Chapter 3 – Methodology (example)

3.1   Introduction

The current chapter presents the process of developing the research methods needed to complete the experimentation portion of the current study. The chapter will discuss in detail the various stages of developing the methodology of the current study. This includes a detailed discussion of the philosophical background of the research method chosen. In addition to this, the chapter describes the data collection strategy including selection of research instrumentation and sampling. The chapter closes with a discussion on the analysis tools that will be used to analyse the data collected.

3.2   Selecting an appropriate research approach

Creswall (2013) stated that research approaches are plans and procedures that range from steps including making broad assumptions to detailed methods of data collection, analysis, and interpretation. The several decisions involved in the process are used to decide which approach should be used in a specific study which is informed using philosophical assumptions which are brought to the study (Creswall 2013). Included in this are procedures of inquiry or research designs and specific research methods that are used for data collection, its analysis, and finally its interpretation. However, Guetterman (2015); Lewis (2015); and Creswall (2013) argue that the selection of the specific research approach is based on the nature of the research problem, or the issue that is being addressed by any study, personal experiences of the researchers', and even the audience for which the study is being developed for.

There are many ways in which research approaches can be customised to develop an approach most suited for a particular study. However, the main three categories with which research approaches are organised include; qualitative, quantitative, and mixed methods of research. Creswall (2013) comments that all three approaches are not to be considered so discrete or

distinct to one another. Creswall (2013) states, "qualitative and quantitative approaches should not be viewed as rigid, distinct categories, polar opposite, or dichotomies" (p.32). Newmand and Benz (1998) pointed out that quantitative and qualitative approaches instead represent different ends on a continuum, since a study "tends" to be more quantitative than qualitative or vice versa. Lastly, mixed methods research resides in the middle of the continuum as it is able to incorporate elements and characteristics of both quantitative and qualitative approaches. Lewis (2015) points out that the main distinction that is often cited between quantitative and qualitative research is that it is framed in terms of using numbers rather than words; or using closed-ended questions for quantitative hypotheses over open-ended questions for qualitative interview questions. Guetterman (2015) points out that a clearer way of viewing gradations of differences between the approaches is to examine the basic philosophical assumptions that are brought to the study, the kinds of research strategies used, and the particular methods that are implemented in conducting the strategies.

3.2.1 Underlying Philosophical Assumptions

An important component of defining the approach to research involves philosophical assumptions which contribute to the broad research approach of planning or proposing to conduct research. It involves the intersection of philosophy, research designs and specific methods as illustrated in the Fig. 1 below.
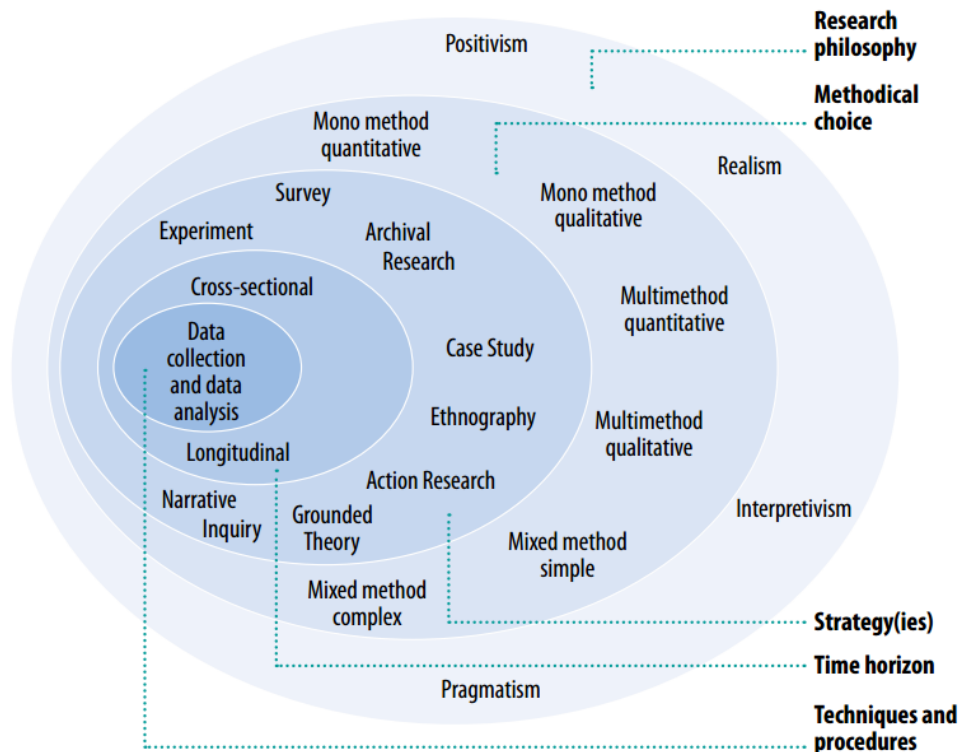
Figure 3.2-1- Research Onion (Source; Saunders and Tosey 2013)

Slife and Williams (1995) has argued that philosophical ideas have remained hidden within research but they still play an influential role in the practice of the research and it is for this reason that it is most identified. There are various philosophical assumptions that are used to construct or develop a study on. Saunders et al. (2009) define research philosophy as a belief about the way in which data about a phenomenon should be gathered, analysed and used. Saunders et al. (2009) goes on to identify common research philosophies such as positivism, realism, interpretivism, subjectivism, and pragmatism. Dumke (2002) believes that research philosophy is mainly characterised by two views; positivism and phenomenology.

Positivism reflects the acceptance in adopting the philosophical stance of natural scientists (Saunders, 2003). According to Remenyi et al. (1998) there is a greater preference in working with an "observable social reality" and that the outcome of such research can be "law-like" generalisations that are the same to those which are produced by physical and natural scientists. Gill and Johnson (1997) add that it will also place a greater emphasis on a highly structure methodology in order to allow for replication for other studies. Dumke (2002) agrees and explains

that a positivist philosophical assumption produces highly structured methodologies and allows for generalization and quantification of objectives that can be evaluated by statistical methods. For this philosophical approach, the researcher is considered an objective observer who should not be impacted by or impact the subject of research.

On the other hand, more phenomenological approaches agree with the view that the social world of business and management is too complex to develop theories and laws similar to natural sciences. Saunders et al. (2000) argues that this is the reason why reducing observations in the real world to simple laws and generalisations produces a sense of reality which is a bit superficial and doesn't present the complexity of it.

The current study chooses positivistic assumptions due to the literature review's discussion of the importance of Big Data in industrial domains and the need for measuring its success in operations of business. The research aims of the current study is to examine the impact that Big Data has on automobile companies' operations. In order to identify a positive relationship with Big Data usage and beneficial business outcomes, theory need to be used to generate hypotheses which can later be tested of the relationship which would allow for explanations of laws that can later be assessed (Bryman and Bell, 2015).

3.2.2   Selecting Interpretive Research Approach

Interpretive research approaches are derived from research philosophy that is adopted. According to Dumke (2002) the two main research approaches are deductive and inductive. The inductive approach is commonly referred to when theory is dervive from observations. Thus, the research begins with a specific observation and measures. It is then from detecting some sort of patter that a hypothesis is developed. Dumke (2002) argues that researchers who use an inductive approach usually work with qualitative data and apply various methods to gather specific information that places different views. From the philosophical assumptions discussed in the previous section, it is reasonable to use the deductive approach for the current study. It is also considered the most commonly used theory to establish a relationship between theory and research. The figure below illustrates the steps used for the process of deduction.

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┌─────────────────┐
│     Theory      │
└─────────────────┘
         │
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│   Hypothesis    │
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│ Data Collection │
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│   Hypotheses    │
│confirmed or rejected│
└─────────────────┘
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┌─────────────────┐
│Revision of theory│
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Figure 3.2-2- The process of deduction (Source, Bryman and Bell 2015)

Based on what is known about a specific domain the theoretical considerations encompassing it a hypothesis or hypotheses are deduced that will later be subjected to empirical enquiry (Daum, 2013). It is through these hypotheses that concepts of the subject of interest will be translated into entities that are rational for a study. Researchers are then able to deduce their hypotheses and convert them into operational terms.

3.3   Justifying the Use of Quantitative Research Method

Saunders (2003) notes that almost all research will involve some sort of numerical data or even contain data that could be quantified in order to help a researcher answer their research questions and meet objectives of the study. However, quantitative data refers to all and every data that can be a product of all research strategies (Bryman and Bell, 2015; Guetterman, 2015; Lewis, 2015; Saunders, 2003). Based on the philosophical assumptions and interpretive research approach a quantitative research method is the best suited for the current study. Haq (2014) explains that quantitative research is about collecting numerical data and then analysing it through the use of statistical methods in order to explain a specific phenomenon. Mujis (2010) defends the use of quantitative research because unlike qualitative research which argues that

there is no pre-existing reality, quantitative assumes that there exits only a single reality about a social conditions which cannot be influenced by researchers in any way. Also, qualitative research is commonly used when there is little to no knowledge of a phenomenon whereas quantitative research is used to find the cause and effect relationship between variables generally to either verify or nullify some kind of theory or hypothesis (Creswall 2002; Feilzer 2010; Teddlie and Tashakkori 2012).

3.4   Selecting an Appropriate Research Strategy

There are many strategies available to implement in a study as evidence from Fig. 1. There are many strategies available for mono-quantitative method such as telephone interviews, web based surveys, postal surveys, and structured questionnaires (Haq 2014). Each instrument has its own pros and cons in terms of quality, time, and cost of data. Brymand (2006); Driscoll et al. (2007); Edwards et al. (2002); and Newby et al. (2003) note that most researchers use structured questionnaires for data collection they are unable to control or influence respondents which leads to low response rates but more accurate data obtained. Saunders and Tosey (2015) have argued that quantitative data is simpler to obtain and more concise to present. Therefore, the current study uses a survey based questionnaire (See Appendix A).

3.4.1   Justifying the use of Survey Based Questionnaire

Surveys are considered the most traditional forms of conducting research and useful in non-experimental descriptive designs that look to describe some sort of reality. Survey based questionnaires are often restricted to a representative sample of a potential group that is of the study's interest. In this case, it is the executives currently working for automobile companies in the UK. The survey instrument is then chosen as for its effectiveness at being practical and inexpensive (Kelley et al., 2003). Due to the philosophical assumptions, interpretive approach, and methodological approach chosen, the survey design for the current study is considered the best instrument that is in line with these premises in addition to be cost effective.

3.5 Empirical Research Methodology

3.5.1 Research Design

This section describes how research is designed in terms of the techniques used for data collection, sampling strategy, and data analysis for a quantitative method. Before going into the strategies of data collection and analysis, a set of hypotheses were developed.

3.5.1.1 Hypotheses Development

The current study is using a quantitative research approach making it essential to develop a set of hypotheses that will be used as a test standard for the mono-method quantitative design. The following are a set of hypotheses which have been developed from the examination of the literature review.

H_1- The greater the company's budget for Big Data initiatives (More than 1 million GBP) the greater the company's ability to monetize and generate new revenues.

H_2- The greater the company's budget for Big Data initiatives (More than 1 million GBP) the more decrease in expenses in found.

H_3- The greatest impact of Big Data on a company is changing the way business is done.

H_4- Big Data integrating in a company has resulted in competitive significance.

H_5- The analytical abilities of a company allows for achieved measureable results.

H_6- Investing in Big Data will lead to highly successful business results.

H_7- A business's operations function is fuelling Big Data initiatives and effecting change in organisation of operations.

H_8- The implementation of Big Data in the company has positive impacts on business.

3.5.1.2 Data Collection

This section includes the sampling method used to collect the number of respondents needed to provide information which is then analysed after collection.

3.5.1.2.1 Sampling Method

Collis (2009) explains that there are many kinds of sampling methods that can be used for creating a specific target sample from a population. This current study uses simple random sampling to acquire respondents with which the survey will be conducted. Simple random sampling is considered the most basic form of probability sampling. Under the method, elements taken from the population at random with all elements having an equal chance of being selection. According to () as of 2014 there are about thirty five active British car manufacturers in the UK, each having an employee population of 150 or more. This is why the total population of employees in car manufacturers is estimated to 5,250 employees. The sample therefore developed used the following equation;

$$\frac{\dfrac{z^2 \times p(1-p)}{e^2}}{1 + (\dfrac{z^2 \times p(1-p)}{e^2 N})}$$

Where; N is population size, *e* is margin of error (as a decimal), *z* is confidence level (as a z-score), and *p* is percentage value (as a decimal).Thus, the sample size is with a normal distribution of 50%. With the above equation, population of 5,250; with a 95% confidence level and 5% margin of error, the total sample size needed for the current equals 300. Therefore, N=300 which is the sample size of the current study.

3.5.1.2.2 Survey

The survey develop (see Appendix A) has a total of three sections, A, B, and C with a total of 39 questions. Each section has its own set of questions with an objective to accomplish. The survey is a mix of closed end questions that look to comprehend the demographic makeup of the respondents, the Big Data initiatives of the company, and the impact that Big Data was having in their company. The survey is designed to take no longer than twenty minutes. The survey was

constructed on Survey Monkey.com an online survey provided website. The survey was left on the website for a duration of 40 days in order to ensure that a maximum number of respondents were able to answer to the survey. The only way that the survey was allowed for a respondent is if they passed a security question which as if they are working for an automobile company in the UK at the time of taking the survey. Gupta et al. (2004) believes that web surveys are visual stimulus, and the respondent has complete control with regard to whether or how each question is read and understood. That is why Dillman (2000) argued that web questionnaires are expected to closely resemble those that are taken through the mail/postal services.

3.5.2   Data Analysis

The collected data is then analysed through Statistical Package for Social Science (SPSS) version 24 for descriptive analysis. The demographic section of the survey will be analysed using descriptive statistics. Further analysis of the data includes regression analysis. Simple regression analysis includes only one independent variable and one dependent variable. Farrar and Glauber (1967) assert that the purpose of a regression analysis is to estimate the parameters of dependency, and it should not be used to determine the interdependency of a relationship.

3.6   Conclusions

The chapter provides descriptive and in-depth discussion of the methods involved in the research of the current study. The current study is looking towards a quantitative approach that takes into account positivism as it philosophical undertaking, using deductive reasoning for its interpretive approach, is a mono-quantitative method that involves the use of a survey instrument for data collection. The methodology chapter also provided the technique for data analysis which is descriptive statistics through frequency analysis and regression analysis.

Examples of results;

Question 8- Of these staff, are most working in or for your consumer facing (B2C) businesses, your commercial or wholesale (B2B) businesses or both?
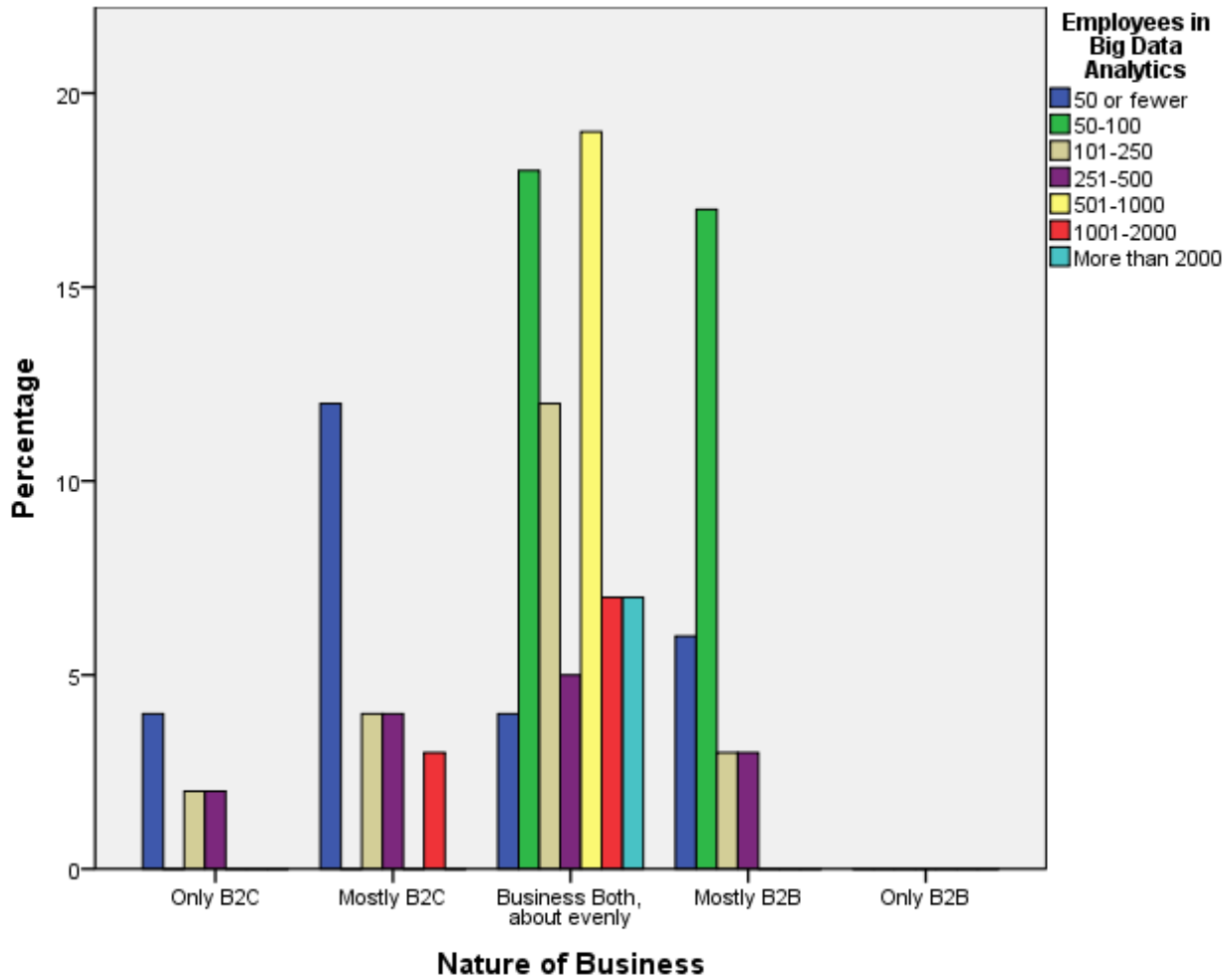

Figure 3.6-1 Approximately how many staff in your company are dedicated to analytics, modeling, data mining (not including routine reporting)? Of these staff, are most working in or for your consumer facing (B2C) businesses, your commercial or wholesale (B2B) businesses or both?

Based on the illustration, nineteen (19) respondents indicated that 501-1000 employees are dedicated to analytics for both B2B and B2C evenly. The category of using Big Data analytics for both B2B and B2C comprises of the most agreement of respondents with 72 of 132 indicated so.
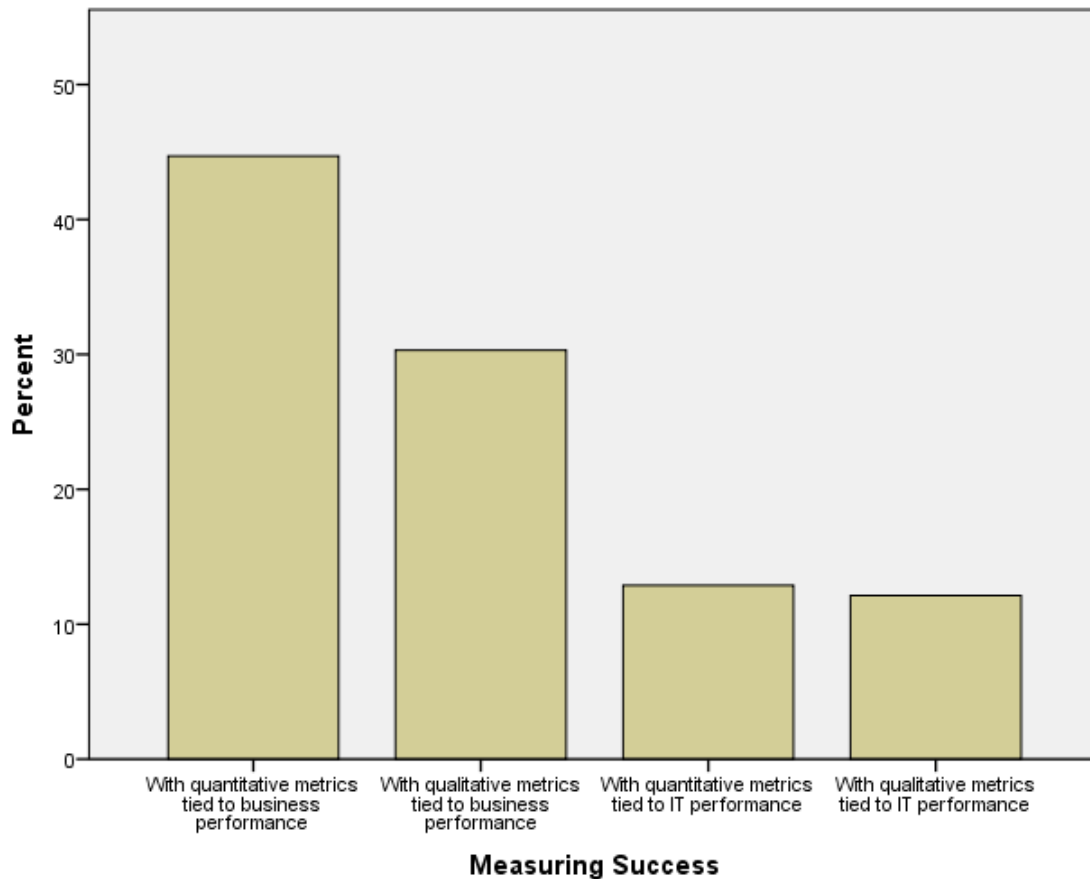
Figure 3.6-2 How does the company plan to measure the success of your Big Data initiatives?

The figure above represents the respondents answers to their automobile company's plan for measuring the success of Big Data. Of the 132 participants 44.70 per cent responded that the company is planning on using quantitative metrics that are associated to business performance to analyse if Big Data is actually successful. Another, 30.30 per cent indicated that their company was planning on using qualitative metrics that are tied to business performance. Using business performance as a means of analysing the success of Big Data is coherent to the results of the literature review that indicated previous studies of do such. As an automobile company, they need to know the results of using Big Data analytics and that is only by using business performance indicators regardless of being qualitative or quantitative.
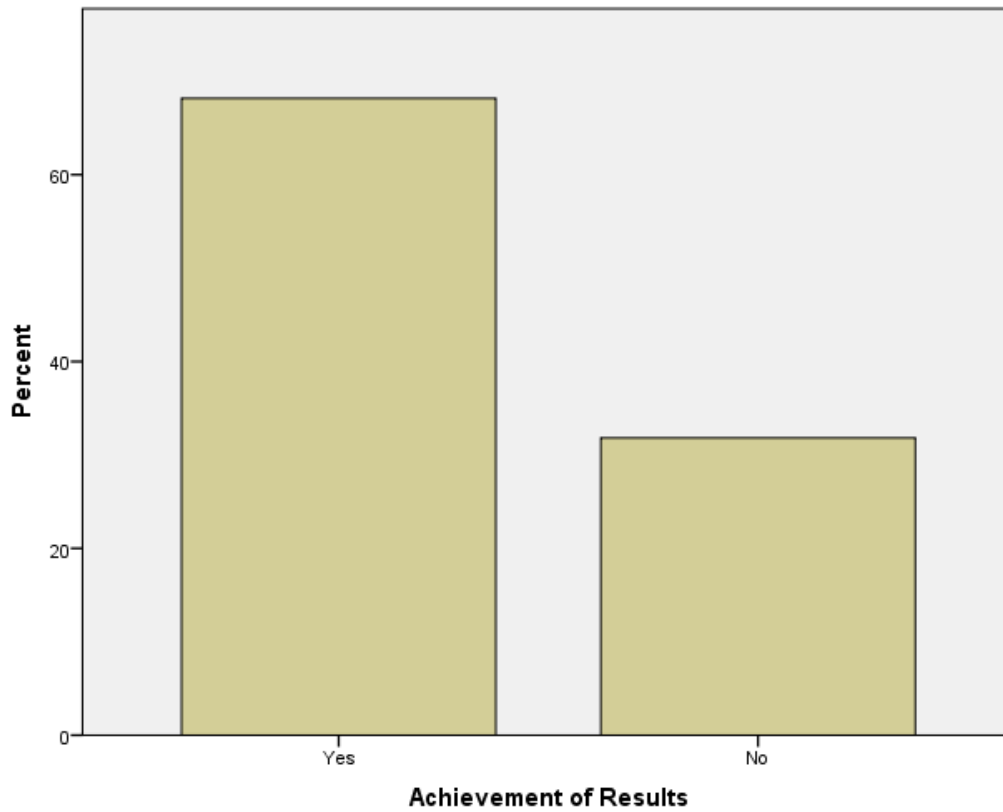
Figure 3.6-3 Has the company achieved measurable results from their investments in Big Data?

Fig. 4.3-6 portrays the response of participants in regards to actually achieving measurable results from Big Data. According to 68.18 per cent of respondents the company that they worked for did indeed show measurable results from their investments in Big Data. However, 31.82 per cent indicated that there was indeed no measurable result in investing in Big Data.
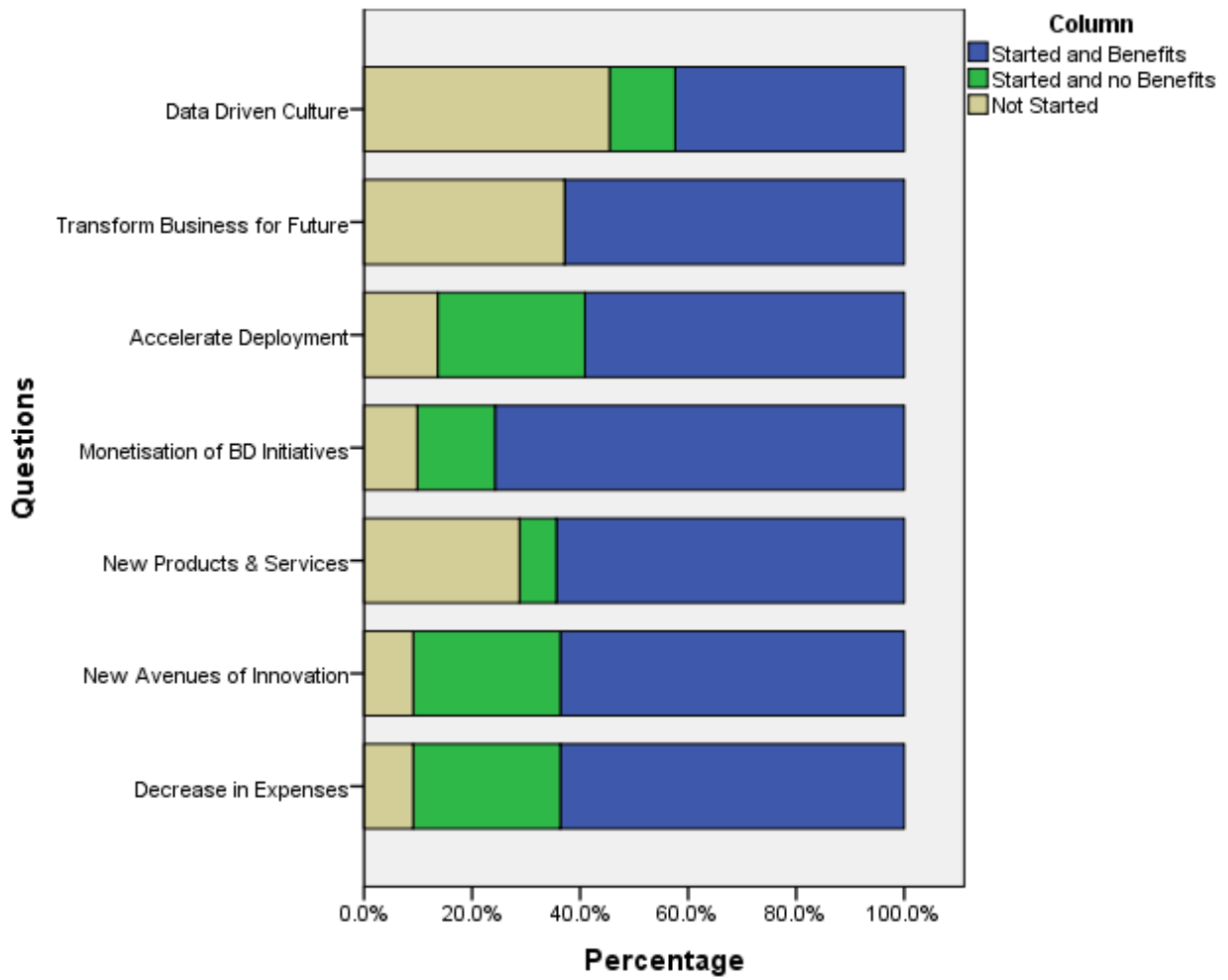
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