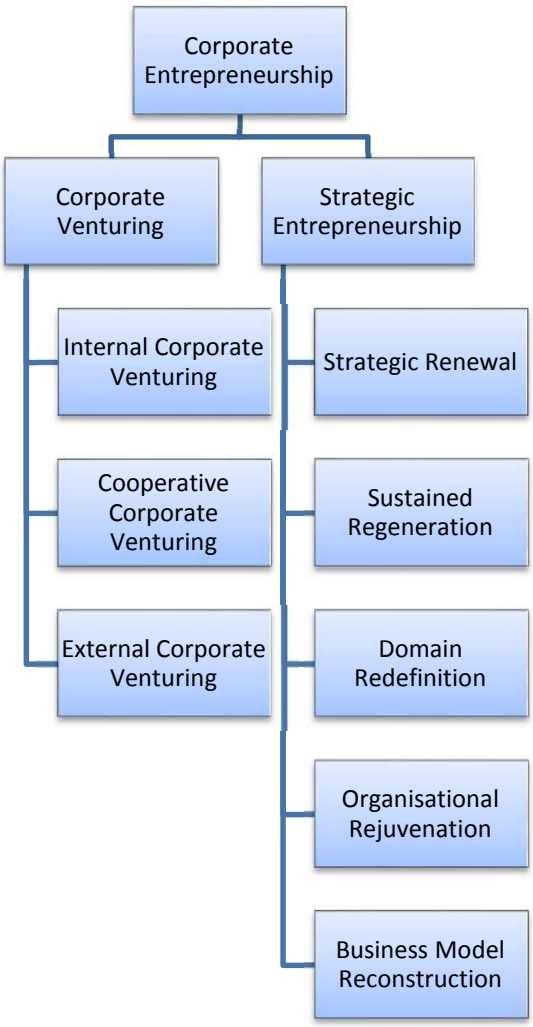


Figure 2-2: Defining Corporate Entrepreneurship; Source: (Morris, Kuratko, & Covin, 2010)

2.3.1 Corporate Venturing

Birth and creation of new business within the organisation that can integrate into the greater business portfolio (Narayanan et al., 2009). Corporate Venturing can be recognised as the first major category of CE and include methodologies for creating, expanding or investing into new businesses (Kuratko D. F., 2009; McGrath, Keil, & Tukiainen, 2006). Zahra, Randerson, & Fayolle (2013) propose that organisational renewal through venturing serves the following two purposes, namely:

- The goal of exploring opportunities in existing and new markets
- Extending and levering organisational capabilities to exploit discovered or created opportunities.

Venturing assists in extending an organisation's capability set, expedite strategic movement, enhance strategic expertise and allows benefit from knowledge created by

and obtained from outside (Zahra, et al., 2013). Therefore, corporate venturing can complement the internal capabilities and skillset of a corporation, thereby providing future sustained profitability and growth.

Corporate Venturing can further be classified as:

- **Internal Corporate Venturing:** The creation of new business that generally resides within the main corporate structure but some can be located outside of the organisation as semi-autonomous structures (Sharma et al., 1999).
- **External Corporate Venturing:** Organisations may also invest in another company that is in an early stage of the entrepreneurial process. An example could be mergers with and acquisitions of young infant businesses that are showing signs of growth (Covin & Kuratko, 2010).
- **Cooperative Corporate Venturing:** Otherwise known as joint corporate venturing or collaborative corporate venturing refers to entrepreneurial activity in which new businesses are created and owned by the organisation in conjunction with one or more external development partners (Kuratko & Audretsch, 2013). These would typically exist beyond the organisational boundaries of the founders.

2.3.2 Strategic Entrepreneurship

Covin et al. (2010) propose that strategic entrepreneurship can be defined as the adoption of strategically innovative activities in the aim of organisational competitive advantage. This can include

- Strategic Renewal.
- Sustained Regeneration.
- Domain Redefinition.
- Organisational Rejuvenation.
- Business Model Reconstruction.

In contrast with Corporate Venturing, Strategic Entrepreneurship exhibit large-scale or have high consequence innovations that the organisation adopts in order to pursue competitive advantage (Kuratko & Audretsch, 2013). With Corporate Venturing involving organisational effort in the creation of new business, Strategic Entrepreneurship correlates to broader initiatives that do not necessarily result in new business being added to the organisation. (Covin & Kuratko, 2010).

2.4 Measuring Corporate Entrepreneurship

The Corporate Entrepreneurship Assessment Instrument (CEAI), as developed by Kuratko et al. (2014) is a diagnostic tool used for assessing manager's perceptions of the five major dimensions critical to creating an entrepreneurial/innovative environment. This tool can additionally be utilised to manage the organisation's internal environment in the successful implementation of a corporate innovation strategy. The instrument measures the degree to which individuals perceive the five elements of the internal environment, as discussed above through a 48 item Likert style questionnaire.

The intention of the tool is to measure perceptions of individuals of the overall organisation or industry and not to look at any one individual's score. Scoring is as per scoring scale in Kuratko et al. (2014) with average score for each scale being indicated. Identification of the scale's standard deviation will indicate how consistent the perceptions are across departments, companies and industries. An organisation or industry profile can be generated from the collation of average scores for the individual elements.

Building on the CEAI, the content, structural and convergent validity of the model was tested (Hornsby J. S., Kuratko, Holt, & Wales, 2013). The findings indicate that the "organisational boudaries" did not survive the factor analysis as consistent with findings of Adonisi (2003) and Adonisi & van Wyk (2012). It did however show content validity and convergence with theoretically related construct.

van Wyk & Adonisi (2011) propose that it is imperative to evaluate the construct validity of the CEAI in a South African cultural setting as psychometric instruments are not always portable to other cultures. Their research, through confirmatory factor analysis indicates and eight-factor 34-item solution as opposed to the five-factor 48-item CEAI. The eight Factors include:

- Work Discretion.
- Management Support and Risk Acceptance.
- Rewards/Reinforcement.
- Innovative Initiatives.
- Financial Support.
- Sufficient Time.
- Organisational Boundaries.
- Inadequate Time.

The eight-factor scale can be applied to differentiate between differences of perceptions between employees' perceptions and of the corporate entreprenerial climate within the organisation as opposed to just top management perception (van Wyk & Adonisi, 2011). This structure could also give insight into the disparities and differences in middle manager percetions across different organisations and industries in a common cultural climate.

2.5 Organisational Structure: Human Capital

Proper and efficient management of human capital is at the epicentre of the modern organisation (Bakker & Schaufeli, 2008). It can also be seen that management behaviour has a strong influence on employees in relation to engagement and turnover (Chen & Silverthorne, 2005). Employees who experience a sense of purpose in their work and who believe that they can influence the system in which they are embedded are more engaged (Stander & Rothmann, 2010).

With globalisation of markets it becomes increasingly important that managers and leaders react quickly to the changing climate in order to attain competitive advantage (van Wyk et al., 2012). Goosen et al. (2002) further identify the key factor of "Management" and its ten dimensions of intrapreneurship as an internal influence especially in terms of structures, processes and internal relations.

The design of individual positions within an organisation is characterised by task specialisation and formalisation and indicates the extent to which an organisation attempts to steer and control the behaviour of its employees (Wales et al., 2011). Hierarchal organisational structures are less supportive of innovation because the creation of an innovative environment inevitably involves relinquishing some authority usually associated with leadership and ownership, either legal or psychological in the organisation (Hsu et al., 2014).

There are three dominant theoretical perspectives that seek to explain how Human Resources Management (HRM) may influence innovation and entrepreneurship (Hayton, Hornsby, & Bloodgood, 2013) namely:

- **Resources and capabilities based perspectives:**
  The role of HRM in building unique resources that create value were organisations are able to leverage their human and social capital in the creation of tacit knowledge. Acquiring intangible assets that are valued by stakeholders thus creates competitive advantages. The HR system must facilitate the

acquisition of, integration and exploitation of new knowledge, thereby the HR system itself becomes a strategic capability.

- **The behavioural view:**
  HRM creates the ability, motivation and opportunity for individual and collective behaviour in organisations. Behaviours are determined by the organisation's strategy thus organisations should select HR practices that drive the creation or acquisition of ability and motivation in employees, as well as providing the opportunity.
- **Social exchange theory:**
  The creation of social capital, organisational citizenship, pro-social behaviours, perceived organisational support and relational psychological contracts. This is founded on the principle of reciprocity whereby positive treatment creates a motivation to reciprocate. This leads to the development of trust through which knowledge is exchanged.

Hayton et al. (2013) propose a process model below showing the integration of Human Resources Management and Corporate Entrepreneurship.

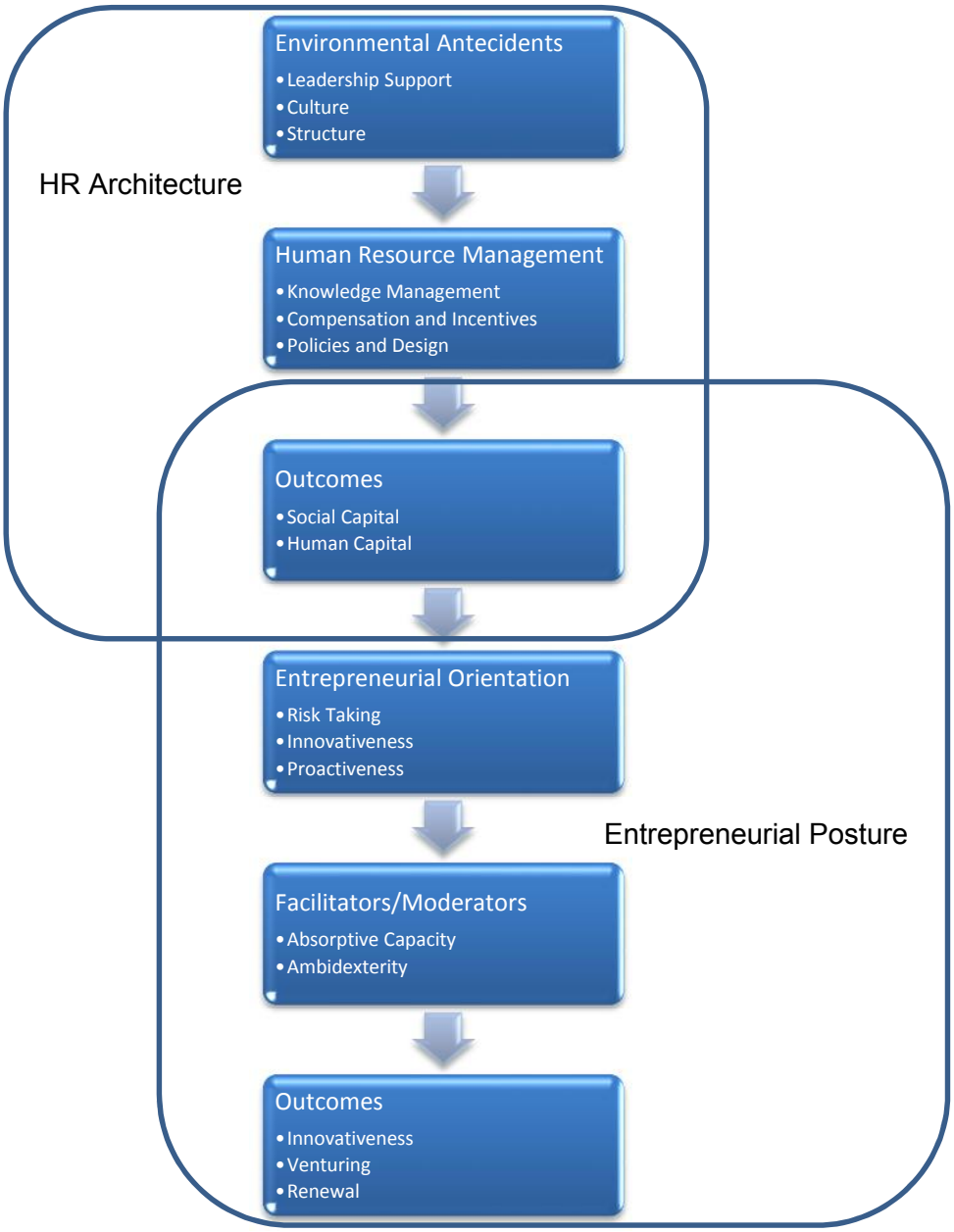


Figure 2-3: A Process Model of the Integration of Human Resource Management and Corporate Entrepreneurship (Hayton, Hornsby, & Bloodgood, 2013).

The model in fig 2-3 above attempts to give an indication of how the environmental antecedents (leadership support, culture and structure) are managed through an effective HRM process to deliver human and social capital as an outcome. It is in these environmental antecedents were the five factors: Top Management Support, Rewards and Reinforcement, Autonomy and Discretion, Time Availability and Organizational Boundaries reside (Hornsby, Kuratko, & Zahra, 2002; Hornsby J. S., Kuratko,

Shepherd, & Bott, 2009) as expanded on below. These factors reflect fundamental issues such as strategy, leadership, resources and organisational culture.

Developing an organisation wide Entrepreneurial Orientation (EO) is generated from the development of the corresponding necessary practices at the upper levels of the organisation. This allows for the generation of human and social capital within the organisation for pursuing a corporate entrepreneurship strategy. As can be seen in the model, the outcomes of Entrepreneurial Posture include the elements of CE (innovation, venturing and renewal) with a clear requirement for moderators/facilitators to make the process work.

For the purposes of this research the organisational structure and thus the internal environment will be defined as the environment created by the manager such that it is highly conducive to innovation and entrepreneurial behaviour and can be identified in five specific dimensions (Kuratko et al., 2014), namely:

1. Top management support: It has been concluded that top management support can be directly positively related with an organisation's innovative outcomes
2. Work discretion: Entrepreneurial opportunity is often achieved by those with discretion on how to perform their work and those encouraged to experiment.
3. Rewards and reinforcement: Innovation and risk taking that is rewarded can often boost entrepreneurial behaviour
4. Time availability: Unstructured or free time availability among managers can be important in generating entrepreneurial initiatives.
5. Organisational boundaries: When innovation is treated as a structured and purposeful process, it can result in higher levels of innovative outcomes. Organisational boundaries need to be perceived as flexible in promoting entrepreneurial activity.

Top management leadership plays a pivotal role in influencing entrepreneurial activity but if the organisational environment is not conducive to entrepreneurship, then it is limited to the corporate level only (Kantur & Iseri-Sey, 2013). Entrepreneurship within an organisation may be superficially present at every level but the various manners in which behaviour is exhibited across these levels is a key driver of the level of CE within the organisation (Wales et al., 2011). CE behaviour within an organisation requires an internal environment that eliminates constraints on employees by fostering horizontal participation and provides resources for innovation endeavours (Hornsby et al., 2002; Morris et al., 2011; Wales et al., 2011).

It is through the analysis of the organisational environment with specific attention to middle management where additional variables/antecedents may be uncovered. CE research has thus far implicitly assumed homogeneity within organisations and failed to realise that a) managers of different levels have different roles that provide more or less ability to influence CE and b) managerial level is important in understanding CE actions thus requiring a granulated focused approach to each managerial level (Hornsby et al., 2009; Wales et al., 2011).

2.6 Organisation/Sector Factors

Prior research indicates that there may be significant differences regarding the economic sector where the company operates in that may affect the existence of corporate entrepreneurship (Burgers, Jansen, Van den Bosch, & Volberda, 2009). Gomez-Haro, Aragon-Correa, & Cordon-Pozo (2011) and Zahra (1991) further corroborate this by showing the influence that external factors may have on an organisation's entrepreneurial behaviour. However this theory is in stark contrast with that of Covin & Lumpkin (2011) & Hornsby et al. (2002) which stipulate that internal organisational factors play a far more critical role in encouraging corporate entrepreneurship than environmental/external factors. For the purposes of this research, the various sectors under investigation will give insight into possible environmental or industry specific differences that may or may not exist. This could arise from the external environment or from the organisational structure that was developed as a response to this environment. For the purposes of this research, the macroeconomic environment within the various sectors will be contrasted on the basis of contribution to Gross Domestic Product (GDP). The table below indicates the summary of GDP contribution per sector and annual growth rate.

Sector	Contribution to GDP	Growth Rate
Petrochemical	5,0%	2,0%
Manufacturing	15,0%	1.5%
Banking	21,0%	3.8%
Professional services	21,4%	3.7%

Table 2-1: Contribution to GDP by Sector and annual growth rate as adapted from (Statistics South Africa, 2014)

2.7 Middle Management

The CEAI instrument as developed by Hornsby et al. (2002) indicate that there are significant differences in perception of the key dimensions, as stated above by upper middle and middle to lower managers. Hornsby et al. (2009) further conclude that managers at higher levels, by virtue of their high ranking positions within the organisation can make use of top management support thereby successful at entrepreneurial activities. An integrative model of CE Strategy (Ireland, Covin, & Kuratko, 2008) is presented in the figure below.

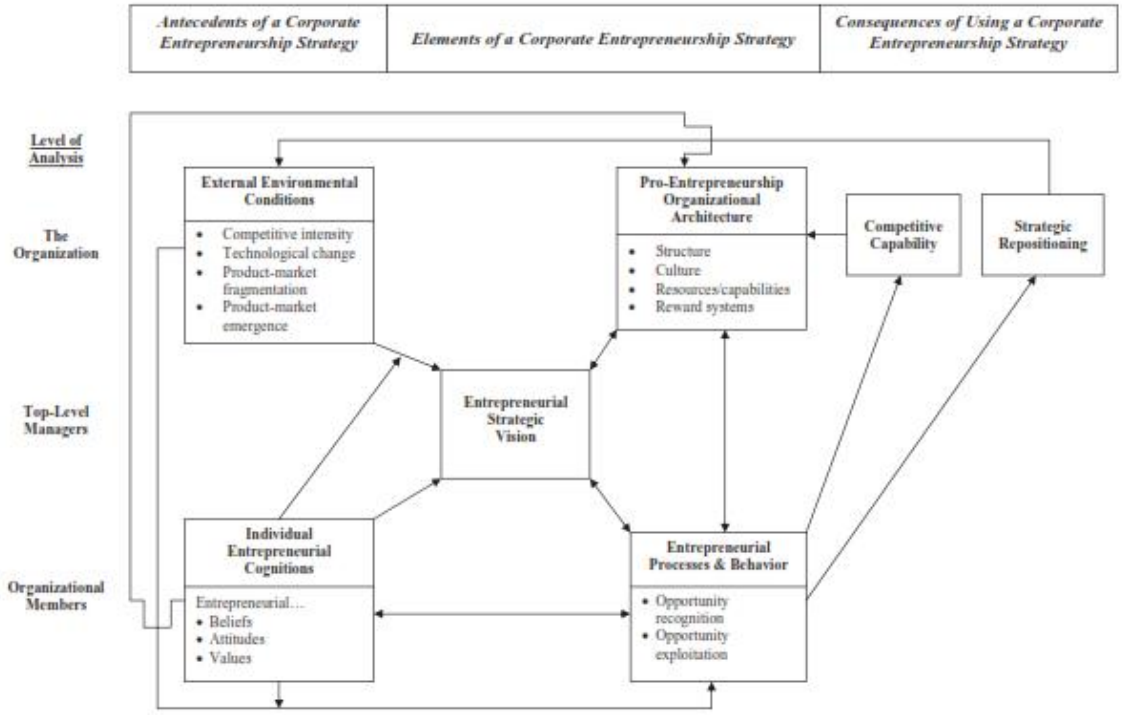


Figure 2-4: An Integrative Model of Corporate Entrepreneurship Strategy

With focus on the bottom left corner of the model, Individual Entrepreneurial Cognitions highlights three components. These three classes of variables may be related to an individual's interpretation of corporate entrepreneurship (Rutherford & Holt, 2007), namely process, context and individual variables. It is within these individual variables where "Individual Entrepreneurial Cognitions" as part of the "Integrative Model of Corporate Entrepreneurship Strategy" Model (Ireland et al., 2008) have a bearing on the organisation's entrepreneurial strategic vision. These individual cognitions include beliefs, attitudes and values and can be seen in their model above. It is because these factors are of an individual level that a top down and bottom up approach is required in understanding the impact and role of management at all levels in the process (Phan et al., 2009).

Despite the growing recognition of the role of middle managers in increased levels of CE, very little is actually known regarding specific factors that can influence middle managers in achieving their objectives (Hornsby et al., 2002). Vast amounts of research has focused on the activities and roles of Top Managements Teams (TMT) in the support of successful CE initiatives (Van Doorn, Jansen, Van den Bosch, & Volberda, 2013). Senior level managers have ratifying, recognizing and directing roles corresponding to competance definition, modification and deployment subprocesses (Kuratko & Audretsch, 2013). Ling, Simsek, Lubatkin, & Veiga (2008) demonstrated that top leadership had a significant "directing role" in shaping four key factors, namely:

- Behavoural Integration
- Risk taking propensity
- Decentralisation of responsibility
- Long term compensation

Senior level management are responsible for the strategic entrepreneurial vision and a facilitating organisational structure (Kuratko & Audretsch, 2013). Middle managers on the other hand work as change agents and promote innovation from the center of the organisation and a model for their behaviour can be explained as follows (Kuratko & Audretsch, 2013):

- Endorse: they endorse CE perspectives arising from senior level management and "sell" the idea to the primary level implementation level below.
- Refinement: they convert entrepreneurial opportunities into implementable initiatives that conform with the organisation
- Shepherding: ensure that entrepreneurial initiatives originating from below are supported.
- Identification and acquisition: ensuring that resources needed for entrepreneurial initiatives are supported from concept through to implementation.

It can be seen that middle management level is where entrepreneurial opportunities are given the most support in terms of resources such that ideas can translate to reality.

(Hornsby et al., 2002) summarise the contributions of middle managers within organisations as follows:

- Fostering communication regarding company mission, goals, and priorities.
- Interaction with diverse employees allows formal and informal approaches to encourage innovation and calculated risk taking.
- Communication of ideas of innovation to upper management thus creating opportunity where ideas are evaluated against organisational strategic goals.
- Employ different approaches to make organisational structure less resistant to change thus encouraging CE.

Middle managers must display the technical competance and have a thorough understanding of the development phase, shaping phase and application of organisational competencies to effectively tap into lower level managers (Kuratko & Audretsch, 2013). Middle managers must further have understanding of the organisation's strategic intentions and vision within the internal and external political context (Kuratko & Audretsch, 2013). For the purposes of this research, the four strategic roles of middle managers can be summarised (Wooldridge, Schmidt, & Floyd, 2008) as follows:

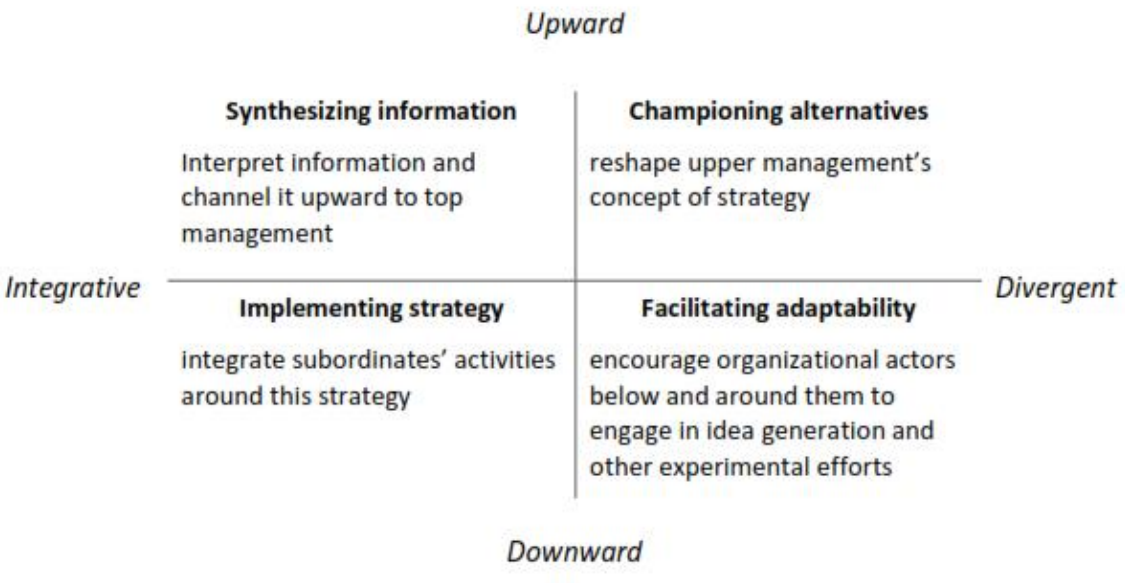


Figure 2-5: Four Strategic Roles of a Middle Manager

The past mehodology of only downward implementation is challenged in today's knowledge intensive organisations. Middle managers are now required to influence upward, integrate horizontally and engage in divergent initiatives (Wooldridge et al., 2008) as illustrated in Fig 2-5 above. The illustration plots the different roles in two dimensions namely: Integration versus diverging and upward versus downward. Bounded by limited attentional capacity, middle managers cannot attend to all opportunities and must choose what to focus on at any given moment in time. Ren & Guo (2011) stipulate that it is imperative to understand the process by which middle managers allocate their limited attentional focus to entrepeneurial opportunities as:

- organisations may miss the chance to exploit an opportunity should the opportunity not appear on the middle manager's radar screen,
- organisations may pursue exploitative opportunities excessively and miss the next innovative breakthrough idea.

Hornsby at al. (2002) provide a model, as indicated below to illustrate the concept of middle managers' positioning in creating or changing a CE supportive organisation.

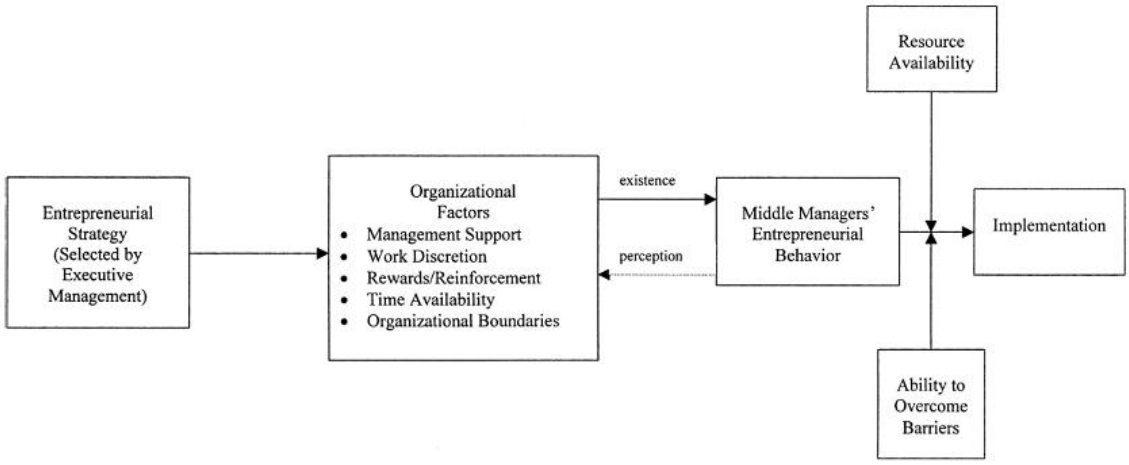


Figure 2-6: Middle manager's perception of the internal environment for CE

It should be noted from the model above that once there is understanding regarding the manner in which middle managers perceive the internal envrionment, it is then possible to identify how variations can be translated to CE successes or losses. It is how the middle manager perceived the organisational factors that determines how he utilises available resources and his ability to overcome barriers to successfully implement strategy. It should also be noted that executive strategy implementation needs to take note of the process flow to achieve strategy implementation through acknowledging organisational factors and the middle manager's key role.

A contrasting theory to Centralised Leadership theory (where leadership is perceived as position, process or activity controlled by a central authority) is ditributed leadership where leadership is shared and ideas are moved from the middle to the top and bottom (von Krogh, Nonaka, & Rechsteiner, 2012). This can be seen as contributing to the Hornsby et al. (2002) model by proposing that middle level managers enable lower level group interaction through intervention and the provision of critical resources (von Krogh et al., 2012).

Brundin, Patzelt, & Shepherd (2008) postulate that employee entrepreneurial actions are directly related to managers' emotions and displays. Willingness to act increased when managers expressed confidence and satisfaction on projects and correspondingly decreased when frustration was shown. (Hornsby et al., 2009) showed:

- More positive relationship between managerial support and entrepreneurial action for senior and middle level managers than for lower level managers, and
- More positive relationship between work discretion and entrepreneurial action for senior and middle level managers than for lower level managers.

Hornsby et al. (2009) propose that the entrepreneurial actions expected of middle managers is to purpose and interpret entrepreneurial opportunities in order to increase the organisation's competitiveness. Their 2009 study further concluded that:

- The relationship between managerial support and entrepreneurial action is more positive for senior and middle level managers than it is for lower level managers.
- The relationship between work discretion and entrepreneurial action is more positive for senior and middle level managers than it is for lower level managers.

2.8 Individual Factors

Understanding the effect of individual managers on organisational performance has been rather elusive even though it is acknowledged that middle managers' personality traits and individual positions within the organisation play a pivotal role in fostering innovation (Mollick, 2012). Mollick (2012) further proposes that the increasing evidence of the impact of individual differences on organisational performance across many industries suggests that one cannot assume that organisational-level processes are the lowest relevant level of analysis in explaining performance differences between

organisations. Mollick's (2012) studies find that the effect of managers on organisational performance was greater than that of organisational factors, implying that individual managerial differences play a greater role in organisational performance.

2.8.1 Age

The positive attributes of age include the accumulation of a wealth of experience while the negative attributes include declining ability for risk tolerance and desire for uncertainty (Bosma & Levie, 2010). This can however be contrasted with mixed results achieved in organisational behaviour literature (Bindl & Parker, 2010). de Jong, Parker, Wennekers, & Wu (2011) propose that an inverted U distribution can be anticipated due to the following reasons:

- Motivation for intrapreneurship should decrease with age
- Perceived capability should increase with age which indicates experience in the workplace
- Prior work suggests that motivation and capability are necessary conditions for intrapreneurial behaviour.

It is through this understanding it can be expected that middle aged people are more likely to exhibit intrapreneurial behaviour, which is more than younger and older employees.

2.8.2 Tenure

Organisational tenure can be defined as the number of years that an individual is employed at an organisation. Prior research indicates that as individuals build domain specific experience, knowledge and skills then the more likely they are to exploit opportunities (Unger, Rauch, Frese, & Rosenbusch, 2011). de Jong et al. (2011) argue that tenure should correlate with age in an inverted U distribution. This implies that individuals at a certain tenure level are more intrapreneurially inclined than those at the start and end of their careers.

2.8.3 Gender

Bosma & Levie (2010) propose that males have been found more likely to be self-employed but organisational behaviour studies conclude on mixed results regarding significant relationships (de Jong et al., 2011). Further studies by (Urbano & Turro, 2013) conclude that gender appears non-significant, indicating that there is no relevant differences in the probability that men or women become corporate entrepreneurs.

3 Research Questions

The aim of this study is to investigate and expand on existing literature on the relationship between middle management perceptions of the internal environment and its effects on levels of corporate entrepreneurship. A further aim is to identify the effect of biographical variables within the middle management level on the perception of corporate entrepreneurship.

The dependent variables are Likert scale responses and levels of corporate entrepreneurship as per the adapted eight factor solution for the CEAI questionnaire (van Wyk & Adonisi, 2011). The independent variables are middle manager age, gender diversity, length of service and industry worked in.

The research questions are as follows:

1) Does middle manager age play a significant role in middle manager perceptions of Corporate Entrepreneurship?

2) Does length of service play a significant role in middle manager perceptions of Corporate Entrepreneurship?

3) Does gender play a significant role in middle manager perceptions of Corporate Entrepreneurship?

4) Are there significant differences or similarities in perceptions of middle managers across the four different industries?

5) To what extent do middle manager perceptions predict levels of Corporate Entrepreneurship hence organisational performance?

4 Research methodology

4.1 Research design

Saunders and Lewis (2012) noted that there are three types of studies, namely exploratory, descriptive and explanatory. The research methodology used in this particular study is explanatory as it is designed to assess the similarities/differences in middle manager's perceptions regarding corporate entrepreneurship within four different industries and test relationships between variables. According to (Saunders, Lewis, & Thornhill, 2009), the objective of explanatory research is to identify relationships that exist between:

- A dependent variable changes in response to changes in other variables,
- An independent variable causing changes in a dependant variable,
- An extraneous variable causing changes in a dependant variable, thus providing an alternative explanation

A further aim was to produce an accurate representation and make predictions regarding the phenomena under study. This explanatory research, which was quantitative in nature attempted to answer questions on the relationships between the independent and dependant variables. The key purpose was to explain, predict (identify antecedents to) and therefore control those dependant variables. The quantitative nature of the study was supported by data gathered through the use of the Likert scale questionnaire and thus the use of ranked categorical data.

4.2 Research Strategy

A survey strategy, associated with a deductive approach was utilised to obtain research data. It is a common strategy in business and management research and is frequently used to answer who, what, where, how type of questions. Other data collection instruments that were considered but not chosen included examination of secondary sources, observation and semi-structured interviews. The chosen survey questionnaire allowed quick and easy collection of large amounts of data from a sizable population in an extremely economical manner. The data collected could be standardised and therefore facilitated easy comparison. The survey strategy can also be seen as authoritative in nature to the respondents making it comparatively simple and easily understood.

A self-administered online questionnaire (Google Docs™) was developed and emailed to participants to ensure access to an adequate number of respondents and in different

geographic areas. A Microsoft Word™ document questionnaire was also emailed to eligible respondents with a request for it to be completed and mailed back to the researcher. This was done to ensure that those with email access but not open access to the internet were able to participate in the survey. A pilot study was done on the online questionnaire with 10 respondents. Feedback on the process of completing the survey was acquired to ensure that the time required to complete the survey was the duration promised. It also tested the data collection mechanism through Google Docs™. This prior pilot study contributed significantly to the high response rate achieved with this survey. The ability of the controlled self-administered online survey was to ensure zero spoilt surveys (user was prompted when a question was mistakenly skipped without answering or when two choices to the same question were selected). An Internet based questionnaire administered through an email offered great degree of control as most users responded through their own personal email thus giving a high probability of the required respondent completing the questionnaire. This gave an improved degree of reliability to the data.

The choice of questionnaire was influenced by the following factors:

- Characteristics of the respondents from whom data collection was required. The respondents in question were individuals that were computer literate who could be contacted via email, internet and intranet.
- Confidence of the correct person having responded. This was high as personal email was used.
- Importance of reaching specific respondents of a specific managerial level and within a specific industry.
- Contamination or distortion of answers was low.
- Size of sample required considering the likely response rate. This was large and geographically dispersed. The likely response rate for internet and intranet mediated questionnaires is approximately 30% (Saunders, Lewis, & Thornhill, 2009).
- The survey instrument type, number of questions and feasible length of questionnaire. Apart from various other reasons, one of the main reasons the eight factor instrument (van Wyk & Adonisi, 2011) was utilised was due to it being short, ensuring minimum time for completion. The complexity of questions was at an acceptable level as tested in the pilot study. Questions were closed and segmented to ensure respondents' interest levels were kept high while progressing through the questionnaire.

- Time taken to complete collection. All questionnaires were returned within eight weeks from distribution, with follow ups done once within two days of initial distribution. Follow ups were not possible with respondents that were referred by others. A staged approach was used in different industries to ensure focus by the researcher.

It was however imperative that the aims of the questionnaire are clear and understanding existed of how the responses will help improve the learning. Some of the advantages of a properly conducted interview questionnaires include:

- Questions and responses are standardised so as to provide an unbiased and objective view.
- Return rate can be quick and effective if driven correctly.
- The data collected could be analysed independently without dependence on information from others.

Some limitations include:

- Lagging indication as information is reliant on a person's memory after the event has happened.
- Open ended questions can result in a large amount of data to analyse. This was however avoided.
- Participants might have been unwilling to share real opinions out of fear of victimisation.
- Data collected was unlikely to be as wide ranging as those collected through other research strategies i.e. the limit to the number of questions that can be asked before goodwill is compromised.
- Non respondents could not be recorded thus an impact assessment of the bias caused by refusal could not be done.
- Uninformed response could have introduced contamination and reduced data reliability as respondents did not have the required experience to answer questions posed or simply guessed answers.
- Social desirability could have been an influencing factor as respondents could have answered certain questions in a manner they believe to be the desired response (Dillman, 2007).

The measuring instruments that were considered was the Corporate Entrepreneurship Assessment Instrument (CEAI) (Hornsby et al., 2002) and the CEAI as a diagnostic

instrument (Kuratko et al., 2014). The adapted eight-factor solution for the CEAI (van Wyk & Adonisi, 2011) was used in this research as it was more suitable for the South African context.

The explanatory research design intended to examine the situation as it existed at a specific moment in time i.e. a cross-sectional study. It was not possible to change or modify the current situation with an intention to detect cause and affect relationships.

A non-probability quota convenience sampling technique was used to ensure that the sample selected represents certain characteristics predetermined by the researcher (Saunders & Lewis, 2012).

4.3 Type of variables

Three types of data variables (Dillman, 2007) can be distinguished below:

- Behaviour Variables: data on what organisations or people have done, currently doing or will do. This is a recording of a concrete experience.
- Opinion Variables: data on what respondents feel, think or believe.
- Attribute variables: data on characteristics and attributes of the respondents (this includes age, gender, length of service etc.).

All three of the above mentioned variables were already incorporated in the eight factor solution (van Wyk & Adonisi, 2011), and the initial screening questions of the survey questionnaire.

4.4 Internal validity

Internal validity in relation to questionnaires refers to the ability of the questionnaire to measure what it was intended to measure. This is ensuring that the questionnaire actually represents the reality of what is being measured (Saunders et al., 2009). Cooper & Schindler (2008) dissect questionnaire internal validity as follows:

- Content validity: the extent to which the questions hence the measurement instrument provides adequate coverage of the investigative questions. This was achieved by definition of the research through a problem definition and in-depth literature review.
- Criterion related validity or predictive validity: the ability of the questions and the extent to which it can make accurate predictions. This was achieved utilising statistical methods in proving/disproving relationships and strengths of relationships between variables.

- Construct validity: the extent to which the measuring questions actually measure the presence of the constructs that are intended to be measured. This was difficult to prove against existing data.

4.5 Reliability

Often referred to as consistency, respondents may consistently interpret a question in the survey questionnaire in a certain manner when the intention was meant in another (Saunders et al., 2009). The result is that even though the question is reliable, it will contravene internal validity thereby jeopardising the research question. The question of reliability has been addressed through the use of an existing measuring instrument, the eight factor solution (van Wyk & Adonisi, 2011) built on an existing body of literature. Mitigation steps for reliability that were considered were as follows:

- Re-Test: estimating the reliability by correlation of data from the same questionnaire administered under the same set of conditions. This was not pursued due to time constraints.
- Internal consistency: correlating the responses to each question within the questionnaire to others within the same questionnaire. This measures the consistency of responses across all questions and/or subgroup of questions. Cronbach's alpha was used as a principal method in evaluating internal consistency.
- Alternative form: the use of check questions i.e. using the same question in a different wording. This method was not used as it would have lengthened the survey and introduced respondent fatigue and jeopardised the response rate. The use of an existing instrument mitigated the need for excessive alternative form questioning.

4.6 Individual question design

The majority of the individual questions in the survey were extracted from the eight factor solution (van Wyk & Adonisi, 2011). Type, wording and order of additional questions were given considerable thought as the intention was to be clear, familiar and easily understood by all respondents. This served to increase internal validity of the questionnaire. Closed ended or forced choice (Dillman, 2007) questions were used in a manner of providing a number of alternative answers for the respondent to choose from. This proved to be quick and reduce the amount of writing that the user had to perform. This also allowed easier coding of response data as the answers were predetermined.

Additional variables were introduced and defined as follows:

- Sector Definition: respondents had the choice of four industries with the ability to input a user defined choice should the industry not be listed.
- Management Level Definition: respondents were given a choice of three management levels to select from and limited to select only one.
- Number of years of service in current position: a dropdown list was utilised with only one response being allowed from the given five year category bandwidths.
- Age: a dropdown list was utilised with only one response being allowed from the given five year category bandwidths.
- Gender: a dropdown list was utilised with only one response being allowed to be selected between male and female.

The body of the research instrument was structured as matrix with questions being listed vertically and the Likert scale on the horizontal axis. Likert responses were limited to one response per question and the document automatically prompting the user should a question be mistakenly skipped. This sought to increase internal consistency and validity.

4.7 Population

The population for this study was middle managers from the public and private sector (specifically the petrochemical, manufacturing, banking and professional services industries) within South Africa. Middle managers were defined as managers occupying positions that fell within a range of two levels below the head of the organisation and one level above supervisory staff or professional workers.

4.8 Sampling Frame

The sample for this study was a minimum of 30 middle managers from companies within each of the 4 industries in South Africa. This required a minimum of 120 respondents in total across the 4 industries for statistical significance and the use of parametric statistical data analysis. Participants were screened to determine eligibility.

4.9 Unit of Analysis

The unit of analysis was middle managers belonging to any one of the 4 industries under consideration within South Africa.

4.10 Data Collection

A self-administered survey questionnaire composing of initial screening questions and an eight-factor 34-item solution (van Wyk & Adonisi, 2011) for the Corporate Entrepreneurship Assessment Instrument (CEAI) (Hornsby et al, 2002) was used to assess the perceptions of middle managers in four different industries.

4.11 Data Analysis

Ordinal data retreived through the Likert style questionnaire was analysed through both parametric and non-parametric tests: Chi Square test, Pearson r, Spearman, Kendal tau, Lavene's test, ANOVA, t test, Kruskal Wallis H test, Tukey's HSD/Tukey-Kramer, Scheffe's test in adition to descriptive statistics to draw inferences on the data collected. A scoring scale was also utilised as per Kuratko et al. (2014). The data was then coded according to the following coding matrix:

Industry	
Petrochemical	S1
Manufacturing	S2
Banking	S3
Professional Services	S4
Tenure	
0 - 5 years	1
6 - 10 years	2
11 - 15 years	3
16 - 20 years	4
21 - 25 years	5
26 - 30 years	6
> 30 years	7
Age	
18 - 25	1
26 - 30	2
31 - 35	3
36 - 40	4
41 - 45	5
46 - 50	6
> 50	7
Gender	
Male	M
Female	F
Likert	
Strongly Disagree	1
Disagree	2
Not Sure	3
Agree	4
Strongly Agree	5

Table 4-1: Data coding table

Furrther details of various tests used are expanded on below:

4.11.1 Chi Square Test

The chi-square test was used to determine whether there was a significant difference between expected and observed frequencies in the various categories. It identified if the number of responses by individuals that fell in each category differ significantly from the number that was expected. It also indicated if the difference between the expected and observed value was due to sampling error or a real difference.

4.11.2 Pearson's (r)

Pearson's correlation coefficient was used as a statistical measure of the strength of the linear relationship between paired data. Positive r values denote positive linear correlation, negative values denote negative linear correlation, and a value of 0 denotes no linear correlation. The closer the r value is to 1 or –1, the stronger the linear correlation.

4.11.3 Spearman's Correlation Coefficient (ρ)

Spearman's correlation coefficient was used as a statistical measure of the strength of the monotonic relationship between paired data. The interpretation is similar to that of Pearson's r with regard to the closeness to -1 or +1 denoting strength of the relationship.

Spearman correlation coefficient is computed on ranks and denotes monotonic relationships while Pearson's r as noted above is based on true values and depicts linear relationships. Spearman could be used only in analyzing Age and Tenure as these were the only monotonic relationship distributions.

4.11.4 Kendal (tau)

Kendall's tau is a non-parametric measure of correlation between two ranked variables. It is similar to Spearman's and Pearson's r, in that it measures the relationship between two variables. Positive and negative values indicate the same as Spearman and Pearson above. They key difference is that Kendall's tau represents a probability i.e. the difference between the probabilities that the observed data are in the same order versus that they are not.

4.11.5 Lavene's Test

Levene's test was used to assess variance homogeneity, which was a precondition for parametric tests such as the t-test and ANOVA. This test can be used with two or more samples. When the significance from this test was less than 0.05 (alpha), then the

variances were significantly different and parametric tests could not be used. Non-parametric tests would then needed to be followed. Levene's test works by testing the null hypothesis that the variances of the group are the same. The output probability is the probability that at least one of the samples in the test has a significantly different variance. If this is greater than a selected percentage (alpha = 0.05, i.e. 5%) then it is considered too great to be able to usefully apply parametric tests.

4.11.6 Kruskal-Wallis Test

The Kruskal-Wallis H test is a non-parametric test which was used in conjunction with a one-way ANOVA. It was used as an extension of the Wilcoxon Rank-Sum test to more than two independent samples. One-way ANOVA is usually robust, but there existed many situations where the assumptions were sufficiently violated thus making the Kruskal-Wallis test useful. Violations listed as follows:

- Group sample deviated from normal when sample sizes are relatively small, unequal and the data is not symmetric.
- Group variances are quite different when there are significant outliers.

Some key characteristics of why the Kruskal-Wallis test was selected:

- No assumptions were made or could not be made on the type of distribution.
- It was assumed that all groups have a distribution with the same shape.
- No population parameters were estimated thus no confidence intervals.

If the p-value < 0.05 (i.e. alpha < 5%) it can be conclude that there is significant difference between the categories.

4.11.7 T Test

The t-Test was used to test the null hypothesis that the means of two populations are equal. A two-tail test (inequality) was conducted. If t Stat < -t Critical two-tail or t Stat > t Critical two-tail, the null hypothesis was rejected. When the null hypothesis was not rejected, then the observed difference between the sample means was not convincing enough to say that the distribution differs significantly not due to chance.

4.11.8 Tukey's HSD (Honestly Significant Difference)

The Tukey's HSD/Tukey-Kramer test was used to focus on the largest value of the difference between two group means. The statistic q has a distribution called the studentised range q. If $q > q_{crit}$ (studentised range q table) then the two means are

significantly different. This test allowed picking the largest pairwise difference in means thereby allowing control over the experiment for all possible pairwise contrasts. This was specifically used as an alternative form of testing for relationships between the various sectors. A “1” and “-1” or “0.5” and ”-0.5” in the contrast column allowed for each sector to be compared to each other through a series of iterations.

4.11.9 Scheffe’s Test

The Scheffe’s test was used for adjusting significance levels in a linear regression analysis to account for multiple comparisons between the various sectors. It was useful in analysis of variance, and in constructing simultaneous confidence bands for regressions involving the basis functions. Scheffe’s test applies to the set of estimates of all possible contrasts among the factor level means, not just the pairwise differences considered by Tukey’s method as stipulated above. A “1” and “-1” or “0.5” and ”-0.5” in the contrast column allowed for each sector to be compared to each other through a series of iterations.

4.12 Limitations and Assumptions

Limitations regarding the data collection have been pointed out in section 4.2 above. The time dimension is a further limitation as this study was cross-sectional as opposed to longitudinal. It is limited by the fact that it was carried out at a specific moment in time and as such cannot give the sequence of events thereby difficult to infer causality.

Not being able to reach and assess sufficient respondents could have proven to be detrimental to the statistical analysis and could have derailed the quantitative nature of this study. An alternative plan would be follow a qualitative route with in-depth interviews with selected middle managers from the four different industries.

The findings of this study may only be applicable to the South African sample and as such may not be able to be generalised across other countries and sectors.

The sample may prove to consist of middle managers concentrated in a few specific geographic areas in South Africa as this is where the specific industry predominantly resides. Cultural and other unknown geographic factors may have skewed the results and this may not be easily factored out.

Possible Methodological Limitations include:

- Sample size: the number of the units of analysis used in this study was sufficient to perform statistical tests but a larger sample could have made finding significant relationships from the data much easier. Acquiring a large enough sample from lower and upper level managers from within the same industries could have allowed a longitudinal comparison of perception differences within a specific industry.
- Lack of prior research studies on the topic: prior research studies forms the basis of the literature review and helped lay a foundation for understanding the research problem that was being investigated. Studies of late have been highlighting the need for better understanding of the various roles within organisational structures with regard to corporate entrepreneurship.
- Missing variables in the data collection phase: In retrospect it was discovered that more effort should have went into identifying elements that differentiated lower, middle and upper level managers. Understanding the respondent's perception in this regard could have given more insight on additional relationships.
- Self-reported data: limited by the fact that it rarely can be independently verified and contain several potential sources of bias listed as follows:
    i. Selective memory i.e. remembering or not remembering experiences that occurred in the past.
    ii. Telescoping i.e. recalling events that occurred at a moment in time as if they occurred at another.
    iii. Attribution i.e. the act of attributing positive events and outcomes to one's own agency but attributing negative events and outcomes to the external.
    iv. Exaggeration i.e. the act of representing outcomes as more significant than is actuality.

Possible Limitations of the Researcher include:

- Access: access to people and organisations was limited by the social circles of the researcher.
- Longitudinal effects: the time available to investigate the research problem and to measure change or stability within a sample was constrained by the due date of this research report.
- Cultural and other bias on the part of the researcher: Bias with regard to when a person, place, or thing is viewed or shown in a consistently inaccurate way.

This may include both positive and negative bias. Particular attention was given to this during proof-reading of this particular research report. Problem statement, selection of the data to be studied, omissions , ordering of events and the manner chosen to represent a phenomenon, or to use possible words with a positive or negative connotation was critically evaluated and avoided to the best of the researcher's ability.

5 Results

5.1 Introduction

As outlined the chapter prior, various statistical tests were performed to check validity and investigate correlation. More than two tests were utilised per construct to ensure results have better accuracy and that theories are contrasted to ensure robustness of the results. Tables and graphs have been shown in the same order as the research questions from the chapter prior. Detailed calculations have been included in the appendices for reference. Summaries are shown in this chapter with the results discussion following in the next chapter. Certain elements of the tables have been highlighted in colour to show contrast in results. More detail in provided below.

5.2 Response Rate

The total number of surveys sent out was 281. The total number returned was 198 with 172 usable responses. The usable responses constituted those that were of a middle management level. The initial response rate achieved was thus 70.46% with 61.2% usable responses. This proves to be adequate by traditional standards as the threshold to acceptability standing at 60% ensuring face validity and survey quality (Johnson & Wislar, 2012).

5.3 Internal Consistency

5.3.1 Cronbach's Alpha

Cronbach's Alpha									
	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Complete
S1	0,69	0,73	0,57	0,84	0,70	0,68	0,82	0,84	0,83
S2	0,74	0,79	0,73	0,87	0,69	0,69	0,70	0,64	0,81
S3	0,81	0,87	0,73	0,95	0,61	0,95	0,82	0,61	0,97
S4	0,84	0,86	0,54	0,91	0,88	0,63	0,77	0,74	0,90
All	0,78	0,81	0,67	0,89	0,69	0,77	0,78	0,73	0,86

Table 5-1: Table of Cronbach's alpha Coefficients

5.3.2 Error Variance

	Error Variance								
	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Complete
S1	52%	46%	68%	30%	51%	54%	32%	29%	32%
S2	46%	37%	47%	25%	53%	52%	51%	59%	34%
S3	35%	23%	47%	9%	63%	9%	32%	62%	6%
S4	29%	27%	71%	18%	23%	60%	41%	45%	19%
All	38%	34%	56%	21%	53%	41%	39%	46%	26%

Table 5-2: Table of error variance

5.4 Descriptive Statistics

5.4.1 Age Composition

Age Group	Frequency	Percentage	Cumulative Percentage
18 - 25	11	6%	6%
26 - 30	29	17%	23%
31 - 35	47	27%	51%
36 - 40	27	16%	66%
41 - 45	35	20%	87%
46 - 50	8	5%	91%
> 50	15	9%	100%
Total	**172**	**100%**	

Table 5-3: Middle Manager Age Comparison

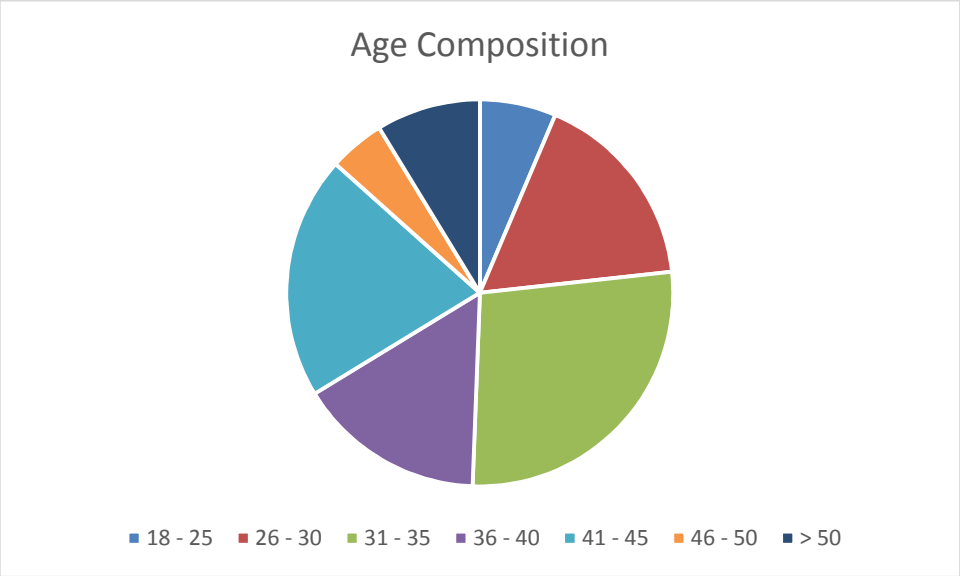


Figure 5-1: Pie chart showing Middle Manager Age Composition

As is evident from table 5-3 and the pie chart in figure 5-1 above, the vast majority of respondents were between the 31-35 age bandwidth (27%) followed by the 41-45 age bandwidth (20%).

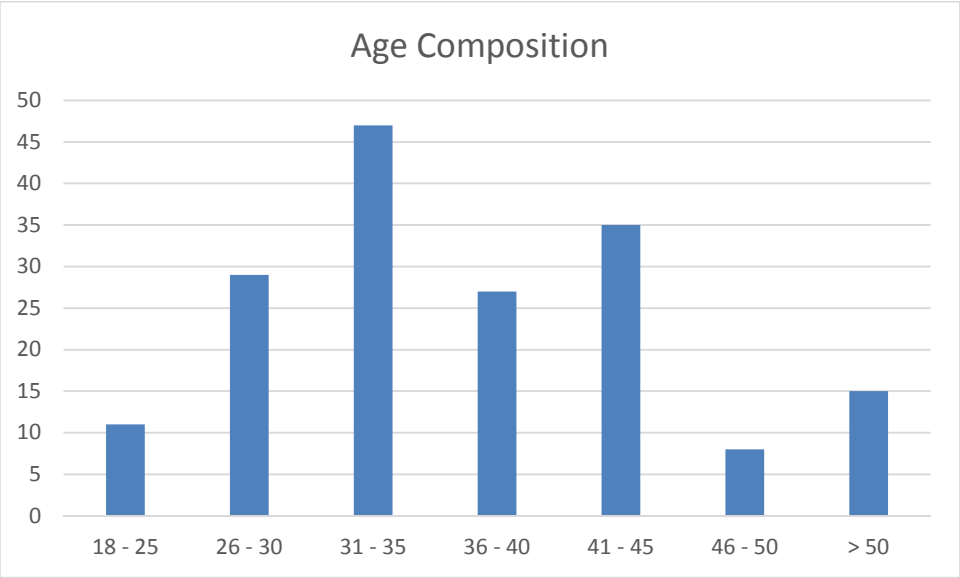


Figure 5-2: Bar Graph showing Middle Manager Age Composition

As can be seen from the bar graph in figure 5-2 above, there appears to be a normal distribution that is skewed slightly to the left around the 31-35 age bandwidth.

5.4.2 Tenure Composition

Tenure	Frequency	Percentage	Cumulative Percentage
0 - 5 years	96	56%	56%
6 - 10 years	41	24%	80%
11 - 15 years	16	9%	89%
16 - 20 years	8	5%	94%
21 - 25 years	5	3%	97%
26 - 30 years	2	1%	98%
> 30 years	4	2%	100%
Total	**172**	**100%**	

Table 5-4: Middle Manager Tenure Composition

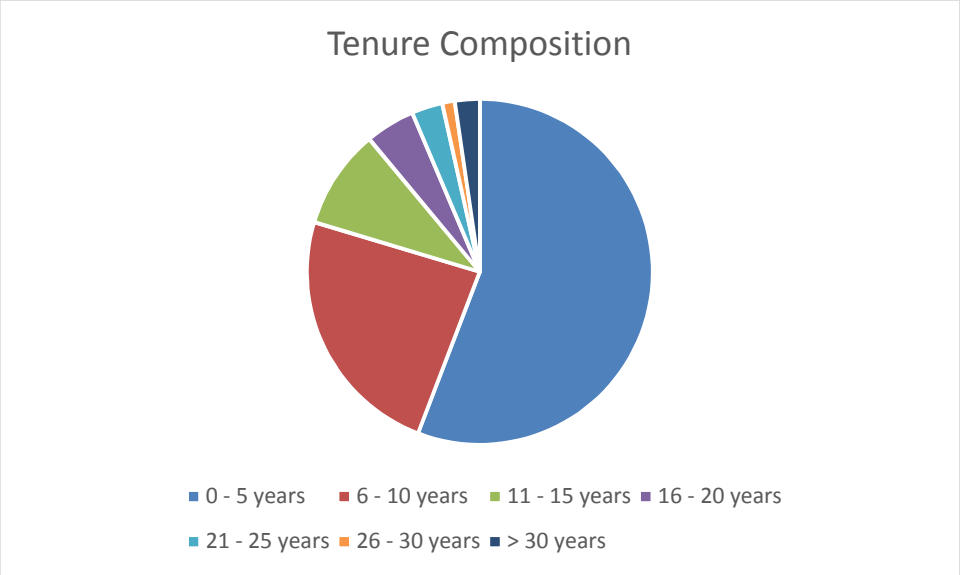


Figure 5-3: Pie chart showing Middle Manager Tenure Composition

As is evident from the table and pie chart above, the vast majority of respondents are from the 0-5 year experience bandwidth (56%) followed by the 6-10 year bandwidth (24%).

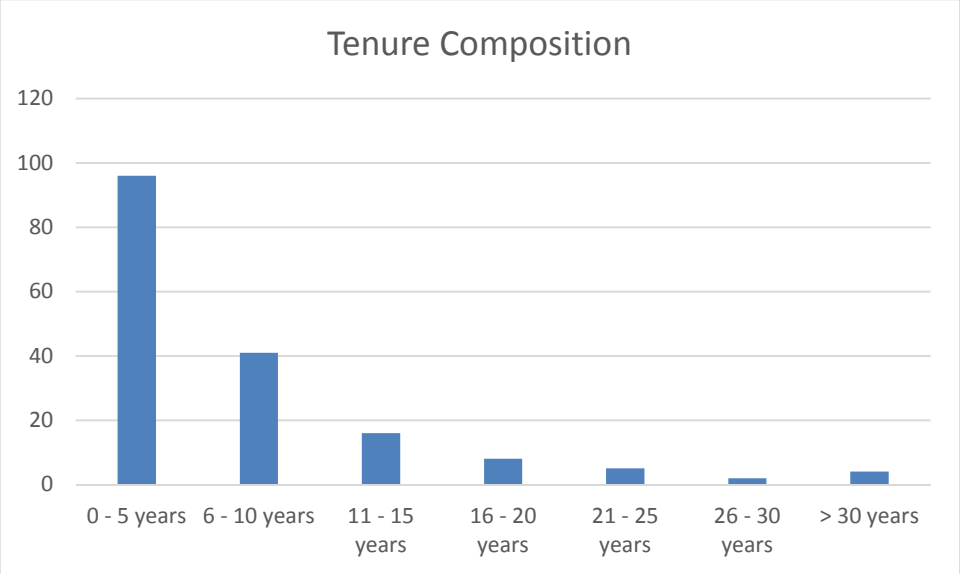


Figure 5-4: Bar Graph showing Middle Manager Tenure Composition

The bar graph above gives a clear visual indication of how the tenure distribution is skewed far to the left.

5.4.3 Gender Composition

Gender	Frequency	Percentage	Cumulative Percentage
Male	129	75%	75%
Female	43	25%	100%
Total	**172**	**100%**	

Table 5-5: Middle Manager Gender Composition

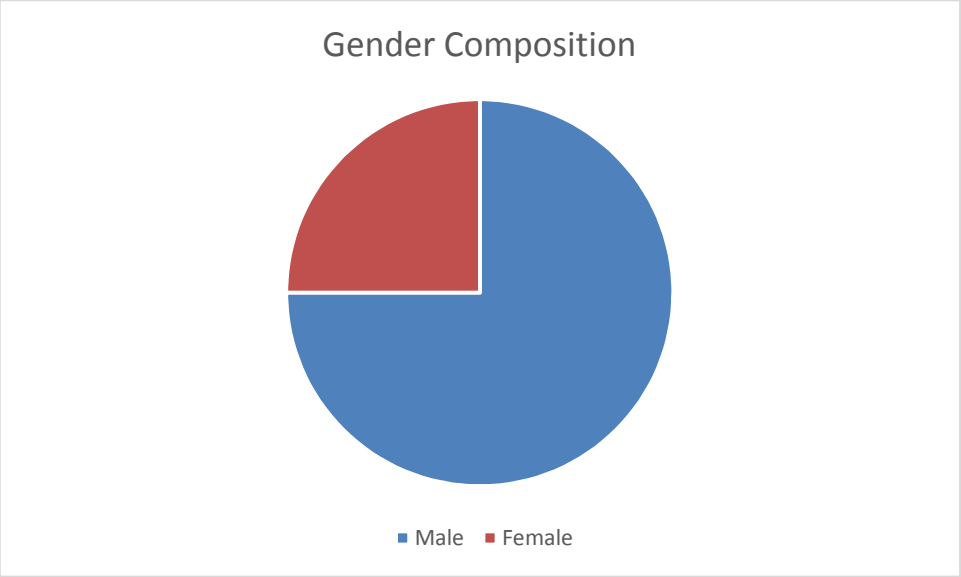


Figure 5-5: Pie Chart showing Middle Manager Gender Composition

The table and pie chart above indicate that the vast majority of respondents were male (75%).

5.4.4 Industry Composition

Industry	Frequency	Percentage	Cumulative Percentage
Petrochemical	60	35%	35%
Manufacturing	49	28%	63%
Banking	32	19%	82%
Professional services	31	18%	100%
Total	**172**	**100%**	

Table 5-6: Industry Composition

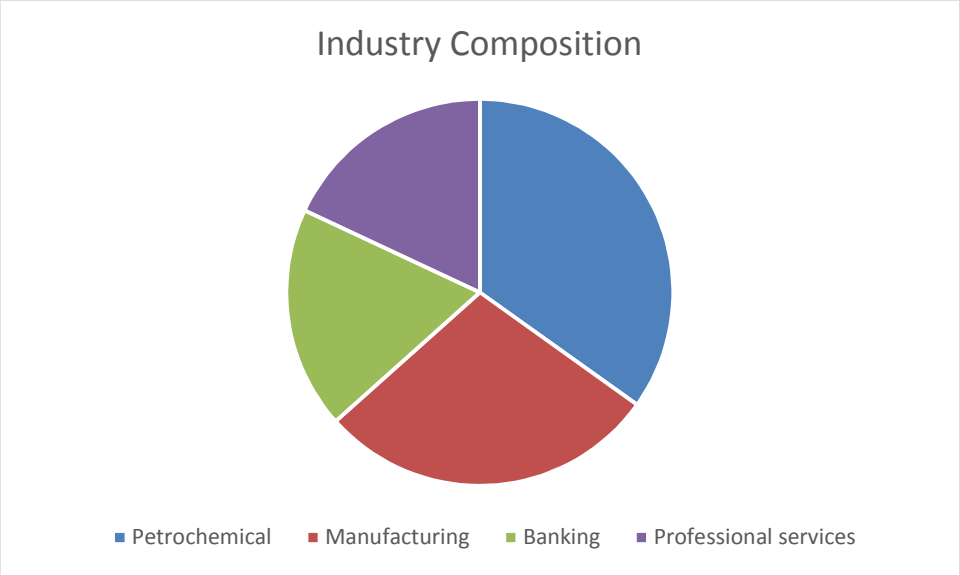


Figure 5-6: Pie chart showing Industry Comparison

Table 5-6 and the pie chart in figure 5-6 above indicate the percentage composition of respondents. The majority of respondents were from the petrochemical and manufacturing sectors. A minimum of 30 respondents per sector was achieved allowing the use of parametric analysis in some tests.

5.4.5 Likert Scale Percentage Responses across Questions

		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
total	1	1%	1%	3%	2%	2%	4%	11%	11%	7%	13%	2%	3%	5%	3%	5%	4%	10%	18%	19%	25%	18%	8%	2%	2%	1%	2%
	2	24%	15%	33%	17%	33%	29%	42%	33%	42%	28%	23%	13%	24%	15%	23%	30%	36%	33%	31%	51%	34%	26%	19%	27%	40%	22%
	3	6%	4%	5%	5%	9%	10%	14%	13%	8%	15%	12%	6%	11%	23%	12%	17%	13%	19%	18%	10%	12%	8%	8%	6%	11%	7%
	4	54%	58%	44%	52%	38%	49%	27%	33%	36%	34%	48%	65%	44%	40%	42%	41%	34%	20%	30%	13%	35%	49%	56%	51%	42%	51%
	5	15%	23%	15%	24%	17%	7%	5%	10%	6%	9%	15%	13%	17%	20%	19%	9%	6%	10%	2%	1%	1%	9%	15%	13%	7%	19%
S1	1	2%	2%	0%	5%	3%	7%	22%	15%	8%	17%	5%	3%	7%	3%	8%	7%	10%	20%	12%	25%	22%	7%	3%	2%	0%	3%
	2	22%	12%	42%	23%	42%	35%	52%	33%	48%	32%	18%	20%	28%	13%	17%	28%	37%	45%	37%	65%	37%	22%	13%	32%	30%	18%
	3	7%	3%	7%	3%	7%	12%	8%	20%	10%	8%	10%	0%	8%	32%	13%	23%	8%	18%	18%	5%	17%	8%	10%	5%	8%	10%
	4	65%	72%	48%	47%	33%	43%	17%	25%	32%	40%	53%	65%	45%	32%	50%	35%	40%	17%	33%	5%	25%	53%	63%	47%	48%	52%
	5	5%	12%	3%	22%	15%	3%	2%	7%	2%	3%	13%	12%	12%	20%	12%	7%	5%	0%	0%	0%	0%	10%	10%	15%	13%	17%
S2	1	2%	0%	6%	0%	0%	2%	8%	8%	4%	12%	0%	2%	6%	6%	4%	2%	14%	29%	16%	18%	18%	10%	0%	2%	0%	0%
	2	35%	20%	37%	18%	33%	33%	29%	45%	43%	33%	22%	12%	31%	27%	31%	35%	37%	29%	29%	53%	37%	35%	31%	29%	49%	27%
	3	4%	6%	4%	6%	16%	10%	18%	10%	8%	18%	24%	8%	16%	16%	12%	18%	24%	24%	31%	4%	8%	12%	10%	4%	16%	2%
	4	57%	61%	45%	63%	41%	47%	39%	31%	37%	31%	43%	63%	39%	39%	45%	41%	24%	18%	24%	24%	37%	39%	47%	49%	33%	57%
	5	2%	12%	8%	12%	10%	8%	6%	6%	8%	6%	10%	14%	8%	12%	8%	4%	0%	0%	0%	0%	0%	4%	12%	16%	2%	14%
S3	1	0%	0%	3%	3%	0%	3%	3%	6%	6%	9%	0%	0%	0%	0%	0%	3%	6%	3%	41%	50%	19%	3%	0%	0%	0%	0%
	2	22%	6%	16%	0%	28%	19%	56%	25%	22%	13%	22%	3%	6%	3%	31%	28%	34%	13%	19%	6%	34%	31%	16%	16%	47%	13%
	3	0%	0%	0%	0%	3%	3%	6%	3%	3%	19%	0%	13%	6%	9%	3%	0%	0%	6%	0%	25%	0%	3%	0%	3%	3%	0%
	4	34%	41%	41%	56%	38%	72%	28%	44%	56%	34%	47%	72%	47%	47%	19%	53%	44%	34%	34%	16%	44%	53%	63%	75%	50%	59%
	5	44%	53%	41%	41%	31%	3%	6%	22%	13%	25%	31%	13%	41%	41%	47%	16%	16%	44%	6%	3%	3%	9%	22%	6%	0%	28%
S4	1	0%	0%	6%	0%	3%	3%	3%	13%	10%	13%	3%	6%	3%	3%	3%	3%	10%	13%	16%	10%	10%	10%	3%	3%	3%	3%
	2	16%	19%	26%	19%	23%	23%	32%	23%	52%	32%	35%	10%	23%	10%	16%	26%	35%	35%	35%	65%	26%	16%	16%	29%	35%	32%
	3	13%	6%	10%	13%	10%	16%	26%	13%	10%	19%	6%	10%	13%	29%	16%	19%	19%	26%	16%	13%	23%	3%	10%	16%	16%	16%
	4	48%	42%	39%	39%	45%	42%	29%	42%	23%	26%	48%	61%	45%	48%	45%	39%	29%	16%	26%	10%	42%	55%	52%	39%	35%	29%
	5	23%	32%	19%	29%	19%	16%	10%	10%	6%	10%	6%	13%	16%	10%	19%	13%	6%	10%	6%	3%	0%	16%	19%	13%	10%	19%

Table 5-7: Percentage Composition of Likert Scale Responses

Table 5-7 above gives a visual indication of the percentage responses per question (horizontal axis) per sector and for the entire sample of respondents as a whole. The cells are colour coded to indicate biasness to a specific response. The closer to the

colour red the cell achieves indicates a higher percentage response to the specific Likert scale answer (vertical axis). This attempts to also give a visual indication of the skewness in percentage response per question and per sector.

5.5 Correlation

5.5.1 Age Comparison

Age Comparison								
	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8
Pearson	0,1394	0,2331	0,0496	0,2281	0,2496	0,1543	0,1192	-0,1338
Spearman	0,1587	0,2626	0,0581	0,2449	0,268	0,1987	0,1195	-0,1256
Kendall	0,4812	0,4988	0,2749	0,3423	0,4138	0,2875	0,2898	0,2995

Table 5-8: Correlation Table - Age Comparison

5.5.2 Tenure Comparison

Tenure Comparison								
	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8
Pearson	0,04710	0,11303	-0,01256	0,12416	0,13367	0,06434	0,10147	-0,16447
Spearman	0,05571	0,14851	-0,01637	0,11395	0,09062	0,12494	0,15413	-0,13519
Kendall	0,43560	0,41480	0,24072	0,28859	0,29920	0,20604	0,29865	0,33034

Table 5-9: Correlation Table: Tenure Comparison

5.5.3 Gender Comparison

	Gender Comparison						
	t_{stat}	t_{crit}	p	α	f	f_{crit}	Kruskal-Wallis
Q1	0,3354	2,011	0,7388	0,05	1,484	3,897	no
Q2	0,3544	2,0096	0,7246	0,05	0,551	3,897	no
Q3	0,2135	2,0129	0,8319	0,05	0,05	3,897	no
Q4	1,0312	2,0017	0,3067	0,05	1,99	3,897	no
Q5	0,1866	2,005	0,8527	0,05	1,76	3,897	no
Q6	0,3525	2,008	0,7259	0,05	0,001	3,897	no
Q7	1,9418	2,008	0,058	0,05	4,488	3,897	no
Q8	1,7345	2,007	0,089	0,05	0,739	3,897	no
Q9	0,679	2,012	0,5003	0,05	0,118	3,897	no
Q10	0,833	2,0096	0,409	0,05	2,133	3,897	no
Q11	0,142	2,009	0,887	0,05	0,485	3,897	no
Q12	0,419	2,011	0,677	0,05	0,138	3,897	no
Q13	0,563	2,01	0,576	0,05	0,574	3,897	no
Q14	0,595	2,0117	0,554	0,05	0,203	3,897	no
Q15	2,574	2,0017	0,0126	0,05	3,296	3,897	no
Q16	1,534	2,0086	0,1312	0,05	1,796	3,897	no
Q17	0,567	2,014	0,574	0,05	1,047	3,897	no
Q18	2,119	2,013	0,0396	0,05	4,074	3,897	no
Q19	0,0597	2,0167	0,952	0,05	1,473	3,897	no
Q20	1,483	2,015	0,145	0,05	0,389	3,897	no
Q21	0,1027	2,0117	0,918	0,05	1,231	3,897	no
Q22	2,093	2,004	0,0409	0,05	3,036	3,897	no
Q23	3,3886	1,996	0,0011	0,05	4,472	3,897	yes
Q24	0,1677	2,0096	0,8699	0,05	0,041	3,897	no
Q25	1,088	2,0096	0,282	0,05	0,063	3,897	no
Q26	0,733	2,0118	0,467	0,05	0,0149	3,897	no

Table 5-10: Correlation Table - Gender Comparison

Table 5-10 above illustrates the summary of four statistical tests that were performed to investigate possible differences or similarities between males and females. Each test was conducted for each question to ascertain if different factors of the questionnaire induce different results from either gender. The table is colour coded to highlight in red those cells that present values were: t>tcrit, p<alpha, f>fcrit and were the Kruskal Wallis test is positive. The confidence level was set at 95% (alpha = 0.05) for all of the statistical tests. Question 23 presents clear difference in sample means between males and females. Questions 15,18 and 22 are closely following as they pass three out of the four statistical tests for difference in distributions.

Male					
		Q15	Q18	Q22	Q23
Strongly Disagree	1	7	26	11	3
Disagree	2	33	44	37	27
Not Sure	3	16	24	9	11
Agree	4	51	25	62	74
Strongly Agree	5	22	10	10	14
total		129	129	129	129
mean		3.37	2.6	3.18	3.53

Female					
		Q15	Q18	Q22	Q23
Strongly Disagree	1	1	5	2	0
Disagree	2	7	12	8	6
Not Sure	3	4	9	4	3
Agree	4	21	10	23	23
Strongly Agree	5	10	7	6	11
total		43	43	43	43
mean		3.74	3.05	3.53	3.91

Table 5-11: Mean values for statistically different distributions

As can be seen in table 5-11 above, females perceive these questions to be more positive than their male counterparts as the mean value per question for females is a fraction higher than that for males.

5.5.4 Industry Comparison

2 dimensional comparison tests were performed according to the following matrix:

	S1	S2	S3	S4
S1	X	S2 vs S2	S3 vs S1	S4 vs S1
S2	S1 vs S2	X	S3 vs S2	S4 vs S2
S3	S1 vs S3	S2 vs S3	X	S4 vs S3
S4	S1 vs S4	S2 vs S4	S3 vs S4	X

Table 5-12: Industry Comparison Table

As can be seen in table 5-12 above, the 6 tests that needed to be performed were: S1 vs S2, S1 vs S3, S1 vs S4, S2 vs S3, S2 vs S4 and S3 vs S4. Statistical analysis commenced with a single factor ANOVA and a Kruskal-Wallis test to determine if there was a significant difference in variances (see appendix G1). A Lavene's test was then carried out to determine if the sample could be analysed by parametric methods. T-tests were then conducted to ascertain the strength of correlation. The summarised

correlation tables listed below (5.5.4.1 to 5.5.4.7) have been colour coded to highlight positive statistical significance in red.

5.5.4.1 Petrochemical versus Manufacturing

The table below represents a summary of the various statistical tests that were performed to identify significant differences in responses from middle managers in the petrochemical and manufacturing sectors.

		S1 vs S2					
		t_{stat}	t_{crit}	p	α	f	f_{crit}
Factor1	Q1	1,44	1,98	0,15	0,05	4,27	2,66
	Q2	0,84	1,98	0,40	0,05	4,65	2,66
	Q3	0,05	1,99	0,96	0,05	4,86	2,66
	Q4	0,62	1,98	0,54	0,05	3,76	2,66
	Q5	0,63	1,98	0,53	0,05	2,03	2,66
Factor2	Q6	1,19	1,98	0,24	0,05	2,05	2,66
	Q7	3,88	1,98	0,00	0,05	6,69	2,66
	Q8	0,30	1,98	0,77	0,05	3,17	2,66
	Q9	1,50	1,98	0,14	0,05	4,09	2,66
	Q10	0,18	1,98	0,86	0,05	2,78	2,66
Factor3	Q11	0,55	1,98	0,58	0,05	2,32	2,66
	Q12	0,34	1,98	0,47	0,05	0,89	2,66
	Q13	0,65	1,98	0,52	0,05	7,19	2,66
	Q14	1,26	1,98	0,21	0,05	6,45	2,66
Factor4	Q15	0,81	1,98	0,42	0,05	1,88	2,66
	Q16	0,18	1,98	0,86	0,05	1,39	2,66
Factor5	Q17	1,66	1,98	0,11	0,05	2,37	2,66
	Q18	0,05	1,98	0,96	0,05	20,61	2,66
	Q19	0,50	1,98	0,62	0,05	0,39	2,66
Factor6	Q20	2,54	1,99	0,01	0,05	2,31	2,66
	Q21	0,84	1,98	0,41	0,05	1,55	2,66
Factor7	Q22	2,11	1,98	0,04	0,05	2,21	2,66
	Q23	1,15	1,98	0,25	0,05	1,63	2,66
Factor8	Q24	0,33	1,98	0,74	0,05	0,90	2,66
	Q25	2,97	1,98	0,00	0,05	2,98	2,66
	Q26	0,04	1,98	0,97	0,05	2,61	2,66

Table 5-13: Correlation Table - S1 vs S2

Although the ANOVA f value is larger than f_{crit} for a large number of the questions (corroborated by the Kruskal-Wallis test), the difference was found to be insignificant according to a t-test at a 95% confidence interval. It is only Question 7 and 25 were it was concluded that the difference is not due to chance as all three tests confirmed this.

5.5.4.2 Petrochemical versus Banking

The table below represents a summary of the various statistical tests that were performed to identify significant differences in responses from middle managers in the petrochemical and banking sectors.

		S1 vs S3					
		t_{stat}	t_{crit}	p	α	f	f_{crit}
Factor1	Q1	2.09	2.01	0.04	0.05	4.27	2.66
	Q2	3.38	2.00	0.00	0.05	4.65	2.66
	Q3	3.55	2.00	0.00	0.05	4.86	2.66
	Q4	3.58	1.99	0.00	0.05	3.76	2.66
	Q5	2.16	2.00	0.04	0.05	2.03	2.66
Factor2	Q6	2.34	1.99	0.02	0.05	2.05	2.66
	Q7	2.25	2.00	0.03	0.05	6.69	2.66
	Q8	2.76	2.00	0.01	0.05	3.17	2.66
	Q9	3.11	2.00	0.00	0.05	4.09	2.66
	Q10	2.60	2.00	0.01	0.05	2.78	2.66
Factor3	Q11	1.49	2.00	0.14	0.05	2.32	2.66
	Q12	1.85	1.99	0.07	0.05	0.89	2.66
	Q13	4.47	1.99	0.00	0.05	7.19	2.66
	Q14	3.81	1.99	0.00	0.05	6.45	2.66
Factor4	Q15	1.48	2.00	0.14	0.05	1.88	2.66
	Q16	1.74	2.00	0.09	0.05	1.39	2.66
Factor5	Q17	1.28	2.00	0.21	0.05	2.37	2.66
	Q18	7.16	2.00	0.00	0.05	20.61	2.66
	Q19	0.90	2.01	0.37	0.05	0.39	2.66
Factor6	Q20	1.04	2.02	0.31	0.05	2.31	2.66
	Q21	1.24	2.00	0.22	0.05	1.55	2.66
Factor7	Q22	0.16	2.00	0.87	0.05	2.21	2.66
	Q23	1.33	2.00	0.19	0.05	1.63	2.66
Factor8	Q24	1.47	1.99	0.15	0.05	0.90	2.66
	Q25	1.87	2.00	0.07	0.05	2.98	2.66
	Q26	2.05	1.99	0.04	0.05	2.61	2.66

Table 5-14: Correlation Table - S1 vs S3

11 out of 26 questions indicate a statistically significant difference in means between the petrochemical and banking sectors at a 95% confidence level. Factor 1 (Work Discretion) and Factor 2 (Management Support and Risk Acceptance) show a significant difference in distribution. Questions 13 and 14 as part of Factor 3 (Rewards/Reinforcement) shows marked difference in terms of perception of

recognition. Question 18 as part of Factor 5 (Financial Support) indicates significant difference in terms of financial rewards and compensation differences.

5.5.4.3 Petrochemical versus Professional Services

The table below represents a summary of the various statistical tests that were performed to identify significant differences in responses from middle managers in the petrochemical and professional services sector.

		S1 vs S4					
		t_{stat}	t_{crit}	p	α	f	f_{crit}
Factor1	Q1	1,27	2,00	0,21	0,05	4,27	2,66
	Q2	0,32	2,01	0,75	0,05	4,65	2,66
	Q3	0,97	2,01	0,34	0,05	4,86	2,66
	Q4	0,83	2,00	0,41	0,05	3,76	2,66
	Q5	1,53	2,00	0,13	0,05	2,03	2,66
Factor2	Q6	1,77	2,00	0,08	0,05	2,05	2,66
	Q7	3,60	2,00	0,00	0,05	6,69	2,66
	Q8	1,39	2,00	0,17	0,05	3,17	2,66
	Q9	0,22	2,00	0,82	0,05	4,09	2,66
	Q10	0,20	2,00	0,84	0,05	2,78	2,66
Factor3	Q11	1,32	2,00	0,19	0,05	2,32	2,66
	Q12	0,12	2,00	0,90	0,05	0,89	2,66
	Q13		2,00	0,94	0,05	7,19	2,66
	Q14	0,00	2,00	1,00	0,05	6,45	2,66
Factor4	Q15	0,87	2,00	0,39	0,05	1,88	2,66
	Q16	1,05	2,00	0,30	0,05	1,39	2,66
Factor5	Q17	0,24	2,00	0,81	0,05	2,37	2,66
	Q18	1,72	2,01	0,09	0,05	20,61	2,66
	Q19	0,09	2,01	0,93	0,05	0,39	2,66
Factor6	Q20	2,26	2,01	0,03	0,05	2,31	2,66
	Q21	2,20	2,00	0,03	0,05	1,55	2,66
Factor7	Q22	0,50	2,00	0,62	0,05	2,21	2,66
	Q23	0,19	2,00	0,85	0,05	1,63	2,66
Factor8	Q24	0,50	2,00	0,62	0,05	0,90	2,66
	Q25	1,32	2,00	0,19	0,05	2,98	2,66
	Q26	1,20	2,00	0,24	0,05	2,61	2,66

Table 5-15: Correlation Table - S1 vs S4

Although the ANOVA f value is larger than f_{crit} for a large number of the questions (corroborated by the Kruskal-Wallis test), the difference was found to be insignificant

according to a t-test at a 95% confidence interval. It is only Question 7 where it is concluded that the difference is not due to chance as all three tests confirmed this.

5.5.4.4 Manufacturing versus Banking

The table below represents a summary of the various statistical tests that were performed to identify significant differences in responses from middle managers in the manufacturing and banking sectors.

		S2 vs S3					
		t_{stat}	t_{crit}	p	α	f	f_{crit}
Factor1	Q1	3,07	2,00	0,00	0,05	4,27	2,66
	Q2	3,85	1,99	0,00	0,05	4,65	2,66
	Q3	3,30	2,00	0,00	0,05	4,86	2,66
	Q4	3,25	1,99	0,00	0,05	3,76	2,66
	Q5	1,67	2,00	0,10	0,05	2,03	2,66
Factor2	Q6	1,17	1,99	0,25	0,05	2,05	2,66
	Q7	1,11	2,00	0,27	0,05	6,69	2,66
	Q8	2,46	2,00	0,02	0,05	3,17	2,66
	Q9	1,71	2,00	0,09	0,05	4,09	2,66
	Q10	2,41	2,00	0,02	0,05	2,78	2,66
Factor3	Q11	1,97	2,00	0,05	0,05	2,32	2,66
	Q12	1,06	1,99	0,29	0,05	0,89	2,66
	Q13	5,02	1,99	0,00	0,05	7,19	2,66
	Q14	4,70	1,99	0,00	0,05	6,45	2,66
Factor4	Q15	2,08	2,00	0,04	0,05	1,88	2,66
	Q16	1,59	2,00	0,12	0,05	1,39	2,66
Factor5	Q17	2,57	2,00	0,01	0,05	2,37	2,66
	Q18	6,66	2,00	0,00	0,05	20,61	2,66
	Q19	0,55	2,01	0,59	0,05	0,39	2,66
Factor6	Q20	0,70	2,00	0,49	0,05	2,31	2,66
	Q21	0,53	2,00	0,60	0,05	1,55	2,66
Factor7	Q22	1,65	2,00	0,10	0,05	2,21	2,66
	Q23	2,23	1,99	0,03	0,05	1,63	2,66
Factor8	Q24	1,06	1,99	0,30	0,05	0,90	2,66
	Q25	0,69	2,00	0,49	0,05	2,98	2,66
	Q26	2,02	1,99	0,05	0,05	2,61	2,66

Table 5-16: Correlation Table - S2 vs S3

9 out of 26 questions indicate a statistically significant difference in means between the manufacturing and banking sectors at a 95% confidence level. Factor 1 (Work Discretion), Factor 2 (Management Support and Risk Acceptance), Factor 3 (Rewards

and Reinforcement) and Factor 5 (Financial Support) show a significant difference in distribution.

5.5.4.5 Manufacturing versus Professional Services

The table below represents a summary of the various statistical tests that were performed to identify significant differences in responses from middle managers in the manufacturing and professional services sector.

		S2 vs S4					
		t_{stat}	t_{crit}	p	α	f	f_{crit}
Factor1	Q1	2,39	2,00	0,02	0,05	4,27	2,66
	Q2	0,92	2,00	0,36	0,05	4,65	2,66
	Q3	0,94	2,00	0,35	0,05	4,86	2,66
	Q4	0,34	2,00	0,73	0,05	3,76	2,66
	Q5	1,03	2,00	0,31	0,05	2,03	2,66
Factor2	Q6	0,74	2,00	0,47	0,05	2,05	2,66
	Q7	0,14	2,00	0,89	0,05	6,69	2,66
	Q8	1,12	2,00	0,27	0,05	3,17	2,66
	Q9	1,43	2,00	0,16	0,05	4,09	2,66
	Q10	0,05	2,00	0,96	0,05	2,78	2,66
Factor3	Q11	0,89	2,00	0,38	0,05	2,32	2,66
	Q12	0,48	2,00	0,64	0,05	0,89	2,66
	Q13	1,40	2,00	0,17	0,05	7,19	2,66
	Q14	1,15	1,99	0,25	0,05	6,45	2,66
Factor4	Q15	1,55	2,00	0,13	0,05	1,88	2,66
	Q16	0,90	2,00	0,37	0,05	1,39	2,66
Factor5	Q17	1,11	2,00	0,27	0,05	2,37	2,66
	Q18	1,58	2,00	0,12	0,05	20,61	2,66
	Q19	0,29	2,00	0,77	0,05	0,39	2,66
Factor6	Q20	0,11	1,99	0,91	0,05	2,31	2,66
	Q21	1,33	2,00	0,19	0,05	1,55	2,66
Factor7	Q22	2,17	2,00	0,03	0,05	2,21	2,66
	Q23	1,10	2,00	0,28	0,05	1,63	2,66
Factor8	Q24	0,77	2,00	0,45	0,05	0,90	2,66
	Q25	1,04	2,00	0,30	0,05	2,98	2,66
	Q26	1,14	2,01	0,26	0,05	2,61	2,66

Table 5-17: Correlation Table - S2 vs S4

Although the ANOVA f value is larger than f_{crit} for a large number of the questions (corroborated by the Kruskal-Wallis test), the difference was found to be insignificant

according to a t-test at a 95% confidence interval. It is only Question 1 where it was concluded that the difference is not due to chance as all three tests confirmed this.

5.5.4.6 Banking versus Professional Services

The table below represents a summary of the various statistical tests that were performed to identify significant differences in responses from middle managers in the banking and professional services sectors.

		S3 vs S4					
		t_{stat}	t_{crit}	p	α	f	f_{crit}
Factor1	Q1	0,83	2,00	0,41	0,05	4,27	2,66
	Q2	2,22	2,00	0,03	0,05	4,65	2,66
	Q3	2,01	2,00	0,05	0,05	4,86	2,66
	Q4	2,25	2,01	0,03	0,05	3,76	2,66
	Q5	0,58	2,00	0,57	0,05	2,03	2,66
Factor2	Q6	0,30	2,00	0,76	0,05	2,05	2,66
	Q7	1,15	2,00	0,25	0,05	6,69	2,66
	Q8	1,17	2,00	0,25	0,05	3,17	2,66
	Q9	2,84	2,00	0,01	0,05	4,09	2,66
	Q10	2,10	2,00	0,04	0,05	2,78	2,66
Factor3	Q11	2,45	2,00	0,02	0,05	2,32	2,66
	Q12	1,34	2,01	0,19	0,05	0,89	2,66
	Q13	2,95	2,00	0,01	0,05	7,19	2,66
	Q14	3,43	2,00	0,00	0,05	6,45	2,66
Factor4	Q15	0,65	2,00	0,52	0,05	1,88	2,66
	Q16	0,62	2,00	0,54	0,05	1,39	2,66
Factor5	Q17	1,34	2,00	0,18	0,05	2,37	2,66
	Q18	4,39	2,00	0,00	0,05	20,61	2,66
	Q19	0,71	2,00	0,48	0,05	0,39	2,66
Factor6	Q20	0,59	2,00	0,56	0,05	2,31	2,66
	Q21	0,63	2,00	0,53	0,05	1,55	2,66
Factor7	Q22	0,58	2,00	0,57	0,05	2,21	2,66
	Q23	0,90	0,00	0,37	0,05	1,63	2,66
Factor8	Q24	1,72	2,01	0,09	0,05	0,90	2,66
	Q25	0,37	2,00	0,72	0,05	2,98	2,66
	Q26	2,74	2,00	0,01	0,05	2,61	2,66

Table 5-18: Correlation Table - S3 vs S4

8 out of 26 questions indicate a statistically significant difference in means between the banking and professional services sectors at a 95% confidence level. Factor 1 (Work Discretion) and Factor 2 (Management Support and Risk Acceptance), Factor 3 (Rewards/Reinforcement) and Factor 5 (Financial Support) indicates significant difference in distribution.

5.5.4.7 Contrast tests

The table below summarises the Tukey and Scheffe contrast tests. Detailed test results can be found in appendix G1. The table has been colour coded to highlight cells that show positive correlation.

		S1 vs S2		S1 vs S3		S1 vs S4		S2 vs S3		S2 vs S4		S3 vs S4		S1&S2 vs S3&S4	
		Tukey	Scheffe	Tukey	Scheffe	Tukey	Scheffe	Tukey	Scheffe	Tukey	Scheffe	Tukey	Scheffe	Tukey	Scheffe
Factor1	Q1	no	no	yes	yes	no	no	yes	yes	no	no	no	no	no	no
	Q2	no	no	no	no	no	no	no	no	no	no	no	no	no	no
	Q3	no	no	no	no	no	no	no	no	no	no	no	no	no	no
	Q4	no	no	yes	yes	no	no	yes	yes	no	no	no	no	no	no
	Q5	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Factor2	Q6	no	no	no	no	no	no	no	no	no	no	no	no	no	no
	Q7	yes	yes	no	no	yes	yes	no	no	no	no	no	no	no	no
	Q8	no	no	yes	yes	no	no	no	no	no	no	no	no	yes	no
	Q9	no	no	yes	yes	no	no	no	no	no	no	yes	yes	no	no
	Q10	no	no	yes	no	no	no	no	no	no	no	no	no	no	no
Factor3	Q11	no	no	no	no	no	no	no	no	no	no	no	no	no	no
	Q12	no	no	no	no	no	no	no	no	no	no	no	no	no	no
	Q13	no	no	yes	yes	no	no	yes	yes	no	no	yes	no	yes	yes
	Q14	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	yes	yes
Factor4	Q15	no	no	no	no	no	no	no	no	no	no	no	no	no	no
	Q16	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Factor5	Q17	no	no	no	no	no	no	yes	no	no	no	no	no	no	no
	Q18	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	yes	yes
	Q19	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Factor6	Q20	no	no	no	no	no	no	no	no	no	no	no	no	no	no
	Q21	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Factor7	Q22	no	no	no	no	no	no	no	no	no	no	no	no	no	no
	Q23	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Factor8	Q24	no	no	no	no	no	no	no	no	no	no	no	no	no	no
	Q25	yes	yes	no	no	no	no	no	no	no	no	no	no	no	no
	Q26	no	no	no	no	no	no	no	no	no	no	yes	no	no	no

Table 5-19: Correlation Table - Contrast Coefficients Significance

As is evident in the table above (table 5-19), it can be noted that there exists significant differences in perception between Petrochemical and Banking, between Manufacturing and banking and between Banking and Professional Services. Majority of these differences can be attributed to Factor1, Factor2, Factor3 and Factor5. There is also a marked difference when Petrochemical is combined with Manufacturing and compared to Banking combined with Professional Services. This difference is concentrated in Q13 and Q14 of Factor3 and Q18 of Factor5.

5.6 Scoring Scale

The table below indicates a summary of scores achieved per factor and per industry sector as per (Kuratko et al., 2014)

	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Total
Petrochemical	3,43	2,71	3,48	3,23	2,66	2,18	3,51	1,51	2,84
Manufacturing	3,40	3,00	3,38	3,16	2,52	2,49	3,16	1,68	2,85
Banking	4,09	3,36	4,07	3,66	3,26	2,47	3,63	1,41	3,24
Professional services	3,67	3,04	3,46	3,47	2,77	2,65	3,60	1,76	3,05

Table 5-20: Scoring Scale

Average scores were calculated and averaged across the questions making up the factor. Factor 8 was reversed due to negative questioning. All sectors follow a similar trend although there is clear ranking within the factors that differ significantly. Banking seems to assume a lead followed by professional services, with manufacturing and petrochemical jostling for the tail end.

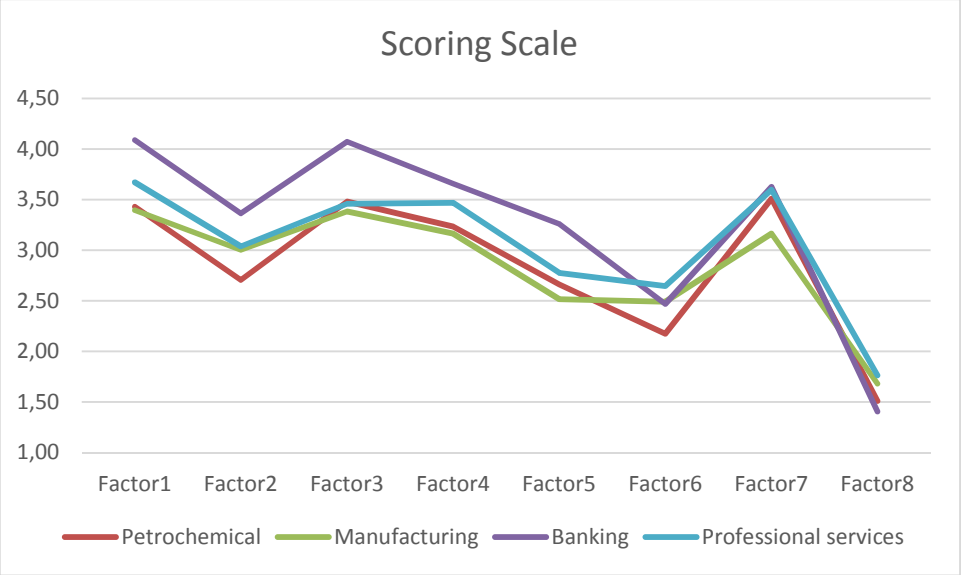


Figure 5-7: Graph indicating scoring scale results per sector

6 Discussion of results

6.1 Introduction

In this chapter, the results of this study will be evaluated and interpreted with respect to the four research questions stipulated in chapter 3 and taking into consideration the literature that was reviewed in chapter 2.

6.2 Internal Consistency

Cronbach's alpha, a number between 0 and 1 describes the extent to which all the items in test measure the same concept or construct and hence it represents the inter-relatedness of the items within the test. Further, alpha was calculated for each factor within the test and for each industry to prevent over inflated values of alpha. As can be seen in table 5-1, alpha ranges from 0.54 to 0.97. The low value of alpha (0.54 Factor3 Sector 4) could be due to a low number of questions, poor interrelatedness between items or heterogeneous constructs. If alpha had dropped any further then it would probably be due to poor correlation between items and these items would have needed to be revised or discarded. An alpha value above 0.9 can be considered too high and may suggest that some items are redundant as they are testing the same question in a different manner. The alpha values as indicated were not a major cause for concern as the range that was intended was between 0.6 and 0.9. Although 5 out of the 45 items fell marginally outside the range, the test gave good indication of test reliability. The highest percentage error variance of 71% in Factor 3 Sector 4 correlates to the low Cronbach alpha figure in that area. No modifications to the questionnaire were deemed necessary as the questionnaire was taken from an already proven construct (van Wyk & Adonisi, 2011).

6.3 Does middle manager age play a significant role in middle manager perceptions of Corporate Entrepreneurship?

Appendix D1 indicates the tabulated modes of each age bandwidth calculated according to each question. The Chi square test was then performed after determining the table of expected values. Both the Chi square value and the Cramer's V coefficient indicate that there exists no significant proof of independence and that there exists a weak strength of association if any. Person's r denotes an extremely weak positive linear correlation (all less than 0.2) for all factors except Factor 8 where it is an extremely weak negative. There also exists an extremely weak monotonic relationship between age and perception. Kendal further corroborates this weakness in correlation.

These findings are in contrast with existing literature with respect to an inverted U distribution (de Jong et al., 2011) and could fall into the category of mixed results as defined by Bindl & Parker (2010). As a positive, it could be deduced that motivation for intrapreneurship does not decrease with age. However as a negative, it could also indicate that perceived capability does not increase with age and experience.

6.4 Does length of service play a significant role in middle manager perceptions of Corporate Entrepreneurship?

Pearson's r and Kendal coefficients both denoted extremely weak correlations. These findings are again in direct contrast with the expected inverted U distribution (de Jong et al., 2011). This finding could indicate that as individuals build domain specific experience, this experience may not necessarily result in ability to exploit opportunities. The positive aspect of this finding is that individuals who are approaching the end of their careers still have the ability and inclination to innovate and behave in a more intrapreneurial manner. Another positive aspect is that those managers at the start of their career are able to act in an intrapreneurial manner at a much quicker rate thereby exploiting opportunities much easily.

Appendix E1 indicates the tabulated means of each tenure bandwidth calculated according to each question. A table of expected values are also indicated. The Chi-square test was then performed. Both the Chi-square value and the Cramer's V coefficient indicated that there exists no significant proof of independence and that there exists a weak strength of association if any. Both the Pearson's r and Spearman coefficient confirmed this weak correlation. The low Kendall value also indicated a weak monotonic relationship.

6.5 Does gender play a significant role in middle manager perceptions of Corporate Entrepreneurship?

Only question 23: "I clearly know what level of work performance is expected from me in terms of amount, quality, and timelines of output" presented statistically significant differences in sample means at a 95% confidence level. Question 23 resides in factor 7: Organisational boundaries. Significant results can include the following questions (table 6-1 below) as they passed three out of the four tests for statistical significant difference in sample means:

Factor 4: Innovative initiatives	Q15: My organization is quick to use improved work methods.
Factor 5: Financial Support	Q18: Individuals with successful innovative projects receive additional rewards and compensation beyond the standard reward system for their ideas and efforts.
Factor 7: Organisational Boundaries	Q22: My job description clearly specifies the standards of performance on which my job is evaluated. Q23: I clearly know what level of work performance is expected from me in terms of amount, quality, and timelines of output

Table 6-1: Significant questions that exhibit difference in sample mean

As is evident from the specific mean values for these questions (table 5-11) it seems as though females perceive the CE climate as more positive than their male counterparts. As theory suggested mixed (de Jonget al., 2011) to non significant differences in distribution (Urbano & Turro, 2013), a small element of CE was discovered that is indeed significantly different. Factor 7 (Organisational boundaries) in particular constitutes the majority of the difference in perceptions. Organisational boundaries as previously defined by Kuratko et al. (2014) are when innovation is treated as a structured and purposeful process resulting in higher levels of innovative outcomes. Organisational boundaries need to be perceived as flexible in promoting entrepreneurial activity. It can be deduced that females experience and perceive their organisational boundaries as purposeful thus positively effecting CE (as reflected in the higher mean scores in appendix G1). For the purposes of this study, it can be assumed that gender does not play a significant role in middle manager perceptions of CE due to 1 in 26 questions being found significantly different across all statistical tests performed. Further research needs to be conducted on these three factors as listed in table 6-1 above.

6.6 Are there significant differences or similarities in perceptions of middle managers across the four different industries?

Following the results summary in Chapter 5 (section 5.5.4) there exists a marked difference in perception between the Petrochemical and Banking, between Petrochemical and Professional Services, between Manufacturing and Banking, between Manufacturing and Professional Services and between Banking and

Professional Services. There is also a great deal of similarity between Petrochemical and Manufacturing. When sectors are clustered, a smaller difference can be noted between Petrochemical with Manufacturing versus Banking with Professional Services.

These findings support those of Burgers et al. (2009); Gomez-Haro et al. (2011) and Zahra (1991) in that the economic sector in which a company operates may affect the existence of corporate entrepreneurship. They also conclude that external factors may influence an organisation's entrepreneurial behaviour.

These findings at first glance seem to oppose the theories of Covin & Lumpkin (2011); Hornsbyet al. (2002); Kuratko D. F. (2012) and Kuratko & Audretsch (2013), which stipulate that internal organisational factors play a far more critical role in encouraging corporate entrepreneurship than environmental/external factors. This study proposes that there currently exists differences in the perception of corporate entrepreneurship which is specific to the industries under investigation. These differences can be attributed in theory primarily to the internal environment. The internal environment in turn is developed and constrained by the external environment. Chapter 7 proposes a process model built on the findings of this research.

A detailed analysis and discussion of results on a question specific level can be found below.

6.6.1 Petrochemical versus Manufacturing Sector

Question 7 and 25 is where we can conclude that the difference in responses is not due to chance as all three tests statistically confirmed this. Details on the specific questions are as follows:

- Q7: The term ''risk taker'' is considered a positive attribute for people in my work area. The ANOVA yields a mean of 2.25 for S1 and 3.06 for S2. This indicates that the manufacturing sector is indifferent to marginally tolerant of risk taking while the petrochemical sector views it as negative.
- Q25: My job is structured so that I have very little time to think about wider organisational problems. The ANOVA yields a mean of 3.45 for S1 and 2.88 for S2. This indicates that the petrochemical sector is in agreement with inadequate time while the manufacturing sector is indifferent to mild disagreement.

6.6.2 Petrochemical versus Banking Sector

Significant differences at a 95% confidence interval can be categorised per factor as indicated below.

Factor 1 (Work Discretion):

- Q1: I have the freedom to decide what I do on my job. The petrochemical sector perceives this as indifferent to mildly agree (mean = 3.5) while the banking sector is in agreement (mean = 4).
- Q2: It is basically my own responsibility to decide how my job gets done. The petrochemical sector perceives this as in agreement (mean = 3.8) while the banking sector is tending toward strong agreement (mean = 4.4).
- Q3: I almost always get to decide what I do on my job. The petrochemical sector perceives this as indifferent (mean = 3.1) while the banking sector is in agreement (mean = 4).
- Q4: I have much autonomy on my job and am left on my own to do my own work. The petrochemical sector perceives this as indifferent to mildly agree (mean = 3.5) while the banking sector is in agreement (mean = 4.3).

On average it can be concluded that work discretion is more positively perceived in the banking sector than it is in the petrochemical sector.

Factor 2 (Management support and risk acceptance):

- Q7: The term ‘‘risk taker’’ is considered a positive attribute for people in my work area. The petrochemical sector perceives this as disagreement (mean = 2.25) while the banking sector is indifferent (mean = 2.78).
- Q8: This organisation supports many small and experimental projects, realising that some will undoubtedly fail. The petrochemical sector perceives this as disagreement to indifferent (mean = 2.75) while the banking sector is in between indifference to agreement (mean = 3.5).
- Q9: An employee with a good idea is often given free time to develop that idea. The petrochemical sector perceives this as disagreement to indifferent (mean = 2.7) while the banking sector is in between indifference to agreement (mean = 3.4).
- Q10: There is considerable desire among people in the organisation for generating new ideas without regard for crossing departmental or functional

boundaries. The petrochemical sector perceives this as indifferent (mean = 2.8) while the banking sector is in between indifference to agreement (mean = 3.5).

On average it can be concluded that management support and risk acceptance is more positively perceived in the banking sector than it is in the petrochemical sector.

Factor 3 (Rewards and Reinforcement):

- Q13: My supervisor will give me special recognition if my work performance is especially good. The petrochemical sector perceives this as indifferent (mean = 3.2) while the banking sector is in agreement (mean = 4.2).
- Q14: My manager would tell his/her boss if my work was outstanding. The petrochemical sector perceives this as indifferent to agreement (mean = 3.5) while the banking sector is in agreement (mean = 4.25).

On average it can be concluded that recognition is more positively perceived in the banking sector than it is in the petrochemical sector.

Factor 5 (Financial Support):

- Q18: Individuals with successful innovative projects receive additional rewards and compensation beyond the standard reward system for their ideas and efforts. The petrochemical sector perceives this as disagreement (mean = 2.3) while the banking sector is in agreement (mean = 4.03).

Herein lies the largest difference in terms of rewards and compensation structure with the banking sector showing a marked difference in response. The banking sector shows a positive response over of the negative one of the petrochemical sector.

6.6.3 Petrochemical versus Professional Services Sector

Question 7 is where it can be concluded that the difference in responses is not due to chance as all three tests statistically confirmed this. Details on the specific question are as follows:

- Q7: The term ‘‘risk taker’’ is considered a positive attribute for people in my work area. The ANOVA yields a mean of 2.25 for S1 and 3.1 for S4. This indicates that the Professional services sector is indifferent to risk taking while the petrochemical sector views it as negative.

6.6.4 Manufacturing versus Banking Sector

Significant differences at a 95% confidence interval can be categorised per factor as indicated below.

Factor 1 (Work Discretion):

- Q1: I have the freedom to decide what I do on my job. The manufacturing sector perceives this as indifferent (mean = 3.2) while the banking sector is in agreement (mean = 4).
- Q2: It is basically my own responsibility to decide how my job gets done. The manufacturing sector perceives this as in agreement (mean = 3.6) while the banking sector is tending toward strong agreement (mean = 4.4).
- Q3: I almost always get to decide what I do on my job. The manufacturing sector perceives this as indifferent (mean = 3.1) while the banking sector is in agreement (mean = 4).
- Q4: I have much autonomy on my job and am left on my own to do my own work. The manufacturing sector perceives this as indifferent to mildly agree (mean = 3.6) while the banking sector is in agreement (mean = 4.3).

On average it can be concluded that work discretion is more positively perceived in the banking sector than it is in the manufacturing sector.

Factor 2 (Management support and risk acceptance):

- Q8: This organisation supports many small and experimental projects, realizing that some will undoubtedly fail. The manufacturing sector perceives this as indifferent (mean = 2.8) while the banking sector is in between indifference to agreement (mean = 3.5).
- Q10: There is considerable desire among people in the organisation for generating new ideas without regard for crossing departmental or functional boundaries. The manufacturing sector perceives this as indifferent (mean = 2.9) while the banking sector is in between indifference to agreement (mean = 3.5).

On average it can be concluded that management support and risk acceptance is more positively perceived in the banking sector than it is in the manufacturing sector.

Factor 3 (Rewards and Reinforcement):

- Q13: My supervisor will give me special recognition if my work performance is especially good. The manufacturing sector perceives this as indifferent (mean = 3.1) while the banking sector is in agreement (mean = 4.2).
- Q14: My manager would tell his/her boss if my work was outstanding. The manufacturing sector perceives this as indifferent (mean = 3.2) while the banking sector is in agreement (mean = 4.3).

On average it can be concluded that recognition is more positively perceived in the banking sector than it is in the manufacturing sector.

Factor 5 (Financial Support):

- Q18: Individuals with successful innovative projects receive additional rewards and compensation beyond the standard reward system for their ideas and efforts. The manufacturing sector perceives this as disagreement (mean = 2.3) while the banking sector is in agreement (mean = 4).

Herein lies the largest difference in terms of rewards and compensation structure with the banking sector showing a marked difference in response. The banking sector shows a positive response over of the negative one of the manufacturing sector. The manufacturing sector's differences almost echo the differences between the petrochemical sector and the banking sector. This indicates similarities between the petrochemical and manufacturing sectors.

6.6.5 Manufacturing versus Professional Services Sector

Question 1 is where we can conclude that the difference in responses is not due to chance as all three tests statistically confirmed this. Details on the specific questions are as follows:

- Q1: I have the freedom to decide what I do on my job. The ANOVA yields a mean of 3.2 for S2 and 3.8 for S4. This indicates that the manufacturing sector is indifferent to decision freedom while the professional services sector views it as positive as in agreement.

6.6.6 Banking versus Professional Services Sector

Significant differences at a 95% confidence interval can be categorised per factor as indicated below.

Factor 1 (Work Discretion):

- Q2: It is basically my own responsibility to decide how my job gets done. The professional services sector perceives this as in agreement (mean = 3.8) while the banking sector is between agreement and strong agreement (mean = 4.4).
- Q3: I almost always get to decide what I do on my job. The professional services sector perceives this as indifferent to agreement (mean = 3.4) while the banking sector is in agreement (mean = 4).
- Q4: I have much autonomy on my job and am left on my own to do my own work. The professional services sector perceives this as indifferent to mildly agree (mean = 3.77) while the banking sector is in agreement (mean = 4.3).

On average it can be concluded that work discretion is more positively perceived in the banking sector than it is in the professional services sector.

Factor 2 (Management support and risk acceptance):

- Q9: An employee with a good idea is often given free time to develop that idea. The professional services sector perceives this as disagreement to indifferent (mean = 2.6) while the banking sector is in between indifference to agreement (mean = 3.4).
- Q10: There is considerable desire among people in the organisation for generating new ideas without regard for crossing departmental or functional boundaries. The professional services sector perceives this as indifferent (mean = 2.9) while the banking sector is in between indifference to agreement (mean = 3.5).

On average it can be concluded that management support and risk acceptance is more positively perceived in the banking sector than it is in the professional services sector.

Factor 3 (Rewards and Reinforcement):

- Q13: My supervisor will give me special recognition if my work performance is especially good. The professional services sector perceives this as between indifferent and in agreement (mean = 3.5) while the banking sector is in agreement (mean = 4.2).
- Q14: My manager would tell his/her boss if my work was outstanding. The professional services sector perceives this as between indifferent and in

agreement (mean = 3.5) while the banking sector is in agreement (mean = 4.25).

On average it can be concluded that recognition is more positively perceived in the banking sector than it is in the professional services sector.

Factor 5 (Financial Support):

- Q18: Individuals with successful innovative projects receive additional rewards and compensation beyond the standard reward system for their ideas and efforts. The professional services sector perceives this as indifferent (mean = 2.7) while the banking sector is in agreement (mean = 4).

Herein lies the largest difference in terms of rewards and compensation structure with the banking sector showing a marked difference in response. The banking sector shows a positive response over of the indifferent one of the professional services sector.

6.7 To what extent do middle manager perceptions predict levels of Corporate Entrepreneurship hence organisational performance?

Table 5-20 and figure 5-7 indicate the soring scale results as per (Kuratko et al., 2014). When comparing these results to the table 2-1: contribution to GDP by sector and annual growth rates, we can conclude that professional services and banking leads followed by manufacturing and petrochemical. There is a direct correlation between middle manager perception of corporate entrepreneurship and organisation/industry performance.

6.8 Proposed External Environmental Constraint Model

Due to the significant difference in perception of middle managers within the four sectors investigated, it can be proposed that the external environment has some effect in shaping corporate entrepreneurship within an organisation. A model of the macroeconomic environment can be proposed to better understand the impact of these differences in perceptions of CE.

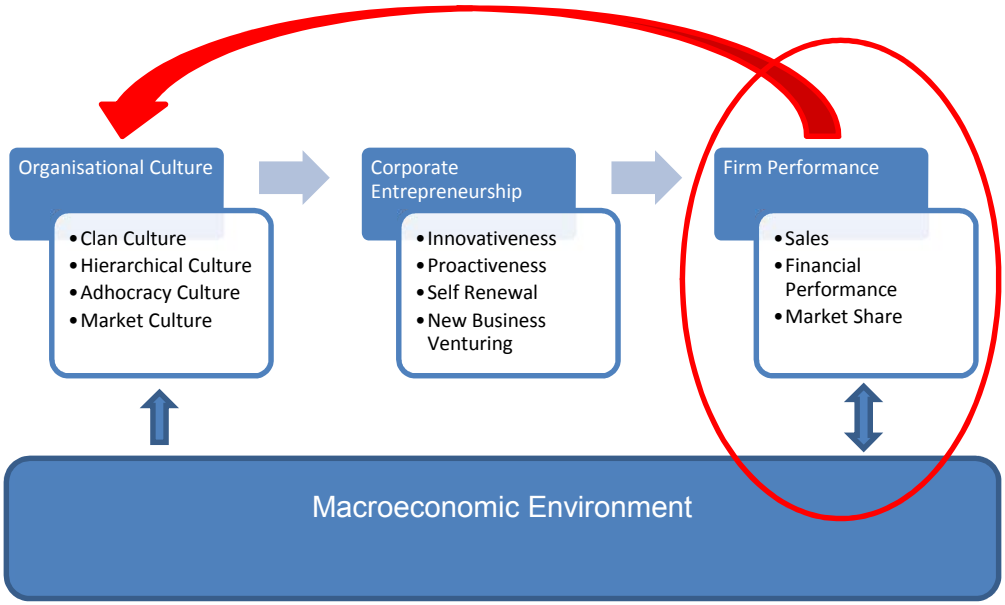


Figure 6-1: Proposed External Macroeconomic CE Model

Fig 6-1 above is an adapted from the research model proposed by Behram & Özdemirci (2014). The results of this study show that there exist significant differences in middle manager perceptions of corporate entrepreneurship within different industries. The model shows that the macroeconomic factors constrain the firm's performance but is also effected by the firm's performance. Firm performance in turn effects organisational culture which is an input to CE. The macroeconomic environment also effects organisational culture directly due to availablity of information and social connectedness of individuals and organisations.

7 Conclusion

7.1 Contributions of the current study

The existing body of knowledge seeks to identify antecedents to CE. This study contributes to that existing body of knowledge by identifying differences with regard to perceptions of middle level managers within different sectors of the economy. In light of the analysis undertaken it can be concluded that middle manager perceptions on CE differ significantly according to industry sector. Key factors such as work discretion, management support and risk acceptance, rewards and reinforcement and financial support vary significantly. Industry performance and growth can further be correlated to those industries that attain a high CE score (Kuratko et al., 2014).

It can also be concluded that biographic factors such as age, tenure and gender do not play a significant role in middle manager perceptions of corporate entrepreneurship. This signals the need for organisations to focus on internal factors that promote a CE conducive environment.

In the testing for differences and similarities between middle managers biographic variables this study utilised the Chi-square test and Cramer's V coefficient to check for sample independence between two distributions. This was used for assessing if any relationships exist between middle manager age, length of service and gender and middle manager perceptions. Pearson's r, Spearman's correlation coefficient and Kendall's rank correlation coefficient was used to determine if any significant correlation existed between these variables at a 95% confidence interval.

In the analysis of the various sectors, each sector was compared to each other resulting in six individual t tests that were performed across the 26 question eight factor questionnaire. A single factor ANOVA was also used to determine significant relationships between sectors. Tukey and Scheffe's contrast tests were utilised to confirm relationships between sectors. Through the analysis of sample means per question per sector, the average response was then used as a scoring scale (Kuratko et al., 2014) to determine the CE environment.

In summary this study showed that:

1. Middle manager age does not play a significant role in middle manager perceptions of CE. These findings are in contrast with existing literature with respect to an inverted U distribution (de Jong et al., 2011) and could fall into the

category of mixed results as defined by Bindl & Parker (2010). It could be deduced that motivation for intrapreneurship does not decrease with age. However as a negative, it could also indicate that perceived capability does not increase with age and experience. As such, envronmental constraints and organisational culture prevent middle managers from seizing new opportunities as their perceived capabilities increase.

2. Length of service does not play a significant role in middle manager perceptions of CE. Implications for this finding are that as individuals build domain specific experience, this experience may not necessarily result in ability to exploit opportunities. The positive aspect of this finding is that individuals who are approaching the end of their careers still have the ability and inclination to innovate and behave in a more intrapreneurial manner. Another positive aspect is that those middle managers at the start of their tenure are able to act in an intrapreneurial manner at a much quicker rate thereby exploiting opportunities much easily.
3. Gender does not play a significant role in middle manager perceptions of CE. Three factors do present some results regarding difference in perception. These results however could be confirmed as statistically significant apart form Factor 7: Organisation boundaries. The skewness in female response and participation in the survey could jeopardise the validity of these results. Further studies are required in this area.
4. There are significant differences and similarities in perceptions of middle managers across the four different industries. There exist clear differences in the following factors:
    - Factor 1: Work Discretion
    - Factor 2: Management support and risk acceptance
    - Factor 3: Rewards and Reinforcement
    - Factor 5: Financial Support

    The Petrochemical and Manufacturing sectors show remarkably similar characteristics and responses. The same can be said for the Banking and Professional Services sectors. The differences indicated in the factors above are at significant values when comparing Petrochemical to Banking and when comparing Manufacturing to Banking. These findings are in contrast with some elements of existing literature by Covin & Lumpkin (2011); Hornsbyet al. (2002); Kuratko D. F. (2012) and Kuratko & Audretsch (2013), who downplay the

influence of external factors on CE. The findings are however supported by those of Burgers et al. (2009); Gomez-Haro et al. (2011) and Zahra (1991).

5. Middle manager perceptions do predict levels of CE hence organisational performance. Banking scores as per (Kuratko et al., 2014) correlate to sector GDP contribution and sector growth (Statistics South Africa, 2014).

7.2 Implications for management

Continuous innovation is imperative for effective competitive advantage in the global marketplace (Kuratko et al., 2014). Rapid technological change, restrained economic growth and increasing international competition has made it imperative that organisations have the abilities to improve and create new value (Rigtering & Weitzel, 2013). Goosen et al. (2002) identify “Management” as a key factor to influence organisational structures, processes and internal relations. It is critical for management to understand the changing macroeconimic environment and react accordingly by questionning legacy HRM processes and architectures of long established sectors. The banking sector in South Africa ranks number three out of 148 countries in comparison (World Economic Forum, 2014). It is through understanding this sector in totallity and transposing key learnings to other sectors within the country is success will be achieved. Key learnings from Factor 1: Work Discretion, Factor 2: Management support and risk acceptance, Factor 3: Rewards and Reinforcement, and Factor 5: Financial Support can be applied to the petrochemical and manufacturing sectors as a start. Further research into other sectors could reveal other factors that could be improved on to foster CE thereby innovation and firm performance.

Much has been learned about the roles of the middle management function and its associated constructs in supporting a strategy of entrepreneurship in established organisations. We are however only at the early stages of our complete understanding. Theoretical development lags behind empirical work at this stage. Several significant challenges, need to be resolved by future research as outlined below such that the field’s growing understanding of these phenomena can contribute to enhanced organisational capacity for innovation and entrepreneurial performance.

7.3 Limitations of the current study

- Limited responses were achieved from female middle managers. This did allow for effective statistical analysis on perception differences.
- Limitations regarding the survey structure, data collection and data analysis were described in detail in chapter 4. Key highlights of the limitations include response bias on the part of the respondent. Limited access to a large enough sample of middle managers across different industries limited the number of cross comparisons that could have been performed.
- The time constraint on this research prevented a longitudinal study of middle managers perceptions to ascertain if perceptions changed as responsibility within the organisation changed.
- This study was constrained to a South African construct and to specific geographic area (as various industries are concentrated in geographic areas). This may prove that the generalisability of the findings may be limited.
- The limited number of sectors surveyed constrained the findings to four specific sectors. More sectors need to be evaluated to ensure generalisability of findings.

7.4 Directions for future research

Further studies should include the perceptions of managers of lower and upper levels to contrast perceptions within sectors.

Additional sectors can be analysed to ensure generalisability of findings.

Additional geographic areas and countries should be added as an additional variable.

Specific financial performance measures of an organisations and sectors could be included to ascertain the direct correlation between CE culture and performance.

Greater understanding is required regarding the constraints that the macroeconomic environment places on firm performance and its effects on organisational culture. A deeper understanding is required regarding which elements translate into CE advantages and disadvantages.

8 Reference List

Adonisi, M. P. (2003). The Relationship between corporate entrepreneurship, market orientation, organizational flexibility and job satisfaction. *Unpublished Doctoral Thesis*.

Adonisi, M., & van Wyk, R. (2012). The Influence of Market Orientation, Flexibility and Job Satisfaction on Corporate Entrepreneurship. *International Business & Economics Research Journal, 11*(5), 477-486.

Bakker, A. B., & Schaufeli, W. B. (2008). Positive organisational behaviour: Engaged employees in flourishing organisations. *Journal of Organizational Behaviour, 29*, 147-154. doi:10.1002/job.515

Behram, N. K., & Özdemirci, A. (2014). The Empirical Link between Environmental Conditions, Organizational Culture, Corporate Entrepreneurship and Performance: The Mediating Role of Corporate Entrepreneurship. *International Journal of Business and Social Science, 5*(2), 264-276.

Bindl, U. K., & Parker, S. K. (2010). Proactive work behaviour: forward thinking and change orientated action in organizations. *APA handbook of industrial and organizational psychology*.

Bosma, N., & Levie, J. (2010). *Global Entrepreneurship Monitor.* Global Entrepreneurship Research Association.

Brundin, E., Patzelt, H., & Shepherd, D. A. (2008). Managers' emotional displays and employees' willingness to act entrepreneurially. *Journal of Business Venturing, 23*(2), 221-243.

Bruton, G. D., Filatotchev, I., Si, S., & Wright, M. (2013, September). Entrepreneurship and Strategy in Emerging Economies. *Strategic Entrepreneurship Journal, 7*(3), 169-180. doi:10.1002/sej.1159

Burgers, J. A., Jansen, J. J., Van den Bosch, F., & Volberda, H. W. (2009). Structural differentiation and corporate venturing: the moderating role of formal and informal integration mechanisms. *Journal of Business Venturing, 24*(3), 206-220.

Burroughs, J. E., Dahl, D. W., Moreau, C. P., Chattopadhyay, A., & Gorn, G. J. (2011). Facilitating and Rewarding Creativity During New Product Development. *Journal of Marketing, 75*(4), 53-67.

Bysted, R., & Jespersen, K. R. (2014). Exploring Managerial Mechanisms that Influence Innovative Work Behaviour: Comparing private and public employees. *Public Management Review, 16*(2), 217-241. doi:10.1080/14719037.2013.806576

Chen, J. C., & Silverthorne, C. (2005). Leadership effectiveness, leadership style and employee readiness. *Leadership and Organisation Development Journal, 26*, 280-288. doi:10.1108/01437730510600652

Cooper, D. R., & Schindler, P. S. (2008). *Business Research Methods* (10th ed.). McGraw-Hill.

Corbett, A., Covin, J. G., O'Connor, G. C., & Tucci, C. L. (2013). Corporate Entrepreneurship: State-of-the-Art Research and a Future Research Agenda. *Journal of Product Innovation Management, 30*(5), 812-820. doi:10.1111/jpim.12031

Covin, J. G., & Kuratko, D. F. (2010). The Concept of Corporate Entrepreneurship. In V. K. Narayanan, & G. C. O'Connor, *Encyclopedia of Technology and Innovation Management* (pp. 207-214). Oxford: Blackwell Publishers.

Covin, J. G., & Lumpkin, G. T. (2011). Entrepreneurial orientation theory and research: Reflections on a needed construct. *Entrepreneurship Theory and Practice, 35*(5), 855-72. doi:10.111/j.1540-6520.2011.00482.x

Covin, J. G., & Slevin, D. P. (2002). The entrepreneurial imperatives of strategic leadership. In M. A. Hitt, R. D. Ireland, S. M. Camp, & D. L. Sexton, *Strategic Entrepreneurship: Creating a new mindset* (pp. 309-327). Oxford: Blackwell Publishers.

de Jong, J., Parker, S. K., Wennekers, S., & Wu, C. (2011). *Corporate Entrepreneurship at the Individual Level: Measurement and Determinants.* University of Western Australia.

Dillman, D. A. (2007). *Mail and Internet Surveys: The Tailored Design Method* (2nd ed.). Wiley.

Farmer, T. M., & Butte, X. (2014, September). Inspire to motivate. *American society for training and developemnt*, pp. 54-59.

Garvin, D. A., & Levesqu, L. C. (2006). Meeting the challenge of corporate entrepreneurship. *Harvard Business Review, 84*(10), 102-112.

Goldense, B. L. (2013, July). The Maker Movement Spurs Corporate Innovation and Entrepreneurship. *Machine Design, 85*(9), pp. 76-76.

Goldman Sachs International. (2013). *Two decades of freedon: A twenty year review.* Retrieved March 24, 2014

Gomez-Haro, S., Aragon-Correa, J., & Cordon-Pozo, E. (2011). Differentiating the effects of the institutional environment on corporate entrepreneurship. *Management Decision, 49*(9), 1677-1693.

Goodale, J. C., Kuratko, D. F., Hornsby, J. S., & Covin, J. G. (2011). Operations management and corporate entrepreneurship: the moderating effect of operations control on the antecedents of corporate entrepreneurial activity in relation to innovation performance. *Journal of Operatiosn Management, 29*(2), 116-127.

Goosen, C. J., Coning, T. J., & Smit, E. (2002). Corporate Entrepreneurship and financial performance: The role of management. *South African Journal of Business Management, 33*(4), 21-27.

Goosen, C. J., de Coning, T. J., & Smit, E. (2002). The development of a factor based instrument to measure corporate entrepreneurship: A South African perspective. *South African Journal of Business Management, 33*(3), 39-51.

Hajipour, B., & Mas'oomi, S. (2012). A survey on the relationship between financial performance and Corporate Venturing. *Interdisciplinary Journal of Contemporary Research in Business, 2*(12), 890-901.

Halme, M., Lindeman, S., & Linna, P. (2012, June). Innovation for Inclusive Business: Intrapreneurial Bricolage in Multinational Corporations. *Journal of Management Studies, 49*(4), 743-784. doi:10.1111/j.1467-6486.2012.01045.x

Haynie, J. M., Shepherd, D., Mosakowski, E., & Early, P. C. (2010). A situated metacognitive model of the entrepreneurial mindset. *Journal of Business Venturing, 25*(2), 217-229.

Hayton, J. C., Hornsby, J. S., & Bloodgood, J. (2013). Part II: The Contribution of HRM to Corporate Entrepreneurship: a review and agenda for future research. *Management, 16*(4), 357-432.

Herrington, M., & Kew, J. (2013). *GEM2013: South African Report.* Retrieved March 24, 2014, from http://www.gemconsortium.org/docs/download/3336

Hornsby, J. S., Kuratko, D. F., & Zahra, S. A. (2002). Middle Managers' perception of the internal environment for corporate entrepreneurship: assessing a measurement scale. *Journal of Business Venturing, 17*, 253-273.

Hornsby, J. S., Kuratko, D. F., Holt, D. T., & Wales, W. J. (2013). Assessing a measurement of organisational preparedness for corporate entrepreneurship. *Journal of Product Innovation Management, 30*(5), 937-995. doi:10.1111/jpim.12038

Hornsby, J. S., Kuratko, D. F., Shepherd, D. A., & Bott, J. P. (2009). Managers' corporate entrepreneurial actions: Examining perception and position. *Journal of Business Venturing, 24*, 236-247. doi:10.1016/j.jbusvent.2008.03.002

Hsu, C., Tan, K. C., Jayaram, J., & Laosirihongthong, T. (2014). Corporate entrepreneurship, operations core competency and innovation in emerging economies. *International Journal of Production Research, 52*(18), 5467-5483. doi:10.1080/00207543.2014.915069

Huy, Q. N. (2002). Emotional balancing of organizational continuity and radical change: The contribution of middle managers. *Administrative Science Quarterly, 47*, 31-69.

Ireland, D. R., Covin, J. G., & Kuratko, D. F. (2008). Conceptualising Corporate Entrepreneurship Strategy. *Entrepreneurship Theory and Practice, 33*(1), 19-46. doi:10.1111/j.1540-6520.2008.00279x

Johnson, T. P., & Wislar, J. S. (2012). Response Rates and Nonresponse Errors in Surveys. *Journal of American Medical Association, 307*(17), 1805-1806.

Kantur, D., & Iseri-Sey, A. (2013). Organizational context and firm-level entrepreneurship: a multiple-case analysis. *Journal of Organizational Change Management, 26*(2), 305-325. doi:10.1108/0963-4811311328362

Kew, J. (2014, February 20). Retrieved February 24, 2014, from Bloomberg News: http://www.bloomberg.com/news/2014-02-20/edcon-loss-narrows-as-discount-division-clothing-sales-climb.html

Kim, Y., Brodhag, C., & Mebratu, D. (2014). Corporate social responsibility driven innovation. *The European Journal of Social Science Research, 27*(2), 175-196. doi:10.1080/13511610.2014.915191

Kuratko, D. F. (2009). The entrepreneurial imperative of the 21st century. *Business Horizons, 52*(5), 421-428.

Kuratko, D. F. (2012). Corporate entrepreneurship. In D. Hjorth, *Handbook on organizational entrepreneurship.* Northampton: Edward Elgar Publishing.

Kuratko, D. F., & Audretsch, D. B. (2013). Clarifying the domains of corporate entrepreneurship. *International Entrepreneurship Management Journal, 9*, 323-335. doi:10.1007/s11365-013-0257-4

Kuratko, D. F., Covin, J. G., & Hornsby, J. S. (2014). Why implementing corporate innovation is so difficult. *Business Horizons, 57*, 647-655. doi:10.1016/j.bushor.2014.05.007

Kuratko, D. F., Hornsby, J. S., & Covin, J. G. (2014). Diagnosing a firm's internal environment for corporate entrepreneurship. *Business Horizons, 57*, 37-47.

Kyrgidou, L. P., & Hughes, M. (2010). Strategic entrepreneurship: origins, core elements and research directions. *European Business Review, 22*(1), 43-63.

Li, Y., & Zahra, S. (2012). Formal Institutions, Culture and Venture Capital Activity: A cross country analysis. *Journal of Business Venturing, 27*(4), 401-413.

Lin, S. J., & Lee, J. R. (2011). Configuring a corporate venturing portfolio to create growth value: within portfolio diversity and strategic linkage. *Journal of Business Venturing, 26*(4), 489-503.

Ling, Y., Simsek, Z., Lubatkin, M. H., & Veiga, J. F. (2008). Transformational leadership's role in promoting corporate entrepreneurship: examining the CEO-TMT interface. *Academy of Management Journal, 51*(3), 557-576.

Manyika, J., Chui, M., Bughin, J., Dobbs, R., Bisson, P., & Marrs, A. (2013). *Disruptive technologies: Advances that will transform life, business, and the global economy.* Mckinsey Global Institute.

Mathews, C. (2013, December 20). Retrieved February 24, 2014, from BDlive: http://www.bdlive.co.za/business/mining/2013/12/19/shrinking-margins-necessitate-cost-cuts-in-mining-industry

McGrath, R. G., Keil, T., & Tukiainen, T. (2006). Extracting value from corporate venturing. *MIT Sloan Management Review, 48*(1), 50-56.

Mochiko, T. (2014, Januray 13). Retrieved February 24, 2014, from BDlive.

Mollick, E. (2012). People and process, suits and innovators: The role of individuals in firm performance. *Strategic Management Journal, 33*, 1001-1015. doi:10.1002/smj

Morris, M. H., Kuratko, D. F., & Covin, J. G. (2010). *Corporate entrepreneurship and Innovation.* Mason, OH: Cengage/Southwestern Publishers.

Morris, M. H., Kuratko, D. F., & Covin, J. G. (2011). *Corporate entrepreneurship & innovation.* Boston: Cengage/South-Western/Publishers.

Narayanan, V., Yang, Y., & Zahra, S. (2009, February). corporate Venturing and Value Creation: a review and proposed framework. *Research Policy, 38*(1), 58-76. doi:10.1016/j.respol.2008.08.015

Phan, P. H., Wright, M., Ucbasaran, D., & Tan, W.-L. (2009). Corporate entrepreneurship: Current research and future directions. *Journal of Business Venturing, 24*, 197-205. doi:10.1016/j.jbusvent.2009.01.007

Ren, C. R., & Guo, C. (2011). Middlemanagers' strategic role in the corporate entrepreneurship process: attention based effects. *Journal of Management, 37*(6), 1586-1610.

Rigtering, J. P., & Weitzel, U. (2013). Work context and employee behaviour as antecedents for intrapreneurship. *International Entrepreneurship Management Journal, 9*, 337-360. doi:10.1007/s11365-013-0258-3

Robson, C. (2002). *Real world research* (2nd ed.). Oxford:Blackwell.

Rutherford, M. W., & Holt, D. T. (2007). Corporate entrepreneurship: An empirical look at the innovativeness dimension and its antecedents. *Journal of Organizational Change Management, 20*(3), 429-446. doi:10.1108/0953-4810710740227

Saunders, M., & Lewis, P. (2012). *Doing Research in Business and Management: An Essential Guide to Planning Your Project.* FT Prentice Hall.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research method for business students* (5th ed.). Pearson Education Limited.

Schmelter, R., Mauer, R., Borsch, C., & Brettel, M. (2010). Boosting Corporate Entrepreneurship through HRM Practices: Evidence from German SMEs. *Human Resource Managament, 49*(4), 715-741.

Sharma, P., & Chrisman, J. J. (1999). Toward a reconciliation of the definitional issues in the filed of corporate entrepreneurship. *Entrepreneurship theory and Practice, 23*, 11-27.

Spillane, C., & Burkhardt, P. (2014, January 13). Retrieved February 24, 2014, from BDlive: http://www.bdlive.co.za/business/energy/2014/01/13/sasols-reorganisation-puts-1000-jobs-on-line

Stander, M. W., & Rothmann, S. (2010). Psychological Empowerment, Job Insecurity and Employee Engagement. *SA Journal of Industrial Psychology, 36*. doi:10.4102/sajip.v36i1.849

Statistics South Africa. (2014). Statistical Release: Gross Domestic Product.

Tuominen, T., & Toivonen, M. (2011). Studying Innovation and Change Activities in Kibs Through the Lens of Innovative Behaviour. *International Journal of Innovation Management, 15*, 393-422.

Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing, 26*(3), 341-358.

Urbano, D., & Turro, A. (2013). Conditioning factors for corporate entrepreneurship:an in(ex)ternal approach. *International Entrepreneurship Management Journal, 9*, 379-396. doi:10.1007/s11365-013-0261-8

Van Doorn, S., Jansen, J. P., Van den Bosch, F., & Volberda, H. (2013). Entrepreneurial orientation and firm performance: Drawing attention to the senior team. *Journal of Prodduct Innovation Management*. doi:10.111/jpim.12032

van Wyk, R., & Adonisi, M. (2011). An eight-factor solution for the Corporate Entrepreneurship Assessment Instrument. *African Journal of Business Management, 5 (8)*, 3047-3055.

van Wyk, R., & Adonisi, M. (2012). Antecedents of corporate entrepreneurship. *South African Journal of Business Management, 43*(3), 65-78.

von Krogh, G., Nonaka, I., & Rechsteiner, L. (2012). Leadership in Organizational Knowledge Creation: A Review and Framework. *Journal of Management Studies*, 240-277. doi:10.1111/j.1467-6486.2010.00978.x

Wales, W., Monsen, E., & Mckelvie, A. (2011). The organisational pervasiveness of entrpreneurial orientation. *Entrepreneurship Theory and Practice, 35*(5), 895-923.

Wooldridge, B., Schmidt, T., & Floyd, S. (2008). The middle management perspective on strategy process: contributions, synthesis, and future research. *Journal of Management, 34*(6), 1190-1221.

World Economic Forum. (2014). *The Global Competitiveness Report.*

Yang, J., Zhang, Z.-X., & Tsui, A. S. (2010). Middle Manager Leadership and Frontline Employee Performance: Bypass, Cascading, and Moderating Effects. *Journal of Management Studies, 47*(4), 654-678. doi:10.1111/j.1467-6486.2009.00902.x

Yousif Al-Hakim, L. A., & Hassan, S. (2011). The Role of Middle Managers in Knowledge Management Implementation for Innovation Enhancement. *International Journal of Innovation, Management and Technology, 2*(1), 86-94.

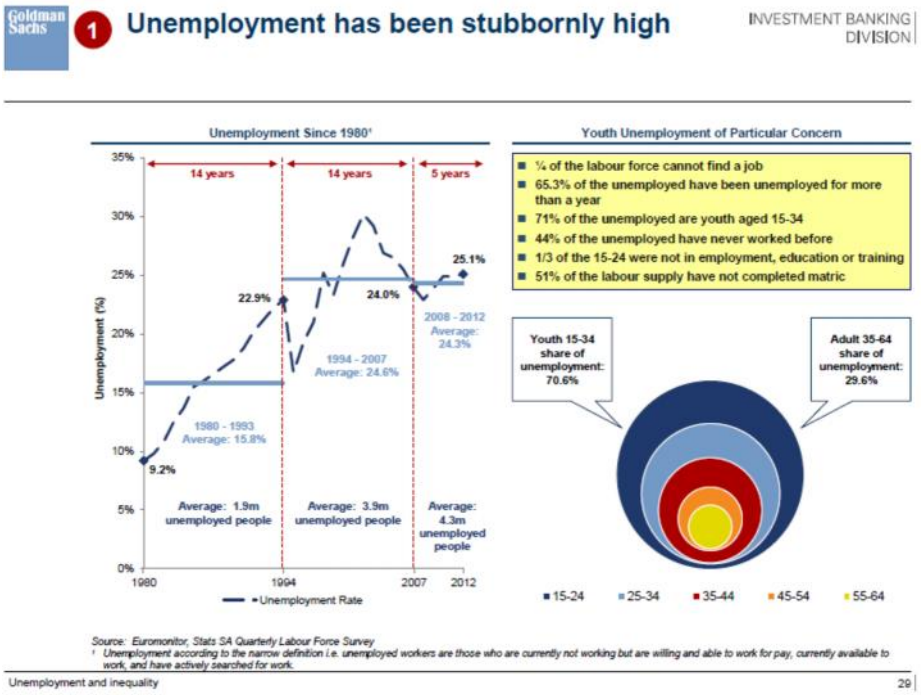
Zahra, S. A. (1991). Predictors and financial outcomes of corporate entrepreneurship: An exploratory study. *Journal of Business Venturing, 6*(4), 259-285.

Zahra, S. A., Randerson, K. A., & Fayolle, A. (2013). Part I: The Evolution and Contributions of Corporate Entrepreneurship Research. *Management, 16*(4), 357-432.

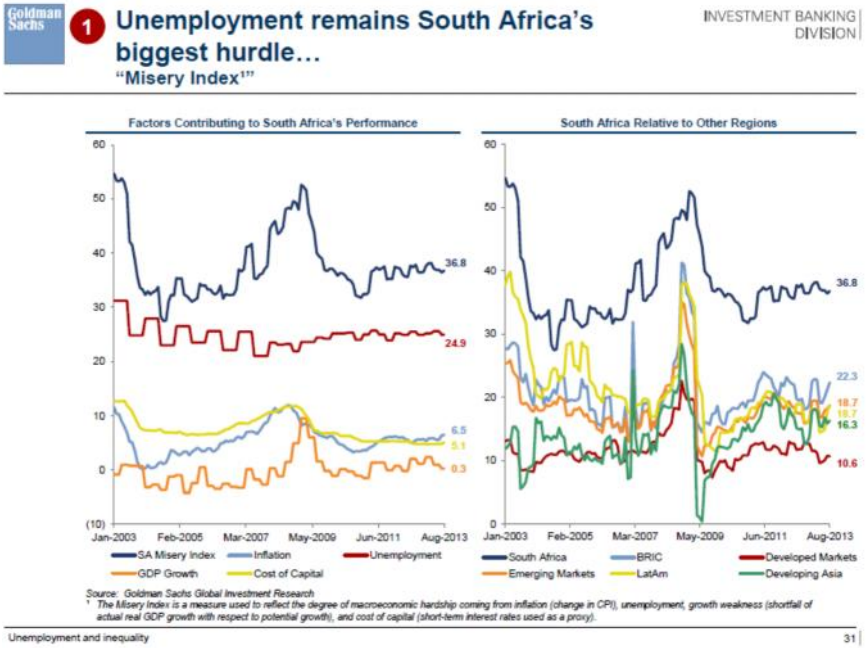
Zhang, Z., & Jia, M. (2010). Using Social Exchange Theory to Predict the effects of high performance HRM practices on Corporate Entrepreneurship: Evidence from China. *Human Resources Management, 49*(4), 743-765.

9 Appendix A1 – South African Statistics

South African Unemployment Rate for the past 20 years



South African Unemployment comparison and causes



10 Appendix B1 – Questionnaire

Using the Likert scale below, please indicate how much you agree or disagree with each of the following statements. Only one option may be selected per question.				
Strongly Disagree **1**	**Disagree** **2**	**Not Sure** **3**	**Agree** **4**	**Strongly Agree** **5**

Factor 1: Work discretion						
#	**Question**	**1**	**2**	**3**	**4**	**5**
1	I have the freedom to decide what I do on my job.	☐	☐	☐	☐	☐
2	It is basically my own responsibility to decide how my job gets done.	☐	☐	☐	☐	☐
3	I almost always get to decide what I do on my job.	☐	☐	☐	☐	☐
4	I have much autonomy on my job and am left on my own to do my own work.	☐	☐	☐	☐	☐
5	I seldom have to follow the same work methods or steps for doing my major tasks from day to day.	☐	☐	☐	☐	☐

Factor 2: Management support and risk acceptance						
#	**Question**	**1**	**2**	**3**	**4**	**5**
6	Individual risk takers are often recognized for their willingness to champion new projects, whether eventually successful or not.	☐	☐	☐	☐	☐
7	The term ‘‘risk taker’’ is considered a positive attribute for people in my work area.	☐	☐	☐	☐	☐
8	This organization supports many small and experimental projects, realizing that some will undoubtedly fail.	☐	☐	☐	☐	☐
9	An employee with a good idea is often given free time to develop that idea.	☐	☐	☐	☐	☐
10	There is considerable desire among people in the organization for generating new ideas without regard for crossing departmental or functional boundaries.	☐	☐	☐	☐	☐

Factor 3: Rewards/ reinforcement						
#	**Question**	**1**	**2**	**3**	**4**	**5**
11	My manager helps me get my work done by removing obstacles and roadblocks.	☐	☐	☐	☐	☐
12	My supervisor will increase my job responsibilities if I am performing well in my job.	☐	☐	☐	☐	☐
13	My supervisor will give me special recognition if my work performance is especially good.	☐	☐	☐	☐	☐
14	My manager would tell his/her boss if my work was outstanding.	☐	☐	☐	☐	☐

Factor 4: Innovative initiatives						
#	Question	1	2	3	4	5
15	My organization is quick to use improved work methods.	☐	☐	☐	☐	☐
16	My organization is quick to use improved work methods that are developed by workers.	☐	☐	☐	☐	☐

Factor 5: Financial support						
#	Question	1	2	3	4	5
17	Money is often available to get new project ideas off the ground.	☐	☐	☐	☐	☐
18	Individuals with successful innovative projects receive additional rewards and compensation beyond the standard reward system for their ideas and efforts.	☐	☐	☐	☐	☐
19	There are several options within the organization for individuals to get financial support for their innovative projects and ideas.	☐	☐	☐	☐	☐

Factor 6: Sufficient time						
#	Question	1	2	3	4	5
20	I always seem to have plenty of time to get everything done.	☐	☐	☐	☐	☐
21	I have just the right amount of time and workload to do everything well.	☐	☐	☐	☐	☐

Factor 7: Organisational boundaries						
#	**Question**	**1**	**2**	**3**	**4**	**5**
22	My job description clearly specifies the standards of performance on which my job is evaluated.	☐	☐	☐	☐	☐
23	I clearly know what level of work performance is expected from me in terms of amount, quality, and timelines of output.	☐	☐	☐	☐	☐

Factor 8: Inadequate time						
#	**Question**	**1**	**2**	**3**	**4**	**5**
24	During the past three months, my workload kept me from spending time on developing new ideas.	☐	☐	☐	☐	☐
25	My job is structured so that I have very little time to think about wider organizational problems.	☐	☐	☐	☐	☐
26	I feel that I am always working with time constraints on my job.	☐	☐	☐	☐	☐

11 Appendix C1 – Consistency Matrix

Research Questions	Literature Review	Data Collection Tool	Analysis
Research Question 1: 1) Does middle manager age play a significant role in middle manager perceptions of Corporate Entrepreneurship?	(van Wyk & Adonisi, 2011) (van Wyk & Adonisi, 2012) (Adonisi & van Wyk, 2012) (Kuratko, Hornsby, & Covin, 2014)	Questionnaire including Eight Factor solution for CEAI	Scoring Scale as per (Kuratko, Hornsby, & Covin, 2014) Central tendency – Median or mode parametric tests: chi-square test, Mann–Whitney test, Wilcoxon signed-rank test
Research Question 2: 2) Does length of service play a significant role in middle manager perceptions of Corporate Entrepreneurship?	(Hornsby, Kuratko, & Zahra, 2002) (Goosen, de Coning, & Smit, 2002) (Kuratko, Hornsby, & Covin, 2014) (van Wyk & Adonisi, 2012)	Questionnaire including Eight Factor solution for CEAI	Scoring Scale as per (Kuratko, Hornsby, & Covin, 2014) parametric tests: chi-square test, Mann–Whitney test, Wilcoxon signed-rank test
Research Question 3: 3) Does gender play a significant role in middle manager perceptions of Corporate Entrepreneurship?	(van Wyk & Adonisi, 2011) (Hornsby J. S., Kuratko, Shepherd, & Bott, 2009)	Questionnaire including Eight Factor solution for CEAI	Scoring Scale as per (Kuratko, Hornsby, & Covin, 2014) Central tendency – Median or mode
Research Question 4: 4) Are there significant differences or similarities in perceptions of middle managers across the four different industries?	(van Wyk & Adonisi, 2011) (Hornsby J. S., Kuratko, Shepherd, & Bott, 2009)	Questionnaire including Eight Factor solution for CEAI	Scoring Scale as per (Kuratko, Hornsby, & Covin, 2014) Central tendency – Median or mode
Research Question 5: 5) To what extent do middle manager perceptions predict levels of Corporate Entrepreneurship hence organisational performance?	(van Wyk & Adonisi, 2011) (Hornsby J. S., Kuratko, Shepherd, & Bott, 2009)	Questionnaire including Eight Factor solution for CEAI	Scoring Scale as per (Kuratko, Hornsby, & Covin, 2014) Central tendency – Median or mode

12 Appendix D1 – Statistics Age Comparison

Table of Modes

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
18 - 25	2	4	2	4	2	4	2	2	2	2	2	4	4	4	4	2	2	2	2	1	2	4	4	4	4	5
26 - 30	4	4	4	4	2	2	2	2	2	2	4	4	4	4	4	4	2	1	2	2	1	4	4	5	2	4
31 - 35	4	4	2	4	4	4	2	2	2	4	4	4	4	4	4	2	2	2	2	1	2	2	4	4	4	4
36 - 40	4	4	4	4	4	4	2	4	4	2	4	4	4	4	4	4	2	2	4	2	4	4	4	2	2	2
41 - 45	4	4	4	4	4	4	2	4	4	4	4	4	4	5	4	4	4	5	4	2	4	4	4	4	2	4
46 - 50	4	4	4	4	5	4	2	2	4	1	5	4	4	3	2	2	4	2	3	2	2	4	4	2	2	4
> 50	4	4	4	4	4	4	2	2	4	4	4	4	4	4	4	4	4	4	4	2	2	4	4	4	2	4

Table of Expected Values

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Total
18 - 25	3	4	3	4	3	3	2	2	3	2,4	3,4	3,5	3,5	3,5	3,3	2,8	2,5	2,3	2,7	1,5	2,1	3,3	3,5	3,2	2,3	3,4	76
26 - 30	3	4	3	4	3	3	2	2	3	2,5	3,5	3,7	3,7	3,7	3,4	2,9	2,6	2,4	2,8	1,6	2,2	3,4	3,7	3,3	2,4	3,5	79
31 - 35	4	4	3	4	3	4	2	2	3	2,6	3,6	3,8	3,8	3,8	3,5	3	2,7	2,4	2,8	1,6	2,3	3,5	3,8	3,4	2,4	3,6	81
36 - 40	4	4	4	4	4	4	2	3	3	2,8	4	4,1	4,1	4,1	3,8	3,2	2,9	2,6	3,1	1,8	2,5	3,8	4,1	3,7	2,6	4	88
41 - 45	4	5	4	5	4	4	2	3	4	3,2	4,5	4,7	4,7	4,7	4,3	3,7	3,3	3	3,5	2	2,8	4,3	4,7	4,2	3	4,5	100
46 - 50	4	4	3	4	3	4	2	2	3	2,6	3,7	3,9	3,9	3,9	3,6	3	2,8	2,5	2,9	1,7	2,3	3,6	3,9	3,5	2,5	3,7	83
> 50	4	4	4	4	4	4	2	3	3	3	4,2	4,4	4,4	4,4	4,1	3,4	3,1	2,8	3,3	1,9	2,7	4,1	4,4	3,9	2,8	4,2	94
Total	26	28	24	28	25	26	14	18	22	19	27	28	28	28	26	22	20	18	21	12	17	26	28	25	18	27	601

Chi-Square Test

SUMMARY		Alpha	0,05
Count	*Rows*	*Cols*	*df*
601	7	26	150

CHI-SQUARE

	chi-sq	*p-value*	*x-crit*	*sig*	*Cramer V*
Pearson's	33,38957	1	179,5806	no	0,09622602
Max likelihood	34,13324	1	179,5806	no	0,09729173

Table of Means

Age	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
18 - 25	3,18	4,27	2,64	4,18	2,91	3,55	2,45	2,82	2,45	2,91	3,09	3,82	3,45	3,64	3,45	3,09	3,09	2,91	2,91	1,91	2,27	3,27	3,45	3,64	3,82	4,09
26 - 30	3,31	3,69	3,17	4,00	3,14	2,83	2,45	2,45	2,55	2,52	3,34	3,72	3,21	3,45	2,93	2,90	2,45	2,17	2,31	1,97	2,31	3,28	3,66	3,69	3,31	3,48
31 - 35	3,53	3,85	3,17	3,45	3,64	3,15	2,83	3,02	2,77	2,83	3,51	3,77	3,47	3,53	3,19	2,96	2,57	2,51	2,38	1,94	2,70	2,94	3,43	3,77	3,26	3,68
36 - 40	3,41	3,74	3,11	3,70	3,22	3,44	2,85	3,15	2,89	3,15	3,22	3,89	3,07	3,44	3,78	3,37	2,78	2,81	2,96	2,30	2,63	3,30	3,41	3,04	3,00	3,26
41 - 45	4,00	4,17	4,06	4,06	3,51	3,57	2,83	3,40	3,43	3,37	3,83	3,40	3,83	3,91	3,91	3,54	3,43	3,37	2,69	2,54	3,14	3,66	4,03	3,57	2,94	3,97
46 - 50	3,63	3,88	3,38	3,75	3,88	3,38	2,63	3,13	3,38	2,88	3,63	3,88	3,50	3,63	3,38	3,00	3,38	2,25	2,75	2,13	2,25	3,25	3,75	2,50	2,88	3,38
> 50	3,67	3,67	3,40	3,60	2,93	3,13	2,80	2,60	3,13	3,13	3,67	3,87	3,53	3,33	3,80	3,67	3,27	2,80	3,27	2,20	2,60	3,33	3,73	3,07	2,93	3,33

13 Appendix E1 – Statistics Tenure Comparison

Table of Means

Tenure	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
0 - 5 years	3,57	3,86	3,28	3,83	3,33	3,27	2,65	2,93	2,83	2,97	3,40	3,64	3,45	3,67	3,34	3,11	2,79	2,70	2,63	1,95	2,56	3,10	3,53	3,61	3,28	3,70
6 - 10 years	3,46	3,95	3,29	3,49	3,34	3,29	2,90	3,02	2,95	2,88	3,59	3,78	3,56	3,59	3,56	3,34	2,95	2,83	2,49	2,56	3,00	3,66	3,66	3,37	2,95	3,56
11 - 15 years	3,56	3,81	3,56	4,00	3,25	3,25	2,75	3,38	3,13	3,06	3,69	3,75	3,00	3,06	3,56	3,13	2,56	2,44	2,75	2,00	2,50	3,19	3,88	3,63	3,19	3,69
16 - 20 years	3,38	4,13	3,63	3,63	3,75	2,88	2,88	2,50	2,75	2,75	3,38	4,50	3,50	3,75	3,38	3,13	3,50	3,00	2,63	2,63	2,88	3,25	4,13	2,75	3,25	3,50
21 - 25 years	4,20	4,00	3,60	4,20	4,20	3,80	2,20	3,40	4,00	3,60	4,00	3,20	3,60	3,40	4,20	4,00	3,60	3,00	2,80	2,40	1,80	3,20	3,40	3,20	3,20	3,40
26 - 30 years	3,50	3,00	3,00	4,50	4,00	3,00	3,50	3,50	3,00	3,00	3,50	4,00	3,00	3,00	3,50	2,50	2,50	1,50	3,50	1,50	2,00	2,50	3,00	3,00	2,50	4,00
> 30 years	4,00	3,75	3,50	4,00	2,75	3,00	3,00	2,25	3,00	3,25	3,75	4,00	3,75	3,50	4,25	3,75	4,00	2,75	4,00	2,50	3,00	4,00	4,25	2,50	2,00	2,50

Expected Values

Tenure	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Total
0 - 5 years	3.59	3.71	3.34	3.87	3.44	3.15	2.78	2.93	3.03	3.01	3.54	3.76	3.34	3.35	3.61	3.21	3.06	2.55	2.91	2.17	2.48	3.2	3.61	3.09	2.85	3.41	82.99
6 - 10 years	3.68	3.8	3.42	3.96	3.53	3.22	2.85	3.01	3.1	3.08	3.63	3.85	3.42	3.43	3.7	3.29	3.14	2.61	2.98	2.23	2.54	3.28	3.7	3.16	2.92	3.49	85.02
11 - 15 years	3.62	3.74	3.37	3.9	3.48	3.17	2.81	2.96	3.06	3.04	3.57	3.79	3.37	3.38	3.64	3.24	3.09	2.57	2.93	2.19	2.5	3.23	3.65	3.11	2.88	3.44	83.75
16 - 20 years	3.69	3.81	3.43	3.98	3.54	3.24	2.86	3.02	3.12	3.1	3.64	3.87	3.43	3.45	3.71	3.3	3.15	2.62	2.99	2.24	2.55	3.3	3.72	3.17	2.93	3.5	85.38
21 - 25 years	3.88	4	3.6	4.18	3.72	3.4	3	3.17	3.27	3.25	3.82	4.06	3.6	3.62	3.9	3.47	3.31	2.75	3.14	2.35	2.68	3.46	3.9	3.33	3.08	3.68	89.60
26 - 30 years	3.44	3.55	3.2	3.7	3.3	3.01	2.66	2.81	2.9	2.88	3.39	3.6	3.2	3.21	3.46	3.08	2.94	2.44	2.79	2.08	2.38	3.07	3.46	2.96	2.73	3.26	79.50
> 30 years	3.77	3.89	3.5	4.05	3.61	3.3	2.91	3.08	3.18	3.15	3.71	3.94	3.5	3.51	3.78	3.37	3.21	2.67	3.05	2.28	2.6	3.36	3.79	3.23	2.99	3.57	87.00
Total	25.67	26.50	23.86	27.65	24.62	22.49	19.87	20.98	21.66	21.51	25.29	26.87	23.86	23.96	25.79	22.96	21.91	18.21	20.79	15.53	17.74	22.90	25.84	22.06	20.37	24.35	593.24

Chi-Square Test

SUMMARY		Alpha	0.05		
Count	*Rows*	*Cols*	*df*		
593.24	7	26	150		
CHI-SQUARE					
	chi-sq	*p-value*	*x-crit*	*sig*	*Cramer V*
Pearson's	7.926324695	1	179.58	no	0.04718951
Max likelihood	8.079396168	1	179.58	no	0.047642988

14 Appendix F1 – Statistics: Gender Comparison

Q1: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.525423729	3.454545455
Variance	1.003621614	1.193181818
Observations	118	33
Hypothesized Mean Difference	0	
df	48	
t Stat	0.335384222	
P(T<=t) one-tail	0.369398361	
t Critical one-tail	1.677224196	
P(T<=t) two-tail	0.738796722	
t Critical two-tail	2.010634758	

Q2: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.796610169	3.727272727
Variance	0.881355932	1.017045455
Observations	118	33
Hypothesized Mean Difference	0	
df	49	
t Stat	0.354350162	
P(T<=t) one-tail	0.36229846	
t Critical one-tail	1.676550893	
P(T<=t) two-tail	0.72459692	
t Critical two-tail	2.009575237	

Q3: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.220338983	3.272727273
Variance	1.233087064	1.642045455
Observations	118	33
Hypothesized Mean Difference	0	
df	46	
t Stat	-0.21350305	
P(T<=t) one-tail	0.415939048	
t Critical one-tail	1.678660414	
P(T<=t) two-tail	0.831878096	
t Critical two-tail	2.012895599	

Q4: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.644067797	3.848484848
Variance	1.25684485	0.945075758
Observations	118	33
Hypothesized Mean Difference	0	
df	58	
t Stat	-1.03128032	
P(T<=t) one-tail	0.153345358	
t Critical one-tail	1.671552762	
P(T<=t) two-tail	0.306690715	
t Critical two-tail	2.001717484	

Q5: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.313559322	3.272727273
Variance	1.345284659	1.204545455
Observations	118	33
Hypothesized Mean Difference	0	
df	54	
t Stat	0.186562316	
P(T<=t) one-tail	0.426351472	
t Critical one-tail	1.673564906	
P(T<=t) two-tail	0.852702944	
t Critical two-tail	2.004879288	

Q6: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.194915254	3.272727273
Variance	1.218093583	1.267045455
Observations	118	33
Hypothesized Mean Difference	0	
df	51	
t Stat	-0.35253425	
P(T<=t) one-tail	0.362945207	
t Critical one-tail	1.67528495	
P(T<=t) two-tail	0.725890413	
t Critical two-tail	2.00758377	

Q7: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	2.669491525	3.121212121
Variance	1.300086919	1.422348485
Observations	118	33
Hypothesized Mean Difference	0	
df	50	
t Stat	-1.94175481	
P(T<=t) one-tail	0.02890594	
t Critical one-tail	1.675905025	
P(T<=t) two-tail	0.057811881	
t Critical two-tail	2.008559112	

Q8: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	2.796610169	3.212121212
Variance	1.462552513	1.484848485
Observations	118	33
Hypothesized Mean Difference	0	
df	51	
t Stat	-1.73446186	
P(T<=t) one-tail	0.044438577	
t Critical one-tail	1.67528495	
P(T<=t) two-tail	0.088877154	
t Critical two-tail	2.00758377	

Q9: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	2.805084746	2.96969697
Variance	1.2351876	1.59280303
Observations	118	33
Hypothesized Mean Difference	0	
df	47	
t Stat	-0.67922808	
P(T<=t) one-tail	0.250162412	
t Critical one-tail	1.677926722	
P(T<=t) two-tail	0.500324824	
t Critical two-tail	2.011740514	

Q10: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	2.822033898	3.03030303
Variance	1.463783862	1.65530303
Observations	118	33
Hypothesized Mean Difference	0	
df	49	
t Stat	-0.83263937	
P(T<=t) one-tail	0.204544081	
t Critical one-tail	1.676550893	
P(T<=t) two-tail	0.409088161	
t Critical two-tail	2.009575237	

Q11: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.423728814	3.454545455
Variance	1.100970592	1.255681818
Observations	118	33
Hypothesized Mean Difference	0	
df	49	
t Stat	-0.14157356	
P(T<=t) one-tail	0.44399866	
t Critical one-tail	1.676550893	
P(T<=t) two-tail	0.88799732	
t Critical two-tail	2.009575237	

Q12: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.669491525	3.757575758
Variance	0.94111256	1.189393939
Observations	118	33
Hypothesized Mean Difference	0	
df	47	
t Stat	-0.41984033	
P(T<=t) one-tail	0.338257588	
t Critical one-tail	1.677926722	
P(T<=t) two-tail	0.676515176	
t Critical two-tail	2.011740514	

Q13: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.288135593	3.424242424
Variance	1.300883674	1.564393939
Observations	118	33
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.56306795	
P(T<=t) one-tail	0.288004736	
t Critical one-tail	1.677224196	
P(T<=t) two-tail	0.576009472	
t Critical two-tail	2.010634758	

Q14: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.5	3.363636364
Variance	1.08974359	1.426136364
Observations	118	33
Hypothesized Mean Difference	0	
df	47	
t Stat	0.595415535	
P(T<=t) one-tail	0.277211045	
t Critical one-tail	1.677926722	
P(T<=t) two-tail	0.55442209	
t Critical two-tail	2.011740514	

Q15: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.322033898	3.848484848
Variance	1.33130523	1.007575758
Observations	118	33
Hypothesized Mean Difference	0	
df	58	
t Stat	-2.57449861	
P(T<=t) one-tail	0.006306723	
t Critical one-tail	1.671552762	
P(T<=t) two-tail	0.012613447	
t Critical two-tail	2.001717484	

Q16: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.118644068	3.454545455
Variance	1.165290453	1.255681818
Observations	118	33
Hypothesized Mean Difference	0	
df	50	
t Stat	-1.53435133	
P(T<=t) one-tail	0.065623621	
t Critical one-tail	1.675905025	
P(T<=t) two-tail	0.131247243	
t Critical two-tail	2.008559112	

Q17: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	2.796610169	2.939393939
Variance	1.240330291	1.746212121
Observations	118	33
Hypothesized Mean Difference	0	
df	45	
t Stat	-0.56694701	
P(T<=t) one-tail	0.286783753	
t Critical one-tail	1.679427393	
P(T<=t) two-tail	0.573567506	
t Critical two-tail	2.014103389	

Q18: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	2.415254237	2.939393939
Variance	1.202158482	1.683712121
Observations	118	33
Hypothesized Mean Difference	0	
df	46	
t Stat	-2.11854712	
P(T<=t) one-tail	0.019780371	
t Critical one-tail	1.678660414	
P(T<=t) two-tail	0.039560741	
t Critical two-tail	2.012895599	

Q19: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	2.711864407	2.727272727
Variance	1.095755469	1.892045455
Observations	118	33
Hypothesized Mean Difference	0	
df	43	
t Stat	-0.05969672	
P(T<=t) one-tail	0.476336885	
t Critical one-tail	1.681070703	
P(T<=t) two-tail	0.95267377	
t Critical two-tail	2.016692199	

Q20: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	2.110169492	2.424242424
Variance	0.816818774	1.251893939
Observations	118	33
Hypothesized Mean Difference	0	
df	44	
t Stat	-1.48288937	
P(T<=t) one-tail	0.072615816	
t Critical one-tail	1.680229977	
P(T<=t) two-tail	0.145231632	
t Critical two-tail	2.015367574	

Q21: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	2.661016949	2.636363636
Variance	1.251629726	1.551136364
Observations	118	33
Hypothesized Mean Difference	0	
df	47	
t Stat	0.102712183	
P(T<=t) one-tail	0.459314199	
t Critical one-tail	1.677926722	
P(T<=t) two-tail	0.918628398	
t Critical two-tail	2.011740514	

Q22: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.169491525	3.636363636
Variance	1.44111256	1.238636364
Observations	118	33
Hypothesized Mean Difference	0	
df	55	
t Stat	-2.09321278	
P(T<=t) one-tail	0.020477726	
t Critical one-tail	1.673033965	
P(T<=t) two-tail	0.040955452	
t Critical two-tail	2.004044783	

Q23: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.491525424	4.060606061
Variance	1.106765175	0.621212121
Observations	118	33
Hypothesized Mean Difference	0	
df	67	
t Stat	-3.38858702	
P(T<=t) one-tail	0.000590278	
t Critical one-tail	1.667916114	
P(T<=t) two-tail	0.001180556	
t Critical two-tail	1.996008354	

Q24: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.43220339	3.393939394
Variance	1.238954078	1.433712121
Observations	118	33
Hypothesized Mean Difference	0	
df	49	
t Stat	0.16474528	
P(T<=t) one-tail	0.434911117	
t Critical one-tail	1.676550893	
P(T<=t) two-tail	0.869822234	
t Critical two-tail	2.009575237	

Q25: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.203389831	2.96969697
Variance	1.086484137	1.21780303
Observations	118	33
Hypothesized Mean Difference	0	
df	49	
t Stat	1.088290877	
P(T<=t) one-tail	0.140895339	
t Critical one-tail	1.676550893	
P(T<=t) two-tail	0.281790679	
t Critical two-tail	2.009575237	

Q26: t-Test: Two-Sample Assuming Unequal Variances

	Male	*Female*
Mean	3.593220339	3.424242424
Variance	1.132261336	1.439393939
Observations	118	33
Hypothesized Mean Difference	0	
df	47	
t Stat	0.732519696	
P(T<=t) one-tail	0.233744473	
t Critical one-tail	1.677926722	
P(T<=t) two-tail	0.467488947	
t Critical two-tail	2.011740514	

Q1

ANOVA: Single Factor

DESCRIPTION Alpha ,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	467	3.620155	1.081153	138.3876	0.09226	3.437603	3.802707
Female	43	146	3.395349	1.149502	48.27907	0.159799	3.072861	3.717837

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	1.629845	1	1.629845	1.484323	0.224787	3.896742	0.1517	0.002808
Within Groups	186.6667	170	1.098039					
Total	188.2965	171	1.101149					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	11479.5	3398.5	
count	129	43	172
r^2/n	1021542	268600.1	1290142
H			1.288508
df			1
p-value			0.256323
alpha			0.05
sig			no

Q2

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	497	3.852713	0.86095	110.2016	0.083576	3.687345	4.018082
Female	43	171	3.976744	1.023256	42.97674	0.144757	3.684612	4.268876

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.496124	1	0.496124	0.550607	0.459094	3.896742	0.092393	-0.00262
Within Groups	153.1783	170	0.901049					
Total	153.6744	171	0.898681					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	10872	4006	
count	129	43	172
r^2/n	916282	373210.1	1289492
H			1.026423
df			1
p-value			0.311
alpha			0.05
sig			no

Q3

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	432	3.348837	1.322674	169.3023	0.103819	3.143413	3.554262
Female	43	142	3.302326	1.596899	67.06977	0.179821	2.939433	3.665218

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.069767	1	0.069767	0.050177	0.823024	3.896742	0.027892	-0.00555
Within Groups	236.3721	170	1.390424					
Total	236.4419	171	1.382701					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	11194	3684	
count	129	43	172
r^2/n	971361.5	315624.6	1286986
H			0.015759
df			1
p-value			0.9001
alpha			0.05
sig			no

Q4

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	479	3.713178	1.221778	156.3876	0.093414	3.528343	3.898014
Female	43	171	3.976744	0.83278	34.97674	0.161798	3.650224	4.303265

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	2.24031	1	2.24031	1.990197	0.160148	3.896742	0.175658	0.005724
Within Groups	191.3643	170	1.125673					
Total	193.6047	171	1.132191					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	10857.5	4020.5	
count	129	43	172
r^2/n	913839.6	375916.8	1289756
H			1.132948
df			1
p-value			0.287147
alpha			0.05
sig			no

Q5

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	443	3.434109	1.403828	179.6899	0.10231	3.23167	3.636547
Female	43	136	3.162791	1.187154	49.86047	0.177207	2.805173	3.520408

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	2.374031	1	2.374031	1.758155	0.186634	3.896742	0.165101	0.004389
Within Groups	229.5504	170	1.350296					
Total	231.9244	171	1.356283					

Kruskal-Wallis Test

	Male	Female	
median	4	3	
rank sum	11536.5	3341.5	
count	129	43	172
r^2/n	1031712	259665.6	1291378
H			1.786737
df			1
p-value			0.181324
alpha			0.05
sig			no

Q6

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	421	3.263566	1.164365	149.0388	0.095313	3.074973	3.452159
Female	43	140	3.255814	1.194906	50.18605	0.165087	2.922655	3.588973

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.001938	1	0.001938	0.001654	0.96761	3.896742	0.005063	-0.00584
Within Groups	199.2248	170	1.171911					
Total	199.2267	171	1.165069					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	11158	3720	
count	129	43	172
r^2/n	965123.8	321823.3	1286947
H			3.13E-06
df			1
p-value			0.998589
alpha			0.05
sig			no

Q7

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	339	2.627907	1.235465	158.1395	0.098795	2.432424	2.82339
Female	43	131	3.046512	1.331118	55.90698	0.171118	2.701182	3.391841

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	5.651163	1	5.651163	4.488266	0.035581	3.896742	0.263791	0.019877
Within Groups	214.0465	170	1.259097					
Total	219.6977	171	1.284782					

Kruskal-Wallis Test

	Male	Female	
median	2	3	
rank sum	10606	4272	
count	129	43	172
r^2/n	871994.1	424418.2	1296412
H			3.81717
df			1
p-value			0.05073
alpha			0.05
sig			no

Q8

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	378	2.930233	1.549782	198.3721	0.108211	2.716119	3.144346
Female	43	134	3.116279	1.390919	58.4186	0.187426	2.738037	3.494521

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	1.116279	1	1.116279	0.738997	0.391193	3.896742	0.107039	-0.00152
Within Groups	256.7907	170	1.510534					
Total	257.907	171	1.508228					

Kruskal-Wallis Test

	Male	Female	
median	3	3	
rank sum	10923.5	3954.5	
count	129	43	172
r^2/n	924983.4	363676.1	1288659
H			0.690578
df			1
p-value			0.405968
alpha			0.05
sig			no

Q9

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	375	2.906977	1.241279	158.8837	0.101485	2.706172	3.107782
Female	43	128	2.976744	1.594684	66.97674	0.175777	2.622012	3.331476

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.156977	1	0.156977	0.118153	0.731471	3.896742	0.0428	-0.00515
Within Groups	225.8605	170	1.328591					
Total	226.0174	171	1.321739					

Kruskal-Wallis Test

	Male	Female	
median	3	2	
rank sum	11084.5	3793.5	
count	129	43	172
r^2/n	952450.7	334666.1	1287117
H			0.068476
df			1
p-value			0.793568
alpha			0.05
sig			no

Q10

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	373	2.891473	1.410005	180.4806	0.1088	2.676193	3.106753
Female	43	138	3.209302	1.883721	79.11628	0.188448	2.828999	3.589605

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	3.257752	1	3.257752	2.133376	0.145969	3.896742	0.181867	0.006546
Within Groups	259.5969	170	1.527041					
Total	262.8547	171	1.537162					

Kruskal-Wallis Test

	Male	Female	
median	3	3	
rank sum	10771.5	4106.5	
count	129	43	172
r^2/n	899420.3	392170.8	1291591
H			1.872832
df			1
p-value			0.171151
alpha			0.05
sig			no

Q11

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	455	3.527132	1.141836	146.155	0.094643	3.339864	3.714399
Female	43	146	3.395349	1.197121	50.27907	0.163927	3.064531	3.726166

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.560078	1	0.560078	0.484708	0.487248	3.896742	0.086688	-0.003
Within Groups	196.4341	170	1.155495					
Total	196.9942	171	1.152013					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	11318.5	3559.5	
count	129	43	172
r^2/n	993088.7	294652.1	1287741
H			0.320123
df			1
p-value			0.571534
alpha			0.05
sig			no

Q12

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	478	3.705426	0.881298	112.8062	0.083385	3.540435	3.870418
Female	43	162	3.767442	0.944629	39.67442	0.144427	3.475976	4.058908

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.124031	1	0.124031	0.138282	0.710458	3.896742	0.046302	-0.00504
Within Groups	152.4806	170	0.896945					
Total	152.6047	171	0.892425					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	11070	3808	
count	129	43	172
r^2/n	949960.5	337229.4	1287190
H			0.097941
df			1
p-value			0.754315
alpha			0.05
sig			no

Q13

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	439	3.403101	1.351865	173.0388	0.102331	3.200621	3.60558
Female	43	153	3.55814	1.34773	56.60465	0.177243	3.200449	3.91583

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.775194	1	0.775194	0.573859	0.449778	3.896742	0.094324	-0.00248
Within Groups	229.6434	170	1.350844					
Total	230.4186	171	1.347477					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	10953.5	3924.5	
count	129	43	172
r^2/n	930071	358179.1	1288250
H			0.525514
df			1
p-value			0.468499
alpha			0.05
sig			no

Q14

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	464	3.596899	1.11749	143.0388	0.094486	3.409942	3.783856
Female	43	151	3.511628	1.255814	52.74419	0.163655	3.181359	3.841897

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.234496	1	0.234496	0.203615	0.652394	3.896742	0.056186	-0.00465
Within Groups	195.7829	170	1.151664					
Total	196.0174	171	1.146301					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	11258.5	3619.5	
count	129	43	172
r^2/n	982587.8	304669.3	1287257
H			0.125048
df			1
p-value			0.723623
alpha			0.05
sig			no

Q15

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	435	3.372093	1.422965	182.1395	0.102483	3.169313	3.574873
Female	43	161	3.744186	1.147287	48.18605	0.177506	3.385965	4.102407

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	4.465116	1	4.465116	3.295638	0.071226	3.896742	0.226042	0.013171
Within Groups	230.3256	170	1.354856					
Total	234.7907	171	1.373045					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	10680.5	4197.5	
count	129	43	172
r^2/n	884287.4	409744.3	1294032
H			2.857148
df			1
p-value			0.090969
alpha			0.05
sig			no

Q16

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	405	3.139535	1.167878	149.4884	0.095443	2.950685	3.328385
Female	43	146	3.395349	1.197121	50.27907	0.165312	3.061736	3.728961

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	2.110465	1	2.110465	1.795984	0.181987	3.896742	0.166867	0.004606
Within Groups	199.7674	170	1.175103					
Total	201.8779	171	1.180573					

Kruskal-Wallis Test

	Male	Female	
median	3	4	
rank sum	10787	4091	
count	129	43	172
r^2/n	902010.6	389215.8	1291226
H			1.725816
df			1
p-value			0.188946
alpha			0.05
sig			no

Q17

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	366	2.837209	1.231105	157.5814	0.102297	2.634798	3.039621
Female	43	131	3.046512	1.712071	71.90698	0.177183	2.688942	3.404081

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	1.412791	1	1.412791	1.046565	0.307753	3.896742	0.127381	0.000271
Within Groups	229.4884	170	1.349932					
Total	230.9012	171	1.350299					

Kruskal-Wallis Test

	Male	Female	
median	3	3	
rank sum	10911.5	3966.5	
count	129	43	172
r^2/n	922952.2	365886.6	1288839
H			0.762906
df			1
p-value			0.382421
alpha			0.05
sig			no

Q18

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	336	2.604651	1.506541	192.8372	0.109458	2.38807	2.821232
Female	43	131	3.046512	1.664452	69.90698	0.189587	2.66391	3.429113

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	6.296512	1	6.296512	4.073951	0.045121	3.896742	0.251321	0.017558
Within Groups	262.7442	170	1.545554					
Total	269.0407	171	1.573337					

Kruskal-Wallis Test

	Male	Female	
median	2	3	
rank sum	10620	4258	
count	129	43	172
r^2/n	874297.7	421641	1295939
H			3.626172
df			1
p-value			0.056878
alpha			0.05
sig			no

Q19

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	334	2.589147	1.228319	157.2248	0.102207	2.386914	2.791381
Female	43	122	2.837209	1.710963	71.86047	0.177027	2.479954	3.194465

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	1.984496	1	1.984496	1.472658	0.22661	3.896742	0.151102	0.00274
Within Groups	229.0853	170	1.34756					
Total	231.0698	171	1.351285					

Kruskal-Wallis Test

	Male	Female	
median	2	3	
rank sum	10856.5	4021.5	
count	129	43	172
r^2/n	913671.3	376103.8	1289775
H			1.140488
df			1
p-value			0.285549
alpha			0.05
sig			no

Q20

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	274	2.124031	0.828246	106.0155	0.086922	1.952041	2.296021
Female	43	96	2.232558	1.420819	59.67442	0.150553	1.92873	2.536386

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.379845	1	0.379845	0.389726	0.53328	3.896742	0.077732	-0.00356
Within Groups	165.6899	170	0.974647					
Total	166.0698	171	0.971168					

Kruskal-Wallis Test

	Male	Female	
median	2	2	
rank sum	11158.5	3719.5	
count	129	43	172
r^2/n	965210.3	321736.8	1286947
H			0
df			1
p-value			1
alpha			0.05
sig			no

Q21

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	350	2.713178	1.253028	160.3876	0.101321	2.512698	2.913659
Female	43	107	2.488372	1.541528	64.74419	0.175493	2.134213	2.842531

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	1.629845	1	1.629845	1.230718	0.268834	3.896742	0.138134	0.00134
Within Groups	225.1318	170	1.324305					
Total	226.7616	171	1.326091					

Kruskal-Wallis Test

	Male	Female	
median	2	2	
rank sum	11467.5	3410.5	
count	129	43	172
r^2/n	1019407	270500.2	1289908
H			1.193971
df			1
p-value			0.27453
alpha			0.05
sig			no

Q22

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	410	3.178295	1.39765	178.8992	0.102321	2.975835	3.380754
Female	43	152	3.534884	1.207087	50.69767	0.177225	3.17723	3.892538

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	4.100775	1	4.100775	3.036329	0.083228	3.896742	0.216967	0.011701
Within Groups	229.5969	170	1.35057					
Total	233.6977	171	1.366653					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	10707	4171	
count	129	43	172
r^2/n	888681	404587	1293268
H			2.549133
df			1
p-value			0.110355
alpha			0.05
sig			no

Q23

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	456	3.534884	1.031977	132.093	0.087973	3.360815	3.708953
Female	43	168	3.906977	0.895903	37.62791	0.152373	3.599475	4.214479

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	4.465116	1	4.465116	4.472458	0.035903	3.896742	0.263326	0.019789
Within Groups	169.7209	170	0.998358					
Total	174.186	171	1.018632					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	10590.5	4287.5	
count	129	43	172
r^2/n	869447.2	427503.6	1296951
H			4.034351
df			1
p-value			0.044583
alpha			0.05
sig			yes

Q24

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	449	3.48062	1.157825	148.2016	0.095691	3.29128	3.66996
Female	43	148	3.44186	1.252492	52.60465	0.165741	3.107382	3.776339

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.04845	1	0.04845	0.041017	0.839748	3.896742	0.025217	-0.00561
Within Groups	200.8062	170	1.181213					
Total	200.8547	171	1.174589					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	11217	3661	
count	129	43	172
r^2/n	975357.3	311695.8	1287053
H			0.042795
df			1
p-value			0.836113
alpha			0.05
sig			no

Q25

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Male	129	408	3.162791	1.09048	139.5814	0.092589	2.979587	3.345994
Female	43	134	3.116279	1.152824	48.4186	0.160369	2.792641	3.439917

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	0.069767	1	0.069767	0.063088	0.801984	3.896742	0.031275	-0.00548
Within Groups	188	170	1.105882					
Total	188.0698	171	1.099823					

Kruskal-Wallis Test

	Male	Female	
median	3	4	
rank sum	11213.5	3664.5	
count	129	43	172
r^2/n	974748.7	312292.1	1287041
H			0.037827
df			1
p-value			0.845791
alpha			0.05
sig			no

Q26

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
Male	129	468	3.627907	1.047965	134.1395	0.09512	3.439696	3.816118
Female	43	155	3.604651	1.530454	64.27907	0.164753	3.272167	3.937136

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	0.017442	1	0.017442	0.014944	0.90285	3.896742	0.015221	-0.00576
Within Groups	198.4186	170	1.167168					
Total	198.436	171	1.160445					

Kruskal-Wallis Test

	Male	Female	
median	4	4	
rank sum	11095.5	3782.5	
count	129	43	172
r^2/n	954342	332728.1	1287070
H			0.049632
df			1
p-value			0.823706
alpha			0.05
sig			no

15 Appendix G1 – Statistics: Industry Comparison

15.1 Industry Comparison – Question 1

ANOVA: Single Factor

DESCRIPTION — Alpha 0,05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	210	3,5	0,898305	53	0,131743	3,236383	3,763617
S2	49	158	3,22449	1,052721	50,53061	0,145782	2,931375	3,517604
S3	32	128	4	1,354839	42	0,180396	3,63208	4,36792
S4	31	117	3,774194	0,980645	29,41935	0,183283	3,39988	4,148507

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	13,34654	3	4,448848	4,272116	0,006167	2,658399	0,32937	0,05399
Within Groups	174,95	168	1,041369					
Total	188,2965	171	1,101149					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	4	
rank sum	4924	3488	3515,5	2950,5	
count	60	49	32	31	172
r^2/n	404096,3	248288,7	386210,6	280821	1319417
H					13,09431
df					3
p-value					0,004437
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,35966
medians	0,425487
trimmed	0,343314

S1vsS2: t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	3,5	3,224489796
Variance	0,898305085	1,052721088
Observations	60	49
Hypothesized Mean Difference	0	
df	99	
t Stat	1,442959171	
P(T<=t) one-tail	0,076094308	
t Critical one-tail	1,660391156	
P(T<=t) two-tail	0,152188616	
t Critical two-tail	1,984216952	

S2vsS3: t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	3,224489796	4
Variance	1,052721088	1,35483871
Observations	49	32
Hypothesized Mean Difference	0	
df	60	
t Stat	-3,06972551	
P(T<=t) one-tail	0,001607846	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,003215693	
t Critical two-tail	2,000297822	

S1vsS3: t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	3,5	4
Variance	0,898305085	1,35483871
Observations	60	32
Hypothesized Mean Difference	0	
df	53	
t Stat	-2,08858932	
P(T<=t) one-tail	0,020782014	
t Critical one-tail	1,674116237	
P(T<=t) two-tail	0,041564027	
t Critical two-tail	2,005745995	

S2vsS4: t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	3,224489796	3,774193548
Variance	1,052721088	0,980645161
Observations	49	31
Hypothesized Mean Difference	0	
df	66	
t Stat	-2,38511095	
P(T<=t) one-tail	0,009976929	
t Critical one-tail	1,668270514	
P(T<=t) two-tail	0,019953858	
t Critical two-tail	1,996564419	

S1vsS4: t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	3,5	3,774193548
Variance	0,898305085	0,980645161
Observations	60	31
Hypothesized Mean Difference	0	
df	58	
t Stat	-1,27010259	
P(T<=t) one-tail	0,104559943	
t Critical one-tail	1,671552762	
P(T<=t) two-tail	0,209119886	
t Critical two-tail	2,001717484	

S3vsS4: t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	4	3,774193548
Variance	1,35483871	0,980645161
Observations	32	31
Hypothesized Mean Difference	0	
df	60	
t Stat	0,830235729	
P(T<=t) one-tail	0,204848442	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,409696883	
t Critical two-tail	2,000297822	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	**1**	3,5	60	53	0,016667	3,5
S2	**-1**	3,22449	49	50,53061	0,020408	-3,22449
S3		4	32	42	0	0
S4		3,774194	31	29,41935	0	0
			172	174,95	0,037075	0,27551

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,13894	1,982946	168	3,6746	-0,23504	0,786059	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	**1**	3,5	60	53	0,016667	3,5
S2	**-1**	3,22449	49	50,53061	0,020408	-3,22449
S3		4	32	42	0	0
S4		3,774194	31	29,41935	0	0
			172	174,95	0,037075	0,27551

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,196491	1,402154	1,966037	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	**1**	3,5	60	53	0,016667	3,5
S2		3,22449	49	50,53061	0	0
S3	**-1**	4	32	42	0,03125	-4
S4		3,774194	31	29,41935	0	0
			172	174,95	0,047917	-0,5

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,157954	-3,16548	168	3,6746	-1,08042	0,080418	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	**1**	3,5	60	53	0,016667	3,5
S2		3,22449	49	50,53061	0	0
S3	**-1**	4	32	42	0,03125	-4
S4		3,774194	31	29,41935	0	0
			172	174,95	0,047917	-0,5

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,223381	-2,23833	5,010128	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	**1**	3,5	60	53	0,016667	3,5
S2		3,22449	49	50,53061	0	0
S3		4	32	42	0	0
S4	**-1**	3,774194	31	29,41935	0,032258	-3,77419
			172	174,95	0,048925	-0,27419

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,159607	-1,71793	168	3,6746	-0,86068	0,312298	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	**1**	3,5	60	53	0,016667	3,5
S2		3,22449	49	50,53061	0	0
S3		4	32	42	0	0
S4	**-1**	3,774194	31	29,41935	0,032258	-3,77419
			172	174,95	0,048925	-0,27419

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,225718	-1,21476	1,475643	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,5	60	53	0	0
S2	**1**	3,22449	49	50,53061	0,020408	3,22449
S3	**-1**	4	32	42	0,03125	-4
S4		3,774194	31	29,41935	0	0
			172	174,95	0,051658	-0,77551

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,164005	-4,72858	168	3,6746	-1,37816	-0,17286	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,5	60	53	0	0
S2	**1**	3,22449	49	50,53061	0,020408	3,22449
S3	**-1**	4	32	42	0,03125	-4
S4		3,774194	31	29,41935	0	0
			172	174,95	0,051658	-0,77551

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,231938	-3,34361	11,17973	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,5	60	53	0	0
S2	**1**	3,22449	49	50,53061	0,020408	3,22449
S3		4	32	42	0	0
S4	**-1**	3,774194	31	29,41935	0,032258	-3,77419
			172	174,95	0,052666	-0,5497

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,165597	-3,31952	168	3,6746	-1,15821	0,0588	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,5	60	53	0	0
S2	**1**	3,22449	49	50,53061	0,020408	3,22449
S3		4	32	42	0	0
S4	**-1**	3,774194	31	29,41935	0,032258	-3,77419
			172	174,95	0,052666	-0,5497

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,23419	-2,34726	5,509607	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,5	60	53	0	0
S2		3,22449	49	50,53061	0	0
S3	**1**	4	32	42	0,03125	4
S4	**-1**	3,774194	31	29,41935	0,032258	-3,77419
			172	174,95	0,063508	0,225806

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,181845	1,241751	168	3,6746	-0,4424	0,894015	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,5	60	53	0	0
S2		3,22449	49	50,53061	0	0
S3	**1**	4	32	42	0,03125	4
S4	**-1**	3,774194	31	29,41935	0,032258	-3,77419
			172	174,95	0,063508	0,225806

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,257168	0,878051	0,770973	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	**0,5**	3,5	60	53	0,004167	1,75
S2	**0,5**	3,22449	49	50,53061	0,005102	1,612245
S3	**-0,5**	4	32	42	0,007813	-2
S4	**-0,5**	3,774194	31	29,41935	0,008065	-1,8871
			172	174,95	0,025146	-0,52485

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,114425	-4,58688	168	3,6746	-0,94532	-0,10439	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	**0,5**	3,5	60	53	0,004167	1,75
S2	**0,5**	3,22449	49	50,53061	0,005102	1,612245
S3	**-0,5**	4	32	42	0,007813	-2
S4	**-0,5**	3,774194	31	29,41935	0,008065	-1,8871
			172	174,95	0,025146	-0,52485

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,161821	-3,24341	10,51973	3	168	7,975197	yes

15.2 Industry Comparison – Question 2

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	228	3,8	0,738983	43,6	0,11865	3,562582	4,037418
S2	49	179	3,653061	0,897959	43,10204	0,131294	3,389076	3,917046
S3	32	141	4,40625	0,636089	19,71875	0,162468	4,074894	4,737606
S4	31	120	3,870968	1,182796	35,48387	0,165068	3,533854	4,208082

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	11,76976	3	3,923252	4,644713	0,003801	2,658399	0,357503	0,059771
Within Groups	141,9047	168	0,844671					
Total	153,6744	171	0,898681					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	5	4	
rank sum	4795,5	3635	3699,5	2748	
count	60	49	32	31	172
r^2/n	383280,3	269657,7	427696,9	243596,9	1324232
H					15,03621
df					3
p-value					0,001786
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,159226
medians	0,267837
trimmed	0,123726

S1vsS2: t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	3,8	3,653061224
Variance	0,738983051	0,897959184
Observations	60	49
Hypothesized Mean Difference	0	
df	98	
t Stat	0,839416076	
P(T<=t) one-tail	0,201639457	
t Critical one-tail	1,660551217	
P(T<=t) two-tail	0,403278915	
t Critical two-tail	1,984467455	

S2vsS3: t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	3,653061224	4,40625
Variance	0,897959184	0,63608871
Observations	49	32
Hypothesized Mean Difference	0	
df	74	
t Stat	-3,85347401	
P(T<=t) one-tail	0,000122954	
t Critical one-tail	1,665706893	
P(T<=t) two-tail	0,000245909	
t Critical two-tail	1,992543495	

S1vsS3: t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	3,8	4,40625
Variance	0,738983051	0,63608871
Observations	60	32
Hypothesized Mean Difference	0	
df	68	
t Stat	-3,37880577	
P(T<=t) one-tail	0,000604336	
t Critical one-tail	1,667572281	
P(T<=t) two-tail	0,001208672	
t Critical two-tail	1,995468931	

S2vsS4: t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	3,653061224	3,870967742
Variance	0,897959184	1,182795699
Observations	49	31
Hypothesized Mean Difference	0	
df	57	
t Stat	-0,91689868	
P(T<=t) one-tail	0,1815295	
t Critical one-tail	1,672028888	
P(T<=t) two-tail	0,363059	
t Critical two-tail	2,002465459	

S1vsS4: t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	3,8	3,870967742
Variance	0,738983051	1,182795699
Observations	60	31
Hypothesized Mean Difference	0	
df	50	
t Stat	-0,31589276	
P(T<=t) one-tail	0,3766994	
t Critical one-tail	1,675905025	
P(T<=t) two-tail	0,753398801	
t Critical two-tail	2,008559112	

S3vsS4: t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	4,40625	3,870967742
Variance	0,63608871	1,182795699
Observations	32	31
Hypothesized Mean Difference	0	
df	55	
t Stat	2,222016672	
P(T<=t) one-tail	0,015207374	
t Critical one-tail	1,673033965	
P(T<=t) two-tail	0,030414748	
t Critical two-tail	2,004044783	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,8	60	43,6	0,016667	3,8
S2	-1	3,653061	49	43,10204	0,020408	-3,65306
S3		4,40625	32	19,71875	0	0
S4		3,870968	31	35,48387	0	0
			172	141,9047	0,037075	0,146939

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,125132	1,17427	168	3,6746	-0,31287	0,606749	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,8	60	43,6	0,016667	3,8
S2	-1	3,653061	49	43,10204	0,020408	-3,65306
S3		4,40625	32	19,71875	0	0
S4		3,870968	31	35,48387	0	0
			172	141,9047	0,037075	0,146939

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,176963	0,830335	0,689456	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,8	60	43,6	0,016667	3,8
S2		3,653061	49	43,10204	0	0
S3	-1	4,40625	32	19,71875	0,03125	-4,40625
S4		3,870968	31	35,48387	0	0
			172	141,9047	0,047917	-0,60625

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,142256	-4,26167	168	3,6746	-1,12899	-0,08351	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,8	60	43,6	0,016667	3,8
S2		3,653061	49	43,10204	0	0
S3	-1	4,40625	32	19,71875	0,03125	-4,40625
S4		3,870968	31	35,48387	0	0
			172	141,9047	0,047917	-0,60625

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,201181	-3,01346	9,080913	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,8	60	43,6	0,016667	3,8
S2		3,653061	49	43,10204	0	0
S3		4,40625	32	19,71875	0	0
S4	-1	3,870968	31	35,48387	0,032258	-3,87097
			172	141,9047	0,048925	-0,07097

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,143745	-0,49371	168	3,6746	-0,59917	0,457238	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,8	60	43,6	0,016667	3,8
S2		3,653061	49	43,10204	0	0
S3		4,40625	32	19,71875	0	0
S4	-1	3,870968	31	35,48387	0,032258	-3,87097
			172	141,9047	0,048925	-0,07097

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,203286	-0,3491	0,121873	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,8	60	43,6	0	0
S2	1	3,653061	49	43,10204	0,020408	3,653061
S3	-1	4,40625	32	19,71875	0,03125	-4,40625
S4		3,870968	31	35,48387	0	0
			172	141,9047	0,051658	-0,75319

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,147706	-5,09924	168	3,6746	-1,29595	-0,21043	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,8	60	43,6	0	0
S2	1	3,653061	49	43,10204	0,020408	3,653061
S3	-1	4,40625	32	19,71875	0,03125	-4,40625
S4		3,870968	31	35,48387	0	0
			172	141,9047	0,051658	-0,75319

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,208888	-3,60571	13,00114	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,8	60	43,6	0	0
S2	1	3,653061	49	43,10204	0,020408	3,653061
S3		4,40625	32	19,71875	0	0
S4	-1	3,870968	31	35,48387	0,032258	-3,87097
			172	141,9047	0,052666	-0,21791

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,14914	-1,46108	168	3,6746	-0,76594	0,330124	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,8	60	43,6	0	0
S2	1	3,653061	49	43,10204	0,020408	3,653061
S3		4,40625	32	19,71875	0	0
S4	-1	3,870968	31	35,48387	0,032258	-3,87097
			172	141,9047	0,052666	-0,21791

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,210916	-1,03314	1,067384	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,8	60	43,6	0	0
S2		3,653061	49	43,10204	0	0
S3	1	4,40625	32	19,71875	0,03125	4,40625
S4	-1	3,870968	31	35,48387	0,032258	-3,87097
			172	141,9047	0,063508	0,535282

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,163773	3,268434	168	3,6746	-0,06652	1,137084	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,8	60	43,6	0	0
S2		3,653061	49	43,10204	0	0
S3	1	4,40625	32	19,71875	0,03125	4,40625
S4	-1	3,870968	31	35,48387	0,032258	-3,87097
			172	141,9047	0,063508	0,535282

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,23161	2,311132	5,34133	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,8	60	43,6	0,004167	1,9
S2	0,5	3,653061	49	43,10204	0,005102	1,826531
S3	-0,5	4,40625	32	19,71875	0,007813	-2,20313
S4	-0,5	3,870968	31	35,48387	0,008065	-1,93548
			172	141,9047	0,025146	-0,41208

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,103053	-3,9987	168	3,6746	-0,79076	-0,0334	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,8	60	43,6	0,004167	1,9
S2	0,5	3,653061	49	43,10204	0,005102	1,826531
S3	-0,5	4,40625	32	19,71875	0,007813	-2,20313
S4	-0,5	3,870968	31	35,48387	0,008065	-1,93548
			172	141,9047	0,025146	-0,41208

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,145739	-2,82751	7,994805	3	168	7,975197	yes

15.3 Industry Comparison – Question 3

ANOVA: Single Factor

DESCRIPTION — Alpha 0,05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	188	3,133333	1,032768	60,93333	0,14691	2,839366	3,427301
S2	49	153	3,122449	1,401361	67,26531	0,162566	2,795588	3,44931
S3	32	128	4	1,354839	42	0,201165	3,58972	4,41028
S4	31	105	3,387097	1,578495	47,35484	0,204384	2,969688	3,804505

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	18,88838	3	6,296127	4,86202	0,002867	2,658399	0,36156	0,06311
Within Groups	217,5535	168	1,294961					
Total	236,4419	171	1,382701					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	4	
rank sum	4626	3814,5	3679,5	2758	
count	60	49	32	31	172
r^2/n	356664,6	296947,1	423085	245373	1322070
H					14,16432
df					3
p-value					0,00269
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,066167
medians	0,75384
trimmed	0,087108

S1vsS2: t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	3,133333333	3,12244898
Variance	1,032768362	1,401360544
Observations	60	49
Hypothesized Mean Difference	0	
df	95	
t Stat	0,050852583	
P(T<=t) one-tail	0,47977488	
t Critical one-tail	1,661051817	
P(T<=t) two-tail	0,95954976	
t Critical two-tail	1,985251004	

S2vsS3: t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	3,12244898	4
Variance	1,401360544	1,35483871
Observations	49	32
Hypothesized Mean Difference	0	
df	67	
t Stat	-3,29483141	
P(T<=t) one-tail	0,000788099	
t Critical one-tail	1,667916114	
P(T<=t) two-tail	0,001576199	
t Critical two-tail	1,996008354	

S1vsS3: t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	3,133333333	4
Variance	1,032768362	1,35483871
Observations	60	32
Hypothesized Mean Difference	0	
df	56	
t Stat	-3,55144983	
P(T<=t) one-tail	0,000392632	
t Critical one-tail	1,672522303	
P(T<=t) two-tail	0,000785264	
t Critical two-tail	2,003240719	

S2vsS4: t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	3,12244898	3,387096774
Variance	1,401360544	1,578494624
Observations	49	31
Hypothesized Mean Difference	0	
df	61	
t Stat	-0,93850054	
P(T<=t) one-tail	0,175844265	
t Critical one-tail	1,670219484	
P(T<=t) two-tail	0,351688531	
t Critical two-tail	1,999623585	

S1vsS4: t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	3,133333333	3,387096774
Variance	1,032768362	1,578494624
Observations	60	31
Hypothesized Mean Difference	0	
df	51	
t Stat	-0,97219532	
P(T<=t) one-tail	0,167770989	
t Critical one-tail	1,67528495	
P(T<=t) two-tail	0,335541979	
t Critical two-tail	2,00758377	

S3vsS4: t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	4	3,387096774
Variance	1,35483871	1,578494624
Observations	32	31
Hypothesized Mean Difference	0	
df	60	
t Stat	2,007008039	
P(T<=t) one-tail	0,024630226	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,049260451	
t Critical two-tail	2,000297822	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,133333	60	60,93333	0,016667	3,133333
S2	-1	3,122449	49	67,26531	0,020408	-3,12245
S3		4	32	42	0	0
S4		3,387097	31	47,35484	0	0
			172	217,5535	0,037075	0,010884

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,154936	0,070251	168	3,6746	-0,55844	0,580213	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,133333	60	60,93333	0,016667	3,133333
S2	-1	3,122449	49	67,26531	0,020408	-3,12245
S3		4	32	42	0	0
S4		3,387097	31	47,35484	0	0
			172	217,5535	0,037075	0,010884

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,219113	0,049675	0,002468	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,133333	60	60,93333	0,016667	3,133333
S2		3,122449	49	67,26531	0	0
S3	-1	4	32	42	0,03125	-4
S4		3,387097	31	47,35484	0	0
			172	217,5535	0,047917	-0,86667

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,176139	-4,92034	168	3,6746	-1,51391	-0,21942	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,133333	60	60,93333	0,016667	3,133333
S2		3,122449	49	67,26531	0	0
S3	-1	4	32	42	0,03125	-4
S4		3,387097	31	47,35484	0	0
			172	217,5535	0,047917	-0,86667

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,249099	-3,47921	12,10489	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,133333	60	60,93333	0,016667	3,133333
S2		3,122449	49	67,26531	0	0
S3		4	32	42	0	0
S4	-1	3,387097	31	47,35484	0,032258	-3,3871
			172	217,5535	0,048925	-0,25376

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,177983	-1,42578	168	3,6746	-0,90778	0,400252	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,133333	60	60,93333	0,016667	3,133333
S2		3,122449	49	67,26531	0	0
S3		4	32	42	0	0
S4	-1	3,387097	31	47,35484	0,032258	-3,3871
			172	217,5535	0,048925	-0,25376

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,251705	-1,00818	1,016419	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,133333	60	60,93333	0	0
S2	1	3,122449	49	67,26531	0,020408	3,122449
S3	-1	4	32	42	0,03125	-4
S4		3,387097	31	47,35484	0	0
			172	217,5535	0,051658	-0,87755

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,182887	-4,79832	168	3,6746	-1,54959	-0,20551	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,133333	60	60,93333	0	0
S2	1	3,122449	49	67,26531	0,020408	3,122449
S3	-1	4	32	42	0,03125	-4
S4		3,387097	31	47,35484	0	0
			172	217,5535	0,051658	-0,87755

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,258641	-3,39293	11,51195	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,133333	60	60,93333	0	0
S2	1	3,122449	49	67,26531	0,020408	3,122449
S3		4	32	42	0	0
S4	-1	3,387097	31	47,35484	0,032258	-3,3871
			172	217,5535	0,052666	-0,26465

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,184663	-1,43314	168	3,6746	-0,94321	0,413914	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,133333	60	60,93333	0	0
S2		3,122449	49	67,26531	0	0
S3	1	4	32	42	0,03125	4
S4	-1	3,387097	31	47,35484	0,032258	-3,3871
			172	217,5535	0,063508	0,612903

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,261153	-1,01338	1,026946	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,133333	60	60,93333	0	0
S2		3,122449	49	67,26531	0	0
S3	1	4	32	42	0,03125	4
S4	-1	3,387097	31	47,35484	0,032258	-3,3871
			172	217,5535	0,063508	0,612903

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,202781	3,022485	168	3,6746	-0,13224	1,358043	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,133333	60	60,93333	0	0
S2		3,122449	49	67,26531	0	0
S3	1	4	32	42	0,03125	4
S4	-1	3,387097	31	47,35484	0,032258	-3,3871
			172	217,5535	0,063508	0,612903

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,286776	2,137219	4,567706	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,133333	60	60,93333	0,004167	1,566667
S2	0,5	3,122449	49	67,26531	0,005102	1,561224
S3	-0,5	4	32	42	0,007813	-2
S4	-0,5	3,387097	31	47,35484	0,008065	-1,69355
			172	217,5535	0,025146	-0,56566

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,127598	-4,4331	168	3,6746	-1,03453	-0,09678	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,133333	60	60,93333	0,004167	1,566667
S2	0,5	3,122449	49	67,26531	0,005102	1,561224
S3	-0,5	4	32	42	0,007813	-2
S4	-0,5	3,387097	31	47,35484	0,008065	-1,69355
			172	217,5535	0,025146	-0,56566

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,180451	-3,13468	9,826205	3	168	7,975197	yes

15.4 Industry Comparison – Question 4

ANOVA: Single Factor

DESCRIPTION — Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	214	3,566667	1,470056	86,73333	0,134163	3,298208	3,835125
S2	49	181	3,693878	0,841837	40,40816	0,14846	3,395379	3,992376
S3	32	138	4,3125	0,608871	18,875	0,18371	3,937822	4,687178
S4	31	117	3,774194	1,180645	35,41935	0,186649	3,393005	4,155382

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Gro	12,1688	3	4,056267	3,755888	0,012065	2,658399	0,31604	0,045863
Within Group	181,4359	168	1,079975					
Total	193,6047	171	1,132191					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	4	
rank sum	4761,5	3894	3544,5	2678	
count	60	49	32	31	172
r^2/n	377864,7	309453,8	392608,8	231344,6	1311272
H					9,809747
df					3
p-value					0,020255
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,001945
medians	0,095147
trimmed	0,00669

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3,566666667	3,693877551
Variance	1,470056497	0,841836735
Observations	60	49
Hypothesized Mean Difference	0	
df	106	
t Stat	-0,62309423	
P(T<=t) one-tail	0,267280471	
t Critical one-tail	1,659356034	
P(T<=t) two-tail	0,534560942	
t Critical two-tail	1,982597262	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	3,693877551	4,3125
Variance	0,841836735	0,608870968
Observations	49	32
Hypothesized Mean Difference	0	
df	74	
t Stat	-3,25106798	
P(T<=t) one-tail	0,000866036	
t Critical one-tail	1,665706893	
P(T<=t) two-tail	0,001732071	
t Critical two-tail	1,992543495	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3,566666667	4,3125
Variance	1,470056497	0,608870968
Observations	60	32
Hypothesized Mean Difference	0	
df	87	
t Stat	-3,57484024	
P(T<=t) one-tail	0,00028735	
t Critical one-tail	1,662557349	
P(T<=t) two-tail	0,0005747	
t Critical two-tail	1,987608282	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	3,693877551	3,774193548
Variance	0,841836735	1,180645161
Observations	49	31
Hypothesized Mean Difference	0	
df	56	
t Stat	-0,34164443	
P(T<=t) one-tail	0,366948618	
t Critical one-tail	1,672522303	
P(T<=t) two-tail	0,733897237	
t Critical two-tail	2,003240719	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3,566666667	3,774193548
Variance	1,470056497	1,180645161
Observations	60	31
Hypothesized Mean Difference	0	
df	67	
t Stat	-0,82953522	
P(T<=t) one-tail	0,20487372	
t Critical one-tail	1,667916114	
P(T<=t) two-tail	0,409747441	
t Critical two-tail	1,996008354	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	4,3125	3,774193548
Variance	0,608870968	1,180645161
Observations	32	31
Hypothesized Mean Difference	0	
df	54	
t Stat	2,252494951	
P(T<=t) one-tail	0,014188874	
t Critical one-tail	1,673564906	
P(T<=t) two-tail	0,028377749	
t Critical two-tail	2,004879288	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,566667	60	86,73333	0,016667	3,566667
S2	-1	3,693878	49	40,40816	0,020408	-3,69388
S3		4,3125	32	18,875	0	0
S4		3,774194	31	35,41935	0	0
			172	181,4359	0,037075	-0,12721

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,141492	-0,89907	168	3,6746	-0,64714	0,392715	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,566667	60	86,73333	0,016667	3,566667
S2	-1	3,693878	49	40,40816	0,020408	-3,69388
S3		4,3125	32	18,875	0	0
S4		3,774194	31	35,41935	0	0
			172	181,4359	0,037075	-0,12721

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,2001	-0,63574	0,404162	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,566667	60	86,73333	0,016667	3,566667
S2		3,693878	49	40,40816	0	0
S3	-1	4,3125	32	18,875	0,03125	-4,3125
S4		3,774194	31	35,41935	0	0
			172	181,4359	0,047917	-0,74583

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,160855	-4,63667	168	3,6746	-1,33691	-0,15475	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,566667	60	86,73333	0,016667	3,566667
S2		3,693878	49	40,40816	0	0
S3	-1	4,3125	32	18,875	0,03125	-4,3125
S4		3,774194	31	35,41935	0	0
			172	181,4359	0,047917	-0,74583

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,227484	-3,27862	10,74937	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,566667	60	86,73333	0,016667	3,566667
S2		3,693878	49	40,40816	0	0
S3		4,3125	32	18,875	0	0
S4	-1	3,774194	31	35,41935	0,032258	-3,77419
			172	181,4359	0,048925	-0,20753

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,162538	-1,27679	168	3,6746	-0,80479	0,389737	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,566667	60	86,73333	0,016667	3,566667
S2		3,693878	49	40,40816	0	0
S3		4,3125	32	18,875	0	0
S4	-1	3,774194	31	35,41935	0,032258	-3,77419
			172	181,4359	0,048925	-0,20753

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,229864	-0,90282	0,815092	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
1		3,185185	27	44,07407	0	0
4	1	26,70475	23	62340,5	0,043478	26,70475
0	-1	141,7143	7	28183,43	0,142857	-141,714
0		3,413913	6	6,898858	0	0
			63	90574,9	0,186335	-115,01

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
11,95943	-9,61664	59	3,73925	-159,729	-70,2902	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
1		3,185185	27	44,07407	0	0
4	1	26,70475	23	62340,5	0,043478	26,70475
0	-1	141,7143	7	28183,43	0,142857	-141,714
0		3,413913	6	6,898858	0	0
			63	90574,9	0,186335	-115,01

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
16,91319	-6,79999	46,23985	3	59	8,282301	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,566667	60	86,73333	0	0
S2	1	3,693878	49	40,40816	0,020408	3,693878
S3		4,3125	32	18,875	0	0
S4	-1	3,774194	31	35,41935	0,032258	-3,77419
			172	181,4359	0,052666	-0,08032

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,168639	-0,47626	168	3,6746	-0,7	0,539365	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,566667	60	86,73333	0	0
S2	1	3,693878	49	40,40816	0,020408	3,693878
S3		4,3125	32	18,875	0	0
S4	-1	3,774194	31	35,41935	0,032258	-3,77419
			172	181,4359	0,052666	-0,08032

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,238492	-0,33677	0,113412	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,566667	60	86,73333	0	0
S2		3,693878	49	40,40816	0	0
S3	1	4,3125	32	18,875	0,03125	4,3125
S4	-1	3,774194	31	35,41935	0,032258	-3,77419
			172	181,4359	0,063508	0,538306

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,185185	2,906854	168	3,6746	-0,14218	1,218788	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,566667	60	86,73333	0	0
S2		3,693878	49	40,40816	0	0
S3	1	4,3125	32	18,875	0,03125	4,3125
S4	-1	3,774194	31	35,41935	0,032258	-3,77419
			172	181,4359	0,063508	0,538306

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,261891	2,055456	4,2249	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,566667	60	86,73333	0,004167	1,783333
S2	0,5	3,693878	49	40,40816	0,005102	1,846939
S3	-0,5	4,3125	32	18,875	0,007813	-2,15625
S4	-0,5	3,774194	31	35,41935	0,008065	-1,8871
			172	181,4359	0,025146	-0,41307

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,116526	-3,5449	168	3,6746	-0,84126	0,015113	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,566667	60	86,73333	0,004167	1,783333
S2	0,5	3,693878	49	40,40816	0,005102	1,846939
S3	-0,5	4,3125	32	18,875	0,007813	-2,15625
S4	-0,5	3,774194	31	35,41935	0,008065	-1,8871
			172	181,4359	0,025146	-0,41307

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,164793	-2,50663	6,283175	3	168	7,975197	no

15.5 Industry Comparison – Question 5

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	189	3,15	1,485593	87,65	0,149003	2,851845	3,448155
S2	49	161	3,285714	1,083333	52	0,164882	2,954197	3,617232
S3	32	119	3,71875	1,434476	44,46875	0,204031	3,302626	4,134874
S4	31	110	3,548387	1,322581	39,67742	0,207296	3,125032	3,971742

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	8,128249	3	2,709416	2,033913	0,111062	2,658399	0,221763	0,017714
Within Groups	223,7962	168	1,33212					
Total	231,9244	171	1,356283					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	3	4	4	4	
rank sum	4685,5	4037,5	3245,5	2909,5	
count	60	49	32	31	172
r^2/n	365898,5	332681,8	329164,7	273070,7	1300816
H					5,592934
df					3
p-value					0,133185
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,25313766
medians	0,29963482
trimmed	0,24910483

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	3,15	3,285714286
Variance	1,48559322	1,083333333
Observations	60	49
Hypothesized Mean Difference	0	
df	107	
t Stat	-0,62687936	
P(T<=t) one-tail	0,266036802	
t Critical one-tail	1,659219312	
P(T<=t) two-tail	0,532073603	
t Critical two-tail	1,98238337	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	3,285714286	3,71875
Variance	1,083333333	1,434475806
Observations	49	32
Hypothesized Mean Difference	0	
df	60	
t Stat	-1,67375986	
P(T<=t) one-tail	0,049691943	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,099383885	
t Critical two-tail	2,000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	3,15	3,71875
Variance	1,48559322	1,434475806
Observations	60	32
Hypothesized Mean Difference	0	
df	64	
t Stat	-2,15603871	
P(T<=t) one-tail	0,01742281	
t Critical one-tail	1,669013025	
P(T<=t) two-tail	0,034845619	
t Critical two-tail	1,997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	3,285714286	3,548387097
Variance	1,083333333	1,322580645
Observations	49	31
Hypothesized Mean Difference	0	
df	59	
t Stat	-1,03209341	
P(T<=t) one-tail	0,153120323	
t Critical one-tail	1,671093032	
P(T<=t) two-tail	0,306240646	
t Critical two-tail	2,000995378	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	3,15	3,548387097
Variance	1,48559322	1,322580645
Observations	60	31
Hypothesized Mean Difference	0	
df	64	
t Stat	-1,53425914	
P(T<=t) one-tail	0,064947466	
t Critical one-tail	1,669013025	
P(T<=t) two-tail	0,129894933	
t Critical two-tail	1,997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	3,71875	3,548387097
Variance	1,434475806	1,322580645
Observations	32	31
Hypothesized Mean Difference	0	
df	61	
t Stat	0,575960493	
P(T<=t) one-tail	0,283380427	
t Critical one-tail	1,670219484	
P(T<=t) two-tail	0,566760855	
t Critical two-tail	1,999623585	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,15	60	87,65	0,016667	3,15
S2	-1	3,285714	49	52	0,020408	-3,28571
S3		3,71875	32	44,46875	0	0
S4		3,548387	31	39,67742	0	0
			172	223,7962	0,037075	-0,13571

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,157143	-0,86363	168	3,6746	-0,71315	0,441725	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,15	60	87,65	0,016667	3,15
S2	-1	3,285714	49	52	0,020408	-3,28571
S3		3,71875	32	44,46875	0	0
S4		3,548387	31	39,67742	0	0
			172	223,7962	0,037075	-0,13571

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,222234	-0,61068	0,372931	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,15	60	87,65	0,016667	3,15
S2		3,285714	49	52	0	0
S3	-1	3,71875	32	44,46875	0,03125	-3,71875
S4		3,548387	31	39,67742	0	0
			172	223,7962	0,047917	-0,56875

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,178649	-3,18362	168	3,6746	-1,22521	0,087713	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,15	60	87,65	0,016667	3,15
S2		3,285714	49	52	0	0
S3	-1	3,71875	32	44,46875	0,03125	-3,71875
S4		3,548387	31	39,67742	0	0
			172	223,7962	0,047917	-0,56875

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,252647	-2,25116	5,067723	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,15	60	87,65	0,016667	3,15
S2		3,285714	49	52	0	0
S3		3,71875	32	44,46875	0	0
S4	-1	3,548387	31	39,67742	0,032258	-3,54839
			172	223,7962	0,048925	-0,39839

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,180518	-2,20691	168	3,6746	-1,06172	0,264945	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,15	60	87,65	0,016667	3,15
S2		3,285714	49	52	0	0
S3		3,71875	32	44,46875	0	0
S4	-1	3,548387	31	39,67742	0,032258	-3,54839
			172	223,7962	0,048925	-0,39839

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,255291	-1,56052	2,435223	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,15	60	87,65	0	0
S2	1	3,285714	49	52	0,020408	3,285714
S3	-1	3,71875	32	44,46875	0,03125	-3,71875
S4		3,548387	31	39,67742	0	0
			172	223,7962	0,051658	-0,43304

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,185492	-2,33452	168	3,6746	-1,11465	0,248575	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,15	60	87,65	0	0
S2	1	3,285714	49	52	0,020408	3,285714
S3	-1	3,71875	32	44,46875	0,03125	-3,71875
S4		3,548387	31	39,67742	0	0
			172	223,7962	0,051658	-0,43304

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,262326	-1,65075	2,724991	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,15	60	87,65	0	0
S2	1	3,285714	49	52	0,020408	3,285714
S3		3,71875	32	44,46875	0	0
S4	-1	3,548387	31	39,67742	0,032258	-3,54839
			172	223,7962	0,052666	-0,26267

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,187294	-1,40247	168	3,6746	-0,9509	0,425556	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,15	60	87,65	0	0
S2	1	3,285714	49	52	0,020408	3,285714
S3		3,71875	32	44,46875	0	0
S4	-1	3,548387	31	39,67742	0,032258	-3,54839
			172	223,7962	0,052666	-0,26267

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,264873	-0,99169	0,983455	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,15	60	87,65	0	0
S2		3,285714	49	52	0	0
S3	1	3,71875	32	44,46875	0,03125	3,71875
S4	-1	3,548387	31	39,67742	0,032258	-3,54839
			172	223,7962	0,063508	0,170363

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,20567	0,828331	168	3,6746	-0,58539	0,926118	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,15	60	87,65	0	0
S2		3,285714	49	52	0	0
S3	1	3,71875	32	44,46875	0,03125	3,71875
S4	-1	3,548387	31	39,67742	0,032258	-3,54839
			172	223,7962	0,063508	0,170363

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,290861	0,585718	0,343066	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,15	60	87,65	0,004167	1,575
S2	0,5	3,285714	49	52	0,005102	1,642857
S3	-0,5	3,71875	32	44,46875	0,007813	-1,85938
S4	-0,5	3,548387	31	39,67742	0,008065	-1,77419
			172	223,7962	0,025146	-0,41571

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,129416	-3,2122	168	3,6746	-0,89126	0,059841	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,15	60	87,65	0,004167	1,575
S2	0,5	3,285714	49	52	0,005102	1,642857
S3	-0,5	3,71875	32	44,46875	0,007813	-1,85938
S4	-0,5	3,548387	31	39,67742	0,008065	-1,77419
			172	223,7962	0,025146	-0,41571

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,183022	-2,27137	5,159129	3	168	7,975197	no

15.6 Industry Comparison – Question 6

ANOVA: Single Factor

DESCRIPTION — Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	181	3,016667	1,203107	70,98333	0,138078	2,740373	3,29296
S2	49	160	3,265306	1,157313	55,55102	0,152792	2,958096	3,572516
S3	32	113	3,53125	0,902218	27,96875	0,189071	3,145637	3,916863
S4	31	107	3,451613	1,255914	37,67742	0,192096	3,0593	3,843926

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	7,046221	3	2,34874	2,053217	0,10838	2,658399	0,213817	0,018039
Within Groups	192,1805	168	1,143932					
Total	199,2267	171	1,165069					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	3	4	4	4	
rank sum	4565	4236,5	3146	2930,5	
count	60	49	32	31	172
r^2/n	347320,4	366284,3	309291,1	277026,8	1299923
H					5,232823
df					3
p-value					0,155521
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,191161
medians	0,072405
trimmed	0,143554

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3,016666667	3,265306122
Variance	1,203107345	1,157312925
Observations	60	49
Hypothesized Mean Difference	0	
df	103	
t Stat	-1,18980657	
P(T<=t) one-tail	0,118428887	
t Critical one-tail	1,659782273	
P(T<=t) two-tail	0,236857775	
t Critical two-tail	1,983264145	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	3,265306122	3,53125
Variance	1,157312925	0,902217742
Observations	49	32
Hypothesized Mean Difference	0	
df	72	
t Stat	-1,16834444	
P(T<=t) one-tail	0,123260956	
t Critical one-tail	1,666293696	
P(T<=t) two-tail	0,246521913	
t Critical two-tail	1,993463567	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3,016666667	3,53125
Variance	1,203107345	0,902217742
Observations	60	32
Hypothesized Mean Difference	0	
df	72	
t Stat	-2,34274295	
P(T<=t) one-tail	0,010954883	
t Critical one-tail	1,666293696	
P(T<=t) two-tail	0,021909766	
t Critical two-tail	1,993463567	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	3,265306122	3,451612903
Variance	1,157312925	1,255913978
Observations	49	31
Hypothesized Mean Difference	0	
df	62	
t Stat	-0,73568401	
P(T<=t) one-tail	0,232348583	
t Critical one-tail	1,669804163	
P(T<=t) two-tail	0,464697166	
t Critical two-tail	1,998971517	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3,016666667	3,451612903
Variance	1,203107345	1,255913978
Observations	60	31
Hypothesized Mean Difference	0	
df	60	
t Stat	-1,76735667	
P(T<=t) one-tail	0,041126802	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,082253603	
t Critical two-tail	2,000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3,53125	3,451612903
Variance	0,902217742	1,255913978
Observations	32	31
Hypothesized Mean Difference	0	
df	59	
t Stat	0,303817541	
P(T<=t) one-tail	0,381167897	
t Critical one-tail	1,671093032	
P(T<=t) two-tail	0,762335794	
t Critical two-tail	2,000995378	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,016667	60	70,98333	0,016667	3,016667
S2	-1	3,265306	49	55,55102	0,020408	-3,26531
S3		3,53125	32	27,96875	0	0
S4		3,451613	31	37,67742	0	0
			172	192,1805	0,037075	-0,24864

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,145621	-1,70744	168	3,6746	-0,78374	0,28646	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,016667	60	70,98333	0,016667	3,016667
S2	-1	3,265306	49	55,55102	0,020408	-3,26531
S3		3,53125	32	27,96875	0	0
S4		3,451613	31	37,67742	0	0
			172	192,1805	0,037075	-0,24864

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,205939	-1,20734	1,457675	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,016667	60	70,98333	0,016667	3,016667
S2		3,265306	49	55,55102	0	0
S3	-1	3,53125	32	27,96875	0,03125	-3,53125
S4		3,451613	31	37,67742	0	0
			172	192,1805	0,047917	-0,51458

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,16555	-3,10833	168	3,6746	-1,12291	0,093746	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,016667	60	70,98333	0,016667	3,016667
S2		3,265306	49	55,55102	0	0
S3	-1	3,53125	32	27,96875	0,03125	-3,53125
S4		3,451613	31	37,67742	0	0
			172	192,1805	0,047917	-0,51458

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,234123	-2,19792	4,830863	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,016667	60	70,98333	0,016667	3,016667
S2		3,265306	49	55,55102	0	0
S3		3,53125	32	27,96875	0	0
S4	-1	3,451613	31	37,67742	0,032258	-3,45161
			172	192,1805	0,048925	-0,43495

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,167282	-2,60008	168	3,6746	-1,04964	0,179748	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,016667	60	70,98333	0,016667	3,016667
S2		3,265306	49	55,55102	0	0
S3		3,53125	32	27,96875	0	0
S4	-1	3,451613	31	37,67742	0,032258	-3,45161
			172	192,1805	0,048925	-0,43495

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,236573	-1,83853	3,380202	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,016667	60	70,98333	0	0
S2	1	3,265306	49	55,55102	0,020408	3,265306
S3	-1	3,53125	32	27,96875	0,03125	-3,53125
S4		3,451613	31	37,67742	0	0
			172	192,1805	0,051658	-0,26594

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,171892	-1,54716	168	3,6746	-0,89758	0,365689	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,016667	60	70,98333	0	0
S2	1	3,265306	49	55,55102	0,020408	3,265306
S3	-1	3,53125	32	27,96875	0,03125	-3,53125
S4		3,451613	31	37,67742	0	0
			172	192,1805	0,051658	-0,26594

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,243091	-1,09401	1,196853	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,016667	60	70,98333	0	0
S2	1	3,265306	49	55,55102	0,020408	3,265306
S3		3,53125	32	27,96875	0	0
S4	-1	3,451613	31	37,67742	0,032258	-3,45161
			172	192,1805	0,052666	-0,18631

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,173561	-1,07344	168	3,6746	-0,82407	0,451459	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,016667	60	70,98333	0	0
S2	1	3,265306	49	55,55102	0,020408	3,265306
S3		3,53125	32	27,96875	0	0
S4	-1	3,451613	31	37,67742	0,032258	-3,45161
			172	192,1805	0,052666	-0,18631

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,245452	-0,75904	0,576136	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,016667	60	70,98333	0	0
S2		3,265306	49	55,55102	0	0
S3	1	3,53125	32	27,96875	0,03125	3,53125
S4	-1	3,451613	31	37,67742	0,032258	-3,45161
			172	192,1805	0,063508	0,079637

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,19059	0,417846	168	3,6746	-0,6207	0,779978	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,016667	60	70,98333	0	0
S2		3,265306	49	55,55102	0	0
S3	1	3,53125	32	27,96875	0,03125	3,53125
S4	-1	3,451613	31	37,67742	0,032258	-3,45161
			172	192,1805	0,063508	0,079637

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,269535	0,295462	0,087298	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,016667	60	70,98333	0,004167	1,508333
S2	0,5	3,265306	49	55,55102	0,005102	1,632653
S3	-0,5	3,53125	32	27,96875	0,007813	-1,76563
S4	-0,5	3,451613	31	37,67742	0,008065	-1,72581
			172	192,1805	0,025146	-0,35045

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,119927	-2,92215	168	3,6746	-0,79113	0,090239	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,016667	60	70,98333	0,004167	1,508333
S2	0,5	3,265306	49	55,55102	0,005102	1,632653
S3	-0,5	3,53125	32	27,96875	0,007813	-1,76563
S4	-0,5	3,451613	31	37,67742	0,008065	-1,72581
			172	192,1805	0,025146	-0,35045

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,169602	-2,06627	4,269487	3	168	7,975197	no

15.7 **Industry Comparison – Question 7**

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	135	2,25	1,072034	63,25	0,13953	1,9708	2,5292
S2	49	150	3,061224	1,267007	60,81633	0,1544	2,750783	3,371666
S3	32	89	2,78125	1,208669	37,46875	0,19106	2,391581	3,170919
S4	31	96	3,096774	1,156989	34,70968	0,194117	2,700334	3,493214

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	23,45292	3	7,81764	6,692477	0,000271	2,658399	0,361964	0,09032
Within Groups	196,2448	168	1,168124					
Total	219,6977	171	1,284782					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	2	3	2	3	
rank sum	3956,5	4928,5	2823	3170	
count	60	49	32	31	172
r^2/n	260898,2	495716,6	249041,5	324158,1	1329814
H					17,28756
df					3
p-value					0,000617
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,363283
medians	0,309965
trimmed	0,282343

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	2,25	3,06122449
Variance	1,072033898	1,267006803
Observations	60	49
Hypothesized Mean Difference	0	
df	99	
t Stat	-3,87952505	
P(T<=t) one-tail	9,4316E-05	
t Critical one-tail	1,660391156	
P(T<=t) two-tail	0,000188632	
t Critical two-tail	1,984216952	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	3,06122449	2,78125
Variance	1,267006803	1,208669355
Observations	49	32
Hypothesized Mean Difference	0	
df	68	
t Stat	1,109925033	
P(T<=t) one-tail	0,135470497	
t Critical one-tail	1,667572281	
P(T<=t) two-tail	0,270940994	
t Critical two-tail	1,995468931	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	2,25	2,78125
Variance	1,072033898	1,208669355
Observations	60	32
Hypothesized Mean Difference	0	
df	60	
t Stat	-2,25222931	
P(T<=t) one-tail	0,013989604	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,027979209	
t Critical two-tail	2,000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	3,06122449	3,096774194
Variance	1,267006803	1,156989247
Observations	49	31
Hypothesized Mean Difference	0	
df	66	
t Stat	-0,14143205	
P(T<=t) one-tail	0,443979726	
t Critical one-tail	1,668270514	
P(T<=t) two-tail	0,887959451	
t Critical two-tail	1,996564419	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	2,25	3,096774194
Variance	1,072033898	1,156989247
Observations	60	31
Hypothesized Mean Difference	0	
df	59	
t Stat	-3,60445427	
P(T<=t) one-tail	0,000321933	
t Critical one-tail	1,671093032	
P(T<=t) two-tail	0,000643866	
t Critical two-tail	2,000995378	

t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	2,78125	3,096774194
Variance	1,208669355	1,156989247
Observations	32	31
Hypothesized Mean Difference	0	
df	61	
t Stat	-1,15141664	
P(T<=t) one-tail	0,127027004	
t Critical one-tail	1,670219484	
P(T<=t) two-tail	0,254054008	
t Critical two-tail	1,999623585	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,25	60	63,25	0,016667	2,25
S2	-1	3,061224	49	60,81633	0,020408	-3,06122
S3		2,78125	32	37,46875	0	0
S4		3,096774	31	34,70968	0	0
			172	196,2448	0,037075	-0,81122

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,147153	-5,5128	168	3,6746	-1,35195	-0,2705	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,25	60	63,25	0,016667	2,25
S2	-1	3,061224	49	60,81633	0,020408	-3,06122
S3		2,78125	32	37,46875	0	0
S4		3,096774	31	34,70968	0	0
			172	196,2448	0,037075	-0,81122

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,208106	-3,89814	15,19547	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,25	60	63,25	0,016667	2,25
S2		3,061224	49	60,81633	0	0
S3	-1	2,78125	32	37,46875	0,03125	-2,78125
S4		3,096774	31	34,70968	0	0
			172	196,2448	0,047917	-0,53125

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,167291	-3,1756	168	3,6746	-1,14598	0,083478	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,25	60	63,25	0,016667	2,25
S2		3,061224	49	60,81633	0	0
S3	-1	2,78125	32	37,46875	0,03125	-2,78125
S4		3,096774	31	34,70968	0	0
			172	196,2448	0,047917	-0,53125

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,236585	-2,24549	5,042228	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,25	60	63,25	0,016667	2,25
S2		3,061224	49	60,81633	0	0
S3		2,78125	32	37,46875	0	0
S4	-1	3,096774	31	34,70968	0,032258	-3,09677
			172	196,2448	0,048925	-0,84677

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,169042	-5,00926	168	3,6746	-1,46793	-0,22561	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,25	60	63,25	0,016667	2,25
S2		3,061224	49	60,81633	0	0
S3		2,78125	32	37,46875	0	0
S4	-1	3,096774	31	34,70968	0,032258	-3,09677
			172	196,2448	0,048925	-0,84677

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,239061	-3,54209	12,54637	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,25	60	63,25	0	0
S2	1	3,061224	49	60,81633	0,020408	3,061224
S3	-1	2,78125	32	37,46875	0,03125	-2,78125
S4		3,096774	31	34,70968	0	0
			172	196,2448	0,051658	0,279974

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,1737	1,611831	168	3,6746	-0,3583	0,918251	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,25	60	63,25	0	0
S2	1	3,061224	49	60,81633	0,020408	3,061224
S3	-1	2,78125	32	37,46875	0,03125	-2,78125
S4		3,096774	31	34,70968	0	0
			172	196,2448	0,051658	0,279974

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,245648	1,139737	1,299	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,25	60	63,25	0	0
S2	1	3,061224	49	60,81633	0,020408	3,061224
S3		2,78125	32	37,46875	0	0
S4	-1	3,096774	31	34,70968	0,032258	-3,09677
			172	196,2448	0,052666	-0,03555

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,175386	-0,20269	168	3,6746	-0,68002	0,608925	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,25	60	63,25	0	0
S2	1	3,061224	49	60,81633	0,020408	3,061224
S3		2,78125	32	37,46875	0	0
S4	-1	3,096774	31	34,70968	0,032258	-3,09677
			172	196,2448	0,052666	-0,03555

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,248034	-0,14333	0,020542	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,25	60	63,25	0	0
S2		3,061224	49	60,81633	0	0
S3	1	2,78125	32	37,46875	0,03125	2,78125
S4	-1	3,096774	31	34,70968	0,032258	-3,09677
			172	196,2448	0,063508	-0,31552

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,192594	-1,63828	168	3,6746	-1,02323	0,392183	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,25	60	63,25	0	0
S2		3,061224	49	60,81633	0	0
S3	1	2,78125	32	37,46875	0,03125	2,78125
S4	-1	3,096774	31	34,70968	0,032258	-3,09677
			172	196,2448	0,063508	-0,31552

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,27237	-1,15844	1,341985	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	2,25	60	63,25	0,004167	1,125
S2	0,5	3,061224	49	60,81633	0,005102	1,530612
S3	-0,5	2,78125	32	37,46875	0,007813	-1,39063
S4	-0,5	3,096774	31	34,70968	0,008065	-1,54839
			172	196,2448	0,025146	-0,2834

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,121189	-2,3385	168	3,6746	-0,72872	0,161919	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	2,25	60	63,25	0,004167	1,125
S2	0,5	3,061224	49	60,81633	0,005102	1,530612
S3	-0,5	2,78125	32	37,46875	0,007813	-1,39063
S4	-0,5	3,096774	31	34,70968	0,008065	-1,54839
			172	196,2448	0,025146	-0,2834

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,171386	-1,65357	2,734301	3	168	7,975197	no

15.8 Industry Comparison – Question 8

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	165	2,75	1,411017	83,25	0,15561	2,438626	3,061374
S2	49	138	2,816327	1,319728	63,34694	0,172192	2,47011	3,162543
S3	32	112	3,5	1,612903	50	0,213077	3,065426	3,934574
S4	31	97	3,129032	1,582796	47,48387	0,216487	2,686907	3,571157

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	13,82617	3	4,608722	3,172168	0,025743	2,658399	0,284725	0,036504
Within Groups	244,0808	168	1,452862					
Total	257,907	171	1,508228					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	3	2	4	4	
rank sum	4661	3930,5	3417,5	2869	
count	60	49	32	31	172
r^2/n	362082	315282,3	364978,3	265521,3	1307864
H					8,435372
df					3
p-value					0,037821
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,908291
medians	0,950221
trimmed	0,92831

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	2,75	2,816326531
Variance	1,411016949	1,319727891
Observations	60	49
Hypothesized Mean Difference	0	
df	104	
t Stat	-0,29529491	
P(T<=t) one-tail	0,384178666	
t Critical one-tail	1,659637437	
P(T<=t) two-tail	0,768357331	
t Critical two-tail	1,983037526	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	2,816326531	3,5
Variance	1,319727891	1,612903226
Observations	49	32
Hypothesized Mean Difference	0	
df	62	
t Stat	-2,45842303	
P(T<=t) one-tail	0,00838088	
t Critical one-tail	1,669804163	
P(T<=t) two-tail	0,016761761	
t Critical two-tail	1,998971517	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	2,75	3,5
Variance	1,411016949	1,612903226
Observations	60	32
Hypothesized Mean Difference	0	
df	60	
t Stat	-2,75854308	
P(T<=t) one-tail	0,003842535	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,00768507	
t Critical two-tail	2,000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	2,816326531	3,129032258
Variance	1,319727891	1,582795699
Observations	49	31
Hypothesized Mean Difference	0	
df	60	
t Stat	-1,11972965	
P(T<=t) one-tail	0,133645696	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,267291392	
t Critical two-tail	2,000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	2,75	3,129032258
Variance	1,411016949	1,582795699
Observations	60	31
Hypothesized Mean Difference	0	
df	58	
t Stat	-1,38796945	
P(T<=t) one-tail	0,085227628	
t Critical one-tail	1,671552762	
P(T<=t) two-tail	0,170455255	
t Critical two-tail	2,001717484	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3,5	3,129032258
Variance	1,612903226	1,582795699
Observations	32	31
Hypothesized Mean Difference	0	
df	61	
t Stat	1,164625387	
P(T<=t) one-tail	0,12435259	
t Critical one-tail	1,670219484	
P(T<=t) two-tail	0,24870518	
t Critical two-tail	1,999623585	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,75	60	83,25	0,016667	2,75
S2	-1	2,816327	49	63,34694	0,020408	-2,81633
S3		3,5	32	50	0	0
S4		3,129032	31	47,48387	0	0
			172	244,0808	0,037075	-0,06633

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,164111	-0,40416	168	3,6746	-0,66937	0,536714	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,75	60	83,25	0,016667	2,75
S2	-1	2,816327	49	63,34694	0,020408	-2,81633
S3		3,5	32	50	0	0
S4		3,129032	31	47,48387	0	0
			172	244,0808	0,037075	-0,06633

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,232088	-0,28578	0,081672	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,75	60	83,25	0,016667	2,75
S2		2,816327	49	63,34694	0	0
S3	-1	3,5	32	50	0,03125	-3,5
S4		3,129032	31	47,48387	0	0
			172	244,0808	0,047917	-0,75

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,186569	-4,01995	168	3,6746	-1,43557	-0,06443	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,75	60	83,25	0,016667	2,75
S2		2,816327	49	63,34694	0	0
S3	-1	3,5	32	50	0,03125	-3,5
S4		3,129032	31	47,48387	0	0
			172	244,0808	0,047917	-0,75

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,263849	-2,84253	8,080004	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,75	60	83,25	0,016667	2,75
S2		2,816327	49	63,34694	0	0
S3		3,5	32	50	0	0
S4	-1	3,129032	31	47,48387	0,032258	-3,12903
			172	244,0808	0,048925	-0,37903

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,188522	-2,01055	168	3,6746	-1,07177	0,31371	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,75	60	83,25	0,016667	2,75
S2		2,816327	49	63,34694	0	0
S3		3,5	32	50	0	0
S4	-1	3,129032	31	47,48387	0,032258	-3,12903
			172	244,0808	0,048925	-0,37903

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,26661	-1,42167	2,021155	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,75	60	83,25	0	0
S2	1	2,816327	49	63,34694	0,020408	2,816327
S3	-1	3,5	32	50	0,03125	-3,5
S4		3,129032	31	47,48387	0	0
			172	244,0808	0,051658	-0,68367

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,193717	-3,52925	168	3,6746	-1,3955	0,028157	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,75	60	83,25	0	0
S2	1	2,816327	49	63,34694	0,020408	2,816327
S3	-1	3,5	32	50	0,03125	-3,5
S4		3,129032	31	47,48387	0	0
			172	244,0808	0,051658	-0,68367

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,273957	-2,49555	6,227793	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,75	60	83,25	0	0
S2	1	2,816327	49	63,34694	0,020408	2,816327
S3		3,5	32	50	0	0
S4	-1	3,129032	31	47,48387	0,032258	-3,12903
			172	244,0808	0,052666	-0,31271

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,195597	-1,59872	168	3,6746	-1,03145	0,406037	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,75	60	83,25	0	0
S2	1	2,816327	49	63,34694	0,020408	2,816327
S3		3,5	32	50	0	0
S4	-1	3,129032	31	47,48387	0,032258	-3,12903
			172	244,0808	0,052666	-0,31271

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,276617	-1,13047	1,277954	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,75	60	83,25	0	0
S2		2,816327	49	63,34694	0	0
S3	1	3,5	32	50	0,03125	3,5
S4	-1	3,129032	31	47,48387	0,032258	-3,12903
			172	244,0808	0,063508	0,370968

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,214789	1,727128	168	3,6746	-0,4183	1,160231	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,75	60	83,25	0	0
S2		2,816327	49	63,34694	0	0
S3	1	3,5	32	50	0,03125	3,5
S4	-1	3,129032	31	47,48387	0,032258	-3,12903
			172	244,0808	0,063508	0,370968

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,303757	1,221264	1,491486	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	2,75	60	83,25	0,004167	1,375
S2	0,5	2,816327	49	63,34694	0,005102	1,408163
S3	-0,5	3,5	32	50	0,007813	-1,75
S4	-0,5	3,129032	31	47,48387	0,008065	-1,56452
			172	244,0808	0,025146	-0,53135

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,135154	-3,93146	168	3,6746	-1,02799	-0,03472	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	2,75	60	83,25	0,004167	1,375
S2	0,5	2,816327	49	63,34694	0,005102	1,408163
S3	-0,5	3,5	32	50	0,007813	-1,75
S4	-0,5	3,129032	31	47,48387	0,008065	-1,56452
			172	244,0808	0,025146	-0,53135

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,191137	-2,77996	7,728186	3	168	7,975197	no

15.9 Industry Comparison – Question 9

ANOVA: Single Factor

DESCRIPTION — Alpha 0,05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	162	2,7	1,128814	66,6	0,144559	2,410738	2,989262
S2	49	148	3,020408	1,312075	62,97959	0,159964	2,698778	3,342038
S3	32	111	3,46875	1,353831	41,96875	0,197946	3,065037	3,872463
S4	31	82	2,645161	1,303226	39,09677	0,201113	2,234434	3,055889

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	15,37233	3	5,124109	4,086733	0,007848	2,658399	0,337788	0,051088
Within Groups	210,6451	168	1,25384					
Total	226,0174	171	1,321739					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	2	3	4	2	
rank sum	4655	4429	3465,5	2328,5	
count	60	49	32	31	172
r^2/n	361150,4	400327,4	375302,8	174900,4	1311681
H					9,974728
df					3
p-value					0,018782
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,8513123
medians	0,5340409
trimmed	0,8427221

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	2,7	3,020408163
Variance	1,128813559	1,31207483
Observations	60	49
Hypothesized Mean Difference	0	
df	99	
t Stat	-1,50060343	
P(T<=t) one-tail	0,06832038	
t Critical one-tail	1,660391156	
P(T<=t) two-tail	0,136640761	
t Critical two-tail	1,984216952	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	3,020408163	3,46875
Variance	1,31207483	1,353830645
Observations	49	32
Hypothesized Mean Difference	0	
df	66	
t Stat	-1,7057672	
P(T<=t) one-tail	0,046376887	
t Critical one-tail	1,668270514	
P(T<=t) two-tail	0,092753774	
t Critical two-tail	1,996564419	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	2,7	3,46875
Variance	1,128813559	1,353830645
Observations	60	32
Hypothesized Mean Difference	0	
df	59	
t Stat	-3,10950122	
P(T<=t) one-tail	0,001442137	
t Critical one-tail	1,671093032	
P(T<=t) two-tail	0,002884275	
t Critical two-tail	2,000995378	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	3,020408163	2,64516129
Variance	1,31207483	1,303225806
Observations	49	31
Hypothesized Mean Difference	0	
df	64	
t Stat	1,430442947	
P(T<=t) one-tail	0,078727154	
t Critical one-tail	1,669013025	
P(T<=t) two-tail	0,157454308	
t Critical two-tail	1,997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	2,7	2,64516129
Variance	1,128813559	1,303225806
Observations	60	31
Hypothesized Mean Difference	0	
df	57	
t Stat	0,222303279	
P(T<=t) one-tail	0,412436211	
t Critical one-tail	1,672028888	
P(T<=t) two-tail	0,824872421	
t Critical two-tail	2,002465459	

t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	3,46875	2,64516129
Variance	1,353830645	1,303225806
Observations	32	31
Hypothesized Mean Difference	0	
df	61	
t Stat	2,835803984	
P(T<=t) one-tail	0,003096801	
t Critical one-tail	1,670219484	
P(T<=t) two-tail	0,006193601	
t Critical two-tail	1,999623585	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,7	60	66,6	0,016667	2,7
S2	-1	3,020408	49	62,97959	0,020408	-3,02041
S3		3,46875	32	41,96875	0	0
S4		2,645161	31	39,09677	0	0
			172	210,6451	0,037075	-0,32041

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,152456	-2,10164	168	3,6746	-0,88062	0,239808	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,7	60	66,6	0,016667	2,7
S2	-1	3,020408	49	62,97959	0,020408	-3,02041
S3		3,46875	32	41,96875	0	0
S4		2,645161	31	39,09677	0	0
			172	210,6451	0,037075	-0,32041

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,215606	-1,48608	2,208441	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,7	60	66,6	0,016667	2,7
S2		3,020408	49	62,97959	0	0
S3	-1	3,46875	32	41,96875	0,03125	-3,46875
S4		2,645161	31	39,09677	0	0
			172	210,6451	0,047917	-0,76875

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,17332	-4,43543	168	3,6746	-1,40563	-0,13187	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,7	60	66,6	0,016667	2,7
S2		3,020408	49	62,97959	0	0
S3	-1	3,46875	32	41,96875	0,03125	-3,46875
S4		2,645161	31	39,09677	0	0
			172	210,6451	0,047917	-0,76875

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,245112	-3,13632	9,836522	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,7	60	66,6	0,016667	2,7
S2		3,020408	49	62,97959	0	0
S3		3,46875	32	41,96875	0	0
S4	-1	2,645161	31	39,09677	0,032258	-2,64516
			172	210,6451	0,048925	0,054839

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,175134	0,313124	168	3,6746	-0,58871	0,698386	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,7	60	66,6	0,016667	2,7
S2		3,020408	49	62,97959	0	0
S3		3,46875	32	41,96875	0	0
S4	-1	2,645161	31	39,09677	0,032258	-2,64516
			172	210,6451	0,048925	0,054839

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,247677	0,221412	0,049023	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,7	60	66,6	0	0
S2	1	3,020408	49	62,97959	0,020408	3,020408
S3	-1	3,46875	32	41,96875	0,03125	-3,46875
S4		2,645161	31	39,09677	0	0
			172	210,6451	0,051658	-0,44834

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,17996	-2,49134	168	3,6746	-1,10962	0,212939	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,7	60	66,6	0	0
S2	1	3,020408	49	62,97959	0,020408	3,020408
S3	-1	3,46875	32	41,96875	0,03125	-3,46875
S4		2,645161	31	39,09677	0	0
			172	210,6451	0,051658	-0,44834

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,254502	-1,76165	3,103398	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,7	60	66,6	0	0
S2	1	3,020408	49	62,97959	0,020408	3,020408
S3		3,46875	32	41,96875	0	0
S4	-1	2,645161	31	39,09677	0,032258	-2,64516
			172	210,6451	0,052666	0,375247

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,181707	2,065118	168	3,6746	-0,29245	1,042948	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,7	60	66,6	0	0
S2	1	3,020408	49	62,97959	0,020408	3,020408
S3		3,46875	32	41,96875	0	0
S4	-1	2,645161	31	39,09677	0,032258	-2,64516
			172	210,6451	0,052666	0,375247

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,256973	1,460259	2,132357	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,7	60	66,6	0	0
S2		3,020408	49	62,97959	0	0
S3	1	3,46875	32	41,96875	0,03125	3,46875
S4	-1	2,645161	31	39,09677	0,032258	-2,64516
			172	210,6451	0,063508	0,823589

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,199536	4,127527	168	3,6746	0,090375	1,556802	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,7	60	66,6	0	0
S2		3,020408	49	62,97959	0	0
S3	1	3,46875	32	41,96875	0,03125	3,46875
S4	-1	2,645161	31	39,09677	0,032258	-2,64516
			172	210,6451	0,063508	0,823589

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,282186	2,918602	8,518238	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	2,7	60	66,6	0,004167	1,35
S2	0,5	3,020408	49	62,97959	0,005102	1,510204
S3	-0,5	3,46875	32	41,96875	0,007813	-1,73438
S4	-0,5	2,645161	31	39,09677	0,008065	-1,32258
			172	210,6451	0,025146	-0,19675

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,125556	-1,56704	168	3,6746	-0,65812	0,264617	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	2,7	60	66,6	0,004167	1,35
S2	0,5	3,020408	49	62,97959	0,005102	1,510204
S3	-0,5	3,46875	32	41,96875	0,007813	-1,73438
S4	-0,5	2,645161	31	39,09677	0,008065	-1,32258
			172	210,6451	0,025146	-0,19675

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,177563	-1,10806	1,227807	3	168	7,975197	no

15.10 Industry Comparison – Question 10

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	169	2,816667	1,508192	88,98333	0,157622	2,501265	3,132068
S2	49	140	2,857143	1,375	66	0,17442	2,506448	3,207837
S3	32	113	3,53125	1,611895	49,96875	0,215833	3,091055	3,971445
S4	31	89	2,870968	1,516129	45,48387	0,219287	2,423124	3,318812

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	12,4187	3	4,139566	2,776946	0,042916	2,658399	0,280335	0,030062
Within Groups	250,436	168	1,49069					
Total	262,8547	171	1,537162					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	3	3	4	3	
rank sum	4848,5	4015,5	3459,5	2554,5	
count	60	49	32	31	172
r^2/n	391799,2	329066,1	374004,4	210499	1305369
H					7,429125
df					3
p-value					0,059408
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,791189
medians	0,717795
trimmed	0,794

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	2,816666667	2,857142857
Variance	1,50819209	1,375
Observations	60	49
Hypothesized Mean Difference	0	
df	104	
t Stat	-0,17549024	
P(T<=t) one-tail	0,430517835	
t Critical one-tail	1,659637437	
P(T<=t) two-tail	0,86103567	
t Critical two-tail	1,983037526	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	2,857142857	3,53125
Variance	1,375	1,611895161
Observations	49	32
Hypothesized Mean Difference	0	
df	63	
t Stat	-2,40701978	
P(T<=t) one-tail	0,009512975	
t Critical one-tail	1,669402222	
P(T<=t) two-tail	0,01902595	
t Critical two-tail	1,998340543	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	2,816666667	3,53125
Variance	1,50819209	1,611895161
Observations	60	32
Hypothesized Mean Difference	0	
df	62	
t Stat	-2,6004928	
P(T<=t) one-tail	0,00581163	
t Critical one-tail	1,669804163	
P(T<=t) two-tail	0,011623261	
t Critical two-tail	1,998971517	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	2,857142857	2,870967742
Variance	1,375	1,516129032
Observations	49	31
Hypothesized Mean Difference	0	
df	62	
t Stat	-0,04983158	
P(T<=t) one-tail	0,480208394	
t Critical one-tail	1,669804163	
P(T<=t) two-tail	0,960416788	
t Critical two-tail	1,998971517	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	2,816666667	2,870967742
Variance	1,50819209	1,516129032
Observations	60	31
Hypothesized Mean Difference	0	
df	61	
t Stat	-0,19955551	
P(T<=t) one-tail	0,421245979	
t Critical one-tail	1,670219484	
P(T<=t) two-tail	0,842491957	
t Critical two-tail	1,999623585	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3,53125	2,870967742
Variance	1,611895161	1,516129032
Observations	32	31
Hypothesized Mean Difference	0	
df	61	
t Stat	2,095562827	
P(T<=t) one-tail	0,020139405	
t Critical one-tail	1,670219484	
P(T<=t) two-tail	0,04027881	
t Critical two-tail	1,999623585	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,816667	60	88,98333	0,016667	2,816667
S2	-1	2,857143	49	66	0,020408	-2,85714
S3		3,53125	32	49,96875	0	0
S4		2,870968	31	45,48387	0	0
			172	250,436	0,037075	-0,04048

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,166233	-0,24349	168	3,6746	-0,65132	0,570365	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,816667	60	88,98333	0,016667	2,816667
S2	-1	2,857143	49	66	0,020408	-2,85714
S3		3,53125	32	49,96875	0	0
S4		2,870968	31	45,48387	0	0
			172	250,436	0,037075	-0,04048

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,23509	-0,17217	0,029644	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,816667	60	88,98333	0,016667	2,816667
S2		2,857143	49	66	0	0
S3	-1	3,53125	32	49,96875	0,03125	-3,53125
S4		2,870968	31	45,48387	0	0
			172	250,436	0,047917	-0,71458

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,188983	-3,78121	168	3,6746	-1,40902	-0,02015	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,816667	60	88,98333	0,016667	2,816667
S2		2,857143	49	66	0	0
S3	-1	3,53125	32	49,96875	0,03125	-3,53125
S4		2,870968	31	45,48387	0	0
			172	250,436	0,047917	-0,71458

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,267262	-2,67372	7,148777	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,816667	60	88,98333	0,016667	2,816667
S2		2,857143	49	66	0	0
S3		3,53125	32	49,96875	0	0
S4	-1	2,870968	31	45,48387	0,032258	-2,87097
			172	250,436	0,048925	-0,0543

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,19096	-0,28436	168	3,6746	-0,756	0,647401	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2,816667	60	88,98333	0,016667	2,816667
S2		2,857143	49	66	0	0
S3		3,53125	32	49,96875	0	0
S4	-1	2,870968	31	45,48387	0,032258	-2,87097
			172	250,436	0,048925	-0,0543

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,270059	-0,20107	0,04043	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,816667	60	88,98333	0	0
S2	1	2,857143	49	66	0,020408	2,857143
S3	-1	3,53125	32	49,96875	0,03125	-3,53125
S4		2,870968	31	45,48387	0	0
			172	250,436	0,051658	-0,67411

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,196222	-3,43543	168	3,6746	-1,39515	0,046931	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,816667	60	88,98333	0	0
S2	1	2,857143	49	66	0,020408	2,857143
S3	-1	3,53125	32	49,96875	0,03125	-3,53125
S4		2,870968	31	45,48387	0	0
			172	250,436	0,051658	-0,67411

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,2775	-2,42921	5,90108	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,816667	60	88,98333	0	0
S2	1	2,857143	49	66	0,020408	2,857143
S3		3,53125	32	49,96875	0	0
S4	-1	2,870968	31	45,48387	0,032258	-2,87097
			172	250,436	0,052666	-0,01382

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,198128	-0,06978	168	3,6746	-0,74186	0,714215	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,816667	60	88,98333	0	0
S2	1	2,857143	49	66	0,020408	2,857143
S3		3,53125	32	49,96875	0	0
S4	-1	2,870968	31	45,48387	0,032258	-2,87097
			172	250,436	0,052666	-0,01382

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,280195	-0,04934	0,002434	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,816667	60	88,98333	0	0
S2		2,857143	49	66	0	0
S3	1	3,53125	32	49,96875	0,03125	3,53125
S4	-1	2,870968	31	45,48387	0,032258	-2,87097
			172	250,436	0,063508	0,660282

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,217567	3,034845	168	3,6746	-0,13919	1,459754	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2,816667	60	88,98333	0	0
S2		2,857143	49	66	0	0
S3	1	3,53125	32	49,96875	0,03125	3,53125
S4	-1	2,870968	31	45,48387	0,032258	-2,87097
			172	250,436	0,063508	0,660282

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,307686	2,145959	4,605142	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	2,816667	60	88,98333	0,004167	1,408333
S2	0,5	2,857143	49	66	0,005102	1,428571
S3	-0,5	3,53125	32	49,96875	0,007813	-1,76563
S4	-0,5	2,870968	31	45,48387	0,008065	-1,43548
			172	250,436	0,025146	-0,3642

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,136902	-2,66032	168	3,6746	-0,86727	0,138857	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	2,816667	60	88,98333	0,004167	1,408333
S2	0,5	2,857143	49	66	0,005102	1,428571
S3	-0,5	3,53125	32	49,96875	0,007813	-1,76563
S4	-0,5	2,870968	31	45,48387	0,008065	-1,43548
			172	250,436	0,025146	-0,3642

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,193609	-1,88113	3,538654	3	168	7,975197	no

15.11 **Industry Comparison – Question 11**

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	211	3,516667	1,203107	70,98333	0,136988	3,242554	3,790779
S2	49	167	3,408163	0,913265	43,83673	0,151587	3,103378	3,712948
S3	32	124	3,875	1,209677	37,5	0,187579	3,492431	4,257569
S4	31	99	3,193548	1,227957	36,83871	0,19058	2,804332	3,582765

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	7,835408	3	2,611803	2,319654	0,077215	2,658399	0,268347	0,022499
Within Groups	189,1588	168	1,125945					
Total	196,9942	171	1,152013					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	4	
rank sum	5276	3949,5	3361,5	2291	
count	60	49	32	31	172
r^2/n	463936,3	318337,8	353115,1	169312,3	1304701
H					7,15999
df					3
p-value					0,066969
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,451999
medians	0,795838
trimmed	0,469503

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	3,516666667	3,408163265
Variance	1,203107345	0,913265306
Observations	60	49
Hypothesized Mean Difference	0	
df	107	
t Stat	0,551626083	
P(T<=t) one-tail	0,291177384	
t Critical one-tail	1,659219312	
P(T<=t) two-tail	0,582354768	
t Critical two-tail	1,98238337	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	3,408163265	3,875
Variance	0,913265306	1,209677419
Observations	49	32
Hypothesized Mean Difference	0	
df	60	
t Stat	-1,96503209	
P(T<=t) one-tail	0,02702272	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,054045441	
t Critical two-tail	2,000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	3,516666667	3,875
Variance	1,203107345	1,209677419
Observations	60	32
Hypothesized Mean Difference	0	
df	63	
t Stat	-1,48977174	
P(T<=t) one-tail	0,070636943	
t Critical one-tail	1,669402222	
P(T<=t) two-tail	0,141273887	
t Critical two-tail	1,998340543	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	3,408163265	3,193548387
Variance	0,913265306	1,227956989
Observations	49	31
Hypothesized Mean Difference	0	
df	57	
t Stat	0,889228585	
P(T<=t) one-tail	0,188808894	
t Critical one-tail	1,672028888	
P(T<=t) two-tail	0,377617787	
t Critical two-tail	2,002465459	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	3,516666667	3,193548387
Variance	1,203107345	1,227956989
Observations	60	31
Hypothesized Mean Difference	0	
df	60	
t Stat	1,322841694	
P(T<=t) one-tail	0,09545388	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,190907759	
t Critical two-tail	2,000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	3,875	3,193548387
Variance	1,209677419	1,227956989
Observations	32	31
Hypothesized Mean Difference	0	
df	61	
t Stat	2,449206772	
P(T<=t) one-tail	0,008602487	
t Critical one-tail	1,670219484	
P(T<=t) two-tail	0,017204974	
t Critical two-tail	1,999623585	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,516667	60	70,98333	0,016667	3,516667
S2	-1	3,408163	49	43,83673	0,020408	-3,40816
S3		3,875	32	37,5	0	0
S4		3,193548	31	36,83871	0	0
			172	189,1588	0,037075	0,108503

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,144472	0,751035	168	3,6746	-0,42237	0,63938	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,516667	60	70,98333	0,016667	3,516667
S2	-1	3,408163	49	43,83673	0,020408	-3,40816
S3		3,875	32	37,5	0	0
S4		3,193548	31	36,83871	0	0
			172	189,1588	0,037075	0,108503

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,204314	0,531062	0,282027	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,516667	60	70,98333	0,016667	3,516667
S2		3,408163	49	43,83673	0	0
S3	-1	3,875	32	37,5	0,03125	-3,875
S4		3,193548	31	36,83871	0	0
			172	189,1588	0,047917	-0,35833

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,164243	-2,18173	168	3,6746	-0,96186	0,245194	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,516667	60	70,98333	0,016667	3,516667
S2		3,408163	49	43,83673	0	0
S3	-1	3,875	32	37,5	0,03125	-3,875
S4		3,193548	31	36,83871	0	0
			172	189,1588	0,047917	-0,35833

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,232275	-1,54271	2,379965	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,516667	60	70,98333	0,016667	3,516667
S2		3,408163	49	43,83673	0	0
S3		3,875	32	37,5	0	0
S4	-1	3,193548	31	36,83871	0,032258	-3,19355
			172	189,1588	0,048925	0,323118

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,165962	1,946945	168	3,6746	-0,28672	0,932961	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,516667	60	70,98333	0,016667	3,516667
S2		3,408163	49	43,83673	0	0
S3		3,875	32	37,5	0	0
S4	-1	3,193548	31	36,83871	0,032258	-3,19355
			172	189,1588	0,048925	0,323118

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,234705	1,376698	1,895298	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,516667	60	70,98333	0	0
S2	1	3,408163	49	43,83673	0,020408	3,408163
S3	-1	3,875	32	37,5	0,03125	-3,875
S4		3,193548	31	36,83871	0	0
			172	189,1588	0,051658	-0,46684

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,170535	-2,73749	168	3,6746	-1,09348	0,159811	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,516667	60	70,98333	0	0
S2	1	3,408163	49	43,83673	0,020408	3,408163
S3	-1	3,875	32	37,5	0,03125	-3,875
S4		3,193548	31	36,83871	0	0
			172	189,1588	0,051658	-0,46684

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,241173	-1,9357	3,746915	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,516667	60	70,98333	0	0
S2	1	3,408163	49	43,83673	0,020408	3,408163
S3		3,875	32	37,5	0	0
S4	-1	3,193548	31	36,83871	0,032258	-3,19355
			172	189,1588	0,052666	0,214615

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,172191	1,246379	168	3,6746	-0,41812	0,847347	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,516667	60	70,98333	0	0
S2	1	3,408163	49	43,83673	0,020408	3,408163
S3		3,875	32	37,5	0	0
S4	-1	3,193548	31	36,83871	0,032258	-3,19355
			172	189,1588	0,052666	0,214615

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,243514	0,881323	0,77673	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,516667	60	70,98333	0	0
S2		3,408163	49	43,83673	0	0
S3	1	3,875	32	37,5	0,03125	3,875
S4	-1	3,193548	31	36,83871	0,032258	-3,19355
			172	189,1588	0,063508	0,681452

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,189085	3,603935	168	3,6746	-0,01336	1,376265	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,516667	60	70,98333	0	0
S2		3,408163	49	43,83673	0	0
S3	1	3,875	32	37,5	0,03125	3,875
S4	-1	3,193548	31	36,83871	0,032258	-3,19355
			172	189,1588	0,063508	0,681452

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,267407	2,548367	6,494174	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,516667	60	70,98333	0,004167	1,758333
S2	0,5	3,408163	49	43,83673	0,005102	1,704082
S3	-0,5	3,875	32	37,5	0,007813	-1,9375
S4	-0,5	3,193548	31	36,83871	0,008065	-1,59677
			172	189,1588	0,025146	-0,07186

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,11898	-0,60396	168	3,6746	-0,50906	0,365346	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,516667	60	70,98333	0,004167	1,758333
S2	0,5	3,408163	49	43,83673	0,005102	1,704082
S3	-0,5	3,875	32	37,5	0,007813	-1,9375
S4	-0,5	3,193548	31	36,83871	0,008065	-1,59677
			172	189,1588	0,025146	-0,07186

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,168264	-0,42706	0,182383	3	168	7,975197	no

15.12 Industry Comparison – Question 12

ANOVA: Single Factor

DESCRIPTION — Alpha 0,05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	217	3,616667	1,087853	64,18333	0,122075	3,372394	3,860939
S2	49	184	3,755102	0,855442	41,06122	0,135085	3,483496	4,026708
S3	32	126	3,9375	0,383065	11,875	0,167159	3,596578	4,278422
S4	31	113	3,645161	1,103226	33,09677	0,169833	3,298315	3,992007

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	2,388319	3	0,796106	0,890355	0,447427	2,658399	0,153776	-0,00192
Within Groups	150,2163	168	0,894145					
Total	152,6047	171	0,892425					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	4	
rank sum	5020	4294	2968	2596	
count	60	49	32	31	172
r^2/n	420006,7	376294,6	275282	217394,1	1288977
H					0,818797
df					3
p-value					0,844966
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,006459
medians	0,366842
trimmed	0,011496

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3,616666667	3,755102041
Variance	1,087853107	0,855442177
Observations	60	49
Hypothesized Mean Difference	0	
df	106	
t Stat	-0,73382054	
P(T<=t) one-tail	0,232339065	
t Critical one-tail	1,659356034	
P(T<=t) two-tail	0,46467813	
t Critical two-tail	1,982597262	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	3,755102041	3,9375
Variance	0,855442177	0,383064516
Observations	49	32
Hypothesized Mean Difference	0	
df	79	
t Stat	-1,0632464	
P(T<=t) one-tail	0,145454769	
t Critical one-tail	1,664371409	
P(T<=t) two-tail	0,290909538	
t Critical two-tail	1,99045021	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3,616666667	3,9375
Variance	1,087853107	0,383064516
Observations	60	32
Hypothesized Mean Difference	0	
df	89	
t Stat	-1,84920187	
P(T<=t) one-tail	0,033874112	
t Critical one-tail	1,662155326	
P(T<=t) two-tail	0,067748225	
t Critical two-tail	1,9869787	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	3,755102041	3,64516129
Variance	0,855442177	1,103225806
Observations	49	31
Hypothesized Mean Difference	0	
df	58	
t Stat	0,477345301	
P(T<=t) one-tail	0,317455085	
t Critical one-tail	1,671552762	
P(T<=t) two-tail	0,634910169	
t Critical two-tail	2,001717484	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3,616666667	3,64516129
Variance	1,087853107	1,103225806
Observations	60	31
Hypothesized Mean Difference	0	
df	60	
t Stat	-0,12294184	
P(T<=t) one-tail	0,451282022	
t Critical one-tail	1,670648865	
P(T<=t) two-tail	0,902564044	
t Critical two-tail	2,000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3,9375	3,64516129
Variance	0,383064516	1,103225806
Observations	32	31
Hypothesized Mean Difference	0	
df	48	
t Stat	1,340514017	
P(T<=t) one-tail	0,093194351	
t Critical one-tail	1,677224196	
P(T<=t) two-tail	0,186388702	
t Critical two-tail	2,010634758	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,616667	60	64,18333	0,016667	3,616667
S2	-1	3,755102	49	41,06122	0,020408	-3,7551
S3		3,9375	32	11,875	0	0
S4		3,645161	31	33,09677	0	0
			172	150,2163	0,037075	-0,13844

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,128744	-1,07527	168	3,6746	-0,61152	0,334649	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,616667	60	64,18333	0,016667	3,616667
S2	-1	3,755102	49	41,06122	0,020408	-3,7551
S3		3,9375	32	11,875	0	0
S4		3,645161	31	33,09677	0	0
			172	150,2163	0,037075	-0,13844

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,182072	-0,76033	0,578106	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,616667	60	64,18333	0,016667	3,616667
S2		3,755102	49	41,06122	0	0
S3	-1	3,9375	32	11,875	0,03125	-3,9375
S4		3,645161	31	33,09677	0	0
			172	150,2163	0,047917	-0,32083

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,146363	-2,19203	168	3,6746	-0,85866	0,216993	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,616667	60	64,18333	0,016667	3,616667
S2		3,755102	49	41,06122	0	0
S3	-1	3,9375	32	11,875	0,03125	-3,9375
S4		3,645161	31	33,09677	0	0
			172	150,2163	0,047917	-0,32083

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,206989	-1,55	2,402506	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,616667	60	64,18333	0,016667	3,616667
S2		3,755102	49	41,06122	0	0
S3		3,9375	32	11,875	0	0
S4	-1	3,645161	31	33,09677	0,032258	-3,64516
			172	150,2163	0,048925	-0,02849

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,147895	-0,19267	168	3,6746	-0,57195	0,51496	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,616667	60	64,18333	0,016667	3,616667
S2		3,755102	49	41,06122	0	0
S3		3,9375	32	11,875	0	0
S4	-1	3,645161	31	33,09677	0,032258	-3,64516
			172	150,2163	0,048925	-0,02849

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,209155	-0,13624	0,01856	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,616667	60	64,18333	0	0
S2	1	3,755102	49	41,06122	0,020408	3,755102
S3	-1	3,9375	32	11,875	0,03125	-3,9375
S4		3,645161	31	33,09677	0	0
			172	150,2163	0,051658	-0,1824

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,15197	-1,20022	168	3,6746	-0,74083	0,376032	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,616667	60	64,18333	0	0
S2	1	3,755102	49	41,06122	0,020408	3,755102
S3	-1	3,9375	32	11,875	0,03125	-3,9375
S4		3,645161	31	33,09677	0	0
			172	150,2163	0,051658	-0,1824

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,214918	-0,84869	0,720266	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,616667	60	64,18333	0	0
S2	1	3,755102	49	41,06122	0,020408	3,755102
S3		3,9375	32	11,875	0	0
S4	-1	3,645161	31	33,09677	0,032258	-3,64516
			172	150,2163	0,052666	0,109941

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,153446	0,716479	168	3,6746	-0,45391	0,673793	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,616667	60	64,18333	0	0
S2	1	3,755102	49	41,06122	0,020408	3,755102
S3		3,9375	32	11,875	0	0
S4	-1	3,645161	31	33,09677	0,032258	-3,64516
			172	150,2163	0,052666	0,109941

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,217005	0,506627	0,256671	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,616667	60	64,18333	0	0
S2		3,755102	49	41,06122	0	0
S3	1	3,9375	32	11,875	0,03125	3,9375
S4	-1	3,645161	31	33,09677	0,032258	-3,64516
			172	150,2163	0,063508	0,292339

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,168501	1,734934	168	3,6746	-0,32684	0,911514	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,616667	60	64,18333	0	0
S2		3,755102	49	41,06122	0	0
S3	1	3,9375	32	11,875	0,03125	3,9375
S4	-1	3,645161	31	33,09677	0,032258	-3,64516
			172	150,2163	0,063508	0,292339

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,238297	1,226784	1,504998	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,616667	60	64,18333	0,004167	1,808333
S2	0,5	3,755102	49	41,06122	0,005102	1,877551
S3	-0,5	3,9375	32	11,875	0,007813	-1,96875
S4	-0,5	3,645161	31	33,09677	0,008065	-1,82258
			172	150,2163	0,025146	-0,10545

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,106028	-0,99451	168	3,6746	-0,49506	0,284165	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,616667	60	64,18333	0,004167	1,808333
S2	0,5	3,755102	49	41,06122	0,005102	1,877551
S3	-0,5	3,9375	32	11,875	0,007813	-1,96875
S4	-0,5	3,645161	31	33,09677	0,008065	-1,82258
			172	150,2163	0,025146	-0,10545

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,149946	-0,70323	0,494528	3	168	7,975197	no

15.13 Industry Comparison – Question 13

ANOVA: Single Factor

DESCRIPTION Alpha 0,05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	196	3,266667	1,419209	83,73333	0,142334	2,981858	3,551476
S2	49	153	3,122449	1,276361	61,26531	0,157502	2,805771	3,439127
S3	32	135	4,21875	0,69254	21,46875	0,194898	3,821252	4,616248
S4	31	108	3,483871	1,258065	37,74194	0,198017	3,079466	3,888275

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	26,20928	3	8,736427	7,187329	0,000144	2,658399	0,441793	0,097407
Within Groups	204,2093	168	1,215532					
Total	230,4186	171	1,347477					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	3	4	4	
rank sum	4774	3566,5	3820	2717,5	
count	60	49	32	31	172
r^2/n	379851,3	259590,3	456012,5	238219,6	1333674
H					18,84389
df					3
p-value					0,000294
alpha					0,05
sig					yes

Levene's Tests

type	p-value
means	0,00325
medians	0,144599
trimmed	0,005049

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	3,266666667	3,12244898
Variance	1,41920904	1,276360544
Observations	60	49
Hypothesized Mean Difference	0	
df	105	
t Stat	0,646893945	
P(T<=t) one-tail	0,25955612	
t Critical one-tail	1,659495383	
P(T<=t) two-tail	0,519112241	
t Critical two-tail	1,982815274	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	3,12244898	4,21875
Variance	1,276360544	0,692540323
Observations	49	32
Hypothesized Mean Difference	0	
df	78	
t Stat	-5,02014067	
P(T<=t) one-tail	1,59231E-06	
t Critical one-tail	1,664624645	
P(T<=t) two-tail	3,18463E-06	
t Critical two-tail	1,990847069	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	3,266666667	4,21875
Variance	1,41920904	0,692540323
Observations	60	32
Hypothesized Mean Difference	0	
df	83	
t Stat	-4,47350638	
P(T<=t) one-tail	1,21225E-05	
t Critical one-tail	1,663420175	
P(T<=t) two-tail	2,4245E-05	
t Critical two-tail	1,98895978	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	3,12244898	3,483870968
Variance	1,276360544	1,258064516
Observations	49	31
Hypothesized Mean Difference	0	
df	64	
t Stat	-1,40015698	
P(T<=t) one-tail	0,083147802	
t Critical one-tail	1,669013025	
P(T<=t) two-tail	0,166295604	
t Critical two-tail	1,997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	3,266666667	3,483870968
Variance	1,41920904	1,258064516
Observations	60	31
Hypothesized Mean Difference	0	
df	64	
t Stat	-0,85699535	
P(T<=t) one-tail	0,197322574	
t Critical one-tail	1,669013025	
P(T<=t) two-tail	0,394645149	
t Critical two-tail	1,997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	4,21875	3,483870968
Variance	0,692540323	1,258064516
Observations	32	31
Hypothesized Mean Difference	0	
df	55	
t Stat	2,946013683	
P(T<=t) one-tail	0,002356167	
t Critical one-tail	1,673033965	
P(T<=t) two-tail	0,004712334	
t Critical two-tail	2,004044783	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,266667	60	83,73333	0,016667	3,266667
S2	-1	3,122449	49	61,26531	0,020408	-3,12245
S3		4,21875	32	21,46875	0	0
S4		3,483871	31	37,74194	0	0
			172	204,2093	0,037075	0,144218

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,150109	0,960751	168	3,6746	-0,40737	0,695809	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,266667	60	83,73333	0,016667	3,266667
S2	-1	3,122449	49	61,26531	0,020408	-3,12245
S3		4,21875	32	21,46875	0	0
S4		3,483871	31	37,74194	0	0
			172	204,2093	0,037075	0,144218

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,212287	0,679353	0,461521	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,266667	60	83,73333	0,016667	3,266667
S2		3,122449	49	61,26531	0	0
S3	-1	4,21875	32	21,46875	0,03125	-4,21875
S4		3,483871	31	37,74194	0	0
			172	204,2093	0,047917	-0,95208

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,170652	-5,57909	168	3,6746	-1,57916	-0,32501	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,266667	60	83,73333	0,016667	3,266667
S2		3,122449	49	61,26531	0	0
S3	-1	4,21875	32	21,46875	0,03125	-4,21875
S4		3,483871	31	37,74194	0	0
			172	204,2093	0,047917	-0,95208

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,241338	-3,94501	15,56313	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,266667	60	83,73333	0,016667	3,266667
S2		3,122449	49	61,26531	0	0
S3		4,21875	32	21,46875	0	0
S4	-1	3,483871	31	37,74194	0,032258	-3,48387
			172	204,2093	0,048925	-0,2172

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,172438	-1,25961	168	3,6746	-0,85084	0,416435	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3,266667	60	83,73333	0,016667	3,266667
S2		3,122449	49	61,26531	0	0
S3		4,21875	32	21,46875	0	0
S4	-1	3,483871	31	37,74194	0,032258	-3,48387
			172	204,2093	0,048925	-0,2172

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,243864	-0,89068	0,793308	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,266667	60	83,73333	0	0
S2	1	3,122449	49	61,26531	0,020408	3,122449
S3	-1	4,21875	32	21,46875	0,03125	-4,21875
S4		3,483871	31	37,74194	0	0
			172	204,2093	0,051658	-1,0963

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,177189	-6,18717	168	3,6746	-1,7474	-0,4452	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,266667	60	83,73333	0	0
S2	1	3,122449	49	61,26531	0,020408	3,122449
S3	-1	4,21875	32	21,46875	0,03125	-4,21875
S4		3,483871	31	37,74194	0	0
			172	204,2093	0,051658	-1,0963

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,250584	-4,37499	19,14055	3	168	7,975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,266667	60	83,73333	0	0
S2	1	3,122449	49	61,26531	0,020408	3,122449
S3		4,21875	32	21,46875	0	0
S4	-1	3,483871	31	37,74194	0,032258	-3,48387
			172	204,2093	0,052666	-0,36142

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,17891	-2,02013	168	3,6746	-1,01884	0,296	no

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,266667	60	83,73333	0	0
S2	1	3,122449	49	61,26531	0,020408	3,122449
S3		4,21875	32	21,46875	0	0
S4	-1	3,483871	31	37,74194	0,032258	-3,48387
			172	204,2093	0,052666	-0,36142

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,253017	-1,42845	2,040472	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,266667	60	83,73333	0	0
S2		3,122449	49	61,26531	0	0
S3	1	4,21875	32	21,46875	0,03125	4,21875
S4	-1	3,483871	31	37,74194	0,032258	-3,48387
			172	204,2093	0,063508	0,734879

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,196464	3,740531	168	3,6746	0,012953	1,456805	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3,266667	60	83,73333	0	0
S2		3,122449	49	61,26531	0	0
S3	1	4,21875	32	21,46875	0,03125	4,21875
S4	-1	3,483871	31	37,74194	0,032258	-3,48387
			172	204,2093	0,063508	0,734879

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,277842	2,644955	6,995787	3	168	7,975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,266667	60	83,73333	0,004167	1,633333
S2	0,5	3,122449	49	61,26531	0,005102	1,561224
S3	-0,5	4,21875	32	21,46875	0,007813	-2,10938
S4	-0,5	3,483871	31	37,74194	0,008065	-1,74194
			172	204,2093	0,025146	-0,65675

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0,123623	-5,31253	168	3,6746	-1,11102	-0,20249	yes

SCHEFFE's CONTRAST					Alpha	0,05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0,5	3,266667	60	83,73333	0,004167	1,633333
S2	0,5	3,122449	49	61,26531	0,005102	1,561224
S3	-0,5	4,21875	32	21,46875	0,007813	-2,10938
S4	-0,5	3,483871	31	37,74194	0,008065	-1,74194
			172	204,2093	0,025146	-0,65675

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0,17483	-3,75653	14,1115	3	168	7,975197	yes

15.14 Industry Comparison – Question 14

ANOVA: Single Factor

DESCRIPTION Alpha 0.05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	211	3.516667	1.135311	66.98333	0.132057	3.252421	3.780913
S2	49	159	3.244898	1.355442	65.06122	0.14613	2.951083	3.538712
S3	32	136	4.25	0.580645	18	0.180827	3.881201	4.618799
S4	31	109	3.516129	0.858065	25.74194	0.18372	3.140922	3.891336

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	20.23095	3	6.74365	6.444938	0.000372	2.658399	0.421806	0.086733
Within Groups	175.7865	168	1.046348					
Total	196.0174	171	1.146301					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	4	
rank sum	4979.5	3584	3761	2553.5	
count	60	49	32	31	172
r^2/n	413257	262144	442035	210334.3	1327770
H					16.46322
df					3
p-value					0.000911
alpha					0.05
sig					yes

Levene's Tests

type	p-value
means	0.005987
medians	0.069593
trimmed	0.007491

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	3.516666667	3.244897959
Variance	1.135310734	1.355442177
Observations	60	49
Hypothesized Mean Difference	0	
df	99	
t Stat	1.259161345	
P(T<=t) one-tail	0.105466434	
t Critical one-tail	1.660391156	
P(T<=t) two-tail	0.210932868	
t Critical two-tail	1.984216952	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	3.244897959	4.25
Variance	1.355442177	0.580645161
Observations	49	32
Hypothesized Mean Difference	0	
df	79	
t Stat	-4.6961619	
P(T<=t) one-tail	5.49788E-06	
t Critical one-tail	1.664371409	
P(T<=t) two-tail	1.09958E-05	
t Critical two-tail	1.99045021	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	3.516666667	4.25
Variance	1.135310734	0.580645161
Observations	60	32
Hypothesized Mean Difference	0	
df	82	
t Stat	-3.80897101	
P(T<=t) one-tail	0.000134236	
t Critical one-tail	1.663649184	
P(T<=t) two-tail	0.000268472	
t Critical two-tail	1.989318557	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	3.244897959	3.516129032
Variance	1.355442177	0.858064516
Observations	49	31
Hypothesized Mean Difference	0	
df	74	
t Stat	-1.15295841	
P(T<=t) one-tail	0.126319082	
t Critical one-tail	1.665706893	
P(T<=t) two-tail	0.252638163	
t Critical two-tail	1.992543495	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	3.516666667	3.516129032
Variance	1.135310734	0.858064516
Observations	60	31
Hypothesized Mean Difference	0	
df	69	
t Stat	0.002490507	
P(T<=t) one-tail	0.499010026	
t Critical one-tail	1.667238549	
P(T<=t) two-tail	0.998020051	
t Critical two-tail	1.994945415	

t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	4.25	3.516129032
Variance	0.580645161	0.858064516
Observations	32	31
Hypothesized Mean Difference	0	
df	58	
t Stat	3.428230962	
P(T<=t) one-tail	0.000561969	
t Critical one-tail	1.671552762	
P(T<=t) two-tail	0.001123939	
t Critical two-tail	2.001717484	

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.516667	60	66.98333	0.016667	3.516667	
S2	-1	3.244898	49	65.06122	0.020408	-3.2449	
S3		4.25	32	18	0	0	
S4		3.516129	31	25.74194	0	0	
			172	175.7865	0.037075	0.271769	

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.139272	1.951357	168	3.6746	-0.24	0.783536	no

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.516667	60	66.98333	0.016667	3.516667	
S2	-1	3.244898	49	65.06122	0.020408	-3.2449	
S3		4.25	32	18	0	0	
S4		3.516129	31	25.74194	0	0	
			172	175.7865	0.037075	0.271769	

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.19696	1.379818	1.903897	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.516667	60	66.98333	0.016667	3.516667	
S2		3.244898	49	65.06122	0	0	
S3	-1	4.25	32	18	0.03125	-4.25	
S4		3.516129	31	25.74194	0	0	
			172	175.7865	0.047917	-0.73333	

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.158331	-4.63164	168	3.6746	-1.31514	-0.15153	yes

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.516667	60	66.98333	0.016667	3.516667	
S2		3.244898	49	65.06122	0	0	
S3	-1	4.25	32	18	0.03125	-4.25	
S4		3.516129	31	25.74194	0	0	
			172	175.7865	0.047917	-0.73333	

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.223914	-3.27507	10.72606	3	168	7.975197	yes

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.516667	60	66.98333	0.016667	3.516667	
S2		3.244898	49	65.06122	0	0	
S3		4.25	32	18	0	0	
S4	-1	3.516129	31	25.74194	0.032258	-3.51613	
			172	175.7865	0.048925	0.000538	

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.159988	0.00336	168	3.6746	-0.58735	0.588429	no

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.516667	60	66.98333	0.016667	3.516667	
S2		3.244898	49	65.06122	0	0	
S3		4.25	32	18	0	0	
S4	-1	3.516129	31	25.74194	0.032258	-3.51613	
			172	175.7865	0.048925	0.000538	

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.226257	0.002376	5.65E-06	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.516667	60	66.98333	0	0	
S2	1	3.244898	49	65.06122	0.020408	3.244898	
S3	-1	4.25	32	18	0.03125	-4.25	
S4		3.516129	31	25.74194	0	0	
			172	175.7865	0.051658	-1.0051	

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.164397	-6.11389	168	3.6746	-1.60919	-0.40101	yes

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.516667	60	66.98333	0	0	
S2	1	3.244898	49	65.06122	0.020408	3.244898	
S3	-1	4.25	32	18	0.03125	-4.25	
S4		3.516129	31	25.74194	0	0	
			172	175.7865	0.051658	-1.0051	

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.232492	-4.32317	18.68982	3	168	7.975197	yes

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.516667	60	66.98333	0	0	
S2	1	3.244898	49	65.06122	0.020408	3.244898	
S3		4.25	32	18	0	0	
S4	-1	3.516129	31	25.74194	0.032258	-3.51613	
			172	175.7865	0.052666	-0.27123	

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.165993	-1.63399	168	3.6746	-0.88119	0.338726	no

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.516667	60	66.98333	0	0	
S2	1	3.244898	49	65.06122	0.020408	3.244898	
S3		4.25	32	18	0	0	
S4	-1	3.516129	31	25.74194	0.032258	-3.51613	
			172	175.7865	0.052666	-0.27123	

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.234749	-1.15541	1.334967	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.516667	60	66.98333	0	0	
S2		3.244898	49	65.06122	0	0	
S3	1	4.25	32	18	0.03125	4.25	
S4	-1	3.516129	31	25.74194	0.032258	-3.51613	
			172	175.7865	0.063508	0.733871	

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.182279	4.026078	168	3.6746	0.064067	1.403675	yes

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.516667	60	66.98333	0	0	
S2		3.244898	49	65.06122	0	0	
S3	1	4.25	32	18	0.03125	4.25	
S4	-1	3.516129	31	25.74194	0.032258	-3.51613	
			172	175.7865	0.063508	0.733871	

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.257782	2.846867	8.104651	3	168	7.975197	yes

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	0.5	3.516667	60	66.98333	0.004167	1.758333	
S2	0.5	3.244898	49	65.06122	0.005102	1.622449	
S3	-0.5	4.25	32	18	0.007813	-2.125	
S4	-0.5	3.516129	31	25.74194	0.008065	-1.75806	
			172	175.7865	0.025146	-0.50228	

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.114698	-4.37918	168	3.6746	-0.92375	-0.08081	yes

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	0.5	3.516667	60	66.98333	0.004167	1.758333	
S2	0.5	3.244898	49	65.06122	0.005102	1.622449	
S3	-0.5	4.25	32	18	0.007813	-2.125	
S4	-0.5	3.516129	31	25.74194	0.008065	-1.75806	
			172	175.7865	0.025146	-0.50228	

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.162207	-3.09655	9.5886	3	168	7.975197	yes

15.15 Industry Comparison – Question 15

ANOVA: Single Factor

DESCRIPTION Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	204	3.4	1.328814	78.4	0.150119	3.099612	3.700388
S2	49	158	3.22449	1.219388	58.53061	0.166117	2.890489	3.55849
S3	32	122	3.8125	1.770161	54.875	0.205559	3.393259	4.231741
S4	31	112	3.612903	1.178495	35.35484	0.208848	3.186378	4.039428

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	7.630247	3	2.543416	1.881022	0.134698	2.658399	0.219639	0.015134
Within Groups	227.1605	168	1.352146					
Total	234.7907	171	1.373045					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	4	
rank sum	5006	3712.5	3318	2841.5	
count	60	49	32	31	172
r^2/n	417667.3	281278.7	344035.1	260455.6	1303437
H					6.649945
df					3
p-value					0.083933
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.190848
medians	0.405226
trimmed	0.197544

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3.4	3.224489796
Variance	1.328813559	1.219387755
Observations	60	49
Hypothesized Mean Difference	0	
df	104	
t Stat	0.809289674	
P(T<=t) one-tail	0.210098107	
t Critical one-tail	1.659637437	
P(T<=t) two-tail	0.420196213	
t Critical two-tail	1.983037526	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	3.224489796	3.8125
Variance	1.219387755	1.77016129
Observations	49	32
Hypothesized Mean Difference	0	
df	58	
t Stat	-2.07629732	
P(T<=t) one-tail	0.021153997	
t Critical one-tail	1.671552762	
P(T<=t) two-tail	0.042307994	
t Critical two-tail	2.001717484	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3.4	3.8125
Variance	1.328813559	1.77016129
Observations	60	32
Hypothesized Mean Difference	0	
df	56	
t Stat	-1.48208387	
P(T<=t) one-tail	0.07196185	
t Critical one-tail	1.672522303	
P(T<=t) two-tail	0.143923701	
t Critical two-tail	2.003240719	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	3.224489796	3.612903226
Variance	1.219387755	1.178494624
Observations	49	31
Hypothesized Mean Difference	0	
df	65	
t Stat	-1.54868828	
P(T<=t) one-tail	0.063156087	
t Critical one-tail	1.668635976	
P(T<=t) two-tail	0.126312173	
t Critical two-tail	1.997137908	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3.4	3.612903226
Variance	1.328813559	1.178494624
Observations	60	31
Hypothesized Mean Difference	0	
df	64	
t Stat	-0.86799665	
P(T<=t) one-tail	0.194319656	
t Critical one-tail	1.669013025	
P(T<=t) two-tail	0.388639312	
t Critical two-tail	1.997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3.8125	3.612903226
Variance	1.77016129	1.178494624
Observations	32	31
Hypothesized Mean Difference	0	
df	59	
t Stat	0.653333235	
P(T<=t) one-tail	0.258039785	
t Critical one-tail	1.671093032	
P(T<=t) two-tail	0.51607957	
t Critical two-tail	2.000995378	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.4	60	78.4	0.016667	3.4
S2	-1	3.22449	49	58.53061	0.020408	-3.22449
S3		3.8125	32	54.875	0	0
S4		3.612903	31	35.35484	0	0
			172	227.1605	0.037075	0.17551

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.15832	1.108578	168	3.6746	-0.40625	0.757274	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.4	60	78.4	0.016667	3.4
S2	-1	3.22449	49	58.53061	0.020408	-3.22449
S3		3.8125	32	54.875	0	0
S4		3.612903	31	35.35484	0	0
			172	227.1605	0.037075	0.17551

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.223899	0.783883	0.614472	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.4	60	78.4	0.016667	3.4
S2		3.22449	49	58.53061	0	0
S3	-1	3.8125	32	54.875	0.03125	-3.8125
S4		3.612903	31	35.35484	0	0
			172	227.1605	0.047917	-0.4125

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.179987	-2.29184	168	3.6746	-1.07388	0.248879	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.4	60	78.4	0.016667	3.4
S2		3.22449	49	58.53061	0	0
S3	-1	3.8125	32	54.875	0.03125	-3.8125
S4		3.612903	31	35.35484	0	0
			172	227.1605	0.047917	-0.4125

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.254539	-1.62057	2.626261	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.4	60	78.4	0.016667	3.4
S2		3.22449	49	58.53061	0	0
S3		3.8125	32	54.875	0	0
S4	-1	3.612903	31	35.35484	0.032258	-3.6129
			172	227.1605	0.048925	-0.2129

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.18187	-1.17063	168	3.6746	-0.8812	0.455396	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.4	60	78.4	0.016667	3.4
S2		3.22449	49	58.53061	0	0
S3		3.8125	32	54.875	0	0
S4	-1	3.612903	31	35.35484	0.032258	-3.6129
			172	227.1605	0.048925	-0.2129

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.257203	-0.82776	0.685192	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.4	60	78.4	0	0
S2	1	3.22449	49	58.53061	0.020408	3.22449
S3	-1	3.8125	32	54.875	0.03125	-3.8125
S4		3.612903	31	35.35484	0	0
			172	227.1605	0.051658	-0.58801

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.186881	-3.14643	168	3.6746	-1.27472	0.098704	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.4	60	78.4	0	0
S2	1	3.22449	49	58.53061	0.020408	3.22449
S3	-1	3.8125	32	54.875	0.03125	-3.8125
S4		3.612903	31	35.35484	0	0
			172	227.1605	0.051658	-0.58801

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.26429	-2.22486	4.950024	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.4	60	78.4	0	0
S2	1	3.22449	49	58.53061	0.020408	3.22449
S3		3.8125	32	54.875	0	0
S4	-1	3.612903	31	35.35484	0.032258	-3.6129
			172	227.1605	0.052666	-0.38841

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.188696	-2.05841	168	3.6746	-1.0818	0.304969	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.4	60	78.4	0	0
S2	1	3.22449	49	58.53061	0.020408	3.22449
S3		3.8125	32	54.875	0	0
S4	-1	3.612903	31	35.35484	0.032258	-3.6129
			172	227.1605	0.052666	-0.38841

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.266857	-1.45551	2.118521	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.4	60	78.4	0	0
S2		3.22449	49	58.53061	0	0
S3	1	3.8125	32	54.875	0.03125	3.8125
S4	-1	3.612903	31	35.35484	0.032258	-3.6129
			172	227.1605	0.063508	0.199597

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.20721	0.963257	168	3.6746	-0.56182	0.961011	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.4	60	78.4	0	0
S2		3.22449	49	58.53061	0	0
S3	1	3.8125	32	54.875	0.03125	3.8125
S4	-1	3.612903	31	35.35484	0.032258	-3.6129
			172	227.1605	0.063508	0.199597

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.293039	0.681126	0.463932	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.4	60	78.4	0.004167	1.7
S2	0.5	3.22449	49	58.53061	0.005102	1.612245
S3	-0.5	3.8125	32	54.875	0.007813	-1.90625
S4	-0.5	3.612903	31	35.35484	0.008065	-1.80645
			172	227.1605	0.025146	-0.40046

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.130385	-3.07133	168	3.6746	-0.87957	0.078657	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.4	60	78.4	0.004167	1.7
S2	0.5	3.22449	49	58.53061	0.005102	1.612245
S3	-0.5	3.8125	32	54.875	0.007813	-1.90625
S4	-0.5	3.612903	31	35.35484	0.008065	-1.80645
			172	227.1605	0.025146	-0.40046

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.184393	-2.17176	4.716541	3	168	7.975197	no

15.16 Industry Comparison – Question 16

ANOVA: Single Factor

DESCRIPTION Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	184	3.066667	1.181921	69.73333	0.139798	2.786932	3.346401
S2	49	152	3.102041	1.010204	48.4898	0.154695	2.791005	3.413077
S3	32	112	3.5	1.354839	42	0.191426	3.109584	3.890416
S4	31	103	3.322581	1.225806	36.77419	0.194489	2.925381	3.71978

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	4.880584	3	1.626861	1.387393	0.248419	2.658399	0.187181	0.006712
Within Groups	196.9973	168	1.172603					
Total	201.8779	171	1.180573					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	3	3	4	4	
rank sum	4831.5	4002	3208.5	2836	
count	60	49	32	31	172
r^2/n	389056.5	326857.2	321702.3	259448.3	1297064
H					4.080096
df					3
p-value					0.252944
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.80013544
medians	0.91484596
trimmed	0.84636879

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3.066666667	3.102040816
Variance	1.181920904	1.010204082
Observations	60	49
Hypothesized Mean Difference	0	
df	105	
t Stat	-0.17617821	
P(T<=t) one-tail	0.430246644	
t Critical one-tail	1.659495383	
P(T<=t) two-tail	0.860493288	
t Critical two-tail	1.982815274	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	3.102040816	3.5
Variance	1.010204082	1.35483871
Observations	49	32
Hypothesized Mean Difference	0	
df	59	
t Stat	-1.58607239	
P(T<=t) one-tail	0.059034251	
t Critical one-tail	1.671093032	
P(T<=t) two-tail	0.118068502	
t Critical two-tail	2.000995378	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3.066666667	3.5
Variance	1.181920904	1.35483871
Observations	60	32
Hypothesized Mean Difference	0	
df	60	
t Stat	-1.739784	
P(T<=t) one-tail	0.04351226	
t Critical one-tail	1.670648865	
P(T<=t) two-tail	0.087024519	
t Critical two-tail	2.000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	3.102040816	3.322580645
Variance	1.010204082	1.225806452
Observations	49	31
Hypothesized Mean Difference	0	
df	59	
t Stat	-0.89916282	
P(T<=t) one-tail	0.186110561	
t Critical one-tail	1.671093032	
P(T<=t) two-tail	0.372221122	
t Critical two-tail	2.000995378	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3.066666667	3.322580645
Variance	1.181920904	1.225806452
Observations	60	31
Hypothesized Mean Difference	0	
df	60	
t Stat	-1.05143749	
P(T<=t) one-tail	0.148637027	
t Critical one-tail	1.670648865	
P(T<=t) two-tail	0.297274054	
t Critical two-tail	2.000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3.5	3.322580645
Variance	1.35483871	1.225806452
Observations	32	31
Hypothesized Mean Difference	0	
df	61	
t Stat	0.620025878	
P(T<=t) one-tail	0.268775074	
t Critical one-tail	1.670219484	
P(T<=t) two-tail	0.537550148	
t Critical two-tail	1.999623585	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.066667	60	69.73333	0.016667	3.066667
S2	-1	3.102041	49	48.4898	0.020408	-3.10204
S3		3.5	32	42	0	0
S4		3.322581	31	36.77419	0	0
			172	196.9973	0.037075	-0.03537

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.147435	-0.23993	168	3.6746	-0.57714	0.50639	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.066667	60	69.73333	0.016667	3.066667
S2	-1	3.102041	49	48.4898	0.020408	-3.10204
S3		3.5	32	42	0	0
S4		3.322581	31	36.77419	0	0
			172	196.9973	0.037075	-0.03537

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.208504	-0.16966	0.028783	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.066667	60	69.73333	0.016667	3.066667
S2		3.102041	49	48.4898	0	0
S3	-1	3.5	32	42	0.03125	-3.5
S4		3.322581	31	36.77419	0	0
			172	196.9973	0.047917	-0.43333

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.167612	-2.58534	168	3.6746	-1.04924	0.182572	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.066667	60	69.73333	0.016667	3.066667
S2		3.102041	49	48.4898	0	0
S3	-1	3.5	32	42	0.03125	-3.5
S4		3.322581	31	36.77419	0	0
			172	196.9973	0.047917	-0.43333

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.237038	-1.82811	3.342001	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.066667	60	69.73333	0.016667	3.066667
S2		3.102041	49	48.4898	0	0
S3		3.5	32	42	0	0
S4	-1	3.322581	31	36.77419	0.032258	-3.32258
			172	196.9973	0.048925	-0.25591

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.169365	-1.51102	168	3.6746	-0.87826	0.366436	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.066667	60	69.73333	0.016667	3.066667
S2		3.102041	49	48.4898	0	0
S3		3.5	32	42	0	0
S4	-1	3.322581	31	36.77419	0.032258	-3.32258
			172	196.9973	0.048925	-0.25591

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.239519	-1.06845	1.141586	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.066667	60	69.73333	0	0
S2	1	3.102041	49	48.4898	0.020408	3.102041
S3	-1	3.5	32	42	0.03125	-3.5
S4		3.322581	31	36.77419	0	0
			172	196.9973	0.051658	-0.39796

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.174032	-2.2867	168	3.6746	-1.03746	0.24154	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.066667	60	69.73333	0	0
S2	1	3.102041	49	48.4898	0.020408	3.102041
S3	-1	3.5	32	42	0.03125	-3.5
S4		3.322581	31	36.77419	0	0
			172	196.9973	0.051658	-0.39796

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.246119	-1.61694	2.61449	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.066667	60	69.73333	0	0
S2	1	3.102041	49	48.4898	0.020408	3.102041
S3		3.5	32	42	0	0
S4	-1	3.322581	31	36.77419	0.032258	-3.32258
			172	196.9973	0.052666	-0.22054

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.175722	-1.25505	168	3.6746	-0.86625	0.425169	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.066667	60	69.73333	0	0
S2	1	3.102041	49	48.4898	0.020408	3.102041
S3		3.5	32	42	0	0
S4	-1	3.322581	31	36.77419	0.032258	-3.32258
			172	196.9973	0.052666	-0.22054

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.248509	-0.88745	0.787573	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.066667	60	69.73333	0	0
S2		3.102041	49	48.4898	0	0
S3	1	3.5	32	42	0.03125	3.5
S4	-1	3.322581	31	36.77419	0.032258	-3.32258
			172	196.9973	0.063508	0.177419

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.192963	0.919446	168	3.6746	-0.53164	0.886483	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.066667	60	69.73333	0	0
S2		3.102041	49	48.4898	0	0
S3	1	3.5	32	42	0.03125	3.5
S4	-1	3.322581	31	36.77419	0.032258	-3.32258
			172	196.9973	0.063508	0.177419

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.272891	0.650146	0.42269	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.066667	60	69.73333	0.004167	1.533333
S2	0.5	3.102041	49	48.4898	0.005102	1.55102
S3	-0.5	3.5	32	42	0.007813	-1.75
S4	-0.5	3.322581	31	36.77419	0.008065	-1.66129
			172	196.9973	0.025146	-0.32694

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.121421	-2.69259	168	3.6746	-0.77311	0.119236	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.066667	60	69.73333	0.004167	1.533333
S2	0.5	3.102041	49	48.4898	0.005102	1.55102
S3	-0.5	3.5	32	42	0.007813	-1.75
S4	-0.5	3.322581	31	36.77419	0.008065	-1.66129
			172	196.9973	0.025146	-0.32694

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.171715	-1.90395	3.625032	3	168	7.975197	no

15.17 **Industry Comparison – Question 17**

ANOVA: Single Factor

DESCRIPTION Alpha 0.05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	176	2.933333	1.385311	81.73333	0.148245	2.636697	3.22997
S2	49	127	2.591837	1.038265	49.83673	0.164043	2.262007	2.921666
S3	32	105	3.28125	1.628024	50.46875	0.202992	2.867245	3.695255
S4	31	89	2.870968	1.316129	39.48387	0.20624	2.449769	3.292167

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	9.378474	3	3.126158	2.370839	0.072323	2.658399	0.246711	0.023352
Within Groups	221.5227	168	1.318587					
Total	230.9012	171	1.350299					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	3	2	4	3	
rank sum	5300.5	3657.5	3263	2657	
count	60	49	32	31	172
r^2/n	468255	273006.3	332724	227730.6	1301716
H					5.956001
df					3
p-value					0.113771
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.07214365
medians	0.57098363
trimmed	0.07739789

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	2.933333333	2.591836735
Variance	1.385310734	1.038265306
Observations	60	49
Hypothesized Mean Difference	0	
df	107	
t Stat	1.622909661	
P(T<=t) one-tail	0.053775724	
t Critical one-tail	1.659219312	
P(T<=t) two-tail	0.107551448	
t Critical two-tail	1.98238337	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	2.591836735	3.28125
Variance	1.038265306	1.628024194
Observations	49	32
Hypothesized Mean Difference	0	
df	56	
t Stat	-2.56813536	
P(T<=t) one-tail	0.006459854	
t Critical one-tail	1.672522303	
P(T<=t) two-tail	0.012919709	
t Critical two-tail	2.003240719	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	2.933333333	3.28125
Variance	1.385310734	1.628024194
Observations	60	32
Hypothesized Mean Difference	0	
df	59	
t Stat	-1.279276	
P(T<=t) one-tail	0.102904117	
t Critical one-tail	1.671093032	
P(T<=t) two-tail	0.205808235	
t Critical two-tail	2.000995378	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	2.591836735	2.870967742
Variance	1.038265306	1.316129032
Observations	49	31
Hypothesized Mean Difference	0	
df	58	
t Stat	-1.10643627	
P(T<=t) one-tail	0.136552906	
t Critical one-tail	1.671552762	
P(T<=t) two-tail	0.273105812	
t Critical two-tail	2.001717484	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	2.933333333	2.870967742
Variance	1.385310734	1.316129032
Observations	60	31
Hypothesized Mean Difference	0	
df	62	
t Stat	0.243600189	
P(T<=t) one-tail	0.404172359	
t Critical one-tail	1.669804163	
P(T<=t) two-tail	0.808344717	
t Critical two-tail	1.998971517	

t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	3.28125	2.870967742
Variance	1.628024194	1.316129032
Observations	32	31
Hypothesized Mean Difference	0	
df	61	
t Stat	1.342976896	
P(T<=t) one-tail	0.092127608	
t Critical one-tail	1.670219484	
P(T<=t) two-tail	0.184255217	
t Critical two-tail	1.999623585	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.933333	60	81.73333	0.016667	2.933333
S2	-1	2.591837	49	49.83673	0.020408	-2.59184
S3		3.28125	32	50.46875	0	0
S4		2.870968	31	39.48387	0	0
			172	221.5227	0.037075	0.341497

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.156343	2.184275	168	3.6746	-0.233	0.915995	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.933333	60	81.73333	0.016667	2.933333
S2	-1	2.591837	49	49.83673	0.020408	-2.59184
S3		3.28125	32	50.46875	0	0
S4		2.870968	31	39.48387	0	0
			172	221.5227	0.037075	0.341497

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.221103	1.544516	2.385529	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.933333	60	81.73333	0.016667	2.933333
S2		2.591837	49	49.83673	0	0
S3	-1	3.28125	32	50.46875	0.03125	-3.28125
S4		2.870968	31	39.48387	0	0
			172	221.5227	0.047917	-0.34792

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.177739	-1.95746	168	3.6746	-1.00104	0.305203	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.933333	60	81.73333	0.016667	2.933333
S2		2.591837	49	49.83673	0	0
S3	-1	3.28125	32	50.46875	0.03125	-3.28125
S4		2.870968	31	39.48387	0	0
			172	221.5227	0.047917	-0.34792

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.251361	-1.38413	1.915821	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.933333	60	81.73333	0.016667	2.933333
S2		2.591837	49	49.83673	0	0
S3		3.28125	32	50.46875	0	0
S4	-1	2.870968	31	39.48387	0.032258	-2.87097
			172	221.5227	0.048925	0.062366

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.179599	0.347249	168	3.6746	-0.59759	0.72232	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.933333	60	81.73333	0.016667	2.933333
S2		2.591837	49	49.83673	0	0
S3		3.28125	32	50.46875	0	0
S4	-1	2.870968	31	39.48387	0.032258	-2.87097
			172	221.5227	0.048925	0.062366

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.253991	0.245542	0.060291	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.933333	60	81.73333	0	0
S2	1	2.591837	49	49.83673	0.020408	2.591837
S3	-1	3.28125	32	50.46875	0.03125	-3.28125
S4		2.870968	31	39.48387	0	0
			172	221.5227	0.051658	-0.68941

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.184548	-3.73569	168	3.6746	-1.36755	-0.01127	yes

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.933333	60	81.73333	0	0
S2	1	2.591837	49	49.83673	0.020408	2.591837
S3	-1	3.28125	32	50.46875	0.03125	-3.28125
S4		2.870968	31	39.48387	0	0
			172	221.5227	0.051658	-0.68941

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.26099	-2.64153	6.977685	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.933333	60	81.73333	0	0
S2	1	2.591837	49	49.83673	0.020408	2.591837
S3		3.28125	32	50.46875	0	0
S4	-1	2.870968	31	39.48387	0.032258	-2.87097
			172	221.5227	0.052666	-0.27913

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.18634	-1.49797	168	3.6746	-0.96386	0.405593	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.933333	60	81.73333	0	0
S2	1	2.591837	49	49.83673	0.020408	2.591837
S3		3.28125	32	50.46875	0	0
S4	-1	2.870968	31	39.48387	0.032258	-2.87097
			172	221.5227	0.052666	-0.27913

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.263524	-1.05922	1.121954	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.933333	60	81.73333	0	0
S2		2.591837	49	49.83673	0	0
S3	1	3.28125	32	50.46875	0.03125	3.28125
S4	-1	2.870968	31	39.48387	0.032258	-2.87097
			172	221.5227	0.063508	0.410282

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.204623	2.005067	168	3.6746	-0.34162	1.162189	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.933333	60	81.73333	0	0
S2		2.591837	49	49.83673	0	0
S3	1	3.28125	32	50.46875	0.03125	3.28125
S4	-1	2.870968	31	39.48387	0.032258	-2.87097
			172	221.5227	0.063508	0.410282

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.28938	1.417796	2.010146	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	2.933333	60	81.73333	0.004167	1.466667
S2	0.5	2.591837	49	49.83673	0.005102	1.295918
S3	-0.5	3.28125	32	50.46875	0.007813	-1.64063
S4	-0.5	2.870968	31	39.48387	0.008065	-1.43548
			172	221.5227	0.025146	-0.31352

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.128757	-2.435	168	3.6746	-0.78666	0.159607	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	2.933333	60	81.73333	0.004167	1.466667
S2	0.5	2.591837	49	49.83673	0.005102	1.295918
S3	-0.5	3.28125	32	50.46875	0.007813	-1.64063
S4	-0.5	2.870968	31	39.48387	0.008065	-1.43548
			172	221.5227	0.025146	-0.31352

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.18209	-1.72181	2.964613	3	168	7.975197	no

15.18 Industry Comparison – Question 18

ANOVA: Single Factor

DESCRIPTION — Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	139	2.316667	0.965819	56.98333	0.139679	2.03717	2.596164
S2	49	114	2.326531	1.182823	56.77551	0.154564	2.015759	2.637303
S3	32	129	4.03125	1.321573	40.96875	0.191263	3.641166	4.421334
S4	31	85	2.741935	1.397849	41.93548	0.194324	2.345073	3.138798

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	72.37762	3	24.12587	20.6096	2.02E-11	2.658399	0.748102	0.254859
Within Groups	196.6631	168	1.170614					
Total	269.0407	171	1.573337					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	2	2	4	3	
rank sum	4322.5	3547	4276	2732.5	
count	60	49	32	31	172
r^2/n	311400.1	256759.4	571380.5	240856.7	1380397
H					37.68637
df					3
p-value					3.29E-08
alpha					0.05
sig					yes

Levene's Tests

type	p-value
means	0.532936
medians	0.39048
trimmed	0.521197

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	2.316666667	2.326530612
Variance	0.965819209	1.182823129
Observations	60	49
Hypothesized Mean Difference	0	
df	98	
t Stat	-0.04917473	
P(T<=t) one-tail	0.480440065	
t Critical one-tail	1.660551217	
P(T<=t) two-tail	0.96088013	
t Critical two-tail	1.984467455	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	2.326530612	4.03125
Variance	1.182823129	1.321572581
Observations	49	32
Hypothesized Mean Difference	0	
df	64	
t Stat	-6.66402466	
P(T<=t) one-tail	3.6019E-09	
t Critical one-tail	1.669013025	
P(T<=t) two-tail	7.2038E-09	
t Critical two-tail	1.997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	2.316666667	4.03125
Variance	0.965819209	1.321572581
Observations	60	32
Hypothesized Mean Difference	0	
df	55	
t Stat	-7.15677383	
P(T<=t) one-tail	1.04392E-09	
t Critical one-tail	1.673033965	
P(T<=t) two-tail	2.08783E-09	
t Critical two-tail	2.004044783	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	2.326530612	2.741935484
Variance	1.182823129	1.397849462
Observations	49	31
Hypothesized Mean Difference	0	
df	60	
t Stat	-1.5787769	
P(T<=t) one-tail	0.059822669	
t Critical one-tail	1.670648865	
P(T<=t) two-tail	0.119645338	
t Critical two-tail	2.000297822	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	2.316666667	2.741935484
Variance	0.965819209	1.397849462
Observations	60	31
Hypothesized Mean Difference	0	
df	52	
t Stat	-1.71920315	
P(T<=t) one-tail	0.045762815	
t Critical one-tail	1.674689154	
P(T<=t) two-tail	0.09152563	
t Critical two-tail	2.006646805	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	4.03125	2.741935484
Variance	1.321572581	1.397849462
Observations	32	31
Hypothesized Mean Difference	0	
df	61	
t Stat	4.386563976	
P(T<=t) one-tail	2.31837E-05	
t Critical one-tail	1.670219484	
P(T<=t) two-tail	4.63673E-05	
t Critical two-tail	1.999623585	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.316667	60	56.98333	0.016667	2.316667
S2	-1	2.326531	49	56.77551	0.020408	-2.32653
S3		4.03125	32	40.96875	0	0
S4		2.741935	31	41.93548	0	0
			172	196.6631	0.037075	-0.00986

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.14731	-0.06696	168	3.6746	-0.55117	0.53144	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.316667	60	56.98333	0.016667	2.316667
S2	-1	2.326531	49	56.77551	0.020408	-2.32653
S3		4.03125	32	40.96875	0	0
S4		2.741935	31	41.93548	0	0
			172	196.6631	0.037075	-0.00986

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.208327	-0.04735	0.002242	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.316667	60	56.98333	0.016667	2.316667
S2		2.326531	49	56.77551	0	0
S3	-1	4.03125	32	40.96875	0.03125	-4.03125
S4		2.741935	31	41.93548	0	0
			172	196.6631	0.047917	-1.71458

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.167469	-10.2382	168	3.6746	-2.32997	-1.0992	yes

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.316667	60	56.98333	0.016667	2.316667
S2		2.326531	49	56.77551	0	0
S3	-1	4.03125	32	40.96875	0.03125	-4.03125
S4		2.741935	31	41.93548	0	0
			172	196.6631	0.047917	-1.71458

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.236837	-7.2395	52.41035	3	168	7.975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.316667	60	56.98333	0.016667	2.316667
S2		4.03125	32	40.96875	0	0
S3		2.326531	49	56.77551	0	0
S4	-1	2.741935	31	41.93548	0.032258	-2.74194
			172	196.6631	0.048925	-0.42527

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.169222	-2.51309	168	3.6746	-1.04709	0.196553	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.316667	60	56.98333	0.016667	2.316667
S2		2.326531	49	56.77551	0	0
S3		4.03125	32	40.96875	0	0
S4	-1	2.741935	31	41.93548	0.032258	-2.74194
			172	196.6631	0.048925	-0.42527

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.239316	-1.77702	3.157803	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.316667	60	56.98333	0	0
S2	1	2.326531	49	56.77551	0.020408	2.326531
S3	-1	4.03125	32	40.96875	0.03125	-4.03125
S4		2.741935	31	41.93548	0	0
			172	196.6631	0.051658	-1.70472

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.173885	-9.80374	168	3.6746	-2.34368	-1.06576	yes

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.316667	60	56.98333	0	0
S2	1	2.326531	49	56.77551	0.020408	2.326531
S3	-1	4.03125	32	40.96875	0.03125	-4.03125
S4		2.741935	31	41.93548	0	0
			172	196.6631	0.051658	-1.70472

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.24591	-6.93229	48.05663	3	168	7.975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.316667	60	56.98333	0	0
S2	1	2.326531	49	56.77551	0.020408	2.326531
S3		4.03125	32	40.96875	0	0
S4	-1	2.741935	31	41.93548	0.032258	-2.74194
			172	196.6631	0.052666	-0.4154

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.175573	-2.36599	168	3.6746	-1.06057	0.229756	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.316667	60	56.98333	0	0
S2	1	2.326531	49	56.77551	0.020408	2.326531
S3		4.03125	32	40.96875	0	0
S4	-1	2.741935	31	41.93548	0.032258	-2.74194
			172	196.6631	0.052666	-0.4154

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.248298	-1.67301	2.798965	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.316667	60	56.98333	0	0
S2		2.326531	49	56.77551	0	0
S3	1	4.03125	32	40.96875	0.03125	4.03125
S4	-1	2.741935	31	41.93548	0.032258	-2.74194
			172	196.6631	0.063508	1.289315

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.1928	6.687328	168	3.6746	0.580853	1.997776	yes

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.316667	60	56.98333	0	0
S2		2.326531	49	56.77551	0	0
S3	1	4.03125	32	40.96875	0.03125	4.03125
S4	-1	2.741935	31	41.93548	0.032258	-2.74194
			172	196.6631	0.063508	1.289315

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.27266	4.728655	22.36018	3	168	7.975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	2.316667	60	56.98333	0.004167	1.158333
S2	0.5	2.326531	49	56.77551	0.005102	1.163265
S3	-0.5	4.03125	32	40.96875	0.007813	-2.01563
S4	-0.5	2.741935	31	41.93548	0.008065	-1.37097
			172	196.6631	0.025146	-1.06499

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.121318	-8.77856	168	3.6746	-1.51079	-0.6192	yes

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	2.316667	60	56.98333	0.004167	1.158333
S2	0.5	2.326531	49	56.77551	0.005102	1.163265
S3	-0.5	4.03125	32	40.96875	0.007813	-2.01563
S4	-0.5	2.741935	31	41.93548	0.008065	-1.37097
			172	196.6631	0.025146	-1.06499

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.171569	-6.20738	38.53157	3	168	7.975197	yes

15.19 Industry Comparison – Question 19

ANOVA: Single Factor

DESCRIPTION — Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	164	2.733333	1.114124	65.73333	0.150883	2.431418	3.035249
S2	49	129	2.632653	1.070578	51.38776	0.166962	2.296954	2.968352
S3	32	79	2.46875	2.19254	67.96875	0.206605	2.047377	2.890123
S4	31	84	2.709677	1.47957	44.3871	0.20991	2.280983	3.138372

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	1.592832	3	0.530944	0.388704	0.761283	2.658399	0.102301	-0.01078
Within Groups	229.4769	168	1.365934					
Total	231.0698	171	1.351285					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	3	3	2	2	
rank sum	5421	4222	2495	2740	
count	60	49	32	31	172
r^2/n	489787.4	363781.3	194532	242180.6	1290281
H					1.34467
df					3
p-value					0.718554
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.0002791
medians	0.0695172
trimmed	0.0004086

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	2.733333333	2.632653061
Variance	1.114124294	1.070578231
Observations	60	49
Hypothesized Mean Difference	0	
df	103	
t Stat	0.500796026	
P(T<=t) one-tail	0.308791589	
t Critical one-tail	1.659782273	
P(T<=t) two-tail	0.617583177	
t Critical two-tail	1.983264145	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	2.632653061	2.46875
Variance	1.070578231	2.192540323
Observations	49	32
Hypothesized Mean Difference	0	
df	51	
t Stat	0.545237764	
P(T<=t) one-tail	0.293983365	
t Critical one-tail	1.67528495	
P(T<=t) two-tail	0.58796673	
t Critical two-tail	2.00758377	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	2.733333333	2.46875
Variance	1.114124294	2.192540323
Observations	60	32
Hypothesized Mean Difference	0	
df	48	
t Stat	0.896580422	
P(T<=t) one-tail	0.187208815	
t Critical one-tail	1.677224196	
P(T<=t) two-tail	0.37441763	
t Critical two-tail	2.010634758	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	2.632653061	2.709677419
Variance	1.070578231	1.479569892
Observations	49	31
Hypothesized Mean Difference	0	
df	56	
t Stat	-0.29200918	
P(T<=t) one-tail	0.385679345	
t Critical one-tail	1.672522303	
P(T<=t) two-tail	0.771358689	
t Critical two-tail	2.003240719	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	2.733333333	2.709677419
Variance	1.114124294	1.479569892
Observations	60	31
Hypothesized Mean Difference	0	
df	54	
t Stat	0.091874175	
P(T<=t) one-tail	0.463568998	
t Critical one-tail	1.673564906	
P(T<=t) two-tail	0.927137997	
t Critical two-tail	2.004879288	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	2.46875	2.709677419
Variance	2.192540323	1.479569892
Observations	32	31
Hypothesized Mean Difference	0	
df	59	
t Stat	-0.70664158	
P(T<=t) one-tail	0.241285368	
t Critical one-tail	1.671093032	
P(T<=t) two-tail	0.482570735	
t Critical two-tail	2.000995378	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.733333	60	65.73333	0.016667	2.733333
S2	-1	2.632653	49	51.38776	0.020408	-2.63265
S3		2.46875	32	67.96875	0	0
S4		2.709677	31	44.3871	0	0
			172	229.4769	0.037075	0.10068
Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.159125	0.63271	168	3.6746	-0.48404	0.685402	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.733333	60	65.73333	0.016667	2.733333
S2	-1	2.632653	49	51.38776	0.020408	-2.63265
S3		2.46875	32	67.96875	0	0
S4		2.709677	31	44.3871	0	0
			172	229.4769	0.037075	0.10068
SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.225037	0.447394	0.200161	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.733333	60	65.73333	0.016667	2.733333
S2		2.632653	49	51.38776	0	0
S3	-1	2.46875	32	67.96875	0.03125	-2.46875
S4		2.709677	31	44.3871	0	0
			172	229.4769	0.047917	0.264583
Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.180902	1.462579	168	3.6746	-0.40016	0.929326	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.733333	60	65.73333	0.016667	2.733333
S2		2.632653	49	51.38776	0	0
S3	-1	2.46875	32	67.96875	0.03125	-2.46875
S4		2.709677	31	44.3871	0	0
			172	229.4769	0.047917	0.264583
SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.255834	1.034199	1.069569	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.733333	60	65.73333	0.016667	2.733333
S2		2.632653	49	51.38776	0	0
S3		2.46875	32	67.96875	0	0
S4	-1	2.709677	31	44.3871	0.032258	-2.70968
			172	229.4769	0.048925	0.023656
Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.182795	0.129412	168	3.6746	-0.64804	0.695354	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.733333	60	65.73333	0.016667	2.733333
S2		2.632653	49	51.38776	0	0
S3		2.46875	32	67.96875	0	0
S4	-1	2.709677	31	44.3871	0.032258	-2.70968
			172	229.4769	0.048925	0.023656
SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.258511	0.091508	0.008374	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.733333	60	65.73333	0	0
S2	1	2.632653	49	51.38776	0.020408	2.632653
S3	-1	2.46875	32	67.96875	0.03125	-2.46875
S4		2.709677	31	44.3871	0	0
			172	229.4769	0.051658	0.163903
Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.187832	0.872605	168	3.6746	-0.5263	0.85411	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.733333	60	65.73333	0	0
S2	1	2.632653	49	51.38776	0.020408	2.632653
S3	-1	2.46875	32	67.96875	0.03125	-2.46875
S4		2.709677	31	44.3871	0	0
			172	229.4769	0.051658	0.163903
SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.265634	0.617025	0.38072	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.733333	60	65.73333	0	0
S2	1	2.632653	49	51.38776	0.020408	2.632653
S3		2.46875	32	67.96875	0	0
S4	-1	2.709677	31	44.3871	0.032258	-2.70968
			172	229.4769	0.052666	-0.07702
Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.189656	-0.40613	168	3.6746	-0.77393	0.619885	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.733333	60	65.73333	0	0
S2	1	2.632653	49	51.38776	0.020408	2.632653
S3		2.46875	32	67.96875	0	0
S4	-1	2.709677	31	44.3871	0.032258	-2.70968
			172	229.4769	0.052666	-0.07702
SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.268214	-0.28718	0.08247	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.733333	60	65.73333	0	0
S2		2.632653	49	51.38776	0	0
S3	1	2.46875	32	67.96875	0.03125	2.46875
S4	-1	2.709677	31	44.3871	0.032258	-2.70968
			172	229.4769	0.063508	-0.24093
Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.208264	-1.15684	168	3.6746	-1.00621	0.52436	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.733333	60	65.73333	0	0
S2		2.632653	49	51.38776	0	0
S3	1	2.46875	32	67.96875	0.03125	2.46875
S4	-1	2.709677	31	44.3871	0.032258	-2.70968
			172	229.4769	0.063508	-0.24093
SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.29453	-0.81801	0.669135	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	2.733333	60	65.73333	0.004167	1.366667
S2	0.5	2.632653	49	51.38776	0.005102	1.316327
S3	-0.5	2.46875	32	67.96875	0.007813	-1.23438
S4	-0.5	2.709677	31	44.3871	0.008065	-1.35484
			172	229.4769	0.025146	0.093779
Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.131048	0.715609	168	3.6746	-0.38777	0.57533	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	2.733333	60	65.73333	0.004167	1.366667
S2	0.5	2.632653	49	51.38776	0.005102	1.316327
S3	-0.5	2.46875	32	67.96875	0.007813	-1.23438
S4	-0.5	2.709677	31	44.3871	0.008065	-1.35484
			172	229.4769	0.025146	0.093779
SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.185331	0.506012	0.256048	3	168	7.975197	no

15.20 Industry Comparison – Question 20

ANOVA: Single Factor

DESCRIPTION — Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	114	1.9	0.498305	29.4	0.125789	1.648296	2.151704
S2	49	115	2.346939	1.106293	53.10204	0.139194	2.06707	2.626807
S3	32	69	2.15625	1.684476	52.21875	0.172244	1.804956	2.507544
S4	31	72	2.322581	0.825806	24.77419	0.175	1.965183	2.679978

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	6.574783	3	2.191594	2.30846	0.078327	2.658399	0.211293	0.022313
Within Groups	159.495	168	0.949375					
Total	166.0698	171	0.971168					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	2	2	1.5	2	
rank sum	4617	4646	2604.5	3010.5	
count	60	49	32	31	172
r^2/n	355278.2	440516.7	211981.9	292358.4	1300135
H					5.318489
df					3
p-value					0.149907
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	1.46E-07
medians	0.000123
trimmed	8.29E-07

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	1.9	2.346938776
Variance	0.498305085	1.106292517
Observations	60	49
Hypothesized Mean Difference	0	
df	81	
t Stat	-2.54326684	
P(T<=t) one-tail	0.006442338	
t Critical one-tail	1.663883913	
P(T<=t) two-tail	0.012884677	
t Critical two-tail	1.989686323	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	2.346938776	2.15625
Variance	1.106292517	1.684475806
Observations	49	32
Hypothesized Mean Difference	0	
df	57	
t Stat	0.695290595	
P(T<=t) one-tail	0.244849078	
t Critical one-tail	1.672028888	
P(T<=t) two-tail	0.489698157	
t Critical two-tail	2.002465459	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	1.9	2.15625
Variance	0.498305085	1.684475806
Observations	60	32
Hypothesized Mean Difference	0	
df	41	
t Stat	-1.03799437	
P(T<=t) one-tail	0.152677908	
t Critical one-tail	1.682878002	
P(T<=t) two-tail	0.305355816	
t Critical two-tail	2.01954097	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	2.346938776	2.322580645
Variance	1.106292517	0.825806452
Observations	49	31
Hypothesized Mean Difference	0	
df	71	
t Stat	0.109796728	
P(T<=t) one-tail	0.456440168	
t Critical one-tail	1.666599658	
P(T<=t) two-tail	0.912880337	
t Critical two-tail	1.993943368	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	1.9	2.322580645
Variance	0.498305085	0.825806452
Observations	60	31
Hypothesized Mean Difference	0	
df	49	
t Stat	-2.26059768	
P(T<=t) one-tail	0.014130509	
t Critical one-tail	1.676550893	
P(T<=t) two-tail	0.028261017	
t Critical two-tail	2.009575237	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	2.15625	2.322580645
Variance	1.684475806	0.825806452
Observations	32	31
Hypothesized Mean Difference	0	
df	56	
t Stat	-0.59073646	
P(T<=t) one-tail	0.278536879	
t Critical one-tail	1.672522303	
P(T<=t) two-tail	0.557073758	
t Critical two-tail	2.003240719	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	1.9	60	29.4	0.016667	1.9
S2	-1	2.346939	49	53.10204	0.020408	-2.34694
S3		2.15625	32	52.21875	0	0
S4		2.322581	31	24.77419	0	0
			172	159.495	0.037075	-0.44694

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.132661	-3.36903	168	3.6746	-0.93442	0.040538	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	1.9	60	29.4	0.016667	1.9
S2	-1	2.346939	49	53.10204	0.020408	-2.34694
S3		2.15625	32	52.21875	0	0
S4		2.322581	31	24.77419	0	0
			172	159.495	0.037075	-0.44694

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.187611	-2.38226	5.675174	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	1.9	60	29.4	0.016667	1.9
S2		2.346939	49	53.10204	0	0
S3	-1	2.15625	32	52.21875	0.03125	-2.15625
S4		2.322581	31	24.77419	0	0
			172	159.495	0.047917	-0.25625

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.150816	-1.69909	168	3.6746	-0.81044	0.297938	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	1.9	60	29.4	0.016667	1.9
S2		2.346939	49	53.10204	0	0
S3	-1	2.15625	32	52.21875	0.03125	-2.15625
S4		2.322581	31	24.77419	0	0
			172	159.495	0.047917	-0.25625

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.213286	-1.20144	1.443456	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	1.9	60	29.4	0.016667	1.9
S2		2.346939	49	53.10204	0	0
S3		2.15625	32	52.21875	0	0
S4	-1	2.322581	31	24.77419	0.032258	-2.32258
			172	159.495	0.048925	-0.42258

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.152394	-2.77295	168	3.6746	-0.98257	0.137407	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	1.9	60	29.4	0.016667	1.9
S2		2.346939	49	53.10204	0	0
S3		2.15625	32	52.21875	0	0
S4	-1	2.322581	31	24.77419	0.032258	-2.32258
			172	159.495	0.048925	-0.42258

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.215518	-1.96077	3.844616	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		1.9	60	29.4	0	0
S2	1	2.346939	49	53.10204	0.020408	2.346939
S3	-1	2.15625	32	52.21875	0.03125	-2.15625
S4		2.322581	31	24.77419	0	0
			172	159.495	0.051658	0.190689

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.156593	1.217732	168	3.6746	-0.38473	0.766107	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		1.9	60	29.4	0	0
S2	1	2.346939	49	53.10204	0.020408	2.346939
S3	-1	2.15625	32	52.21875	0.03125	-2.15625
S4		2.322581	31	24.77419	0	0
			172	159.495	0.051658	0.190689

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.221456	0.861067	0.741436	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		1.9	60	29.4	0	0
S2	1	2.346939	49	53.10204	0.020408	2.346939
S3		2.15625	32	52.21875	0	0
S4	-1	2.322581	31	24.77419	0.032258	-2.32258
			172	159.495	0.052666	0.024358

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.158114	0.154054	168	3.6746	-0.55665	0.605363	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		1.9	60	29.4	0	0
S2	1	2.346939	49	53.10204	0.020408	2.346939
S3		2.15625	32	52.21875	0	0
S4	-1	2.322581	31	24.77419	0.032258	-2.32258
			172	159.495	0.052666	0.024358

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.223607	0.108933	0.011866	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		1.9	60	29.4	0	0
S2		2.346939	49	53.10204	0	0
S3	1	2.15625	32	52.21875	0.03125	2.15625
S4	-1	2.322581	31	24.77419	0.032258	-2.32258
			172	159.495	0.063508	-0.16633

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.173627	-0.95797	168	3.6746	-0.80434	0.471681	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		1.9	60	29.4	0	0
S2		2.346939	49	53.10204	0	0
S3	1	2.15625	32	52.21875	0.03125	2.15625
S4	-1	2.322581	31	24.77419	0.032258	-2.32258
			172	159.495	0.063508	-0.16633

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.245546	-0.67739	0.458858	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	1.9	60	29.4	0.004167	0.95
S2	0.5	2.346939	49	53.10204	0.005102	1.173469
S3	-0.5	2.15625	32	52.21875	0.007813	-1.07813
S4	-0.5	2.322581	31	24.77419	0.008065	-1.16129
			172	159.495	0.025146	-0.11595

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.109254	-1.06125	168	3.6746	-0.51741	0.285518	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	1.9	60	29.4	0.004167	0.95
S2	0.5	2.346939	49	53.10204	0.005102	1.173469
S3	-0.5	2.15625	32	52.21875	0.007813	-1.07813
S4	-0.5	2.322581	31	24.77419	0.008065	-1.16129
			172	159.495	0.025146	-0.11595

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.154508	-0.75042	0.563131	3	168	7.975197	no

15.21 **Industry Comparison – Question 21**

ANOVA: Single Factor

DESCRIPTION Alpha 0.05

Groups	*Count*	*Sum*	*Mean*	*Variance*	*SS*	*Std Err*	*Lower*	*Upper*
S1	60	147	2.45	1.200847	70.85	0.14796	2.153932	2.746068
S2	49	129	2.632653	1.362245	65.38776	0.163728	2.303456	2.96185
S3	32	89	2.78125	1.660282	51.46875	0.202603	2.368038	3.194462
S4	31	92	2.967742	1.098925	32.96774	0.205845	2.54735	3.388134

ANOVA

Sources	*SS*	*df*	*MS*	*F*	*P value*	*F crit*	*RMSSE*	*Omega Sq*
Between Groups	6.087381	3	2.029127	1.544781	0.204823	2.658399	0.191872	0.009413
Within Groups	220.6742	168	1.313537					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	2	2	2	3	
rank sum	4682.5	4193	2920	3082.5	
count	60	49	32	31	172
r^2/n	365430.1	358801	266450	306509.9	1297191
H					4.131194
df					3
p-value					0.247642
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.038085
medians	0.407989
trimmed	0.034562

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S2*
Mean	2.45	2.632653061
Variance	1.200847458	1.362244898
Observations	60	49
Hypothesized Mean Difference	0	
df	100	
t Stat	-0.83530425	
P(T<=t) one-tail	0.202768854	
t Critical one-tail	1.660234326	
P(T<=t) two-tail	0.405537708	
t Critical two-tail	1.983971519	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S3*
Mean	2.632653061	2.78125
Variance	1.362244898	1.660282258
Observations	49	32
Hypothesized Mean Difference	0	
df	62	
t Stat	-0.52640777	
P(T<=t) one-tail	0.300241553	
t Critical one-tail	1.669804163	
P(T<=t) two-tail	0.600483105	
t Critical two-tail	1.998971517	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S3*
Mean	2.45	2.78125
Variance	1.200847458	1.660282258
Observations	60	32
Hypothesized Mean Difference	0	
df	55	
t Stat	-1.2353717	
P(T<=t) one-tail	0.110971628	
t Critical one-tail	1.673033965	
P(T<=t) two-tail	0.221943255	
t Critical two-tail	2.004044783	

t-Test: Two-Sample Assuming Unequal Variances

	S2	*S4*
Mean	2.632653061	2.967741935
Variance	1.362244898	1.098924731
Observations	49	31
Hypothesized Mean Difference	0	
df	69	
t Stat	-1.33238396	
P(T<=t) one-tail	0.093558886	
t Critical one-tail	1.667238549	
P(T<=t) two-tail	0.187117773	
t Critical two-tail	1.994945415	

t-Test: Two-Sample Assuming Unequal Variances

	S1	*S4*
Mean	2.45	2.967741935
Variance	1.200847458	1.098924731
Observations	60	31
Hypothesized Mean Difference	0	
df	63	
t Stat	-2.19841892	
P(T<=t) one-tail	0.015800183	
t Critical one-tail	1.669402222	
P(T<=t) two-tail	0.031600367	
t Critical two-tail	1.998340543	

t-Test: Two-Sample Assuming Unequal Variances

	S3	*S4*
Mean	2.78125	2.967741935
Variance	1.660282258	1.098924731
Observations	32	31
Hypothesized Mean Difference	0	
df	59	
t Stat	-0.63106029	
P(T<=t) one-tail	0.265219153	
t Critical one-tail	1.671093032	
P(T<=t) two-tail	0.530438305	
t Critical two-tail	2.000995378	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.45	60	70.85	0.016667	2.45
S2	-1	2.632653	49	65.38776	0.020408	-2.63265
S3		2.78125	32	51.46875	0	0
S4		2.967742	31	32.96774	0	0
			172	220.6742	0.037075	-0.18265

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.156044	-1.17053	168	3.6746	-0.75605	0.390745	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.45	60	70.85	0.016667	2.45
S2	-1	2.632653	49	65.38776	0.020408	-2.63265
S3		2.78125	32	51.46875	0	0
S4		2.967742	31	32.96774	0	0
			172	220.6742	0.037075	-0.18265

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.220679	-0.82769	0.685066	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.45	60	70.85	0.016667	2.45
S2		2.632653	49	65.38776	0	0
S3	-1	2.78125	32	51.46875	0.03125	-2.78125
S4		2.967742	31	32.96774	0	0
			172	220.6742	0.047917	-0.33125

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.177398	-1.86727	168	3.6746	-0.98312	0.320618	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.45	60	70.85	0.016667	2.45
S2		2.632653	49	65.38776	0	0
S3	-1	2.78125	32	51.46875	0.03125	-2.78125
S4		2.967742	31	32.96774	0	0
			172	220.6742	0.047917	-0.33125

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.250879	-1.32036	1.743343	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.45	60	70.85	0.016667	2.45
S2		2.632653	49	65.38776	0	0
S3		2.78125	32	51.46875	0	0
S4	-1	2.967742	31	32.96774	0.032258	-2.96774
			172	220.6742	0.048925	-0.51774

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.179255	-2.8883	168	3.6746	-1.17643	0.140947	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	2.45	60	70.85	0.016667	2.45
S2		2.632653	49	65.38776	0	0
S3		2.78125	32	51.46875	0	0
S4	-1	2.967742	31	32.96774	0.032258	-2.96774
			172	220.6742	0.048925	-0.51774

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.253504	-2.04234	4.171151	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.45	60	70.85	0	0
S2	1	2.632653	49	65.38776	0.020408	2.632653
S3	-1	2.78125	32	51.46875	0.03125	-2.78125
S4		2.967742	31	32.96774	0	0
			172	220.6742	0.051658	-0.1486

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.184194	-0.80674	168	3.6746	-0.82544	0.528243	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.45	60	70.85	0	0
S2	1	2.632653	49	65.38776	0.020408	2.632653
S3	-1	2.78125	32	51.46875	0.03125	-2.78125
S4		2.967742	31	32.96774	0	0
			172	220.6742	0.051658	-0.1486

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.26049	-0.57045	0.325416	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.45	60	70.85	0	0
S2	1	2.632653	49	65.38776	0.020408	2.632653
S3		2.78125	32	51.46875	0	0
S4	-1	2.967742	31	32.96774	0.032258	-2.96774
			172	220.6742	0.052666	-0.33509

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.185983	-1.80172	168	3.6746	-1.0185	0.348323	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.45	60	70.85	0	0
S2	1	2.632653	49	65.38776	0.020408	2.632653
S3		2.78125	32	51.46875	0	0
S4	-1	2.967742	31	32.96774	0.032258	-2.96774
			172	220.6742	0.052666	-0.33509

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.263019	-1.27401	1.623101	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.45	60	70.85	0	0
S2		2.632653	49	65.38776	0	0
S3	1	2.78125	32	51.46875	0.03125	2.78125
S4	-1	2.967742	31	32.96774	0.032258	-2.96774
			172	220.6742	0.063508	-0.18649

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.204231	-0.91314	168	3.6746	-0.93696	0.563974	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		2.45	60	70.85	0	0
S2		2.632653	49	65.38776	0	0
S3	1	2.78125	32	51.46875	0.03125	2.78125
S4	-1	2.967742	31	32.96774	0.032258	-2.96774
			172	220.6742	0.063508	-0.18649

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.288826	-0.64569	0.416916	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	2.45	60	70.85	0.004167	1.225
S2	0.5	2.632653	49	65.38776	0.005102	1.316327
S3	-0.5	2.78125	32	51.46875	0.007813	-1.39063
S4	-0.5	2.967742	31	32.96774	0.008065	-1.48387
			172	220.6742	0.025146	-0.33317

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.12851	-2.59255	168	3.6746	-0.80539	0.139055	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	2.45	60	70.85	0.004167	1.225
S2	0.5	2.632653	49	65.38776	0.005102	1.316327
S3	-0.5	2.78125	32	51.46875	0.007813	-1.39063
S4	-0.5	2.967742	31	32.96774	0.008065	-1.48387
			172	220.6742	0.025146	-0.33317

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.181741	-1.83321	3.360654	3	168	7.975197	no

15.22 Industry Comparison – Question 22

ANOVA: Single Factor

DESCRIPTION — Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	203	3.383333	1.291243	76.18333	0.149343	3.084499	3.682168
S2	49	143	2.918367	1.326531	63.67347	0.165258	2.586094	3.250641
S3	32	107	3.34375	1.265121	39.21875	0.204496	2.926677	3.760823
S4	31	109	3.516129	1.524731	45.74194	0.207768	3.091809	3.940449

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	8.880186	3	2.960062	2.211974	0.088585	2.658399	0.223671	0.020701
Within Groups	224.8175	168	1.338199					
Total	233.6977	171	1.366653					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	3	4	4	
rank sum	5456	3532	2863.5	3026.5	
count	60	49	32	31	172
r^2/n	496132.3	254592.3	256238.5	295474.3	1302437
H					6.246955
df					3
p-value					0.100194
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.976535
medians	0.624233
trimmed	0.959256

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3.383333333	2.918367347
Variance	1.291242938	1.326530612
Observations	60	49
Hypothesized Mean Difference	0	
df	102	
t Stat	2.109285468	
P(T<=t) one-tail	0.018683919	
t Critical one-tail	1.659929976	
P(T<=t) two-tail	0.037367839	
t Critical two-tail	1.983495259	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	2.918367347	3.34375
Variance	1.326530612	1.265120968
Observations	49	32
Hypothesized Mean Difference	0	
df	68	
t Stat	-1.64823665	
P(T<=t) one-tail	0.051958687	
t Critical one-tail	1.667572281	
P(T<=t) two-tail	0.103917374	
t Critical two-tail	1.995468931	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3.383333333	3.34375
Variance	1.291242938	1.265120968
Observations	60	32
Hypothesized Mean Difference	0	
df	64	
t Stat	0.16019505	
P(T<=t) one-tail	0.436615987	
t Critical one-tail	1.669013025	
P(T<=t) two-tail	0.873231974	
t Critical two-tail	1.997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	2.918367347	3.516129032
Variance	1.326530612	1.524731183
Observations	49	31
Hypothesized Mean Difference	0	
df	61	
t Stat	-2.16465364	
P(T<=t) one-tail	0.017168435	
t Critical one-tail	1.670219484	
P(T<=t) two-tail	0.03433687	
t Critical two-tail	1.999623585	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3.383333333	3.516129032
Variance	1.291242938	1.524731183
Observations	60	31
Hypothesized Mean Difference	0	
df	56	
t Stat	-0.49940988	
P(T<=t) one-tail	0.309723576	
t Critical one-tail	1.672522303	
P(T<=t) two-tail	0.619447152	
t Critical two-tail	2.003240719	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3.34375	3.516129032
Variance	1.265120968	1.524731183
Observations	32	31
Hypothesized Mean Difference	0	
df	60	
t Stat	-0.57872721	
P(T<=t) one-tail	0.282469751	
t Critical one-tail	1.670648865	
P(T<=t) two-tail	0.564939502	
t Critical two-tail	2.000297822	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.383333	60	76.18333	0.016667	3.383333
S2	-1	2.918367	49	63.67347	0.020408	-2.91837
S3		3.34375	32	39.21875	0	0
S4		3.516129	31	45.74194	0	0
			172	224.8175	0.037075	0.464966

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.157502	2.952135	168	3.6746	-0.11379	1.043721	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.383333	60	76.18333	0.016667	3.383333
S2	-1	2.918367	49	63.67347	0.020408	-2.91837
S3		3.34375	32	39.21875	0	0
S4		3.516129	31	45.74194	0	0
			172	224.8175	0.037075	0.464966

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.222741	2.087475	4.35755	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.383333	60	76.18333	0.016667	3.383333
S2		2.918367	49	63.67347	0	0
S3	-1	3.34375	32	39.21875	0.03125	-3.34375
S4		3.516129	31	45.74194	0	0
			172	224.8175	0.047917	0.039583

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.179056	0.221067	168	3.6746	-0.61838	0.697542	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.383333	60	76.18333	0.016667	3.383333
S2		2.918367	49	63.67347	0	0
S3	-1	3.34375	32	39.21875	0.03125	-3.34375
S4		3.516129	31	45.74194	0	0
			172	224.8175	0.047917	0.039583

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.253223	0.156318	0.024435	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.383333	60	76.18333	0.016667	3.383333
S2		2.918367	49	63.67347	0	0
S3		3.34375	32	39.21875	0	0
S4	-1	3.516129	31	45.74194	0.032258	-3.51613
			172	224.8175	0.048925	-0.1328

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.18093	-0.73396	168	3.6746	-0.79764	0.532048	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.383333	60	76.18333	0.016667	3.383333
S2		2.918367	49	63.67347	0	0
S3		3.34375	32	39.21875	0	0
S4	-1	3.516129	31	45.74194	0.032258	-3.51613
			172	224.8175	0.048925	-0.1328

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.255873	-0.51899	0.269351	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.383333	60	76.18333	0	0
S2	1	2.918367	49	63.67347	0.020408	2.918367
S3	-1	3.34375	32	39.21875	0.03125	-3.34375
S4		3.516129	31	45.74194	0	0
			172	224.8175	0.051658	-0.42538

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.185915	-2.28805	168	3.6746	-1.10855	0.257781	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.383333	60	76.18333	0	0
S2	1	2.918367	49	63.67347	0.020408	2.918367
S3	-1	3.34375	32	39.21875	0.03125	-3.34375
S4		3.516129	31	45.74194	0	0
			172	224.8175	0.051658	-0.42538

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.262924	-1.61789	2.617579	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.383333	60	76.18333	0	0
S2	1	2.918367	49	63.67347	0.020408	2.918367
S3		3.34375	32	39.21875	0	0
S4	-1	3.516129	31	45.74194	0.032258	-3.51613
			172	224.8175	0.052666	-0.59776

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.18772	-3.18432	168	3.6746	-1.28756	0.092036	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.383333	60	76.18333	0	0
S2	1	2.918367	49	63.67347	0.020408	2.918367
S3		3.34375	32	39.21875	0	0
S4	-1	3.516129	31	45.74194	0.032258	-3.51613
			172	224.8175	0.052666	-0.59776

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.265477	-2.25165	5.069944	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.383333	60	76.18333	0	0
S2		2.918367	49	63.67347	0	0
S3	1	3.34375	32	39.21875	0.03125	3.34375
S4	-1	3.516129	31	45.74194	0.032258	-3.51613
			172	224.8175	0.063508	-0.17238

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.206139	-0.83623	168	3.6746	-0.92986	0.585099	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.383333	60	76.18333	0	0
S2		2.918367	49	63.67347	0	0
S3	1	3.34375	32	39.21875	0.03125	3.34375
S4	-1	3.516129	31	45.74194	0.032258	-3.51613
			172	224.8175	0.063508	-0.17238

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.291524	-0.5913	0.349638	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.383333	60	76.18333	0.004167	1.691667
S2	0.5	2.918367	49	63.67347	0.005102	1.459184
S3	-0.5	3.34375	32	39.21875	0.007813	-1.67188
S4	-0.5	3.516129	31	45.74194	0.008065	-1.75806
			172	224.8175	0.025146	-0.27909

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.129711	-2.15162	168	3.6746	-0.75573	0.197548	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.383333	60	76.18333	0.004167	1.691667
S2	0.5	2.918367	49	63.67347	0.005102	1.459184
S3	-0.5	3.34375	32	39.21875	0.007813	-1.67188
S4	-0.5	3.516129	31	45.74194	0.008065	-1.75806
			172	224.8175	0.025146	-0.27909

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.183439	-1.52142	2.314734	3	168	7.975197	no

15.23 Industry Comparison – Question 23

ANOVA: Single Factor

DESCRIPTION Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	218	3.633333	0.914124	53.93333	0.129584	3.374037	3.89263
S2	49	167	3.408163	1.121599	53.83673	0.143393	3.119852	3.696474
S3	32	125	3.90625	0.861895	26.71875	0.17744	3.544359	4.268141
S4	31	114	3.677419	1.15914	34.77419	0.180279	3.30924	4.045599

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	4.923035	3	1.641012	1.628767	0.18461	2.658399	0.203378	0.010848
Within Groups	169.263	168	1.007518					
Total	174.186	171	1.018632					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	4	
rank sum	5147	3754.5	3200	2776.5	
count	60	49	32	31	172
r^2/n	441526.8	287679	320000	248675.9	1297882
H					4.409738
df					3
p-value					0.220484
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.061209
medians	0.295829
trimmed	0.049758

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3.633333333	3.408163265
Variance	0.914124294	1.121598639
Observations	60	49
Hypothesized Mean Difference	0	
df	98	
t Stat	1.153200301	
P(T<=t) one-tail	0.125816559	
t Critical one-tail	1.660551217	
P(T<=t) two-tail	0.251633118	
t Critical two-tail	1.984467455	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	3.408163265	3.90625
Variance	1.121598639	0.861895161
Observations	49	32
Hypothesized Mean Difference	0	
df	72	
t Stat	-2.23144258	
P(T<=t) one-tail	0.014382919	
t Critical one-tail	1.666293696	
P(T<=t) two-tail	0.028765837	
t Critical two-tail	1.993463567	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3.633333333	3.90625
Variance	0.914124294	0.861895161
Observations	60	32
Hypothesized Mean Difference	0	
df	65	
t Stat	-1.32901588	
P(T<=t) one-tail	0.094244564	
t Critical one-tail	1.668635976	
P(T<=t) two-tail	0.188489128	
t Critical two-tail	1.997137908	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	3.408163265	3.677419355
Variance	1.121598639	1.159139785
Observations	49	31
Hypothesized Mean Difference	0	
df	63	
t Stat	-1.09666495	
P(T<=t) one-tail	0.138481095	
t Critical one-tail	1.669402222	
P(T<=t) two-tail	0.276962191	
t Critical two-tail	1.998340543	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3.633333333	3.677419355
Variance	0.914124294	1.159139785
Observations	60	31
Hypothesized Mean Difference	0	
df	55	
t Stat	-0.19217485	
P(T<=t) one-tail	0.42415652	
t Critical one-tail	1.673033965	
P(T<=t) two-tail	0.848313039	
t Critical two-tail	2.004044783	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3.90625	3.677419355
Variance	0.861895161	1.159139785
Observations	32	31
Hypothesized Mean Difference	0	
df	59	
t Stat	0.902238773	
P(T<=t) one-tail	0.185299374	
t Critical one-tail	1.671093032	
P(T<=t) two-tail	0.370598748	
t Critical two-tail	2.000995378	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.633333	60	53.93333	0.016667	3.633333
S2	-1	3.408163	49	53.83673	0.020408	-3.40816
S3		3.90625	32	26.71875	0	0
S4		3.677419	31	34.77419	0	0
			172	169.263	0.037075	0.22517

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.136663	1.64763	168	3.6746	-0.27701	0.727352	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.633333	60	53.93333	0.016667	3.633333
S2	-1	3.408163	49	53.83673	0.020408	-3.40816
S3		3.90625	32	26.71875	0	0
S4		3.677419	31	34.77419	0	0
			172	169.263	0.037075	0.22517

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.193271	1.16505	1.357342	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.633333	60	53.93333	0.016667	3.633333
S2		3.408163	49	53.83673	0	0
S3	-1	3.90625	32	26.71875	0.03125	-3.90625
S4		3.677419	31	34.77419	0	0
			172	169.263	0.047917	-0.27292

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.155366	-1.75661	168	3.6746	-0.84382	0.29799	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.633333	60	53.93333	0.016667	3.633333
S2		3.408163	49	53.83673	0	0
S3	-1	3.90625	32	26.71875	0.03125	-3.90625
S4		3.677419	31	34.77419	0	0
			172	169.263	0.047917	-0.27292

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.21972	-1.24211	1.542839	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
4	1	3.5	38	37.5	0.026316	3.5
4		18.06977	34	56257.42	0	0
2		59.17647	17	102142.5	0	0
2	-1	3.684913	15	17.62814	0.066667	-3.68491
			104	158455	0.092982	-0.18491

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
8.582988	-0.02154	100	3.698	-31.9248	31.55498	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
4	1	3.5	38	37.5	0.026316	3.5
4		18.06977	34	56257.42	0	0
2		59.17647	17	102142.5	0	0
2	-1	3.684913	15	17.62814	0.066667	-3.68491
			104	158455	0.092982	-0.18491

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
12.13818	-0.01523	0.000232	3	100	8.086603	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.633333	60	53.93333	0	0
S2	1	3.408163	49	53.83673	0.020408	3.408163
S3	-1	3.90625	32	26.71875	0.03125	-3.90625
S4		3.677419	31	34.77419	0	0
			172	169.263	0.051658	-0.49809

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.161317	-3.08762	168	3.6746	-1.09086	0.09469	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.633333	60	53.93333	0	0
S2	1	3.408163	49	53.83673	0.020408	3.408163
S3	-1	3.90625	32	26.71875	0.03125	-3.90625
S4		3.677419	31	34.77419	0	0
			172	169.263	0.051658	-0.49809

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.228137	-2.18328	4.766704	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.633333	60	53.93333	0	0
S2	1	3.408163	49	53.83673	0.020408	3.408163
S3		3.90625	32	26.71875	0	0
S4	-1	3.677419	31	34.77419	0.032258	-3.67742
			172	169.263	0.052666	-0.26926

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.162884	-1.65306	168	3.6746	-0.86779	0.329276	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.633333	60	53.93333	0	0
S2	1	3.408163	49	53.83673	0.020408	3.408163
S3		3.90625	32	26.71875	0	0
S4	-1	3.677419	31	34.77419	0.032258	-3.67742
			172	169.263	0.052666	-0.26926

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.230352	-1.16889	1.3663	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.633333	60	53.93333	0	0
S2		3.408163	49	53.83673	0	0
S3	1	3.90625	32	26.71875	0.03125	3.90625
S4	-1	3.677419	31	34.77419	0.032258	-3.67742
			172	169.263	0.063508	0.228831

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.178865	1.279347	168	3.6746	-0.42843	0.886089	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.633333	60	53.93333	0	0
S2		3.408163	49	53.83673	0	0
S3	1	3.90625	32	26.71875	0.03125	3.90625
S4	-1	3.677419	31	34.77419	0.032258	-3.67742
			172	169.263	0.063508	0.228831

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.252954	0.904635	0.818364	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.633333	60	53.93333	0.004167	1.816667
S2	0.5	3.408163	49	53.83673	0.005102	1.704082
S3	-0.5	3.90625	32	26.71875	0.007813	-1.95313
S4	-0.5	3.677419	31	34.77419	0.008065	-1.83871
			172	169.263	0.025146	-0.27109

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.112549	-2.4086	168	3.6746	-0.68466	0.142488	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.633333	60	53.93333	0.004167	1.816667
S2	0.5	3.408163	49	53.83673	0.005102	1.704082
S3	-0.5	3.90625	32	26.71875	0.007813	-1.95313
S4	-0.5	3.677419	31	34.77419	0.008065	-1.83871
			172	169.263	0.025146	-0.27109

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.159169	-1.70314	2.900671	3	168	7.975197	no

15.24 Industry Comparison – Question 24

ANOVA: Single Factor

DESCRIPTION — Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	205	3.416667	1.298023	76.58333	0.140041	3.136445	3.696888
S2	49	171	3.489796	1.296769	62.2449	0.154965	3.178218	3.801374
S3	32	119	3.71875	0.660282	20.46875	0.191759	3.327655	4.109845
S4	31	102	3.290323	1.27957	38.3871	0.194828	2.892432	3.688214

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	3.170573	3	1.056858	0.898161	0.443461	2.658399	0.165835	-0.00178
Within Groups	197.6841	168	1.176691					
Total	200.8547	171	1.174589					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	4	
rank sum	5086	4312	3045	2435	
count	60	49	32	31	172
r^2/n	431123.3	379456	289750.8	191265.3	1291595
H					1.874595
df					3
p-value					0.598838
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.000967
medians	0.050714
trimmed	0.000971

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3.416666667	3.489795918
Variance	1.298022599	1.296768707
Observations	60	49
Hypothesized Mean Difference	0	
df	103	
t Stat	-0.33344631	
P(T<=t) one-tail	0.369737628	
t Critical one-tail	1.659782273	
P(T<=t) two-tail	0.739475256	
t Critical two-tail	1.983264145	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	3.489795918	3.71875
Variance	1.296768707	0.660282258
Observations	49	32
Hypothesized Mean Difference	0	
df	78	
t Stat	-1.05498165	
P(T<=t) one-tail	0.147345299	
t Critical one-tail	1.664624645	
P(T<=t) two-tail	0.294690598	
t Critical two-tail	1.990847069	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3.416666667	3.71875
Variance	1.298022599	0.660282258
Observations	60	32
Hypothesized Mean Difference	0	
df	82	
t Stat	-1.46934347	
P(T<=t) one-tail	0.072782962	
t Critical one-tail	1.663649184	
P(T<=t) two-tail	0.145565923	
t Critical two-tail	1.989318557	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	3.489795918	3.290322581
Variance	1.296768707	1.279569892
Observations	49	31
Hypothesized Mean Difference	0	
df	64	
t Stat	0.766405623	
P(T<=t) one-tail	0.223126364	
t Critical one-tail	1.669013025	
P(T<=t) two-tail	0.446252729	
t Critical two-tail	1.997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3.416666667	3.290322581
Variance	1.298022599	1.279569892
Observations	60	31
Hypothesized Mean Difference	0	
df	61	
t Stat	0.503726188	
P(T<=t) one-tail	0.3081341	
t Critical one-tail	1.670219484	
P(T<=t) two-tail	0.616268199	
t Critical two-tail	1.999623585	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3.71875	3.290322581
Variance	0.660282258	1.279569892
Observations	32	31
Hypothesized Mean Difference	0	
df	54	
t Stat	1.721852373	
P(T<=t) one-tail	0.045410285	
t Critical one-tail	1.673564906	
P(T<=t) two-tail	0.09082057	
t Critical two-tail	2.004879288	

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.416667	60	76.58333	0.016667	3.416667	
S2	-1	3.489796	49	62.2449	0.020408	-3.4898	
S3		3.71875	32	20.46875	0	0	
S4		3.290323	31	38.3871	0	0	
			172	197.6841	0.037075	-0.07313	
Q TEST							
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*	
0.147692	-0.49515	168	3.6746	-0.61584	0.469578	no	

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.416667	60	76.58333	0.016667	3.416667	
S2	-1	3.489796	49	62.2449	0.020408	-3.4898	
S3		3.71875	32	20.46875	0	0	
S4		3.290323	31	38.3871	0	0	
			172	197.6841	0.037075	-0.07313	
SCHEFFE's TEST							
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*	
0.208867	-0.35012	0.122586	3	168	7.975197	no	

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.416667	60	76.58333	0.016667	3.416667	
S2		3.489796	49	62.2449	0	0	
S3	-1	3.71875	32	20.46875	0.03125	-3.71875	
S4		3.290323	31	38.3871	0	0	
			172	197.6841	0.047917	-0.30208	
Q TEST							
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*	
0.167903	-1.79915	168	3.6746	-0.91906	0.314895	no	

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.416667	60	76.58333	0.016667	3.416667	
S2		3.489796	49	62.2449	0	0	
S3	-1	3.71875	32	20.46875	0.03125	-3.71875	
S4		3.290323	31	38.3871	0	0	
			172	197.6841	0.047917	-0.30208	
SCHEFFE's TEST							
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*	
0.237451	-1.27219	1.61847	3	168	7.975197	no	

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.416667	60	76.58333	0.016667	3.416667	
S2		3.489796	49	62.2449	0	0	
S3		3.71875	32	20.46875	0	0	
S4	-1	3.290323	31	38.3871	0.032258	-3.29032	
			172	197.6841	0.048925	0.126344	
Q TEST							
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*	
0.16966	0.744688	168	3.6746	-0.49709	0.749778	no	

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	1	3.416667	60	76.58333	0.016667	3.416667	
S2		3.489796	49	62.2449	0	0	
S3		3.71875	32	20.46875	0	0	
S4	-1	3.290323	31	38.3871	0.032258	-3.29032	
			172	197.6841	0.048925	0.126344	
SCHEFFE's TEST							
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*	
0.239936	0.526574	0.27728	3	168	7.975197	no	

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.416667	60	76.58333	0	0	
S2	1	3.489796	49	62.2449	0.020408	3.489796	
S3	-1	3.71875	32	20.46875	0.03125	-3.71875	
S4		3.290323	31	38.3871	0	0	
			172	197.6841	0.051658	-0.22895	
Q TEST							
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*	
0.174335	-1.3133	168	3.6746	-0.86957	0.411659	no	

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.416667	60	76.58333	0	0	
S2	1	3.489796	49	62.2449	0.020408	3.489796	
S3	-1	3.71875	32	20.46875	0.03125	-3.71875	
S4		3.290323	31	38.3871	0	0	
			172	197.6841	0.051658	-0.22895	
SCHEFFE's TEST							
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*	
0.246548	-0.92864	0.862374	3	168	7.975197	no	

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.416667	60	76.58333	0	0	
S2	1	3.489796	49	62.2449	0.020408	3.489796	
S3		3.71875	32	20.46875	0	0	
S4	-1	3.290323	31	38.3871	0.032258	-3.29032	
			172	197.6841	0.052666	0.199473	
Q TEST							
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*	
0.176028	1.133189	168	3.6746	-0.44736	0.846307	no	

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.416667	60	76.58333	0	0	
S2	1	3.489796	49	62.2449	0.020408	3.489796	
S3		3.71875	32	20.46875	0	0	
S4	-1	3.290323	31	38.3871	0.032258	-3.29032	
			172	197.6841	0.052666	0.199473	
SCHEFFE's TEST							
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*	
0.248942	0.801286	0.642059	3	168	7.975197	no	

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.416667	60	76.58333	0	0	
S2		3.489796	49	62.2449	0	0	
S3	1	3.71875	32	20.46875	0.03125	3.71875	
S4	-1	3.290323	31	38.3871	0.032258	-3.29032	
			172	197.6841	0.063508	0.428427	
Q TEST							
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*	
0.193299	2.216392	168	3.6746	-0.28187	1.138726	no	

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1		3.416667	60	76.58333	0	0	
S2		3.489796	49	62.2449	0	0	
S3	1	3.71875	32	20.46875	0.03125	3.71875	
S4	-1	3.290323	31	38.3871	0.032258	-3.29032	
			172	197.6841	0.063508	0.428427	
SCHEFFE's TEST							
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*	
0.273367	1.567226	2.456197	3	168	7.975197	no	

TUKEY'S HSD / TUKEY-KRAMER						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	0.5	3.416667	60	76.58333	0.004167	1.708333	
S2	0.5	3.489796	49	62.2449	0.005102	1.744898	
S3	-0.5	3.71875	32	20.46875	0.007813	-1.85938	
S4	-0.5	3.290323	31	38.3871	0.008065	-1.64516	
			172	197.6841	0.025146	-0.0513	
Q TEST							
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*	
0.121632	-0.4218	168	3.6746	-0.49825	0.395644	no	

SCHEFFE's CONTRAST						Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*	
S1	0.5	3.416667	60	76.58333	0.004167	1.708333	
S2	0.5	3.489796	49	62.2449	0.005102	1.744898	
S3	-0.5	3.71875	32	20.46875	0.007813	-1.85938	
S4	-0.5	3.290323	31	38.3871	0.008065	-1.64516	
			172	197.6841	0.025146	-0.0513	
SCHEFFE's TEST							
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*	
0.172014	-0.29826	0.08896	3	168	7.975197	no	

15.25 Industry Comparison – Question 25

ANOVA: Single Factor

DESCRIPTION Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	207	3.45	1.133051	66.85	0.133098	3.183672	3.716328
S2	49	141	2.877551	0.901361	43.26531	0.147282	2.581421	3.173681
S3	32	97	3.03125	0.998992	30.96875	0.182252	2.659545	3.402955
S4	31	97	3.129032	1.249462	37.48387	0.185168	2.750868	3.507196

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	9.50184	3	3.16728	2.979836	0.033022	2.658399	0.234685	0.033379
Within Groups	178.5679	168	1.062904					
Total	188.0698	171	1.099823					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	3	3.5	3	
rank sum	5976.5	3642.5	2603.5	2655.5	
count	60	49	32	31	172
r^2/n	595309.2	270771.6	211819.1	227473.6	1305373
H					7.431019
df					3
p-value					0.059358
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.530384
medians	0.6130358
trimmed	0.5274258

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3.45	2.87755102
Variance	1.133050847	0.901360544
Observations	60	49
Hypothesized Mean Difference	0	
df	106	
t Stat	2.964851504	
P(T<=t) one-tail	0.001870579	
t Critical one-tail	1.659356034	
P(T<=t) two-tail	0.003741158	
t Critical two-tail	1.982597262	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	2.87755102	3.03125
Variance	0.901360544	0.998991935
Observations	49	32
Hypothesized Mean Difference	0	
df	64	
t Stat	-0.69003412	
P(T<=t) one-tail	0.246333724	
t Critical one-tail	1.669013025	
P(T<=t) two-tail	0.492667449	
t Critical two-tail	1.997729654	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3.45	3.03125
Variance	1.133050847	0.998991935
Observations	60	32
Hypothesized Mean Difference	0	
df	67	
t Stat	1.870787015	
P(T<=t) one-tail	0.032871303	
t Critical one-tail	1.667916114	
P(T<=t) two-tail	0.065742605	
t Critical two-tail	1.996008354	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	2.87755102	3.129032258
Variance	0.901360544	1.249462366
Observations	49	31
Hypothesized Mean Difference	0	
df	56	
t Stat	-1.03797105	
P(T<=t) one-tail	0.151872351	
t Critical one-tail	1.672522303	
P(T<=t) two-tail	0.303744703	
t Critical two-tail	2.003240719	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3.45	3.129032258
Variance	1.133050847	1.249462366
Observations	60	31
Hypothesized Mean Difference	0	
df	58	
t Stat	1.319287206	
P(T<=t) one-tail	0.096128879	
t Critical one-tail	1.671552762	
P(T<=t) two-tail	0.192257758	
t Critical two-tail	2.001717484	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	3.03125	3.129032258
Variance	0.998991935	1.249462366
Observations	32	31
Hypothesized Mean Difference	0	
df	60	
t Stat	-0.36562423	
P(T<=t) one-tail	0.357965687	
t Critical one-tail	1.670648865	
P(T<=t) two-tail	0.715931374	
t Critical two-tail	2.000297822	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.45	60	66.85	0.016667	3.45
S2	-1	2.877551	49	43.26531	0.020408	-2.87755
S3		3.03125	32	30.96875	0	0
S4		3.129032	31	37.48387	0	0
			172	178.5679	0.037075	0.572449

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.140369	4.078168	168	3.6746	0.056648	1.088249	yes

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.45	60	66.85	0.016667	3.45
S2	-1	2.877551	49	43.26531	0.020408	-2.87755
S3		3.03125	32	30.96875	0	0
S4		3.129032	31	37.48387	0	0
			172	178.5679	0.037075	0.572449

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.198512	2.8837	8.315727	3	168	7.975197	yes

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.45	60	66.85	0.016667	3.45
S2		2.877551	49	43.26531	0	0
S3	-1	3.03125	32	30.96875	0.03125	-3.03125
S4		3.129032	31	37.48387	0	0
			172	178.5679	0.047917	0.41875

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.159579	2.624094	168	3.6746	-0.16764	1.005139	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.45	60	66.85	0.016667	3.45
S2		2.877551	49	43.26531	0	0
S3	-1	3.03125	32	30.96875	0.03125	-3.03125
S4		3.129032	31	37.48387	0	0
			172	178.5679	0.047917	0.41875

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.225679	1.855515	3.442935	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.45	60	66.85	0.016667	3.45
S2		2.877551	49	43.26531	0	0
S3		3.03125	32	30.96875	0	0
S4	-1	3.129032	31	37.48387	0.032258	-3.12903
			172	178.5679	0.048925	0.320968

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.161249	1.990513	168	3.6746	-0.27156	0.913492	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.45	60	66.85	0.016667	3.45
S2		2.877551	49	43.26531	0	0
S3		3.03125	32	30.96875	0	0
S4	-1	3.129032	31	37.48387	0.032258	-3.12903
			172	178.5679	0.048925	0.320968

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.22804	1.407505	1.981072	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.45	60	66.85	0	0
S2	1	2.877551	49	43.26531	0.020408	2.877551
S3	-1	3.03125	32	30.96875	0.03125	-3.03125
S4		3.129032	31	37.48387	0	0
			172	178.5679	0.051658	-0.1537

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.165692	-0.92762	168	3.6746	-0.76255	0.455153	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.45	60	66.85	0	0
S2	1	2.877551	49	43.26531	0.020408	2.877551
S3	-1	3.03125	32	30.96875	0.03125	-3.03125
S4		3.129032	31	37.48387	0	0
			172	178.5679	0.051658	-0.1537

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.234324	-0.65593	0.430238	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.45	60	66.85	0	0
S2	1	2.877551	49	43.26531	0.020408	2.877551
S3		3.03125	32	30.96875	0	0
S4	-1	3.129032	31	37.48387	0.032258	-3.12903
			172	178.5679	0.052666	-0.25148

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.167301	-1.50317	168	3.6746	-0.86625	0.363283	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.45	60	66.85	0	0
S2	1	2.877551	49	43.26531	0.020408	2.877551
S3		3.03125	32	30.96875	0	0
S4	-1	3.129032	31	37.48387	0.032258	-3.12903
			172	178.5679	0.052666	-0.25148

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.236599	-1.0629	1.129756	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.45	60	66.85	0	0
S2		2.877551	49	43.26531	0	0
S3	1	3.03125	32	30.96875	0.03125	3.03125
S4	-1	3.129032	31	37.48387	0.032258	-3.12903
			172	178.5679	0.063508	-0.09778

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.183716	-0.53225	168	3.6746	-0.77286	0.5773	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.45	60	66.85	0	0
S2		2.877551	49	43.26531	0	0
S3	1	3.03125	32	30.96875	0.03125	3.03125
S4	-1	3.129032	31	37.48387	0.032258	-3.12903
			172	178.5679	0.063508	-0.09778

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.259813	-0.37636	0.141644	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.45	60	66.85	0.004167	1.725
S2	0.5	2.877551	49	43.26531	0.005102	1.438776
S3	-0.5	3.03125	32	30.96875	0.007813	-1.51563
S4	-0.5	3.129032	31	37.48387	0.008065	-1.56452
			172	178.5679	0.025146	0.083634

Q TEST					
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.115602	0.72347	168	3.6746	-0.34116	0.508424	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.45	60	66.85	0.004167	1.725
S2	0.5	2.877551	49	43.26531	0.005102	1.438776
S3	-0.5	3.03125	32	30.96875	0.007813	-1.51563
S4	-0.5	3.129032	31	37.48387	0.008065	-1.56452
			172	178.5679	0.025146	0.083634

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.163485	0.511571	0.261705	3	168	7.975197	no

15.26 Industry Comparison – Question 26

ANOVA: Single Factor

DESCRIPTION Alpha 0.05

Groups	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
S1	60	216	3.6	1.159322	68.4	0.137145	3.325573	3.874427
S2	49	176	3.591837	1.079932	51.83673	0.15176	3.286702	3.896971
S3	32	129	4.03125	0.805444	24.96875	0.187794	3.648242	4.414258
S4	31	102	3.290323	1.47957	44.3871	0.190799	2.90066	3.679985

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	8.843465	3	2.947822	2.612096	0.05307	2.658399	0.286928	0.027349
Within Groups	189.5926	168	1.128527					
Total	198.436	171	1.160445					

Kruskal-Wallis Test

	S1	S2	S3	S4	
median	4	4	4	3	
rank sum	5108.5	4151.5	3341.5	2276.5	
count	60	49	32	31	172
r^2/n	434946.2	351733.7	348925.7	167175.9	1302781
H					6.385736
df					3
p-value					0.094279
alpha					0.05
sig					no

Levene's Tests

type	p-value
means	0.006483
medians	0.067461
trimmed	0.011227

t-Test: Two-Sample Assuming Unequal Variances

	S1	S2
Mean	3.6	3.591836735
Variance	1.159322034	1.079931973
Observations	60	49
Hypothesized Mean Difference	0	
df	104	
t Stat	0.040138947	
P(T<=t) one-tail	0.484029653	
t Critical one-tail	1.659637437	
P(T<=t) two-tail	0.968059306	
t Critical two-tail	1.983037526	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S3
Mean	3.591836735	4.03125
Variance	1.079931973	0.805443548
Observations	49	32
Hypothesized Mean Difference	0	
df	73	
t Stat	-2.02235915	
P(T<=t) one-tail	0.023401833	
t Critical one-tail	1.665996224	
P(T<=t) two-tail	0.046803667	
t Critical two-tail	1.992997126	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S3
Mean	3.6	4.03125
Variance	1.159322034	0.805443548
Observations	60	32
Hypothesized Mean Difference	0	
df	74	
t Stat	-2.04450152	
P(T<=t) one-tail	0.022230859	
t Critical one-tail	1.665706893	
P(T<=t) two-tail	0.044461717	
t Critical two-tail	1.992543495	

t-Test: Two-Sample Assuming Unequal Variances

	S2	S4
Mean	3.591836735	3.290322581
Variance	1.079931973	1.479569892
Observations	49	31
Hypothesized Mean Difference	0	
df	57	
t Stat	1.141513778	
P(T<=t) one-tail	0.129214597	
t Critical one-tail	1.672028888	
P(T<=t) two-tail	0.258429195	
t Critical two-tail	2.002465459	

t-Test: Two-Sample Assuming Unequal Variances

	S1	S4
Mean	3.6	3.290322581
Variance	1.159322034	1.479569892
Observations	60	31
Hypothesized Mean Difference	0	
df	55	
t Stat	1.195941236	
P(T<=t) one-tail	0.11842505	
t Critical one-tail	1.673033965	
P(T<=t) two-tail	0.236850099	
t Critical two-tail	2.004044783	

t-Test: Two-Sample Assuming Unequal Variances

	S3	S4
Mean	4.03125	3.290322581
Variance	0.805443548	1.479569892
Observations	32	31
Hypothesized Mean Difference	0	
df	55	
t Stat	2.744210035	
P(T<=t) one-tail	0.004087678	
t Critical one-tail	1.673033965	
P(T<=t) two-tail	0.008175356	
t Critical two-tail	2.004044783	

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.6	60	68.4	0.016667	3.6
S2	-1	3.591837	49	51.83673	0.020408	-3.59184
S3		4.03125	32	24.96875	0	0
S4		3.290323	31	44.3871	0	0
			172	189.5926	0.037075	0.008163

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.144637	0.05644	168	3.6746	-0.52332	0.539648	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.6	60	68.4	0.016667	3.6
S2	-1	3.591837	49	51.83673	0.020408	-3.59184
S3		4.03125	32	24.96875	0	0
S4		3.290323	31	44.3871	0	0
			172	189.5926	0.037075	0.008163

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.204548	0.039909	0.001593	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.6	60	68.4	0.016667	3.6
S2		3.591837	49	51.83673	0	0
S3	-1	4.03125	32	24.96875	0.03125	-4.03125
S4		3.290323	31	44.3871	0	0
			172	189.5926	0.047917	-0.43125

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.164431	-2.62268	168	3.6746	-1.03547	0.172969	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.6	60	68.4	0.016667	3.6
S2		3.591837	49	51.83673	0	0
S3	-1	4.03125	32	24.96875	0.03125	-4.03125
S4		3.290323	31	44.3871	0	0
			172	189.5926	0.047917	-0.43125

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.232541	-1.85451	3.439217	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.6	60	68.4	0.016667	3.6
S2		3.591837	49	51.83673	0	0
S3		4.03125	32	24.96875	0	0
S4	-1	3.290323	31	44.3871	0.032258	-3.29032
			172	189.5926	0.048925	0.309677

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.166152	1.863821	168	3.6746	-0.30086	0.920219	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	1	3.6	60	68.4	0.016667	3.6
S2		3.591837	49	51.83673	0	0
S3		4.03125	32	24.96875	0	0
S4	-1	3.290323	31	44.3871	0.032258	-3.29032
			172	189.5926	0.048925	0.309677

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.234974	1.317921	1.736915	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.6	60	68.4	0	0
S2	1	3.591837	49	51.83673	0.020408	3.591837
S3	-1	4.03125	32	24.96875	0.03125	-4.03125
S4		3.290323	31	44.3871	0	0
			172	189.5926	0.051658	-0.43941

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.17073	-2.57373	168	3.6746	-1.06678	0.187952	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.6	60	68.4	0	0
S2	1	3.591837	49	51.83673	0.020408	3.591837
S3	-1	4.03125	32	24.96875	0.03125	-4.03125
S4		3.290323	31	44.3871	0	0
			172	189.5926	0.051658	-0.43941

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.241449	-1.8199	3.312038	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.6	60	68.4	0	0
S2	1	3.591837	49	51.83673	0.020408	3.591837
S3		4.03125	32	24.96875	0	0
S4	-1	3.290323	31	44.3871	0.032258	-3.29032
			172	189.5926	0.052666	0.301514

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.172388	1.749043	168	3.6746	-0.33194	0.934971	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.6	60	68.4	0	0
S2	1	3.591837	49	51.83673	0.020408	3.591837
S3		4.03125	32	24.96875	0	0
S4	-1	3.290323	31	44.3871	0.032258	-3.29032
			172	189.5926	0.052666	0.301514

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.243794	1.23676	1.529576	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.6	60	68.4	0	0
S2		3.591837	49	51.83673	0	0
S3	1	4.03125	32	24.96875	0.03125	4.03125
S4	-1	3.290323	31	44.3871	0.032258	-3.29032
			172	189.5926	0.063508	0.740927

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.189302	3.913994	168	3.6746	0.045318	1.436537	yes

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1		3.6	60	68.4	0	0
S2		3.591837	49	51.83673	0	0
S3	1	4.03125	32	24.96875	0.03125	4.03125
S4	-1	3.290323	31	44.3871	0.032258	-3.29032
			172	189.5926	0.063508	0.740927

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.267714	2.767612	7.659676	3	168	7.975197	no

TUKEY'S HSD / TUKEY-KRAMER					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.6	60	68.4	0.004167	1.8
S2	0.5	3.591837	49	51.83673	0.005102	1.795918
S3	-0.5	4.03125	32	24.96875	0.007813	-2.01563
S4	-0.5	3.290323	31	44.3871	0.008065	-1.64516
			172	189.5926	0.025146	-0.06487

Q TEST						
std err	*q-stat*	*df*	*q-crit*	*lower*	*upper*	*sig*
0.119117	-0.54457	168	3.6746	-0.50257	0.372839	no

SCHEFFE's CONTRAST					Alpha	0.05
Groups	*c*	*mean*	*n*	*ss*	*c^2/n*	*c*mean*
S1	0.5	3.6	60	68.4	0.004167	1.8
S2	0.5	3.591837	49	51.83673	0.005102	1.795918
S3	-0.5	4.03125	32	24.96875	0.007813	-2.01563
S4	-0.5	3.290323	31	44.3871	0.008065	-1.64516
			172	189.5926	0.025146	-0.06487

SCHEFFE's TEST						
std err	*t-stat*	*F-stat*	*dfB*	*dfW*	*F-crit*	*sig*
0.168457	-0.38507	0.14828	3	168	7.975197	no

16 Appendix H1: Descriptive Statistics

16.1.1 Descriptive Statistics – All Sectors

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
Mean	3,56	3,88	3,34	3,78	3,37	3,26	2,73	2,98	2,92	2,97	3,49	3,72	3,44	3,58	3,47	3,20	2,89	2,72	2,65	2,15	2,66	3,27	3,63	3,47	3,15	3,62
Standard Error	0,08	0,07	0,09	0,08	0,09	0,08	0,09	0,09	0,09	0,09	0,08	0,07	0,09	0,08	0,09	0,08	0,09	0,10	0,09	0,08	0,09	0,09	0,08	0,08	0,08	0,08
Median	4	4	4	4	4	4	2	3	3	3	4	4	4	4	4	3	3	2	2,5	2	2	4	4	4	3	4
Mode	4	4	4	4	4	4	2	2	2	4	4	4	4	4	4	4	2	2	2	2	4	4	4	4	4	4
Standard Deviation	1,05	0,95	1,18	1,06	1,16	1,08	1,13	1,23	1,15	1,24	1,07	0,94	1,16	1,07	1,17	1,09	1,16	1,25	1,16	0,99	1,15	1,17	1,01	1,08	1,05	1,08
Sample Variance	1,10	0,90	1,38	1,13	1,36	1,17	1,28	1,51	1,32	1,54	1,15	0,89	1,35	1,15	1,37	1,18	1,35	1,57	1,35	0,97	1,33	1,37	1,02	1,17	1,10	1,16
Kurtosis	-0,81	0,32	-1,27	-0,11	-1,35	-1,07	-1,03	-1,22	-1,30	-1,19	-0,82	0,97	-0,92	-0,45	-0,92	-1,07	-1,21	-0,99	-1,24	0,06	-1,43	-1,02	-0,32	-1,01	-1,46	-0,70
Skewness	-0,59	-0,97	-0,27	-0,87	-0,14	-0,40	0,30	0,01	0,13	-0,07	-0,49	-1,18	-0,45	-0,50	-0,44	-0,19	0,04	0,30	0,06	0,84	0,01	-0,47	-0,75	-0,47	0,03	-0,62

16.1.2 Descriptive Statistics – Petrochemical

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
Mean	3,50	3,80	3,13	3,57	3,15	3,02	2,25	2,75	2,70	2,82	3,52	3,62	3,27	3,52	3,40	3,07	2,93	2,32	2,73	1,90	2,45	3,38	3,63	3,42	3,45	3,60
Standard Error	0,12	0,11	0,13	0,16	0,16	0,14	0,13	0,15	0,14	0,16	0,14	0,13	0,15	0,14	0,15	0,14	0,15	0,13	0,14	0,09	0,14	0,15	0,12	0,15	0,14	0,14
Median	4	4	4	4	3	3	2	3	2	3	4	4	4	4	4	3	3	2	3	2	2	4	4	4	4	4
Mode	4	4	4	4	2	4	2	2	2	4	4	4	4	3	4	4	4	2	2	2	2	4	4	4	4	4
Standard Deviation	0,95	0,86	1,02	1,21	1,22	1,10	1,04	1,19	1,06	1,23	1,10	1,04	1,19	1,07	1,15	1,09	1,18	0,98	1,06	0,71	1,10	1,14	0,96	1,14	1,06	1,08
Sample Variance	0,90	0,74	1,03	1,47	1,49	1,20	1,07	1,41	1,13	1,51	1,20	1,09	1,42	1,14	1,33	1,18	1,39	0,97	1,11	0,50	1,20	1,29	0,91	1,30	1,13	1,16
Kurtosis	-0,30	2,01	-1,72	-0,81	-1,44	-1,29	-0,15	-0,99	-1,23	-1,43	-0,31	0,05	-1,11	-0,49	-0,46	-0,92	-1,34	-0,76	-1,33	2,33	-1,26	-0,66	0,79	-1,26	-1,28	-0,32
Skewness	-0,93	-1,42	-0,08	-0,63	0,11	-0,19	0,80	0,19	0,29	-0,09	-0,76	-1,02	-0,35	-0,31	-0,71	-0,14	-0,06	0,42	-0,06	1,04	0,21	-0,67	-1,12	-0,32	-0,30	-0,73

16.1.3 Descriptive Statistics – Manufacturing

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
Mean	3,22	3,65	3,12	3,69	3,29	3,27	3,06	2,82	3,02	2,86	3,41	3,76	3,12	3,24	3,22	3,10	2,59	2,33	2,63	2,35	2,63	2,92	3,41	3,49	2,88	3,59
Standard Error	0,15	0,14	0,17	0,13	0,15	0,15	0,16	0,16	0,16	0,17	0,14	0,13	0,16	0,17	0,16	0,14	0,15	0,16	0,15	0,15	0,17	0,16	0,15	0,16	0,14	0,15
Median	4	4	4	4	4	4	3	2	3	3	4	4	3	4	4	3	2	2	3	2	2	3	4	4	3	4
Mode	4	4	4	4	4	4	4	2	2	2	4	4	4	4	4	4	2	1	3	2	2	4	4	4	2	4
Standard Deviation	1,03	0,95	1,18	0,92	1,04	1,08	1,13	1,15	1,15	1,17	0,96	0,92	1,13	1,16	1,10	1,01	1,02	1,09	1,03	1,05	1,17	1,15	1,06	1,14	0,95	1,04
Sample Variance	1,05	0,90	1,40	0,84	1,08	1,16	1,27	1,32	1,31	1,38	0,91	0,86	1,28	1,36	1,22	1,01	1,04	1,18	1,07	1,11	1,36	1,33	1,12	1,30	0,90	1,08
Kurtosis	-1,43	-0,40	-1,37	-0,11	-1,34	-1,25	-1,03	-1,15	-1,36	-1,09	-0,98	1,09	-1,09	-1,01	-1,13	-1,26	-1,12	-1,23	-1,11	-0,88	-1,55	-1,27	-1,31	-1,08	-1,46	-0,93
Skewness	-0,47	-0,77	-0,17	-0,86	-0,03	-0,25	-0,22	0,29	0,13	0,05	-0,17	-1,13	-0,16	-0,25	-0,27	-0,08	0,05	0,21	-0,14	0,59	0,03	-0,09	-0,24	-0,46	0,41	-0,60

16.1.4 Descriptive Statistics – Banking

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
Mean	4,00	4,41	4,00	4,31	3,72	3,53	2,78	3,50	3,47	3,53	3,88	3,94	4,22	4,25	3,81	3,50	3,28	4,03	2,47	2,16	2,78	3,34	3,91	3,72	3,03	4,03
Standard Error	0,21	0,14	0,21	0,14	0,21	0,17	0,19	0,22	0,21	0,22	0,19	0,11	0,15	0,13	0,24	0,21	0,23	0,20	0,26	0,23	0,23	0,20	0,16	0,14	0,18	0,16
Median	4	5	4	4	4	4	2	4	4	4	4	4	4	4	4	4	4	4	2	1,5	2	4	4	4	3,5	4
Mode	5	5	4	4	4	4	2	4	4	4	4	4	4	4	5	4	4	5	1	1	4	4	4	4	4	4
Standard Deviation	1,16	0,80	1,16	0,78	1,20	0,95	1,10	1,27	1,16	1,27	1,10	0,62	0,83	0,76	1,33	1,16	1,28	1,15	1,48	1,30	1,29	1,12	0,93	0,81	1,00	0,90
Sample Variance	1,35	0,64	1,35	0,61	1,43	0,90	1,21	1,61	1,35	1,61	1,21	0,38	0,69	0,58	1,77	1,35	1,63	1,32	2,19	1,68	1,66	1,27	0,86	0,66	1,00	0,81
Kurtosis	-0,63	3,41	0,40	9,73	-1,30	0,53	-1,03	-0,98	-0,53	-0,55	-0,57	2,63	1,40	1,00	-1,59	-0,95	-1,38	0,43	-1,66	-1,16	-1,61	-1,15	0,69	1,13	-2,10	1,27
Skewness	-0,92	-1,71	-1,18	-2,37	-0,50	-1,30	0,62	-0,55	-0,77	-0,63	-0,82	-0,84	-1,16	-0,93	-0,51	-0,59	-0,27	-1,15	0,32	0,54	-0,05	-0,45	-1,09	-1,35	-0,07	-1,21

16.1.5 Descriptive Statistics – Professional Services

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26
Mean	3,77	3,87	3,39	3,77	3,55	3,45	3,10	3,13	2,65	2,87	3,19	3,65	3,48	3,52	3,61	3,32	2,87	2,74	2,71	2,32	2,97	3,52	3,68	3,29	3,13	3,29
Standard Error	0,18	0,20	0,23	0,20	0,21	0,20	0,19	0,23	0,21	0,22	0,20	0,19	0,20	0,17	0,19	0,20	0,21	0,21	0,22	0,16	0,19	0,22	0,19	0,20	0,20	0,22
Median	4	4	4	4	4	4	3	4	2	3	4	4	4	4	4	4	3	3	2	2	3	4	4	4	3	3
Mode	4	4	4	4	4	4	2	4	2	2	4	4	4	4	4	4	2	2	2	2	4	4	4	4	4	2
Standard Deviation	0,99	1,09	1,26	1,09	1,15	1,12	1,08	1,26	1,14	1,23	1,11	1,05	1,12	0,93	1,09	1,11	1,15	1,18	1,22	0,91	1,05	1,23	1,08	1,13	1,12	1,22
Sample Variance	0,98	1,18	1,58	1,18	1,32	1,26	1,16	1,58	1,30	1,52	1,23	1,10	1,26	0,86	1,18	1,23	1,32	1,40	1,48	0,83	1,10	1,52	1,16	1,28	1,25	1,48
Kurtosis	-0,50	-0,68	-1,09	-0,95	-0,77	-0,81	-0,92	-1,09	-0,69	-1,03	-1,35	1,16	-0,76	0,65	-0,29	-0,94	-1,00	-0,60	-1,04	1,77	-1,07	-0,31	0,01	-1,09	-1,20	-1,30
Skewness	-0,61	-0,73	-0,37	-0,52	-0,55	-0,40	0,14	-0,37	0,62	0,15	-0,25	-1,24	-0,49	-0,72	-0,64	-0,23	0,13	0,41	0,25	1,28	-0,49	-0,89	-0,84	-0,18	0,04	-0,01