AN EXPOSITORY REVIEW OF ROBOT TAX IN THE ERA OF THE FOURTH INDUSTRIAL REVOLUTION.

by

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ABSTRACT

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Background: The looming Fourth Industrial revolution unveils advanced technology, such as robots which will reshape the workforce completely, resulting in a depletion of tax revenue, since they are currently not being taxed. Various scholars and tax-industry experts have proposed taxing the robots, in order to curb this phenomenon.

Main purpose of study: The primary objective of this study is to determine whether the notion of imposing tax on robots is feasible. In order to address this research objective, it was imperative to determine what has previously been published on robot tax, as well as the current understanding thereof.

Method: Academic articles, including industry reports and working papers on scholarly databases such as Google Scholar, EbscoHost and ProQuest were utilised in performing a systematic review on robot tax. A total of seventy publications were found on the scholarly databases, after which the search criteria were applied, in order to screen the publications. Of the seventy publications, only thirty-three publications were selected for the systematic review.

Results: After analysing the publications, it was evident that robot tax is a complex issue with the majority of the authors proposing that some form of direct tax should be levied on the robots.

Conclusions: It is evident that more research and debate are needed, in order to fully comprehend the extent and complexity of this topic. Subsequently, experts should then be able to suggest plausible solutions to curb revenue loss, without discouraging innovation and automation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

Table 1: Abbreviations and acronyms used in this document

Abbreviation	Meaning
AI	Artificial Intelligence
ABDC	Australian Business Dean Council
CPS	Cyber-Physical System
Industry 1.0	First Industrial Revolution
Industry 2.0	Second Industrial Revolution
Industry 3.0	Third Industrial Revolution
Industry 4.0	Fourth Industrial Revolution
IT	Information Technology
OECD	Organisation for Economic Co-operation and Development
US	United States
VAT	Value Added Tax

CHAPTER 1:

INTRODUCTION

1.1. BACKGROUND

The looming Fourth Industrial Revolution (hereafter referred to as Industry 4.0) will cause disruption in social society and industry on a global scale (Gružauskas & Statnickė, 2017). On the one hand, Artificial Intelligence (hereafter referred to as AI) and robots will advance automation in a variety of industries, thereby resulting in economic growth (Korinek & Stiglitz, 2017), while on the other hand, automating technology will prompt ever-increasing unemployment since robots will snitch the jobs of human beings. According to the World Economic Forum, approximately five million jobs will evaporate in 2020 (World Economic Forum, 2016). Consequently, AI will impose a noteworthy impact on the labour market since certain jobs will become non-essential, while others will be in high demand (Postelnicu & Calea, 2019).

World-wide tax revenue is largely generated through personal income tax. This is evident from the following two illustrations: in 2017, eighteen Organisation for Economic Co-operation and Development (OECD) in various countries raised the largest part of their revenues from income taxes, comprising of corporate and personal taxation (Revenue Statistics 2019). Additionally, in 2019, the South African Budget revealed that personal Income tax is the largest contributor to tax revenue in South Africa (National Treasury, 2019). Consequently, job losses due to automation will inevitably diminish the government revenue from income tax.

It is anticipated that robots and AI will dramatically reduce employment across the world since robots will take over tasks that were previously performed by humans (Berksoy, Dane & Popovic, 2017). Inevitably, there will be a reduction of income for the government sector if employment is reduced, as a result of human beings no longer paying personal income tax (Berksoy *et al.*, 2017). Subsequently, tax regulators will need to reframe tax rules and applications, to ensure that they receive the maximum revenue from these technologically advanced services, in order to compensate for the loss of personal income tax.

1

The loss of personal income tax will result in wage inequality. Consequently, some scholars and policy-makers have proposed that robots should be taxed, in order to compensate for the inequality introduced by robotization (Thuemmel, 2018). However, this idea has been criticized because of the dubious feasibility thereof, and the ambiguity with regard to the term "robot" (Abbott & Bogenschneider, 2018). Some authors maintain that all types of tax other than a lumpsum tax imposed on robots will damage the economy, leading to uncertainty regarding which type of tax to impose on robots, if any.

1.2.   RATIONALE FOR THE STUDY

It is expected that robots will replace many human activities, thereby, increasing unemployment leading to a reduction in personal income tax. Concurrently, there is a need for additional sources of revenue to support the increasing number of unemployed humans (Oberson, 2017). As Industry 4.0 gathers pace, it is evident that both government and the private sector are aware of technological advances, such as robots. However, they are uncertain how to respond and consequently, the tax policy needed to address these advances are largely being neglected (Deloitte, Not dated). In addition, this new source of tax revenue has not been fully exploited since the tax authorities lack the necessary knowledge and understanding regarding when, how and where to tax such technologically advanced services.

Tax authorities lack a holistic understanding of robot's tax as the current literature is fragmented. Moreover, the current knowledge that tax authorities have is inadequate to address the policy considerations with reference to robot tax (Petit, 2017). Subsequently, this study aims to critically review the existing literature, in order to: (a) ensure that tax authorities have a comprehensive overview of robots and the possible tax implications thereof; (b) identify those areas that require more research and consideration/debate on going forward; and lastly (c) draw conclusions and make connections to enable tax authorities to make informed decisions regarding the appropriate policies to compensate for the loss of revenue.

This study also aims to delve deeper into the connection between taxation and robots. It will explore the challenges, opportunities, as well as the tax implications of robots by consulting

2

a variety of sources, ultimately narrowing the gap between speculation and reality of robot tax and suggest possible policy action. Although this study is limited in scope, it presents an important first step towards a more comprehensive understanding of robot tax and it could serve as a key for future systematic literature reviews.

1.3. RESEARCH OBJECTIVE

This study is centred around a systematic review of existing literature relating to robot tax in the context of Industry 4.0, focusing on recent publications.

The research focus of this study is directed by the following research objective: Is robot tax feasible? In order to address this research objective, we need to determine what has been published on robot tax, including the current understanding of robot tax by focusing on the following issues:

1. Who are the main contributors to the discussion pertaining to robot tax?
2. Has robot tax been explored by individual authors, or by research teams?
3. What is the timeframe of publications pertaining to robot tax?
4. Where is the information pertaining to robot tax being published?
5. If published in academic journals, what are the quality ratings of these academic journals in terms of the Australian Business Deans List (ABDC list)?
6. To which main science discipline does the publication of such articles belong?
7. Is the publication written from a country's specific perspective; or is it general in nature?
8. What types of taxes are under investigation in these selected studies?
9. What is the research design (nature and timeframe) utilised in each of these publications?
10. What is the main research methodology (qualitative, quantitative, or mixed-method research) adopted by each of these studies?
11. Which issues are being addressed; and what are the emerging themes evident from these publications?

1.4. RESEARCH DESIGN AND METHODOLOGY

The methodology used in this study is a systematic review. This makes use of existing studies by evaluating and analysing the data, in order to reach a clear conclusion (Denyer & Tranfield, 2009). The study reviews various types of research and viewpoints published on robot tax due to the nature of a systematic review and thus, it has a pragmatic philosophical stance since it acknowledges the different ways of interpreting research (Morgan, 2014). The study has a descriptive nature as it aims to answer the following questions: when, how and where to tax robots. Qualitative data are employed, in other words the data are not numerical since documents, such as journal articles are being scrutinised.

Furthermore, as the study utilises previously published articles and reports, the unit of analysis can be classified as secondary data because the data were collected by someone else, for a primary purpose (Johnston, 2017). Lastly, the study has adopted a cross-sectional time dimension as it only focuses on a particular point in time.

1.5. MAIN CONSTRUCTS OF THIS STUDY

This study has three main constructs: Industry 4.0, robotization and the tax imposed thereon. These constructs are discussed comprehensively below.

1.5.1. Industry 4.0.

An "industrial revolution" can be defined as a disruptive process of change pertaining to an industrial sector, in which the traditional methods are improved by way of new technologies and innovations (Janicke & Jacob, 2013). During the eighteenth century, the manufacturing process ameliorated notoriously from hand production to machine production, and this phenomenon is known as Industry 1.0 (Troxler, 2013). The mechanization brought forward by this revolution led to the introduction of machine tools and manufactories.

Furthermore, the shift in the process of manufacturing increased the utilisation of both water and steam power. This revolution can be described as a defining period since the majority of individuals enjoyed an increased income, resulting in their standard-of-living improving dramatically (Deane & Deane, 1979).

Industry 2.0 can be seen as a continuation of Industry 1.0; however, it was primarily characterised by technology. The advance in technology led to innovations, such as electricity, petroleum, electronic-communication technology and transportation, such as motor vehicles and aeroplanes (Mohajan, 2019). Consequently, this revolution introduced various technological innovations, which increased productivity, while, at the same time, decreasing human labour (Atkeson & Kehoe, 2001). Increasing the productivity resulted in economic growth since there was a rapid improvement in technology, as well as in the supply (Mohajan, 2019).

According to Rifin (2012), Industry 3.0, also known as the green revolution, was built on the following five fundamental principles: Firstly, promoting the use of renewable energy, as opposed to other types of energy. Secondly, converting buildings world-wide into micro-power plants to accumulate renewable energy. Next, to make of hydrogen storage in various infrastructures. Fourthly, altering the word-wide power grid through internet technology, also known as smart-grid technology and finally, it led to the transformation of traditional fuel-powered vehicles to electric or plug-in vehicles. In addition to the evolution of renewable energy and smart-grid technologies, Industry 3.0 also brought forward digitalization, which includes the internet, mass production and digital cell-phones (Rifkin, 2008).

Industry 4.0 (also called the technological revolution), entails a combination of the digital, physical and biological worlds (Schwab, 2017). This author continues to say that this revolution introduced a variety of new innovations, such as artificial intelligence, advanced robotics, the Internet of things and 3D printing. The current industrial revolution can be distinguished from previous revolutions as it characterised by a fusion of cyber and physical systems, whereas the other three revolutions were merely characterized by one of these systems (Bloem, Van Doorn, Duivestein, Excoffier, Maas & Van Ommeren, 2014).

This Cyber-Physical System (CPS) refers to the amalgamation of manufacturing, sustainability and client-satisfaction, in other words machines, appliances, devices and

factories are now being administered by computer algorithms. Although, the current revolution introduces an impressive spectrum of innovations, the present study will only consider robotization and the tax implications thereof.

1.5.2. Robotization

In order to grasp the term 'robotization', we should first define the term 'robot'. A robot can be described as mechanism that imitates human actions and functions (Marriam-Webster Dictionary, Not dated). Furthermore, robotization refers to using robots to automate processes (Collins Dictionary, Not dated-a). Many people believe that robots will only snatch the jobs of lower-skilled or routine workers, however this is no longer the case as a fair amount of university-educated or professional jobs will be performed by robots in the near future for example robots can replace lawyers and paralegals as they can review documents at a faster pace than humans while reducing costs for the law firms (Ford, 2015). Consequently, obtaining more schooling or skills will not necessarily ensure a job in the era of robotization. Ford (2015), highlights trends that are introduced by robotization; diminishing job creating, inequality and decline in income and underemployment for recent graduates. The author states that over the last fifty years, the United States economy has continuously struggled to create jobs. Moreover, the increase in utilisation of robots will aggravate the situation at hand. Robotization will increase the inequality between the affluent and improvised as the job opportunities for the middle- and lower-class individuals will decay.

Although there is a lot of uncertainty in the era of robotization, it is certain that robots will replace many human workers resulting in unemployment. Thus, the increase in unemployment will lead to a decrease in tax revenue, which will be detrimental to governments world-wide. It is of the utmost importance that tax authorities need to examine the feasibility of taxing robots to supplement the lost revenue.

Soon robots will be a part of our lives in more way than one, they will be utilised in a variety of industries such as health care, manufacturing and military, resulting in a variety of industries conducting research on this innovation (John, 2011). Consequently, one of the objects of this study is to determine the main science disciplines of publications to assess whether there are sufficient research studies conducted specifically in the tax discipline.

1.5.3 Taxing robots

Tax is imposed on both individuals and organisations, in order to collect revenue for the government (Collins Dictionary, Not dated-b), after which the revenue is used by the government to provide public services. The collection of tax is enforced by a tax system that is controlled and overseen by the government (Slemrod & Gillitzer, 2013). Taxes can be categorized, as either direct or indirect taxes. Direct tax refers to the tax imposed directly on an individual's income or an entity; while indirect tax refers to tax that is imposed on a transaction, such as for example Value-Added Tax (VAT) (Cremer, Pestieau & Rochet, 2001).

From the discussion on 'robotization' in section 1.5.2, it is evident that the government will miss out on a great amount of revenue, if robots start to take over those jobs traditionally performed by human beings. Consequently, there is a need for tax authorities to examine the possibility of taxing robots and establishing what type of tax should be imposed on such robots. When designing a tax policy, the tax authorities must bear in mind the following fundamental tax principles: neutrality, efficiency, certainty and simplicity, effectiveness, and fairness and flexibility (Organisation for Economic Co-operation and Development, 2014).

Tax neutrality introduces the notion that the tax should be imposed at an optimal rate, without any bias towards any individual or organisation. Secondly, tax authorities must ensure that the cost to comply with tax polices is minimised. Next, the tax policies should be straightforward and easily understood by the taxpayers. Effectiveness and fairness in a tax system requires that tax should be imposed at an appropriate time and rate, while avoiding double taxation. Finally, tax policies must be designed to adapt with the ever-evolving technology (Organisation for Economic Co-operation and Development, 2014).

Although automation will have a significant impact on the tax revenue, scholars are at odds on whether robots should be taxed. Yanni and Daubanes (2019) argue that robot tax will decelerate the use of robots to replace human labour and it will reduce the income inequality. Conversely, Shiller (2017) argues that robots should not be taxed as there is no universal definition of 'robot', leading to the term being ambiguous. This author maintains that a lump-sum tax is the only tax that can be imposed without distorting the economy. However, imposing this type of tax would increase the tax burden on the poor.

These constructs are analysed in Chapter 3 of the study and thereafter, emerging themes are identified. Finally, a conclusion is drawn from the literature and potential research areas are identified.

1.6. STRUCTURE OF THE MINI-DISSERTATION

The format of the present study is a mini-dissertation and the structure as follows:

Chapter 1: Introduction

Firstly, this chapter sets out to provide the scope of the study that is undertaken, in order to give the reader a glimpse of the research topic. This is done by acquainting the reader with the background, rationale and research objectives of this study. The background establishes a framework for the reader while the rationale aims to give an insight into why the study was undertaken. Lastly, the research objectives indicate what the primary focus of the study is.

Chapter 2: Research design and methodology

Chapter 2 is centred around the research design and methodology of the study. Initially, the chapter delves deeper into the chosen strategy to address the research question, also known as the research design. Thereafter, the chapter investigates the research methods used and the data-collection process.

Chapter 3: Data analysis and presentation of results

The present study follows a systematised approach, in order to obtain literature. In Chapter 3, the literature is analysed, in order to identify the emerging themes, highlighting research focus areas concerning robot tax, as well as the research areas that need further investigation.

Chapter 4: Conclusion

This chapter provides a synopsis of the study, illuminating the process followed, as well as the results obtained for the systematic review. The highlights, themes and areas identified in Chapter 3 are used to draw a conclusion, and to make recommendations. Furthermore, the chapter sheds light on the limitations of the study and future research areas are suggested.

CHAPTER 2:
RESEARCH DESIGN AND METHODOLOGY

2.1. INTRODUCTION

The main objective of this study is to conduct an expository review of robot tax with reference to Industry 4.0. The previous chapter introduced robot tax as a construct, elaborated on the background and rationale of this study, together with detailed supporting research questions.

This chapter provides an in-depth explanation of the research design that indicates the type of study undertaken. This is followed by a discussion of the research methodology, specifically referencing the research method, the research strategy and data-collection technique. A systematic review is adopted in this study by using methodical methods to collect secondary data, critically analysing the data and drawing conclusions from the findings.

A systematic review can be described as a meticulous and well-defined approach to review the literature on a particular topic (Cronin, Ryan & Coughlan, 2008). The aim of this approach is to provide a comprehensive list of all the published and unpublished studies relating to a subject matter. However, this study is limited in scope and the researcher intends to conduct an initial systematic search, in order to obtain and review the more recent publications in tax, with specific reference to robot tax. The systematic review process consists of the following aspects: data collection, inclusion and exclusion criteria, quality assessment of the publications and an analysis of the findings (Steyn, Smulders, Stark & Penning, 2018).

The present study makes use of these aspects to transform information from a variety of publications into practical and useful insights.

2.2. RESEARCH DESIGN

A research design provides a framework for the research methods and techniques chosen by the researcher (Walliman, 2017). In addition, it enables the researcher to determine what type of evidence is required to address the research question adequately and comprehensively.

The research design refers to the philosophical underpinning of the study, the nature of the study, the reasoning approach of the study, the study's time-horizon, the unit of analysis under investigation in the study, the types of data and the sources of the data (Walliman, 2017). The aforementioned elements are discussed thoroughly in the successive section of the study.

2.2.1. Philosophical stance of the study

A research philosophy can be described as a belief about the method used to collect, analyse and use the data, in relation to a certain phenomenon (Crossan, 2003). The philosophical stance is of the utmost importance, in order to refine the research methods, to evaluate the different methodologies and to assist the researcher to be creative in the selection of the best methodology (Crossan, 2003). There are three types of philosophical stances that a study can adopt and these are:

Positivism proposes that there is only one objective reality, which is isolated from consciousness (Quilan, Zikmund, Babin, Carr & Griffin, 2019). This philosophical stance believes that there is objective truth that can be measured independently of humanity.

Interpretivism maintains that social reality is subjective construct that can be accessed by social interactions (Quilan *et al.*, 2019). This philosophical stance believes that research should be conducted amongst people rather than between objects.

Pragmatism is a sensible approach that believes that the way of thinking is dependent of the research question. This philosophical stance evaluates theories, based on the practicality thereof (Morgan, 2014).

The philosophical stance of this study is pragmatism as it pertains to establishing a research problem, while viewing it from a broad perspective (Salkind, 2010). Furthermore, pragmatism is a problem-oriented philosophy that generally leads to policy suggestions. A pragmatic stance would enable the researcher to address the research problem "taxing robots in Industry 4.0" from within a broad context, leading to practical policy suggestions that the tax authorities can implement, in order to restrict any potential negative impact of Industry 4.0.

2.2.2. The nature of the study

The nature of the study deals with the main classifications of the research study (Dulock, 1993). The three types of studies are described below:

Exploratory studies merely investigate the research problem but they do not necessarily provide a conclusive solution to the research problem (Sandhusen, 2000). This type of study does not provide final findings but rather it makes a way for future researchers (Simmons, 1985).

A descriptive study describes the characteristics of a subject matter, such as an event, or a person. This type of study entails a literature review, accompanied by a qualitative or quantitative research approach. In descriptive studies, the data are collected and encapsulated but the connection between the sets of data and predications are not described (Omair, 2015).

A casual study attempts to reveal the cause-and-effect relationship between a set of variables and evaluating the effect of changes on the existing standards and procedures (Karvanen, 2015). Consequently, this type of study aims to present a hypothesis and to establish causation (Erickson, 2017).

The present research is regarded as descriptive in nature, considering that the research draws attention to topical issues by using a data collection that outlines situations and circumstances thoroughly. This study entails an investigation into robots and the tax implications thereof.

2.2.3. Reasoning methods

Reasoning can be described as a process of thoughts, leading to a conclusion based on precepts and assertions (Johnson-Laird, 1999). The three methods of reasoning can be distinguished as being deductive, inductive and abductive approach (Zalaghi & Khazaei, 2016).

Deductive reasoning is a cogent process of reaching a verdict about a specific instance, based on a general theory or a fact (Quilan *et al.*, 2019). Put differently, this approach initially starts with a general rule and it then subsequently shifts to a specific conclusion. Deductive reasoning thus starts with identifying objectives and thereafter it elucidates the definition and assumptions. Next, the researcher must create a logical structure to achieve the objectives, based on the clarified definitions and presumptions. Clearly, this approach is specific, rather than general, due to the logical structure (Quilan *et al.*, 2019).

Inductive reasoning commences with a specific observation and a limited scope, but it advances to a generalised conclusion (Quilan *et al.*, 2019). Therefore, inductive reasoning shifts from specific to general (Zalaghi & Khazaei, 2016). This approach emphasises observations; and it derives a conclusion therefrom. In addition, conclusions reached by this approach are not logical necessities as the evidence does not guarantee the conclusion, since one cannot be certain that all the possible evidence has been gathered (Zalaghi & Khazaei, 2016).

Abductive reasoning usually entails an incomplete set of observations and it then advances to the most plausible explanation for the set (van Hoek, Aronsson, Kovács & Spens, 2005). This approach focuses on the particulars of a specific situation that then diverges from the general structure, rather than being concerned with generalisation (van Hoek *et al.*, 2005). Leading to a plausible conclusion that creates doubt since it cannot be definitely verified.

This study adopts an inductive method of reasoning as deductive reasoning is usually associated with a hypothesis; while inductive reasoning is associated with a research question. The present study does not intend to examine any hypotheses, but it rather attempts to answer a research question.

2.2.4. Time horizon of the study

This component refers to the timeframe for the research study and it can be divided into cross-sectional or longitudinal studies.

Cross-sectional studies are conducted over a short period of time, or at a specific point in time (Levin, 2006). This time-horizon is used when the study is descriptive, or the purpose of the study is to find a prevalent outcome of interest for the population at a given time. The scope of cross-sectional studies is limited as it is carried out at a specific time and a mere snapshot of the results can be provided (Levin, 2006) . A possible disadvantage of this approach is the fact that no indication is given of the chain of events, therefore the result could possibly change if another timeframe were to be used. The benefit of using a cross-sectional time horizon is that a researcher can evaluate various factors within a short time-frame (Sedgwick, 2014).

Longitudinal studies can be classified as an observational research method, in which the data are collected for the same subject matter continuously over an extended period of time (Ployhart & Vandenberg, 2010). Observational research implies that for the duration of the research, the researcher will not interfere with the subject, but only observe. They key factor in a longitudinal study is that the study extends beyond a single moment in time, resulting in a sequence of events. Establishing a sequence of events is a major advantage as the researcher can see how variables change over time (Caruana, Roman, Hernández-Sánchez & Solli, 2015).

The time horizon of the present study is cross-sectional considering that the data are collected at a specific point in time.

2.2.5. Unit of analysis

The unit of analysis is the entity that is being used and analysed in a study (Babbie, 2005). The entity being analysed could possibly be groups, individuals, social interactions, or objects. Furthermore, it seeks to answer the issue of "who" and "what" is being studied (Trochim & Donnelly, 2010). In other words, it enables the researcher to determine the type of data that should be collected and from whom to collect it from. Typically, the unit of

analysis comprises individuals, however the "who" and "what" is not restrictive as there is a limited variety of potential units of analysis (Kumar, 2018).

The unit of analysis must be pre-determined before a study can be conducted. The unit of analysis hinges on the research problem as it is an extension of defining the research problem, and deciding on a suitable methodology (Kumar, 2018). Thus, to achieve consistency in the research design of a study, the unit of analysis, the data collection and analysis strategy should correspond (Dixon, Durrheim & Tredoux, 2007).

To determine what the unit of analysis is in the present study, one must refer to the research problem. The research problem pertains to Industry 4.0, with emphasises on robot tax, consequently, the unit of analysis consists of journal articles and reports pertaining to this topic. The unit of analysis is of the utmost importance as the data are collected and reviewed, in order to enable the researcher to resolve the research problem.

2.2.6. Types of data

The types of data allude to the nature of the data used in a study (Bacon-Shone, 2013) and these could be either qualitative or quantitative data. The dividing line between these two types of data can sometimes be unclear but a distinction must be made in the manner that the data is collected (Bacon-Shone, 2013). Quantitative data are directly measurable, while qualitative data are recordable.

Quantitative data are data that can be expressed in numbers while qualitative data must be expressed as words (Elkatawneh, 2016). This author further stipulated that numbers in quantitative data can frequently be extracted from the answers in a survey, or in a checklist. In other words, the researcher relies on a survey to collect data. Thereafter, the researcher analyses the numbers – in an attempt to answer the research question.

Qualitative data can be derived from people, for example by an in-depth interview, or from documents, such as journals or newspapers (Elkatawneh, 2016). When gathering qualitative data, the researcher is more actively involved by probing and asking questions, rather than by relying on a pre-established question in a survey. According to Elkatawneh (2016),

qualitative research is analysed by organising the data into themes – without permitting any bias.

The type of data collected in the present study falls within the scope of qualitative data as it uses existing documents to identify various themes by means of a systematic review.

2.2.7. Sources of data

Two sources of data can be distinguished: primary data and secondary data. Primary data can be described as information that is collected and reported by an original researcher of a study, for example by a survey, or in an experiment. In other words, the data are collected for the first time, and with a specific goal in mind (Cronin *et al.*, 2008). Whenever primary data are collected, new data are supplemental to the existing knowledge (Hox & Boeije, 2005).

The most significant advantage of primary data is that the research design and data collection strategy can be altered to ensure that the information collected provides an adequate answer to the research question. However, it is expensive and laborious to collect one's own data (Hox & Boejie, 2005).

Secondary data refers research material created by other researchers that are made available for reuse, such as in a review article (Hox & Boeije, 2005). In other words, the data have been previously gathered by the original researcher for a primary purpose (Johnston, 2017). Secondary data can be used for comprehensive research, research design and methodology advances, as well as for teaching and learning (Hox & Boeije, 2005).

A noteworthy advantage of secondary data is that it is easily accessible and retrievable as it can be acquired via the internet. However, the internet is a boundless and unorganised information source. Johnston (2017), states that it is necessary for a researcher to follow a specific strategy, such as using keywords to navigate the internet.

In the present study, secondary data are used because the research material was previously gathered and used by the original researcher. In other words, the data were collected from existing sources.

2.3. RESEARCH METHODOLOGY

The research methodology used by the researcher determines the quality of data (Wiid & Diggines, 2009). Fallacious methodology can result in inaccurate and unusable data; thus this section relates to an in-depth discussion on the research methodology, with specific reference to the methodological classification, research strategy, data-collection technique, the quality assessment of the data, the sample of academic articles selected for analysis in terms of the research objectives of this study.

2.3.1. Methodological classification

Researchers must decide which methodological classification is most suitable for the data required and the research problem (Wiid & Diggines, 2009). The methodological classifications are as follows: qualitative research, quantitative research and mixed-method research.

Qualitative research collects non-numerical data, while making use of a research-dependent approach as the researcher extracts value from open-ended responses (Babin & Zikmund, 2016). Qualitative data are usually descriptive and they are collected in the form of detailed phrases or words (Kabir, 2016). This type of research is centred around stories, interpretations and explanations, rather than on numerical values. Small-scale sample sizes are used for qualitative research, due to the detail of the data. After the data have been collected, it is reduced by rewording the statements made by respondents, categorising responses or by analysing the data by using key words.

Examples of qualitative research include: focus-group interviews, conversations, documentary review etc. (Babin & Zikmund, 2016).

Quantitative data consist of numerical values and calculations from using a large sample size as it is less complicated to measure and analyse the data, when compared to a qualitative approach (Babin & Zikmund, 2016). The benefit of using a large sampling size is the increased level of accuracy of the data, due to the high quantity of the data collected. A scale is used to measure the collected data, where after it is reduced, and arranged in a purposeful way to reveal any tendencies (Kabir, 2016). From this we can conclude that,

statistics enable a researcher to transmute the collected data into functional information. Quantitative data can be presented in the form of percentages, frequencies and graphs.

Integrating qualitative and quantitate data leads to a mixed-method approach. A mixed-method can be described as multifaceted approach that aims to exploit the strengths, while minimising the weakness of both qualitative and quantitative data (Yin, 2006). A mixed-method is a creative approach to collect data and analyse it from different viewpoints and through diverse research lenses (Pluye, Gagnon, Griffiths & Johnson-Lafleur, 2009).

The present study is qualitative as it is centred around non-numerical data, together with the use of a systematic review.

2.3.2. Systematised review of the literature

According to Booth, Sutton and Papaioannou (2016), a systematic review is a type of study that accumulates, assesses and deciphers the relevant research, in order to answer a research question. A systematic review used secondary data as it pertain to the extracting of information from previously conducted studies. The object of this type of research methodology is to search for the greatest amount of research possible that relates to the relevant research question and thereafter, to evaluate the research findings that can be used, based on certain criteria (Kitchenham, 2004). Thereafter, the data are summarised; and any shortcomings in the existing literature can then be identified.

The result is a fair, consistent and reliable review method, which adds scientific value, whereas traditional literature reviews can be disorganised, unmethodological and they may also fail to detect valuable data (Khallaf, Naderpajouh & Hastak, 2017).

A systematic review presents several benefits and obstacles. This type of research methodology reduces research bias since it increases the quantity of literature used; while traditional approaches frequently focus on similar authors and literature by using routine research methods (Mallett, Hagen-Zanker, Slater & Duvendack, 2012). These authors continue to say that a systematic review is well-grounded and complete, when compared to

other types of reviews since it establishes an informative background, together with also providing consist data.

The most significant obstacle faced when using a systematic review is that it is exerting compared to a traditional review. In addition, it requires extensive data bases, which can be difficult to find (Mallett *et al.*, 2012).

Kitchenham (2004) describes the systematic review process as follows:
- Search for all relevant publications;
- Apply inclusion and exclusion criteria to select suitable studies;
- Evaluate the quality of the publications;
- Integrate the extracted data from all the individual publications;
- Interpret the findings, and thereafter establish a synopsis.

The present study adopted a qualitative systematic review; thus the abovementioned review process was followed meticulously to ensure complete and consist results, which should add value to the current research on tax, with specific reference to Industry 4.0 and robot tax.

2.3.3. Data collection technique

Qualitative research was explored extensively in section 2.3.1, moreover, this section expands on the data collection technique used in the present study. Popular data collection techniques adopted in terms of qualitative data include focus groups, interviews and reviewing documents. Furthermore, this section examines the following elements; keywords, search criteria and the recording of selected journal articles. Each of these elements are discussed comprehensively below.

2.3.3.1. Keywords

Keywords, also known as search terms, are fundamental words or phrases that encapsulate the essence of the subject matter (Babaii & Taase, 2013). Essentially, keywords describe the principle notions of the study, such as the research question and objectives (Saunders,

et al., 2007). In addition, keywords also enable the researcher to find suitable publications pertaining to the present study.

According to Walden University (Not dated), the process of selecting keywords is as follows: Firstly, determine the principal notions of the study, and then examine possible synonyms and antonyms that can be used, which relate to the principal notions of the study. Finally, elucidate any abbreviations used in the research.

In the present study, keywords were used to establish an inclusion and exclusion criteria for the relevant literature. These search terms were acquired from the title, the research question, as well as the objectives of this study. Using keywords to search for literature in the databases ensures that suitable literature is suggested. Table 2 exhibits the keywords used in the present study.

Table 2: Keywords

Initial Topic	Similar Terms	Broader Terms	Narrower Terms
Fourth Industrial Revolution (Industry 4.0)	Technological revolution Technical revolution	Robot tax Integration of physical, digital and biological sphere.	Tax revenue Indirect taxes Direct taxes

Table 2 is a summary of all the keywords relating to the present study. Column 1 details the main topic of the study. Column 2 emanates from Column 1 as it pertains to terms that are similar to the main topic, but they broaden the scope of the articles. Column 3 relates to broader terms, which create a connection between Industry 4.0 and robot tax. In addition, this should assist the researcher to answer the research question. The narrow terms referred to in Column 4 display the specific tax implications that were examined.

2.3.3.2.   Search criteria

This section provides an overview of the search criteria for pinpointing, selecting and documenting the journal articles.

- This review considered only articles published in academic journals and industry reports/ working papers, excluding popular media, such as blogs. In addition, the

following publications were excluded: textbooks, conference papers, unpublished Masters' and PhD studies, and dictionaries.

- The review used in the present study is not restricted to certain country-specific journal articles.

- The review used in the present study is not restricted in terms to a specific type of scientific literature.

- The review used in the present study assesses all journal articles and reports, regardless of the methodology or the research design followed.

- The language used in the articles reviewed had to be English.

- The main topic of this research is a new concept; consequently, only the latest publications was used. The review only considered publications from 2005 onwards.

- The scope of this review is limited, and the search was conducted through scholarly databases, such as Google Scholar, EbscoHost and ProQuest.

Note that the search criteria include both academic journals and industry reports/ working papers. The latter are included in the search criteria because robot tax is such a new phenomenon and the research aims to present a holistic view of robot tax, therefore it includes both types of publication. A total of 33 publications were identified, pertaining to robot tax that is relevant to the current study. After the above-mentioned criteria were applied, the publications were recorded. This process is discussed in more detail below.

2.3.3.3. Recording of selected academic articles

The present study focuses only on journal articles and industry reports, which were obtained from a variety of searches on scholarly databases, using specific keywords (discussed in section 2.3.3.1). Thereafter, an inclusion and exclusion criteria were applied to filter the articles. After filtering the articles, they were uploaded onto Qiqqa, which is a software program specifically created for academic students and researchers. Qiqqa aims to help with many facets of research, such as searching, analysis, storing and tagging literature (Graham, 2013).

Qiqqa has a variety of functions, with the most useful being tagging, which scrutinizes the literature. Qiqqa was used in the present study, to help the researcher record all the articles

and to examine the quality of the recorded articles by making use of the Australian Business Dean Council list (ABDC).

2.3.4. Quality assessment of the data

Data quality can be referred to as data that satisfy the requirements set out by a particular establishment (Glover, 2016). This section clarifies the quality assessment of data with reference to the Australian Business Dean Council (ABDC) rating.

The ABDC list is a useful tool that is used to determine the quality of academic journals. During 2019, the list contained approximately 2682 journal titles pertaining to various disciplines, such as accounting, business tax, economics, finance, information systems, law, management and marketing/tourism/logistics.

The Australian Business Dean Council publishes a list of journals, together with categories ranked from A* to C. The list should serve as a mere guideline to assess the quality of research as even in the same rating category, the quality averages of the research would differ (Australian Business Dean Council, 2019).

 The list is categorised as follows:
A*: This category represents the top 5% - 7% of journals that represent a particular research field. Moreover, only the top-tier journals are selected for this category.
A: This category represents the next 15%-25% of journals that represent a particular research field.
B: This category represents the next 35%-40% of journals representing a particular research field.
C: This category represents all the remaining journals that represent a particular research field.

This study has utilised the ABDC list, in order to assess the quality of the selected academic literature and the results are outlined in the table below. Table 3 only pertains to the twenty-one academic articles from the selected publications and it exhibits the rank of the academic journal on the ABDC list. Consequently, the remaining twelve publications are not displayed

22

in this table due to the fact that they are either classified as a working paper, or an industry report, and consequently, they are not ranked on the ABDC list.

Table 3: Quality assessment results

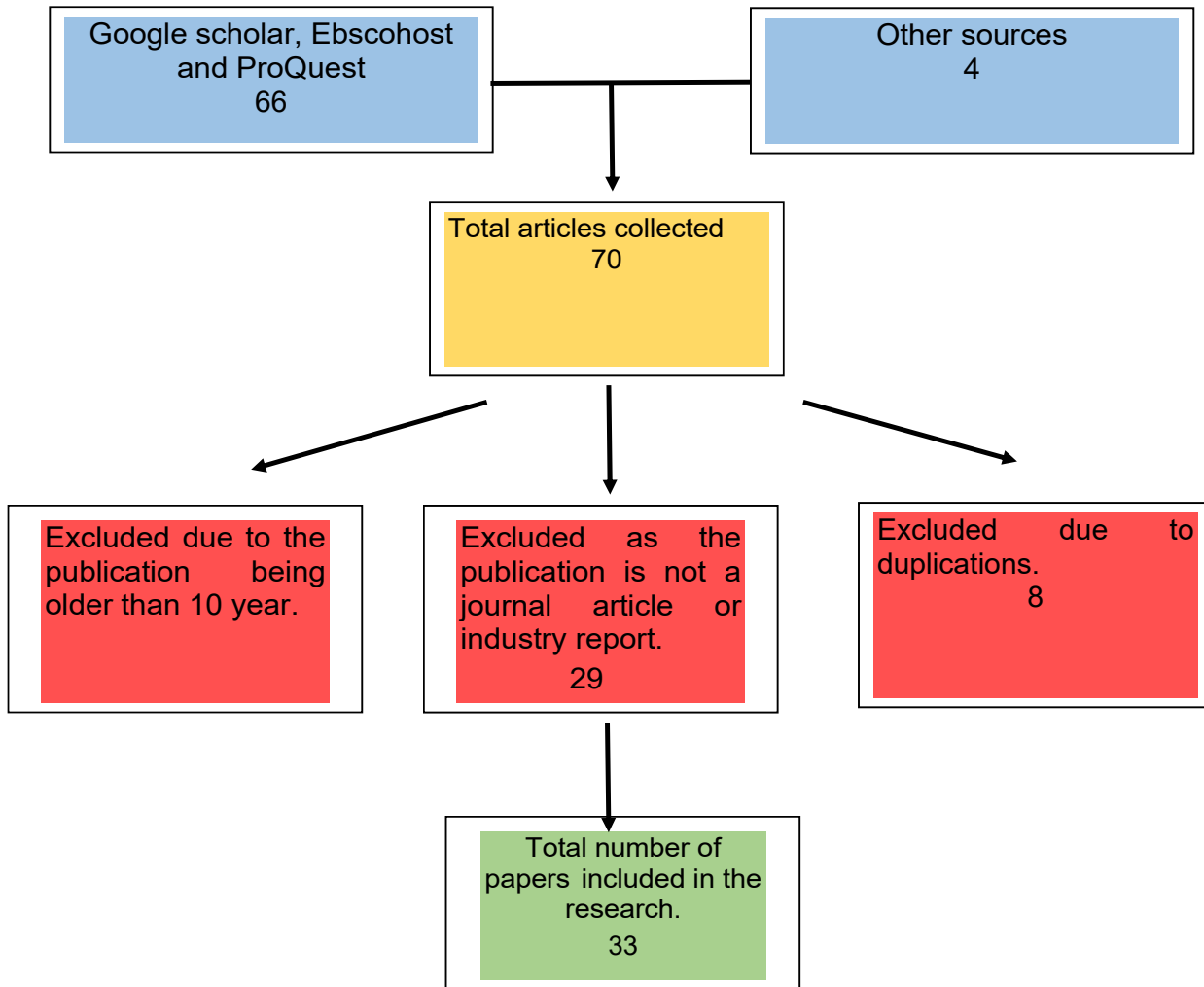| Name of the Journal	A* Rated	A Rated	B Rated	C Rated	Not Rated	Total number
Australasian Science					x	1
Australian Journal of Management		x				1
Beijing Review					x	1
Contemporary Readings in Law and Social Justice					x	1
Digest Finance					x	1
Economics, Management, and Financial Markets				X		1
Harvard Law & Policy Review					x	1
History of Political Economy		x				1
International Tax Review				x		2
Journal of Tax Reform					x	1
Material handling & logistics					x	1
New Scientist					x	1
South Carolina Law Review					x	1
Pepperdine Law Review				x		1
Project Syndicate					x	2
Trade Journal					x	1
International Robotics & Automation Journal					x	1
Wall Street Journal					x	1
World Tax Journal			x			1
Totals						21

The following section presents synopses on the results from the quality assessment.

2.3.5. Summarised overview of the data collected and the quality assessment

This section provides an overview of the data collected and the quality assessment. Initially, Figure 1 exhibits all the articles that were collected. Thereafter, it presents the various

articles that were not selected for the study, based on the exclusion criteria that were applied. Leading to the total number of articles that were used in the present study.

Figure 1: Quality assessment: summary of results

```
┌─────────────────────────┐          ┌─────────────────────────┐
│  Google scholar, Ebscohost│          │      Other sources      │
│      and ProQuest         │          │           4             │
│           66              │          │                         │
└─────────────────────────┘          └─────────────────────────┘
              │                                    │
              └──────────────┬─────────────────────┘
                             ▼
                  ┌─────────────────────┐
                  │ Total articles collected│
                  │          70           │
                  └─────────────────────┘
```

| Excluded due to the publication being older than 10 year. | Excluded as the publication is not a journal article or industry report. 29 | Excluded due to duplications. 8 |

Total number of papers included in the research. 33

2.4.   CONCLUSION

Chapter 2 has explored the research design and methodology in general, in order to establish a framework for the reader. After the background had been outlined, the chapter focused on describing the type of research design and the methodology applicable to the present study. This study has investigated the following research design elements:

philosophical stance, the nature of the study, the reasoning methods, the time horizon, the unit of analysis, the types of data, as well as the source of the data. Thereafter, the research methodology was explored with reference to methodological classification, systematic review, data collection technique and the quality assessment of the data. The research design serves as a blueprint to guide the researcher when answering the research question; while the research methodology is the procedure used to identify and evaluate any information pertaining to the topic at hand. It is of the utmost importance to determine the research design and methodology, in order to ensure that reliable results are obtained that could contribute to current studies.

CHAPTER 3:
DATA ANALYSIS AND RESULTS

3.1. INTRODUCTION

The main purpose of this study is to address the research objective, as set out in Chapter 1, pertaining to the feasibility of robot tax in the context of Industry 4.0 by making use of a systematic review. The preceding chapter explored the research design and methods undertaken in the current study; while this chapter will analyse and discuss the selected literature. Therefore, the researcher will investigate prominent themes and/or disparities emerging from the literature and, thereafter reduce the data to derive insight from them.

This chapter consists of three parts: firstly a brief overview of the data-analysis technique, followed by a discussion of the findings by making use of sub-headings to address each of the research objectives, in order to answer the research question formulated. Finally, a conclusion is drawn from the findings.

3.2. DATA-ANALYSIS TECHNIQUE

The data analysis technique employed depends on the type of data selected for a study. If a researcher makes use of quantitative data, he/she will utilise various statistical analysis methods and techniques (Myers, Well & Lorch, 2010). In contrast to that, if a researcher makes use of qualitative data, he/she will utilise textual techniques, which comprise of the examination of a text (Bolden & Moscarola, 2000).

This study can be classified as a qualitative research since it utilises the literature as data and consequently, it derives insights from patterns (Suter, 2012). The most common methods used to analyse qualitative data are: thematic analysis; content analysis; narrative analysis; discourse analysis; framework analysis, as well as the grounded theory (Dudovsky, 2016).

Thematic analysis entails identifying and interpreting themes emerging from the data (Guest, MacQueen & Namey, 2011). In addition to considering terms or phrases, this type of analysis considers the clear and implied meaning of the data.

Content analysis refers to the tool used to determine whether certain terms or phrases are present within a text (Mayring, 2004). Thereafter, the researcher interprets the occurrence and meaning of these terms or phrases.

Narrative analysis can be used when a researcher wishes to interpret a story with reference to the structure of the story, the substance and the function thereof (Riessman, 1993).

Discourse analysis refers to a tool that is utilised in a social context between a researcher and a respondent, also known as "the study of language" (Johnstone, 2018).

Framework analysis is suitable for a researcher who has limited time. A precise question and a pre-designed sample, in addition to its primary objective, is to outline and analyse a phenomenon in a particular context (Srivastava & Thomson, 2009). The authors continue to state that this type of analysis involves the following steps: "familiarization; identifying a thematic framework; indexing; charting; and mapping and interpretation". A framework analysis is often utilised in policy research.

Finally, grounded analysis refers to collecting data, and thereafter establishing theories (Charmaz, 2006).

The current study makes use of a thematic analysis as it seeks to ascertain academic scholars', industry experts' and practitioners' opinions and knowledge from the selected literature to determine emerging themes. Furthermore, the primary objective of thematic analysis is to use these emerging themes to answer the research objective, as is the purpose of this study (Maguire & Delahunt, 2017). Thematic analysis provides theoretical freedom to the researcher and it is a flexible approach, resulting in rich and comprehensive data (Nowell, Norris, White & Moules, 2017). Furthermore, thematic analysis is useful to showcase important issues emerging from a large set of data.

3.3. RESENTATION OF RESULTS AND DISCUSSION

This section sets forth the results after performing the thematic data analysis on the selected literature. These results are accompanied by a discussion pertaining to the specific sub-heading, reflecting of the research questions stated in Chapter 1.

3.3.1. Authorship

This section pertains to the results of analysing the authors and regency of the selected publications and it addresses the following research questions:

- Who are the main contributors to the discussion pertaining to robot tax?
- Has robot tax been explored by individual authors, or by research teams?
- What is the timeframe of publications pertaining to robot tax?

3.3.1.1. *Authors*

Research question: Who are the main contributors to the discussion pertaining to robot tax?

Table 4 consist of 2 columns, column 1 pertains to the names of the authors from the selected publication; while column 2 reflects the number of publications that the stipulated author has published. The authors of the selected publications were analysed to establish which of them is currently the most prominent author in the field of robot tax.

Table 4: Summary of authors identified from selected literature

Name of author	Number of publications
Abbot, R.	1
Ahmen, S.	1
Arndts, J	1
Bogenschneider, B.	1
Chapple, E.	1

Chatila, R.	1
Chekina, V.D.	1
Daubanes, J.	1
Durán-Cabré, J.M.	1
Floridi, L.	1
Geurreiro, J.	1
Ionescu, L	1
Kamaraeva, E.Y.	1
Kaminska, I.	1
Kappner, K	1
Madhaven, R.	1
Maksimov, N.A.	1
Mazur, O.	1
Mc Gaughey, E.	1
McCredie, B.	1
Miller, C.C.	1
Oberson, X.	2
Organisation for Economic Cooperation & Development.	1
Pham, Q.C.	1
P'Yanova, M.V.	1
Rebelo, S.	1
Righetti, L.	1
Rimmer, M.	1
Robert, L.	1

Sadiq, K.	1
Selko, A.	1
Shigong, L.	1
Shiller, R.J.	1
Sumit, P-C.	1
Telese, P.	1
Theummel, U.	2
Unknown.	2
Varoufakis, Y.	1
Vishnevsky, V.P.	1
West, D.M.	1
Woirol, G.R.	1
Yanni, P-Y.	1
Total	45

*Please note that for the purpose of this Table, the authors were listed as individuals, even if they had co-authored articles, in an attempt to identify authors that might be part of different research teams and as a result, the total number of articles exceeds the number of samples (N=33).

It is evident from Table 4 that the majority of authors merely have one publication on the topic of robot tax. However, there are two authors (Oberson and Theummel), who have each published two papers on this topic. Therefore, it is apparent that there are no prominent authors in the field of robot tax yet, as there is no author who has multiple publications on this topic. The lack of a seminal author in the field of robot tax could be due to the speculation and uncertainty with regard to this field (Davenport, 2020). In addition, given the publication period of the topic – as it was introduced in 2015 – these authors are currently merely expressing their opinions; and no in-depth studies has been undertaken.

3.3.1.2.   Individual authors or research teams

Research question: Has robot tax been explored by individual authors, or by research teams?

Table 5 has two columns, the first column pertains to the number of authors, who wrote the publication, while the second column indicates the amount thereof.

Table 5: Summary of number of authors per publication

Number of authors per publication	Amount
1	23
2	4
3	3
4	1
Unknown	2
Total	33

Unexpectedly, Table 5 indicates that 69,69% (twenty three out of thirty-three) of the publications were written by one author; while only one publication was written by four authors. This came as a surprise as one would assume that in a new field of study, publications would have been written by more than one author, in order to increase collaboration, to develop new ideas and to share expertise (Howard, 2009). In contrast to that, the majority of the selected literature was written by one author, which could possibly be due to the author's wanting to increase their own visibility, popularity and recognition in a new field of study (Katz & Martin, 1997).

3.3.1.3.   *Year of publication*

Research question: What is the timeframe of publications pertaining to robot tax?

Table 6 comprises of two columns; the first column pertains to the year of publications; while the second columns pertains to the number of articles published in that year.

Table 6: Summary of year of publication

Year of publication	Number of publications
2015	1
2016	0
2017	13
2018	8
2019	11
2020	0
Total	33

Even though the review of this study has considered all the publications from 2005 onwards, the selected literature has been published within the past 6 years. As the term "Fourth Industrial Revolution" was only introduced in 2015 by Klaus Schwab, in an article called "Mastering the Fourth Industrial Revolution" (Schwab, 2015), it is notable that there was no publication made before 2015. Still in 2015 and 2016, there was not a significant number of publications literature published. This could possibly be attributed to the newness of the concept of Industry 4.0 and subsequently, scholars and experts had to mull over this new concept before providing publications thereon. The fact that the publications have only been published from 2015 onwards could possibly explain that robot tax is a new field of study, brought forward by Industry 4.0.

The number of publications increased in 2017 and 2019, and it is expected that more publications will be made in the future on this topic.

3.3.2. Publication types

This section indicates the findings, with reference to where the information, or research pertaining to robot tax is currently being published, be it the academic journals, industry reports or working papers. Further analysis on the ABDC rating (refer also to section 2.3.4) and scientific discipline is also addressed in this section.

3.3.2.1.   Academic journals, industry reports and working papers

Research question: Where is information pertaining to robot tax being published?

Column 1 of Table 7 exhibits the type of publication; while column 2 exhibts the number of the specified publications.

Table 7: Summary of type of publication

Type of publication	Number of publications
Academic journals	21
Industry report	8
Working paper	4
Total	33

Although, academic journals are the main source of the selected publications, it was extermely difficult to obtain thirty academic journal articles relating to robot tax due to the recentness of the field. Therefore, the descision was made (see section 2.3.3.2 in Chapter 2) to also include industrial reports and working papers to ensure a more comprehensive picture of the current state of robot tax and knowledge formation. The scarcity of the academic journal articles pertaining to robot tax might be attributed to the newly developed idea thereof. Despite the fact that Industry 4.0 was introduced in 2015, the notion of robots being taxed only gained worldwide attention in 2017, when Bill Gates endorsed robot tax, leading to various types of publication made by both scholars and industry experts seeling to express their personal opinion on the matter (Delaney, 2017).

The selected publications consist of 36,35% industry reports and working papers, which enables the study to obtain a complete and holistic view of robot tax from scholars, as well as industry experts. The holistic view provides more detail regarding robot tax and it increases the reliability of the results (Staudt & Erhorn, 2008).

3.3.2.2.   ABDC rating

Research question: If published in academic journals, what are the quality ratings of the academic journals in terms of the Australian Business Deans List (ABDC list)?

Table 8 only pertains to academic journals from the selected publications to determine whether the journal is ranked on the ABDC list, since the list is an indication of the quality of the journal in which the literature is published. Column 1 of Table 8 exhibits the ABDC rating and column 2 indicates the number of academic journals published per rating.

Table 8: ABDC rating

Rating	Number of academic journals
A*	0
A	2
B	1
C	4
Not listed	14
Total	21

*Please note that for the purpose of this table, only the number of journal articles was listed; and consequently, industry reports and working paper were not included as they cannot appear on the ABDC list.

The findings indicate that only seven out of the twenty-one articles were published in journals that are ranked on the ABDC list. This list reveals the number of high-ranked scholarly journals that focus on robot tax. Most of the selected articles are either C ranked; or they do not appear on the list, which could be indicative that robot tax was not necessarily the focus of these scholarly journals. Another reason why most of the selected journals are not listed, could be attributed to the fact that the publications on robot tax amount to opinion pieces. However, it could be expected that in the future, as more academic articles are written on the topic, this will become more relevant as the notion of Industry 4.0 and robot tax transmutes into a reality. One might then see an increase in the number of articles published in A* and A journals.

3.3.2.3. Scientific disciplines

Research question: To which main science discipline does the publication of such articles belong?

Table 9 provides the findings relating to the scientific discipline of the selected publications. Coloumn 1 indicates the scientific discipline identified and column 2 indicates the number of publications relating to the specific science discipline.

Table 9: Academic discipline

Scientific discipline	Number of publications
Business	4
Economics	1
Finance	2
IT (information technology)	1
Law	3
Other	1
Taxation	21
Total	33

The findings shows that the most prominent scientific discipline is taxation, which could be expected since the study focuses on robot tax. However, it is interesting to note that the topic of robot tax is also examined in other discplines, such as business and law. This is indicative of the complexitiy of this topic.

Law and tax are essentially interwoven as tax rules are encapsulated in tax legislation governed by tax authorities (Thuronyi & Brooks, 2016). As a result, it could be projected that there could be an increasing amount of publications made in the discipline of law on the topic of robot tax because tax authorities will at some point enact legislation to govern and tax robots, after which scholars will probably write academic journal articles on this subject.

3.3.3. Country Perspective

The current section is concerned with the country perspective, pertaining to robot tax.

Research question: Is the publication written from a country's specific perspective; or is it general in nature?

The country perspective is examined, in order to determine which countries have undertaken research with reference to robot tax that is specific to their country and its legislation, or whether the research is general in nature. When analysing the publications, it become apparent that most of the publication were not written from a country's specific perspective but are rather general in nature. Interestingly enough, only three out of thirty-three articles were written from a country specific perspective; while two publications were written with specific reference to the United States of America (US) legislation and the other publication was written from a Russian perspective. These findings suggest that robot tax is still gaining traction in the vast majority of countries.

3.3.4. Theoretical framework

This section presents the findings relating to the type of taxes proposed by the selected publications.

3.3.4.1. Types of taxes

Research question: What types of taxes are under investigation in these selected studies?

Table 10 presents the findings relating to the type of taxes identified from analysing the selected literature. Column 1 stipulates the broad categories of tax, such as direct and indirect tax; levying tax without an indication of a specific tax; or whether the author does not discuss any form of tax that should be imposed on robots.

Table 10: Type of taxes

Type of tax	Number of publications
Direct tax	20
Indirect tax	2
Levy tax (without indication of a specific tax)	5
No mention of levying tax	6
Total	33

The results reveal that most of these publications indicate that direct tax should be imposed on robots; while merely two publications stated that indirect tax is the most suitable taxation method. The fact that direct tax is the preferred method of taxation with reference to the selected publications, might suggest that direct tax could raise more revenue; while simultaneously achieving redistribution (Saez, 2004). Moreover, five publications stipulated that tax should be levied on robots, however the publications do not specifically identify the appropriate tax applicable. Interestingly, 18,18% (six out of thirty-three) publications did not indicate that tax should be levied on robots, but they merely stated that robots taking over human occupations would be problematic from a tax perspective. Thus, it is tenable that certain publications do not explicitly indicate the suitable type of tax, as there is considerable uncertainty looming around robot tax.

Since the current study is centred around taxation, with specific reference to robot tax, merely identifying broad categories would not suffice. Twenty-two articles explicitly indicated the type of tax that should be levied on robots. Table 11 reveals supplementary details on the possible types of taxes that could be used to curb revenue loss, due to robots replacing humans.

Table 11: Proposed tax notion

Proposed tax notion	Number of proposals
Corporate income tax	3
Personal income tax	12
Capital Gains Tax (wealth tax)	2
"Waiting tax"	1
Lump sum tax	3

Creating a universal basic income	1
Providing tax credit	1
VAT	2
Total	25*

*Please note that this table only exhibits the proposed tax notions arising from the twenty-two publications that explicitly indicated the type of tax that should be levied on robots. Furthermore, a few of the publications propose more than one tax notion, and as a result, the total number of proposals may differ from those suggested for the sample (N=33).

Analysing the publications has brought forward fascinating notions, with respect to robot tax. The two most prominent notions where based on corporate income tax and personal income tax. Various publications declared that corporate income tax should be imposed, while others stated that an imputed salary must be given to the robots, leading to the robots rather being taxed on their salaries. Conversely, some authors argued that robots cannot be taxed on a salary since they do not have any legal personality (Oberson, 2017).

Imposing Capital Gains Tax could possibly ensure fair wealth distribution, thereby resulting in a shift of the tax burden to owners and investors (Kaminska, 2017). "Waiting tax" is an auspicious proposal, which entails that little or no tax is imposed at the early developmental stage of robots to encourage innovation, thereafter the tax could be increased (Ahmed, 2017). Furthermore, it should be noted that owners of the robots, together with shareholders will receive significant benefits from the outputs produced by robots, and consequently the tax could rather be imposed on them (Shigong Li, 2017).

Another proposal is implementing lump sum tax as this is the only tax that does not damage the economy (Shiller, 2017). Nevertheless, tax authorities may be hesitant to use this proposal as the imposition of tax would be co-extensive on every taxpayer, regardless of their income, resulting in a considerable tax burden on the impoverished. Moreover, universal basic income could be an innovative approach to ensure that each person has financial security since they would thereby be able to cover their basic costs of living (West, 2015). Finally, two authors introduced the notion of levying VAT on robots, which could be

feasible, with regard to the administration of taxes across different areas of jurisdiction (Arndts & Kappner, 2019; Oberson, 2019).

In conclusion, the analysis reveals that although there is a variety of proposals, there is no consensus on the specific type of tax that should be imposed on robots. This could be indicative of the uncertainty associated with the imminent threat of Industry 4.0, as well as on how to levy robot tax, if at all.

3.3.5 Research designs and methodologies

The present section exhibits the findings pertaining to the research design and methodological classification of the selected publications.

3.3.5.1 Research design

Research question: What is the research design (nature and timeframe) utilised in each of these publications?

Most of the publications were descriptive in nature since the subject of robot tax was merely described, often from a personal perspective (opinion piece). None of the publications employed experimental or causal designs and statistical analysis. This could be due to the fact that robot tax is currently just a conceptual notion, which is not yet a reality. In addition, all the publications employed a cross-sectional time horizon, linking with the publication's descriptive nature.

3.3.5.2 Methodological classification

Research question: What is the main research methodology (qualitative, quantitative, or mixed-method research) adopted by each of these studies?

Column 1 in Table 12 exhibits the three methodological classifications: qualitative; quantitative and mixed-method research; while column 2 exhibits the number of publications pertaining to the indicated methodological classification.

Table 12: Methodological classification

Methodological classification	Number of publications
Mixed	5
Qualitative	28
Quantitative	0
Total	33

According to the findings in Table 12, most of the publications can be classified as qualitative since this method relates to the theoretical concepts of robot tax, while five of the publications relate to theoretical concepts, together with the models to calculate optimal tax. None of the publications are considered to be purely quantitative, thereby indicating that there exists a possible lack of research to develop hypotheses, models and theories relating to robot tax. Therefore, these findings present a gap in the research field concerning quantitative research on robot tax as most of these studies focus on qualitative data.

3.3.6 Issues identified and emerging themes

The current section is concerned with identifying any emerging themes, based on the issues addressed in each the publications.

Research question: Which issues are being addressed; and what are the emerging themes evident from these publications?

The first section identified the broad issues arising from the various publications. In order to establish a cohesive understanding of these issues, section 3.3.6.3 elaborates on the themes emerging from the issues identified in section 3.3.6.1.

3.3.6.1 Issues identified

Issues addressed in the publications:

- Robots could possibly supplant the human workforce, partially or completely causing a significant *reduction in tax revenue,* and simultaneously *escalating the inequality* between the wealthy and impoverished.
- How must *tax systems transmute, in order* to address the abovementioned issues?
- *Job automation* can either lead to new ameliorated jobs; or it could leave humans unemployed. Although, job automation will generate economic growth, these benefits are not distributed to human workers.
- The evolution of AI, with specific reference to robots is a *worldwide concern of significance.*
- What *tax approach* can be used to counteract the obstacles imposed by robots taking over humans' occupations?
- Can *public policy* counter the ramifications of automation with regard to the labour market?
- The current tax systems invigorate automation by providing employers with *preferential tax treatment* for their robot workers.
- The proposal of robot tax poses the following *concerns*: Is there a need to offset the loss of revenue generated from employment taxes; should robot tax be used for human labour force that has been laid off or should robot tax be utilised to perpetuate new occupations.
- Whether robots should be *taxed in the same manner,* as humans are being taxed.

3.3.6.2 Emerging themes

This section highlights a variety of pertinent themes and trends portrayed in the selected publications, as is evident in the issues identified above. These themes are discussed under three sub-headings to derive insight.

3.3.6.2.1 Imputing tax on robots

41

Oberson (2017) argued that tax can only be imputed on robots if they are awarded a legal personality, which entails that tax legislation should introduce a new type of "electronic personality". Although this concept sounds radical, it was already introduced by the Swiss tax reform in 2007, which regards investment funds in the form of corporations with variable capital as having a legal personality leading to the funds being treated as transparent for the purpose of tax.

Alternatively, tax authorities can propose a new tax liability with specific criteria to tax robots. Furthermore, it was evident from the publications that there is no universally recognised definition for the term "robot" (Organisation for Economic Cooperation & Development, 2019). Unfortunately, tax authorities will only be able to tax robots is they are clearly defined from a legal perspective. However, Unknown (2017) recognise the daunting task of distinguishing between robots, computers and software. The European parliament argued that the definition of a robot should be based on the following features, " the acquisition of autonomy through sensors and/ or by exchanging data with its environment (interconnectivity) and trading analysis of those data; self-learning from experience and by interaction (optional criterion); at least a minor physical support; the adaptation of its behaviour and actions to the environment; and the absence of life in the biological sense" (European Parliament, 2017). The International Organisation for Standardisation defines a robots as "actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks (International Organisation of Standardisation, 2012). These definitions highlight the differences between robots and machines, which, in essence, amounts to autonomy and decision-making process.

In conclusion, most authors concur that the exigency to determine an adequate definition for the term "robot", however it is crucial that this definition should be developed, while bearing taxation in mind.

3.3.6.2.2 Robots, revenue and inequality

Initially, robots were employed in the manufacturing sector, however they are also being utilised in both the service and entertainment sectors (Organisation for Economic Cooperation & Development, 2019). Furthermore, robots are becoming more humanized,

which means that they display human-like qualities and as a result, robots are expropriating work opportunities from the human labour force (Robert, 2017). All the authors are in agreement that employing robot employees could deplete the tax revenue as they are currently not being taxed. This phenomenon would escalate the income inequality, resulting in societal division since a minuscule percentage of the population would have high concentrations of income. Furthermore, the unemployed human workers will become overly dependent on the government for some type of income to support their basic needs (Yanni & Daubanes, 2019).

3.3.6.2.3 Robot tax and automation

Even though the authors of the selected publications agreed that the employment of robots could diminish the tax collected by authorities, the authors do not coincide on the policy that should be implemented, in order to curb this phenomenon. Twenty-seven out of thirty-three of the authors concur that robot tax should be levied to generate tax revenue, the remaining authors are hesitant to impose tax on robots as this could be counterproductive; because it might possibly discourage automation and innovation by proliferating the cost associated with robots. In addition, the opposing authors stated that it is plausible for robot tax to make the tax system more convoluted, which could lead to issues of non-compliance.

Although the majority of authors agreed that robot tax should be levied, it is evident in section 3.3.4.1, that the authors disagree on the exact type of tax that should be imposed. The most prominent suggestion made by the authors is direct tax, but there is no assent on the specific type of direct tax that should be levied.

Therefore, it is concluded that inaugurating tax policy pertaining to robots would be a balancing act between generating revenue, while simultaneously incentivizing innovation.

3.4 CONCLUSION

This chapter is centred around a comprehensive analysis of each of the research objectives, in order to answer the imminent research question proposed in section 1.3. Firstly, the chapter examined the authors and the recentness of publication, which found that there is

no prominent author from the selected publications. Furthermore, it should be noted that robot tax is a fairly new notion as all the publications have been written in the past six years. Thereafter, the type of publication and its quality assessment were analysed, which revealed that there is not a large number of scholarly journal articles pertaining to robot tax published in journals on the ABDC list.

The next element examined related to a country's specific perspective on robot tax that uncovered the fact that the publications each have a general viewpoint. The theoretical framework considered the type of tax that was proposed in the publications, which unveiled that the authors do not necessarily endorse the same tax proposal. Next, the research design and methodological classification were analysed. This section exhibited that all the publications were descriptive, cross-sectional and mostly qualitative in nature. Finally, the chapter considered the issues addressed, as well as the emerging themes identified from the publication.

CHAPTER 4:
CONCLUSION

4.1. INTRODUCTION

Chapter 3 presented the data analysis technique utilised in this study, thereafter it exhibited the findings of the data analysis performed. The final chapter provides a synopsis of the findings discussed in chapter 3, to determine whether it is feasible to tax robots. Next, the chapter elucidates the limitations concerning the present study. Thereafter, the chapter proposes insight for future research on the topic of robot tax. Finally, the study concludes with some final remarks.

4.2. SUMMARY OF FINDINGS AND CONCLUSION

The main research objective of the present study was to utilize a systematic review to explore the existing publications related to robot tax, to determine whether it is feasible to impute tax on robots. This main objective was supported by eleven sub-questions that served as a guide in the research process. Furthermore, this section highlights the findings of the study, by making use of the sub-question stated in section 1.3 and thereafter, it provides a conclusion on the research objective posed.

The first three of these sub-questions related to authorship; the first sub-question pertained to identifying the most prominent authors in the field of robot tax, which was determined by conducting research on scholarly databases and thereafter, by systematically identifying and recording the publications related to robot tax. Section 3.3.3.1 indicated that there are no prominent author(s) in this field since most of the authors have only one publication related to robot tax.

The second research question was concerned with whether the topic of robot tax has been explored by individual authors, or by research teams. Section 3.3.3.2 exhibited that almost 70% of the publications had been written by an individual author, and consequently there is not a large variety of research teams that are currently exploring robot tax. The last sub-

45

question related to authorship, and it examined the publication period of the selected publications; while section 3.3.3.3 revealed that there were no publications pertaining to robot tax before 2015, thereby confirming the 'newness' of the topic.

The next cluster of sub-questions was concerned with where the information relating to robot tax was published. Stated differently, the researcher determined the type of publication, since this study was not only limited to academic journals. Table 7 indicates that 36,35% of the publications were classified as either industry reports or working papers; while the rest of the publications were related to academic articles. The following sub-question emanated from the previous one, as it is related to whether the selected academic articles are ranked on the ABDC list. Table 8 shows that fourteen out of the twenty-one selected journal articles were not listed, and majority of the academic articles which were published in ranked journals, was graded a C ranking by the Australian Business Dean Council.

The sixth sub-question was concerned with the scientific discipline pertaining to the selected publications. Section 3.3.2.3 revealed that the most prominent scientific discipline was tax. However, it was evident that due to the complexity of robotization, it has now become an interdisciplinary topic that is researched in various other disciplines, such as law and business, in order to determine how robots would affect each of these sectors.

Thereafter, the seventh question posed pertained to whether the publications were written from a country specific perspective or were more general in nature. The findings in section 3.3.3 indicate that nearly all the publications were general in nature as only three publications were written from a country specific perspective – relating to a research gap pertaining to a country specific perspective on robot tax.

Section 3.3.4.1 detailed the type of taxes (sub-question eight) that were investigated in the publications. Direct tax was recommended, as a possible suggestion to tax robots, by most authors. In addition, this section displayed proposed tax notions such as corporate income tax; personal income tax; wealth tax; "waiting tax"; lump sum tax and creation of a universal basic income.

Next, the research design and methodological classification were analysed, by answering sub-questions nine and ten. Firstly, to determine the nature of the publications and

framework; and thereafter, it was determined whether the publications had applied a qualitative, a quantitative, or a mixed methodology. Section 3.3.5 maintained that the majority of the publications were descriptive in nature, with cross-sectional time horizons and 84,84% of the publication had a qualitative methodological classification. The lack of quantitative studies could be related to the recency and complexity of the topic; but these types of studies will be necessary in the future to test the applicability and impact of the possible tax solutions proposed.

The final sub-question related to the issues addressed and the emerging themes evident from the selected publications. Firstly, the eminent issues arising from the publication were identified and thereafter, emerging themes were identified. The issues identified pertained to the impact of robots replacing human workforce; such as the reduction in tax revenue, escalating the inequality between the wealthy and impoverished and job loss. The need of tax systems to address the afore-mentioned issues and obstacles and how the benefits of economic growth due to automatisation would be distributed to human workers were also identified as important issues.

The last group of issues related to if and how the taxation of robots should be approached. Section 3.3.6 elucidates that the depletion of the human labour force, as a result of employing robots, is a universal concern since a significant amount of tax revenue would probably be lost. This led to various authors proposing the notion of robot tax, in order to curb this revenue loss.

It was therefore concluded that it is feasible to tax robots, when considering the analysis of the conducted data, as well as the findings presented in chapter 3. The first point of departure was to reach a consensus on the definition of the term "robot", and to determine which items or machines should be specifically excluded from the definition. Thereafter, robots need to be afforded a legal personality, in an effort for tax authorities to be able to impose tax on the robots. Thirdly, the type and rate of tax to be levied, and whether direct tax is indeed the best option, needs to be confirmed. Lastly, the implementation of such a proposed robot tax system and legislation, as well as the possible effects thereof, should be thoroughly investigated.

4.3. LIMITATIONS

This study was confronted with the following limitations:

- The literature utilised in the present study was not exhaustive since the study merely reviewed articles published in academic journals and industry reports/ working papers.

- The scope of this study was limited since the search for publications was only conducted in scholarly academic databases, such as Google Scholar, EbscoHost and ProQuest.

- Although great care was taken to include all the relevant search terms, there is a possibility that some authors had used different terms to describe Industry 4.0 and robot tax, as opposed to the key terms identified in this study.

- All the publications had a cross-sectional time-horizon, and therefore the publications do not extend beyond a single moment in time. In other words, there is no sequence of events established.

- The present study only considered publications in English, and this could possibly exclude the study's exposure to additional publications.

4.4. FUTURE RESEARCH

The present study will add to the existing body of knowledge on robot tax in the context of Industry 4.0; since it has provided a holistic overview on the research conducted and of the publications made in this field. However, this study could serve as a starting point for future researchers seeking to derive insight into the field of robot tax. It could also identify any other potential research areas.

Finally, it is recommended that future search should focus on the type of tax that should be imputed on robots, since there is currently no consensus thereon. Moreover, future research could explore the possibility of using VAT to tax robots, since it is currently not being comprehensively investigated.

4.5. CONCLUDING REMARKS

The wave of automation brought forward by Industry 4.0 is inevitable. This study has explored the concept and feasibility of robot tax, which originated from the possible loss of tax revenue caused by robots replacing human jobs.

Although there is no consensus on exactly on how robot tax should be levied, it seems as if experts concur that some form of tax should be imposed. It is evident that more research and debate is needed to comprehend the extent and complexity of this topic. Only thereafter, experts in the fields of automation, law and taxation would be able to suggest plausible solutions to protect various occupations and to ensure optimal tax revenue for government's, while simultaneously encouraging innovation.

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APPENDIX A:

SAMPLE OF SELECTED QUALITY ACADEMIC PUBLICATIONS

List of selected quality academic publications

Abbot, R. & Bogenschneider, B. 2018. Should robots pay taxes? Tax policy in the age of automation. *Harv. L. & Pol'y Rev.,* 12:145.

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APPENDIX B:
TAXONOMY FRAMEWORK

APPENDIX C:

DECLARATION OF PLAGARISM

DECLARATION REGARDING PLAGIARISM

The Faculty of Economic and Management Sciences emphasises integrity and ethical behaviour with regard to the preparation of all written assignments.

Although the lecturer will provide you with information regarding reference techniques, as well as ways to avoid plagiarism, you also have a responsibility to fulfil in this regard. Should you at any time feel unsure about the requirements, you must consult the lecturer concerned before submitting an assignment.

You are guilty of plagiarism when you extract information from a book, article, web page or any other information source without acknowledging the source and pretend that it is your own work. This does not only apply to cases where you quote the source directly but also when you present someone else's work in a somewhat amended (paraphrased) format or when you use someone else's arguments or ideas without the necessary acknowledgement. You are also guilty of plagiarism if you copy and paste information <u>directly</u> from an electronic source (e.g., a website, e-mail message, electronic journal article, or CD-ROM) without paraphrasing it or placing it in quotation marks, <u>even if you acknowledge the source</u>.

You are not allowed to submit another student's previous work as your own. You are furthermore not allowed to let anyone copy or use your work with the intention of presenting it as his/her own.
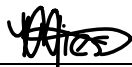
Students who are guilty of plagiarism will forfeit all credits for the work concerned. In addition, the matter will be referred to the Committee for Discipline (Students) for a ruling. Plagiarism is considered a serious violation of the University's regulations and may lead to your suspension from the University. The University's policy regarding plagiarism is available on the Internet at *http://www.library.up.ac.za/plagiarism/index.htm.*

For the period that you are a student in the Faculty of Economic and Management Sciences, the following declaration must accompany **all** written work that is submitted for evaluation. No written work will be accepted unless the declaration has been completed and is included in the particular assignment.

I (full names & surname):	Melandri Wiese
Student number:	16012102

declare the following:

- I understand what plagiarism entails and aware of the University's policy in this regard.
- I declare that this mini-dissertation is my own original work. Where someone else's work was used (whether from a printed source, the internet or any other source), due acknowledgement was given, and reference was made according to departmental requirements.
- I did not copy and paste any information directly from an electronic source (e.g. a web page, electronic journal article or CD ROM) into this document.
- I did not make use of another student's previous work and submitted it as my own.
- I did not allow and will not allow anyone to copy my work with the intention of presenting it as his/her own work.

_____	*08/06/2020*
Signature	Date