

THE EFFECT OF PROACTIVE QUOTATIONS FOR PLANNED MAINTENANCE ON REVENUE

Research report presented to the

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by

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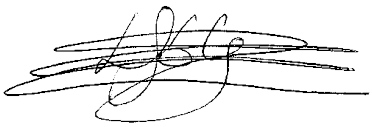
MASTER OF BUSINESS ADMINISTRATION

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DECLARATION

I, **Gert Hendrik Joubert**, hereby declare that this research report is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration, University of South Africa Graduate School of Business Leadership is my own work, except as indicated in the list of references, citations and acknowledgements and this work has not been submitted to any other university.



24 DECEMBER 2023

Signed & Dated

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I would like to express my gratitude to my loving wife, Nicolene Joubert, for her support and understanding through the late nights and extended hours of research and studying. It meant a lot that I could rely on you and know that you have my back. I love you with all my heart and words can't describe how much I appreciate you.

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ABSTRACT

The private healthcare sector in RSA, dominated by major groups like Mediclinic, Netcare, and Life Healthcare, contributes significantly to the country's healthcare expenditure, while numerous organizations offer specialized medical devices and services. Despite the emphasis on proactive customer service delivery (PCSD) in various studies the focus remains on reducing cycle times or automating processes rather than leveraging PCSD for revenue generation through quotations for planned maintenance. This study will contribute to the wider body of knowledge pertaining to PCSD.

The study was conducted on a service division of a healthcare organisation in South Africa. The population consisted of their entire medical device install based that was extracted from the organisation’s CRM and ERP, and filtered to only included non-contract customers. Stratified random sampling was applied to extract a sample group that reflects the larger population due to the different frequencies and labour hours required to complete planned maintenance (PM).

A predictive model was built using multinomial logistic regression analysis, based off a second dataset of reactive PM quotations that was extracted from the CRM and ERP. The predicted results were 72.7% accurate and was filtered and applied to the sample group based on PM hour and frequency requirement to assess if additional revenue could be captured.

The predicted results yielded a 7.2% increase in revenue gained from proactive PM quotes to non-contract customers. The research answered all the research questions and open numerous opportunities for improvement like the automation of low-skilled business processes or another study over an extended period of time using proactive data instead of reactive data.

Keywords: Customer Relationship Management (CRM), Enterprise Resource Planning (ERP), Business Process Management (BPM), Proactive Customer Service Delivery (PCSD).

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LIST OF ABBREVIATIONS AND ACRONYMS

AI	Artificial Intelligence
BPM	Business Process Management
CRM	Customer Relationship Management
CT	Computed Tomography
CV	Cardio Vascular
ERP	Enterprise Resource Planning
IB	Install Base
MG	Mammography
MR	Magnetic Resonance Imaging
NM and PET	Nuclear Medicine and Positron Emission Tomography
OEM	Original Equipment Manufacturer
PCSD	Proactive Customer Service Delivery
PM	Planned Maintenance
REC	Research Ethics Council
RSA	Republic of South Africa
SBL	School of Business Leadership
SLA	Service Level Agreement
UNISA	University of South Africa
US	Ultrasound
USD	United States Dollar
XR	X-Rays

1. CHAPTER 1 - INTRODUCTION

1.1. INTRODUCTION

Proactive quotations for planned maintenance on medical devices might generate additional revenue for organisations. According to Simply Wall St (2023) the Healthcare industry in South Africa have had flat revenues but profit has grown by 23% per year over the past three year. It clearly indicates effective business because sales remain flat while profits are increasing. This can be even more with proactive quotations. Non-contract customers are frequently neglected and service providers expect customers to reach out to them for quotations for services. In contrast to this approach to reactive service delivery a proactive approach to remind customers of planned maintenance due dates might provide additional steams of revenue and even improved customer satisfaction. In line with this Proactive Customer Service Delivery (PCSD) approach, Poll, Polyvyanyy, Rosemann, Roglinger & Rupprecht, (2018) supports the shift of organisations towards proactive Business Process Management (BPM). In alignment to this, this study will assess the effectiveness of the application of PCSD on the specific business process of quotation for planned maintenance specific to non-contract customers.

1.2. BACKGROUND

Netherlands Enterprise Agency (2021) explain that the private healthcare sector of RSA accounts for more than 50% of the country's healthcare expenditure but only services 16% of the population while the public sector supports the remaining 84%. In 2018 alone the RSA market accounted for R 350 billion on medical device imports; excluding services and software which will increase this figure significantly, (Netherlands Enterprise Agency, 2021). Netherlands Enterprise Agency (2021) further discuss that the three major private hospital groups in RSA (Mediclinic, Netcare and Life Healthcare) consist of 66% of the private healthcare sector. Therefore, servicing these medical devices proactively can generate a lot of revenue.

It would seem that in the healthcare industry within South Africa there are various organisations providing numerous solutions. These include Siemens Healthineers that specialises in interventional and diagnostic medical imaging, Stryker that focuses on orthopaedic surgical instrumentation or Dräger Medical with respiratory devices and anaesthesia machines, (Serai, Dillman & Trout, 2017; Greffier *et al.,* 2019; Ramanathan and Jagadeesha, 2022; Satarasinghe *et al.,* 2018; Heiderich *et al.,* 2021 and Rodger *et al.,* 2022). Healthcare organisations sell medical devices and provide after sales services to maintain the equipment, (Porter & Lee, 2018). These devices will require routine maintenance that varies between either hourly or fixed intervals. This is used to calibrate, adjust and align these devices to verify that they operate within the manufactured specification and adhere to specific performance requirements so that they may be deemed fit for medical use, (ISO., 2017).

Brege & Kindström (2020) suggest that a proactive market strategy is key to creating superior customer value in order to achieve success. Many organisations that run a successful service division like Philips Healthcare that supplies medical devices but also repairs and maintains the medical devices in the field through field services, (Ramanathan & Jagadeesha, 2022). For example, a typical service division's income consist of revenue from contract customer, options and upgrades as well as billable parts sold and services rendered. A large percentage of the installed equipment out of contract or without warranty still require routine or planned maintenance. Proactive Customer Service Delivery (PCSD) of field service engineers is crucial to the customer satisfaction within service organisations, (Jauhari, Singh & Kumar, 2017). This is confirmed by Cong *et al.* (2020), who argue that revenue is related to customer satisfaction.

Schüritz, Seebacher & Dorner (2017), address different revenue models that can be used by service organisations to gain additional revenue such as gain sharing, usage fee, subscriptions and multi-sided revenue models. Gorji *et al.* (2018) discuss that service performance can be improved with the right type of

service, the right type of contract and the correct resource allocation to the to the correct target market. To support this, Anshari *et al.* (2019), discuss that the use of Customer Relationship Management (CRM) and Enterprise Resource Management (ERP) systems will enhance customer targeting and resource allocation. Srivastava, Pandey & Sabui (2004) argue that the effective use of CRM and ERP systems will improve business processes while many of the monotonous activities can be automated. Sheshadri *et al.* (2021) even suggest that a competitive advantage and business process improvements can be obtained through the effective use of Artificial Intelligence CRM (AI-CRM) to automatically make decisions without human intervention. Therefore a similar approach can be adopted within healthcare services and the use of CRM and ERP to identify sales and service opportunities to improve revenue.

The CRM and ERP will allow organisations to target resources at specifically identified customers based on the knowledge within these systems. This will allow for business processes such as quoting and invoicing to be improved. Poll *et al*. (2018) propose a model for process forecasting to drive business processes within organisations as a whole toward proactive Business Process Management (BPM) as opposed to reactive BPM. Spring, Faulconbridge & Sarwar (2022) propose a smart contract-based service billing method to simplify billing processes and to manage the transparency and fairness of billing management among multiple organisations. Spring, Faulconbridge & Sarwar (2022), further automated and augmented billing process to relieve professionals from repetitive and low-activity tasks to utilise their expertise more efficiently. When looking at quotations as a specific business process, Buzby *et al.* (2002) suggest that the total cycle time can be reduced by applying lean principles to the administrative process of quotations. Patel & Mcleo (2016) review a semi-automated web-based quotation system that has the ability to predict values for output parameters based on specific input parameters and key words identified. The overall focus of (Buzby *et al.,* 2002 and Patel & Mcleod, 2016) are on reducing

the total cycle time of quotation but there is no mention of proactive service delivery or personalised service with this business process. Personalised products and services can be achieved by collaborating with the value chain and its partners to improve on products sold and services rendered to reduce the overall cost and improve the quality and value offered all while adapting to market changes with agility, (Kavadias, Ladas & Loch, 2016). PCSD is crucial to customer satisfaction and is related to revenue generation, (Cong *et al.,* 2020 and Jauhari, Singh & Kumar, 2017). It would seem that there are opportunities for organisations to improve their revenue through personalised services and proactive service delivery.

Lee *et al. (*2022) found that special benefits would positively influence loyalty and continued support of non-contract customers. Lee *et al.* (2022) further define special benefits like faster service delivery and personalised additional services as benefits that are over and above the core services rendered. Kavadias, Ladas & Loch (2016) support this notion by arguing that in order to transform an industry, organisations need to provide a more personalised product or service with the ability to reuse or recycle products. According to Kavadias, Ladas & Loch (2016) their study revealed that special benefits influence both calculative commitments as well as affective commitment of customers. Therefore, one can argue that if non-contract customers are given special benefits (proactive monitoring and services) it would influence their commitment to a specific service provider. Shin *et al.* (2017) argue that proactive service delivery is resource-intensive and customers prefer that service providers initiate the first contact for services rendered to non-contract customers. Shin *et al.* (2017) further mention that firms shouldn't ignore the conventional practice of prioritizing top customers to focus their resources on providing proactive interactions. Hence, there is a need for organisations to adopt proactive customer service delivery within business processes that add value to customer through personalised products and services to improve customer commitment that will improve revenue generation.

Research has identified the benefits of PCSD, (Sehgal & Gupta, 2020). It has addressed service delivery strategies to generate additional revenue. Research has been tested on a leadership level (Ye, Lyu & He, 2019), knowledge management level [CRM, ERP], business process level [invoicing and quoting] as well as an operational level with its effect on the performance of field engineers. The existing research such as (Buzby *et al.,* 2002; Patel & Mcleod, 2016; Kavadias, Ladas & Loch, 2016; Lee *et al.,* 2022; Shin *et al.,* 2017; Sehgal & Gupta, 2020 and Ye, Lyu & He, 2019) focus on reducing the overall cycle time or automating specific section of the quotation process. Bumblauskas *et al.* (2017) developed a predictive maintenance model for physical asset maintenance. The model from Bumblauskas *et al.* (2017) has the ability to automate certain aspects of the quotation process to automatically assign predefined components and labour hours required for the specific planned maintenance routine that is required. This model developed by Bumblauskas *et al.* (2017) similar to the model developed by Patel & Mcleod (2016) require a manual input of information. Again, the focus as discussed by (Patel & Mcleod, 2016 and Bumblauskas *et al.,* 2017) are on reducing the overall cycle time and not the application of PCSD to quotations for non-contract customer for services. Evidently there is room for additional revenue generation through PCSD with quotations for planned maintenance.

The model titled: Process Forecasting, as discussed by Poll *et al*. (2018) was developed to address process-related issues before they occur, to seize process-related opportunities while reducing process latency. The structured literature review of Poll *et al*. (2018) identified that proactive BPM is still in its infancy and that the existing proactive BPM methods are not sufficient. (Selcuk, 2017 and Shin *et al.,* 2017) cover new trends and techniques within the manufacturing and service industries in the field of predictive or proactive maintenance with the aim of acting before failure. This principle of acting before failure, as reviewed by (Selcuk, 2017 and Shin *et al.,* 2017) are in line with PCSD however the focus is not on proactive quotation for additional

revenue generation but rather on improving reliability, safety and efficiency. Jauhari, Singh & Kumar (2017) review the effects of transformational leadership to influence proactive customer service behaviour and the results indicate a positive impact on subordinates. Ye, Lyu & He (2019) further assess the effects of servant leadership on PCSD performance and find that servant leadership provides employees with an abundance of resources that activate a passion for their work to foster a customer orientated culture that lead to PCSD performance improvement. Bhuyan *et al. (*2020) recommend transforming healthcare cybersecurity from reactive to proactive by reviewing current trends and recommending improvements to organisations. Bhuyan *et al. (*2020) seek to explain the complexities and issues with cybersecurity while recommending proactive preventative step that can be taken to prevent cyberattacks. Brege & Kindström (2020) explore proactive marketing strategies to understand the role of proactivity in creating superior marketing strategies. Linders, Liao & Wang (2018) explorer proactive service delivery through e-Governance to empower and compliment frontline civil servants to improve on service delivery. It is evident that proactivity can be found in abundance in literature but there seems to be a lack of PCSD pertaining to the quotations for services to improve revenue.

1.3. RESEARCH PROBLEM

Shin *et al. (*2017) found that customers prefer that service providers initiate the first contact for services rendered. It would seem that based on this finding that organisations tend to be more reactive with service delivery and wait on customers to initiate rather than proactively providing services. To support the findings from Shin *et al. (*2017) it can be seen that (Sehgal & Gupta, 2020; Ye, Lyu & He, 2019; Buzby *et al.,* 2002; Patel & Mcleod, 2016; Bumblauskas *et al.,* 2017; Poll *et al*., 2018; Selcuk, 2017; Jauhari, Singh & Kumar, 2017; Bhuyan *et al.,* 2020;

Brege & Kindström, 2020 and Linders, Liao & Wang, 2018) found benefits, throughout multiple industries, in proactiveness however none measure the revenue generation that can be gained through proactive quotations for planned maintenance.

Therefore from the evidence above there is a lack of proactive quotations for planned maintenance of medical devices for non-contract customers thereby organisations are missing out on additional revenue.

1.4. RESEARCH AIM

Spring, Faulconbridge & Sarwar (2022), identified that organizations can expect improved performance in professional service delivery by automating or augmenting low-value or repetitive activities.

By analysing the impact on revenue streams through improved maintenance scheduling and engagement with non-contract customers, this research aims to:

- provide valuable insights into the feasibility, effectiveness, and revenue implications of implementing proactive customer service delivery strategies on business processes within the healthcare sector.

1.5. RESEARCH QUESTIONS

This gap in the industry regarding PCSD has opened opportunities for improvements within business processes, customer facing employees' actions and service delivery of service divisions within organisations. This can be exploited as a competitive advantage and additional streams of revenue through business process

improvements to improve customer satisfaction and loyalty. With this in mind the research questions are:

1. Can proactive planned maintenance quotations to non-contract customers within the healthcare industry of South Africa provide additional revenue?
2. What effect would follow-up PM quotation have (six months after the initial quote) on revenue for customer systems that require only an annual PM but rejected the initial quotation?
3. What effect will proactive requoted expired quotations have on revenue?
4. How can the additional revenue affect future financial results of the service division within this organisation based on the results for the year of 2022?

1.6. RESEARCH OBJECTIVE

The research objectives are:

1. To identify if additional revenue can be made through proactive planned maintenance quotations for non-contract customers within the healthcare industry of South Africa.
2. To evaluate the effect on revenue with a follow up quotation for equipment that require annual PMs, six months after the initial quotation was rejected.
3. To assess the effect on revenue by proactively requoting customers on all expired quotations.
4. To measure the magnitude of the predicted increased revenue streams on the annual financial target for this organisation's service division using year 2022 as a basis.

1.7. RESEARCH CONTRIBUTION

The research will contribute to the wider body of knowledge on proactive customer service delivery. It will contribute to help quantify revenue gains that can be obtained through proactive quotations for planned maintenance of medical devices of non-contract customers within the healthcare industry of South Africa. The research will also contribute to future studies to serve as a basis to assess how proactive customer service delivery strategies can influence customer loyalty.

1.8. ABBREVIATED LITERATURE REVIEW

1.8.1. INTRODUCTION

The researcher is of the opinion that additional value can be added to customers through proactive quotations for planned maintenance. This research seeks to quantify this value creation through the additional revenue that the service division of this organization could generate through proactively quoting for PMs on medical equipment for non-contract customers. The literature review will focus on the following areas of importance:

- Customer Relationship Management
- Enterprise Resource Planning
- Business Process Management
- Proactive Customer Service Delivery

1.8.2. CUSTOMER RELATIONSHIP MANAGEMENT

There is great importance in Customer Relationship Management (CRM) in healthcare organizations to manage customer relationships efficiently, especially as the population grows and the number of medical devices requiring maintenance increase. Agapitou, Bersimis & Georgakellos (2017) highlight the benefits of

implementing a CRM, such as improved business processes, customer loyalty, and service quality, acting as a competitive advantage. Baashar *et al.* (2020) further define CRM as innovative technology aiming to enhance customer loyalty, satisfaction, and profitability through effective management of customer relationships and interactions.

A well-implemented CRM stores essential customer information, enabling strategic use to improve business processes and profitability. Moving from reactive to proactive service delivery, as suggested by Shin *et al.* (2017), can be facilitated by CRM. Jalal *et al.* (2019) argue that CRM enable organizations to understand customer needs better, creating better-quality connections by analysing purchasing trends and patterns to enhance customer value. Integrating CRM data with business processes and analytical activities, as suggested by Srivastava, Pandey & Sabui (2004), can significantly enhance business planning and effectiveness. Patel & Mcleod (2016) underscore the importance of utilising CRM data to identify specific customer needs for proactive quotations, considering details like installed equipment location and contact information.

However, despite the potential benefits, Baashar *et al.* (2020) identified a gap in the application and understanding of CRM within the healthcare industry, particularly regarding proactive quotations for non-customers. The utilisation of CRM can help maintain updated customer information, leading to improved service delivery and cost reduction, as suggested by Shahnavazi, Farhangi & Godarzvand Chegini (2023). Overall, the integration of CRM and proactive customer service delivery (PCSD) can potentially generate additional revenue through proactive quotations, aligning with the benefits of PCSD as identified by (Jalal *et al.,* 2019; Shahnava, Farhangi & Godarzvand Chegini, 2023; Srivastava, Pandey & Sabui, 2004; Patel & Mcleod, 2016 and Baashar *et al.,* 2020).

1.8.3. ENTERPRISE RESOURCE PLANNING

Enterprise Resource Planning (ERP) systems in healthcare organizations have a significant role, enabling the alignment of resources and business processes to optimize performance. Stojkic, Veza & Bosnjak (2015) define ERP as a software system integrating various departments into one, automating processes and providing insights throughout the project lifecycle. Lean principles, as explored by Buzby *et al.* (2002), can be implemented beyond manufacturing, enhancing business processes through ERP systems and improving organizational efficiency. (AI-CRM) systems help automate billing and relieve professionals from repetitive tasks, allowing them to focus on core services, as indicated by Spring, Faulconbridge & Sarwar (2022). The use of ERP systems in the healthcare industry is relatively underreported, suggesting the potential for significant improvements in resource utilization and operational efficiency if utilized effectively, as discussed by Mucheleka & Halonen (2015).

ERP systems aid in problem identification and solution provision, leading to enhanced revenue, reduced risks, and improved healthcare quality, according to Mucheleka & Halonen (2015). Additionally, Fiaz, Ikram & Ilyas (2018) highlight the positive influence of ERP systems on service, information, and system quality within healthcare, promoting better resource allocation and optimized planning for improved organizational performance. The researcher concur that effective implementation of ERP systems within service organizations provides a competitive advantage, aligning with the findings of (Buzby *et al.,* 2002; Spring, Faulconbridge & Sarwar, 2022; Srivastava, Pandey & Sabui, 2004; Stojkic, Veza & Bosnjak, 2015; Mucheleka & Halonen, 2015 and Fiaz, Ikram & Ilyas, 2018). However, there seems to be a gap in the literature concerning the application of ERP systems to specific business processes, such as proactive quotations for planned maintenance, aimed at improving revenue generation.

1.8.4. BUSINESS PROCESS MANAGEMENT

Business Process Management (BPM) has a vital role to play when it comes to improving effectiveness and productivity by aligning organizational processes with customer requirements. While Klun & Trkman (2018) define BPM comprehensively, the proactive approach to BPM is not explicitly considered. Furthermore, Handayani & ER (2019) describe the complex nature of BPM implementation, incorporating technical and non-technical aspects and focusing on the life cycle of processes aligned with key performance indicators. However, the review lacks an exploration of the proactive application of BPM, particularly in generating additional revenue through proactive quotations for planned maintenance on medical devices for non-contract customers.

The concept of process forecasting, introduced by Poll *et al.* (2018), is presented as a future-oriented BPM technique aiming to identify and prevent process-related issues, ultimately improving efficiency. While the benefits of process forecasting are highlighted, the specific efficiency of business processes, such as the application of proactive quotations for planned maintenance, is not tested. Poll *et al*. (2018) also suggest that process forecasting is still in its early stages, indicating the potential for further research and its potential to stabilize inconsistent processes. Contrasting perspectives on the impact of BPM implementation are presented, with Handayani & ER (2019) indicating no change in performance for small and medium organizations, while Pranata *et al.* (2023) highlight the positive outcomes achieved when combining solid management principles with a BPM approach. While Klun & Trkman (2018) acknowledge the evolution of BPM, shifting from a holistic organizational strategy to more specific optimizations within subgroups, the focus remains on the broader use of BPM rather than specific proactive approaches within service delivery. The researcher acknowledges the importance of BPM and process forecasting in the healthcare sector, particularly in conjunction with Proactive Customer Service Delivery (PCSD). However, there appears to be a

gap in the literature regarding the implementation of a proactive approach within service delivery, such as proactively sending quotations for planned maintenance to improve revenue generation.

1.8.5. PROACTIVE CUSTOMER SERVICE DELIVERY

With proactive customer-oriented service delivery (PCSD) within the healthcare industry there is a need to adopt proactive approaches to gain a competitive edge and improve customer satisfaction. Several studies, including those by (Jabłoński, 2019; Sehgal & Gupta, 2020 and Poll *et al*., 2018), advocate for a proactive shift to prevent service failures and enhance customer experiences. However, these studies do not explicitly assess the impact of proactive quotations for planned maintenance (PMs) on revenue generation. Specific findings from Sehgal & Gupta (2020) highlight the benefits of proactive approaches in improving service quality and mitigating risks within the healthcare industry. The discussion focus on the integration of proactive customer service delivery in co-production processes to enhance patient care quality, yet it doesn't examine its impact on revenue generation through specific processes like proactive PM quotations.

The importance of transitioning from reactive to proactive service delivery is further emphasized by Bhuyan *et al. (*2020), particularly in the context of strengthening healthcare cybersecurity. Implementing proactive measures to prevent cyberattacks is deemed more effective than reactive measures. Similarly, Shin *et al.* (2017) stress the benefits of proactivity in post-sales service contexts, underlining its positive influence on customer satisfaction. While the studies provide valuable insights into the benefits of proactive customer-oriented approaches, there is a gap in the literature regarding the impact of these proactive measures, especially in the context of generating revenue through proactive quotations for PMs. The need for

further research and analysis on the specific application of proactive strategies within the healthcare industry to enhance revenue generation remains apparent.

1.8.6. CONCLUSION

Based on the literature reviewed (in the context of the healthcare industry) there exists a gap in proactive customer service delivery, particularly concerning the enhancement of quotations as a business process to improve revenue generation. This enhancement refers to the implementation of PCSD tasks aimed at reminding and providing proactive quotations for PMs on medical devices to non-contract customers. This study seeks to improve revenue generation through the above application of PCSD.

1.9. RESEARCH METHODOLOGY

1.9.1. INTRODUCTION

This research seeks to quantify the financial impact that proactive quotations for planned maintenance would have on revenue. It will focus on the service division of a healthcare organisation and will try to predict the outcome of PM quotations presented to customers proactively to quantify the impact of PCSD on revenue.

1.9.2. RESEARCH METHOD AND APPROACH

Leavy (2022) summarizes research design into various different designs; Quantitative research design, Qualitative research design and Mixed methods research design.

Quantitative research attempts to measure the precise nature of a variable while qualitative research seeks to obtain an understanding through detailed description, (Cooper & Schindler, 2014). Qualitative research stresses the subjective

experiences and circumstances of individuals to obtain a deeper knowledge of a phenomenon, whereas quantitative research concentrates on numerical data and statistical analysis to uncover patterns and linkages. Both approaches are essential to the research process and are frequently combined to offer a thorough grasp of challenging research issues. In a single study or research effort, mixed methods research combine qualitative and quantitative research methodologies. By combining the advantages of qualitative and quantitative approaches, this methodology enables researchers to develop a more thorough understanding of a certain phenomenon. Through the integration of different methodologies, scholars can gather, examine, and construe information from several angles, therefore augmenting the comprehensiveness and profundity of the study outcomes, (Leavy, 2022). For the purpose of this research a quantitative approach will be adopted because the researcher seeks to quantify the additional revenue that can be made through proactive quotations. Within quantitative research there are descriptive and inferential statistics, (Leedy, Ormrod & Johnson, 2014). This research will be predictive research that will seek to study the relationship between various nominal and numeric variables to predict the outcome of PM quotes presented to customers proactively. For this reason, inferential statistics will be the most suitable method to build a predictive model.

1.9.3. RESEARCH POPULATION AND SAMPLE FRAMEWORK

This research seeks to quantify the effect of proactive quotations on revenue, hence there will be no participants involved and the study will use secondary data extracted from the organisation's CRM and ERP. The research population will be the entire billable install base of medical devices for this organisation within South Africa. The entire population of 2007 devices will constitute for the secondary data that will be collected. The data will then be filtered to focus only on systems that are billable (non-contract or expired warranty customers). This data will be an interpreted version of the raw data, (Cooper & Schindler, 2014). The sample framework will be extracted from all of these billable systems using stratified

random sampling which involves dividing the population into distinct subgroups, or strata, based on certain characteristics that are relevant to the research or study. This approach is used to ensure that the sample obtained is representative of the entire population, particularly when the population is diverse and exhibits different characteristics, (Berndt, 2021).

1.9.4. DATA COLLECTION

The quantitative data collected to assess proactive revenue creation will be directly extracted from the CRM and ERP. This data will consist of all the billable customers for this organisation in South Africa. The population framework will then be extracted using stratified random sampling to obtain a sizable population that can represent the entire population. A second quantitative data set will also be extracted to obtain all of the PM quotations that were sent to customers during the year of 2022. This data will also be filtered to only include quotations for PMs for billable customers and will be used to build a model that can accurately predict the outcome of proactive quotations. This will ensure the model is relevant to the topic of proactive PM by removing data from corrective maintenance, upgrade and installation quotations. These quotations are reactive and were created and sent upon customer requests.

1.9.5. DATA ANALYSIS

This study aims to predict the outcome of proactive quotation for PMs and its impact on revenue. Categorical and numerical data will be collected. The dependant variable will be categorical while the independent variables will be a mixture of categorical and numeric data. According to Cooper & Schindler (2014) with inferential statistics, various methods exist like T-tests, analysis of variance, correlation analysis; however, the best suited method will be the application of multinomial logistic regression due to the nature of the categorical variables selected. The regression analysis will enable the researcher to assess the

relationship between the selected variable so that the researcher can predict a possible outcome for similar scenarios. The focus is to ensure the model is significantly relevant while obtaining a high predicted ratio for the dependant variables. The data will be analysed with IBM SPSS statistical software.

Thereafter this ratio for the predicted outcome of the dependant variables (accepted, rejected and expired) will be applied to the sample group as a percentage of the total population. The application of the predictive model will then model the outcome of proactive quotations for PMs for these non-contract systems over the period of 2022. Rejected quotations for annual PMs will be requoted six months later and expired quotations will be requoted the following month. These results will then be used to assess how these proactive quotations would have affected the revenue for the year of 2022 to answer the research questions.

1.9.6. VALIDITY, RELIABILITY AND TRUSTWORTHINESS

Taber (2018) considers a stable measure of data over a variety of conditions that yield consistent results as being reliable. The reliability of the data will be ensured through data validation and consistency checks through data sampling and testing. Further reliability will be ensured through collaborating with the organisation's ERP specialists to identify and prevent any possible data issues. The results must be repeatable and consistent in order to be reliable. Validity will be assured by the researcher with the use of randomization and subgroups. The validity will be further assured by the researcher with the rigorous design of the study; the data will not be modified or tampered with but filtered to be directly relevant to the topic of proactive PM quotes for revenue generation, thus managing bias and the integrity of the data. Ultimately supporting the credibility and trustworthiness of the research.

1.10. ETHICAL CONSIDERATIONS

Fleming (2002) underline the significance of ethical considerations as selecting appropriate research methods by using thorough ethical considerations when conducting research. For this study there will be no human participants involved and it is aimed to bring about more-good, than harm. The organisation, its customers, personal information and researcher in this study will all be protected from harm, informed permission is sought from the organisation to use their data. Their right to privacy will be protected and respected and will thus remain anonymous. The research will uphold full transparency throughout its process and will be conducted in a socially and ethically acceptable manner. Approval to collect and use the organisation's data is given and the necessary approval documents will be attached to the application to the REC.

Prior to data collection, a clearance certificate from the UNISA SBL REC will be sought to confirm that the ethical guidelines are being followed. The research will be validated to ensure that it is free from plagiarism on a platform called Turn-it-in and the validation report will be attached in the annexure in the final report. The research is aimed at providing insights and recommendations to the research questions that will be factual, honest, objective, confidential, anonymized and of a respectful manner such that it protects the organisation's intellectual property.

1.11. LIMITATIONS OF THIS STUDY

This research will have the following limitations:

Firstly, the quotations used to build the predictive model is based on reactive data; the customers called and requested quotations for PMs. This will provide some insight into the expected outcome based on the ratio between accepted, rejected and expired quotations however the outcome of these quotes are based on reactive service delivery. This was done due to the limited timeframe and scope

that was available to the researcher but it can serve as a foundation for future work to be conducted over a period of time on proactive quotations.

Secondly, this data was extracted from a specific period in time and there are various macro and micro economic factors that could play a role affecting the outcome of the quotations. In order for this study to be relevant with accurate data, the researcher highly suggest that a similar study should be repeated at least every four to five years to ensure its accuracy. Every possible step will be taken by the researcher to ensure the accuracy of the data to assess the outcome as unbiased as possible.

Thirdly, the researcher is based in Gauteng, South Africa. Even though the population group consist of the install base across the entire country it is only the equipment of one healthcare organisation within South Africa and not all of them. Additionally, the study will not be conducted on an international level but only on a national level due to limited access to international data and time constraints. This also leaves room for future research.

Fourthly, due to limitations and constraints this research was conducted on only data from the year of 2022. This resulted in a small sample of 267 viable quotations that might affect the accuracy of the model however, it can serve as a foundation for future work to expand the scope to proactive quotations over a multiyear period.

Lastly, the researcher is employed by the organisation so there might be a degree of subjectivity. In order to mitigate this risk, the researcher only used quantitative data that can't be influenced by any external input when building the predictive model.

1.12. FORMAT OF THE STUDY

This research will be presented in five chapters:

***Chapter 1: Introduction*:** This chapter discusses an overview of the research field, problem, questions, objectives, abbreviated literature review, research methods and ethical considerations of this research.

Chapter 2: Literature Review: This chapter provides insights into the existing literature regarding CRM, ERP, BPM and PCSD and its application in the field of proactive PMs as well as its effects on revenue.

Chapter 3: Research Methodology: This chapter discusses the research method that was used to conduct the research. It will account for the type of research, population sample and size, the data collection and analysis methods used.

Chapter 4: Research Results*:* This chapter provides the assessment, analysis and the interpretation of the results of the quantitative findings of the research.

Chapter 5: Research Conclusions, Limitations and Recommendations*:* This chapter discusses the conclusion, limitation and recommendations of the research based on the findings and results of the analysis. It will also answer the research questions and provide insights to how this body of work can be incorporated into the industry.

1.13. CONCLUSION

In conclusion, the research titled ***The Effect of Proactive Quotations for Planned Maintenance on Revenue,*** aims to use the findings to contribute to the limited body of knowledge on proactive customer service delivery and further provide insights into the feasibility of automating repetitive low-value business processes to improve the productivity and effectiveness of professional skills and resources.

The next chapter will review the literature that is important with regards to proactive quotations for planned maintenance to capture missed revenue.

2. CHAPTER 2 - LITERATURE REVIEW

2.1. INTRODUCTION

The researcher is of the opinion that additional value can be added to customers through proactive quotations for planned maintenance. This research seeks to quantify this value creation through the additional revenue that the service division of this organization could generate through proactively quoting for PMs on medical equipment for non-contract customers. The literature review will focus the following areas of importance:

- Customer Relationship Management
- Enterprise Resource Planning
- Business Process Management
- Proactive Customer Service Delivery

2.2. CUSTOMER RELATIONSHIP MANAGEMENT

2.2.1. INTRODUCTION

Healthcare organisations need to manage their relationships with their customers. As the population grows and install base of medical devices (that require routine maintenance) increases, it makes managing each of these relationships more difficult. CRMs in turn, simplify managing these relationships. According to Agapitou, Bersimis & Georgakellos (2017) benefits identified by implementing a CRM as a business strategy built on the balanced score card, would improve business processes, customer loyalty, customer service and should act as a competitive advantage. This would be helpful for proactive quotations for PMs to capture missed revenue.

2.2.2. DEFINITION

Customer relationship management is described as a thorough plan and procedure for finding, keeping, and collaborating with certain clients in order to provide greater value for the business and clients, (Sheth & Parvatiyar, 1995). In order to enhance customer acquisition, retention, loyalty, and profitability, Swift (2001,p. 12) defines CRM as "An enterprise approach to understanding and influencing customer behaviour through meaningful communications." Baashar *et al. (*2020) describes a CRM as innovative technology that aim to improve customer loyalty, satisfaction and profitability through effectively managing customer relationships and their interactions. In order to increase efficiency and effectiveness in providing value to customers, it entails integrating the organization's marketing, sales, customer service, and supply chain operations. Evidently, a proper CRM should store all the relevant and specific customer information like their account details, contact numbers, equipment install base, install locations and equipment service history. Many of the information stored on a CRM is used to create quotations and for this study it is relevant to proactive quotations for PM for non-contract customers to capture missed revenue.

2.2.3. CUSTOMER RELATIONSHIP MANAGEMENT

Before looking at the use of CRM it's important to understand its development within the field of research. CRM has been a topic of discussion among many scholars over many years. Ngai (2005) reviewed and classified literature on CRM from 1992 to 2002 and allocated the papers to a few main categories; general, sales, support, marketing, Information Technology (IT), service and Information Systems (IS). Thereafter Wahlberg *et al. (*2009) reviewed all the literature published in three databases (Science Direct, IEEE and Emerald) from 1998 to 2006 and classified his findings into four broad categories; strategic CRM, operational CRM, collaborative

CRM and analytical CRM. Sota *et al. (*2018) proceeded to review the literature from 2007 to 2016 from the top ten marketing journals that were ranked highest based on the number of citations that the journals received as well as the prestige of these journals. It was found that CRM was used extensively by organisations to serve customers better. The findings from Sota *et al.* (2018) differed from Ngai (2005) where Ngai (2005) found the maximum number of articles originate from IT and IS where Sota *et al.* (2018) found that loyalty programs constitute for the majority of CRM strategies and that the majority of the research were empirical studies. Meena & Sahu (2021) proceeded to review research papers on CRM from January 2000 until June 2020. Meena & Sahu (2021) compared the data collection tools, sampling techniques, sampling country, industry, statistical tests and methods as well as software used. The findings identified the majority of the research as either conceptual or empirical, supporting the findings of Sota *et al.* (2018).

Meena & Sahu (2021) conclude that there is very limited literature on CRM in the healthcare industry and this is supported by the findings from Baashar *et al.* (2020). Evidently there is a lack of literature pertaining to the strategic use of CRM to promote proactive quotations for PMs to capture missed revenue. Meena & Sahu (2021) also found that more research is required on Electronic CRM (E-CRM), Mobile CRM (M-CRM) and Social CRM (S-CRM). M-CRM is described as interactive or one-way communication pertaining to sales, marketing, and customer care activities carried out via mobile devices with the aim of establishing and preserving a customer relationship between a business and its clientele, (Kim *et al.,* 2015). In the context of e-business, social customer relationship management, or social CRM, is a new paradigm that allows companies to work together to manage customer expectations through social technologies. It does this by fusing the power of social media with traditional CRM software, which improves customer engagement, (Jami Pour & Hosseinzadeh, 2021). The term "e-CRM" refers to a web-centric method of synchronizing customer relationships across audiences, business functions, and communication channels through e-commerce.

This method has enhanced the purchasing experience by offering personalized and customized services, expanding the potential customer base of organizations, and gathering potential customer data, (Kampani & Jhamb, 2020).

Shahnavazi *et al.* (2020) found that successful E-CRM will yield improved financial results like cost reduction and increased sales and revenue as well as improved customer value, innovation, business process execution, brand image and service. Baashar *et al.* (2020) presented a framework for categorising CRM in healthcare but with a web-based S-CRM combined with an E-CRM that should manage all methods of communication and relationships with their customers through Web 2.0 and social media technologies. Chan *et al.* (2018) further supports the use of S-CRM but argues that it will not replace CRM but will most likely compliment it.

All of these CRMs generate large volumes of data that could potentially be analysed. When combining CRM and Big Data Analytics (BDA), Shahbaz *et al.* (2021) found that salesforce perception of BDA is positively predicted by organizational and individual traits including: voluntariness, user involvement, user participation, and management support; as well as traits like: self-efficacy, playfulness, and social norms. Because of the salesforce's improved person-technology fit and increased CRM capabilities and sales performance, BDA was seen favourably, (Shahbaz *et al.,* 2021). Anshari *et al.* (2019) conclude that big data analytics enable organisations to identify and use specific CRM activities and cater for customer needs enabling organisations to target customers with greater precision.

Chatterjee, Chaudhuri & Vrontis (2022) dived into modern applications of Artificial Intelligence (AI) and assess the impact of an AI-CRM on business-to-business relationship management. Chatterjee, Chaudhuri & Vrontis (2022) found that AI-CRM with automated decision making and operational efficiency improves organisational performance but the study lacks generalizability and is not applied to proactive quotations for PM to assess revenue generation.

The researcher is in agreement with (Shahbaz *et al.,* 2021; Anshari *et al.,* 2019 and Chatterjee, Chaudhuri & Vrontis, (2022) that business should be more personalise and customise its services to create more value for customers. These modern approaches of AI-CRM and BDA and personalised services are supported by the CRM value chain as identified by Buttle & Maklan (2019) in Figure 1. Buttle & Maklan (2019) model the five primary stages (customer portfolio analysis, customer intimacy, network development, value proposition development and managing the customer lifecycle) and the four secondary stages (leadership and culture, data and IT, people and processes) as supporting conditions to enhance customer profitability.

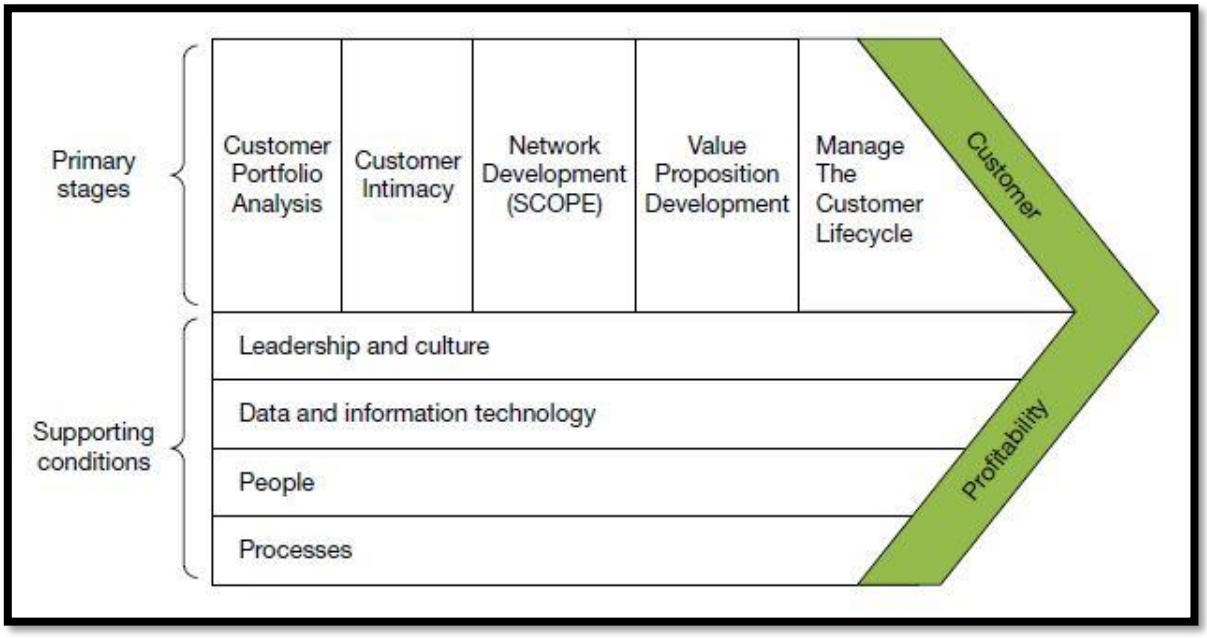


Figure 1: The CRM Value Chain

Source: Buttle & Maklan, 2019

Accordingly, when used strategically CRMs can improve business processes that will improve profitability. The researcher agrees with Shin *et al.* (2017) that the use of a CRM should move from reactive to proactive service delivery. Jalal *et al.* (2019) argue that a CRM enables organisations to understand customer needs and practices better, to enable them to create better-quality connotations between them. This can be done by evaluating purchasing trends and patterns of customers to identify what they perceive as value so that organisations can build upon this. In turn this will create more value for customers like proactive quotations and reminders for PMs that are due. With the aid of a CRM organisations can better understand their customer needs to help improve these relationships through PCSD business processes like quotations for PMs to improve revenue but most of all customer loyalty and satisfaction. Srivastava, Pandey & Sabui (2004) found that when CRM systems consisting of analytical activities are handled independently, they tend to have low applicability but when combined greater results can be obtained in business planning and process. Therefore business processes and analytical activities should be combined with CRM data to improve the effectiveness of these activities like proactive quotations. Similar to Patel & Mcleod (2016), if organisations were to use customer data from their CRM, they would be able to identify the installed location of the specific equipment and that customer's contact details. All of which are used to compile a quotation specific to that customer's needs for PM with the exact knowledge of labour hours, travel time and components specific to maintenance that is required to proactively quote the customer for PM of their equipment.

2.2.4. CONCLUSION

Baashar *et al.* (2020) further elaborate that there exist a substantial gap in the knowledge of using CRM in the healthcare environment and that research on CRMs within the healthcare environment is still in its developmental phase and very limited.

It would seem that there is limited, to no application with regards to proactive quotations for PM for non-customers within the healthcare industry. If organisations were to fully utilize their CRM, they can maintain up to date customer specific information and records to improve on service delivery and reduce unnecessary costs, (Shahnavazi, Farhangi & Godarzvand Chegini, 2023). Implementing the above may help organisations identify PMs that are due that will enable them to quote customers to execute PMs on their equipment. The researcher is in alignment with (Jalal *et al.,* 2019; Shahnavazi, Farhangi & Godarzvand Chegini, 2023; Srivastava, Pandey & Sabui, 2004; Patel & Mcleod, 2016 and Baashar *et al.,* 2020) that CRM will enable PCSD to generate additional revenue through proactive quotations.

2.3. ENTERPRISE RESOURCE PLANNING

2.3.1. INTRODUCTION

Within healthcare organisations there are various departments involved in executing field services. Systems like ERP enable the organisations to align these resources and business processes to be optimally utilised. Stojkic, Veza & Bosnjak (2015) describe an ERP as a type of software system that integrates all business processes for various departments within an organisation into one to automate processes and optimise performance. Stojkic, Veza & Bosnjak (2015) continue by suggesting a model where the ERP system provide insights and support to various processes throughout a project's life cycle. This can typically be used to identify the availability of specific trained human resources that might be available to complete skilled tasks to ensure they are assigned and allocated to execute work instructions in such a way that it helps reduce the down time of equipment.

2.3.2. DEFINITION

There are various ways of defining ERP but according to Bodlaj, Kadic-Maglajlic & Vida (2020), ERP systems are an IT-based system designed for use in contemporary company environments; it is responsible for developing the main information systems software as well as the unique computing organizational model to efficiently strategize and manage all of the company's resources. These systems integrate the information of the business, all of its functional areas, and external organization information-based processes, (Gupta *et al.,* 2018 and Usman, Ahmad & Zakaria, 2019). The implementation of ERP offers significant advantages to the organization, including enhanced customer service, reduced expenses, organizational empowerment, higher productivity and quality, better resource management, and improved planning and decision-making, (Gupta *et al.,* 2018). The researcher is in agreement with (Bodlaj, Kadic-Maglajlic & Vida, 2020; Gupta *et al.,* 2018 and Usman, Ahmad & Zakaria, 2019), that ERP systems are IT-based systems designed for contemporary company environments, responsible for developing main information systems software and a unique computing organizational model to integrate business information, functional areas, and external processes, providing significant advantages such as enhanced customer service, reduced expenses, organizational empowerment, higher productivity and quality, improved resource management, and better planning and decision-making. Evidently so, proactive quotations for planned maintenance to capture missed revenue can benefit greatly from enhanced customer service, higher productivity and improved resource management, planning and decision making that ERP systems have to offer.

2.3.3. ENTERPRISE RESOURCE PLANNING

To understand how ERP adds benefit to this research o proactive quotations to capture additional revenue, it is important to understand the history of ERP. According to Botta-Genoulaz & Millet (2006), the ERP system vendors first targeted manufacturing enterprises rather than the services sector. Material Requirement

Planning (MRP) was the first component of the Enterprise Resource Planning system to be developed in 1960. Subsequently, the system underwent development and evolved into MRP II, (Basoglu, Daim & Kerimoglu, 2007). Many manufacturing businesses embraced the paradigm change from inventory control to MRP improvement between 1960 and 1970, since it allowed them to calculate the materials needed for their processes more efficiently. Subsequently, the MRP system underwent additional development to become a more complex system that featured resource planning, master scheduling, capacity planning, long-range planning, and comprehensive capacity planning, (Xue *et al.,* 2005). In addition, MRP II systems had a financial interface and planning for sales and operations. A helpful tool for organizing all kinds of resources found in an organization was the MRP II system. It made sense to plan the materials and production procedures, but businesses soon learned that profitability and consumer happiness had to be taken into account as well, (Fiaz, Ikram & Ilyas, 2018). The organisation, J.D. Edwards, improved their MRP applications to include closed-loop scheduling, enhanced shop floor reporting, and forward scheduling known as MRP-II in response to the growing number of organizations putting up extra requirements to cut their overhead costs, (Robert Jacobs & 'Ted'Weston Jr, 2007 and Kumar & Van Hillegersberg, 2000).

By the end of the 1980s, SAP, IBM, J. D. Edwards, Baan, PeopleSoft, and Oracle were the main ERP providers, as organizational executives started turning to technology to help with routine operational decision-making, (Razzhivina, Yakimovich & Korshunov, 2015). Organizations sought to enterprise applications to differentiate themselves from the competition because they gave decision-makers greater visibility into their inventories and production levels. In the 1990s, as the market intensified competition, major players sought a competitive edge by releasing applications that integrated operational and accounting aspects, (Bhuiyan, Chowdhury & Ferdous, 2014). Coined ERP by the Gartner Group, this sparked substantial growth with the core six business application vendors, (Robert Jacobs & 'Ted'Weston Jr, 2007). Concerns about Y2K in 2000 led to a rush to install ERP

applications, driving significant growth in the industry, (Brumberg *et al.,* 2016 and Salimi, Dankbaar & Davidrajuh, 2006). The dotcom bubble in 2001 prompted downsizing in the technology industry, (Fadlalla & Amani, 2015). By the late 2000s, ERP landscape changes included Oracle acquiring J. D. Edwards and PeopleSoft, Infor Global Solutions acquiring Baan and IBM's MAPICS, resulting in SAP, Oracle, and Infor emerging as the top three ERP vendors, (Palanisamy, Verville & Taskin, 2015; Verdouw, Robbemond & Wolfert, 2015 and Banerjee, 2015).

ERP software have advanced further as they have reached the mature stage of their lifespan, thanks to the gradual integration of cloud computing. By relocating all of the hardware needed to support an ERP program off-site to a location hosted by a vendor, cloud computing lowers the information technology (IT) overhead for businesses, (Bento *et al.,* 2015). According to a 2016 ERP report conducted by Panorama Consulting, there was a 40% rise in the number of companies adopting cloud-based solutions as opposed to on-premise ones when 215 corporations running ERP programs were surveyed, (Solutions, 2016).

According to Botta-Genoulaz & Millet (2006), modern versions of the ERP systems are capable of managing a number of business units, including purchasing, finance and accounting, manufacturing, order processing, material management, customer relationship management, and planning operations and sales. Because of this, many businesses have already embraced ERPs, and the services industry is seeing a sharp rise in their use, (Acharyulu, 2012). The services sector has accounted for the majority of developed nations' GDP growth. As a result, pressure to provide new competitive offerings has been placed on the service sector by technological advancement, globalization trends, and communication technologies, (Costa, 2015). In order to embrace current technology and make it user-friendly, corporations are interested in purchasing information systems. The healthcare sector faces challenges in using information technology due to the fact that the Enterprise Resource Planning system handles patient care, (Bazhair & Sandhu, 2015).

Majstorovic *et al.* (2020) suggest integrating industry 4.0 and digitalization into the ERP system through networked, digitalized technology systems, including the Internet of Things in accordance with the Industry 4.0 concept, which can delegate production control tasks to "intelligent" objects, such as products, machines, and parts. In this sense, the ERP model facilitates increased flexibility and adaptability of the manufacturing system itself. The method used by Majstorovic *et al.* (2020), which is based on a hybrid model of transition from a centralized to a decentralized management idea, establish new paradigms for production planning and control.

Goldston (2020) proposes a value chain with modules for a sustainable ERP system that has sustainable primary and supporting activities that are based on sustainable practices, processes and systems (that stem from innovative and socially conscious leaders) that will ultimately foster sustainable suppliers and customers without compromising the requirements of individuals in the future.

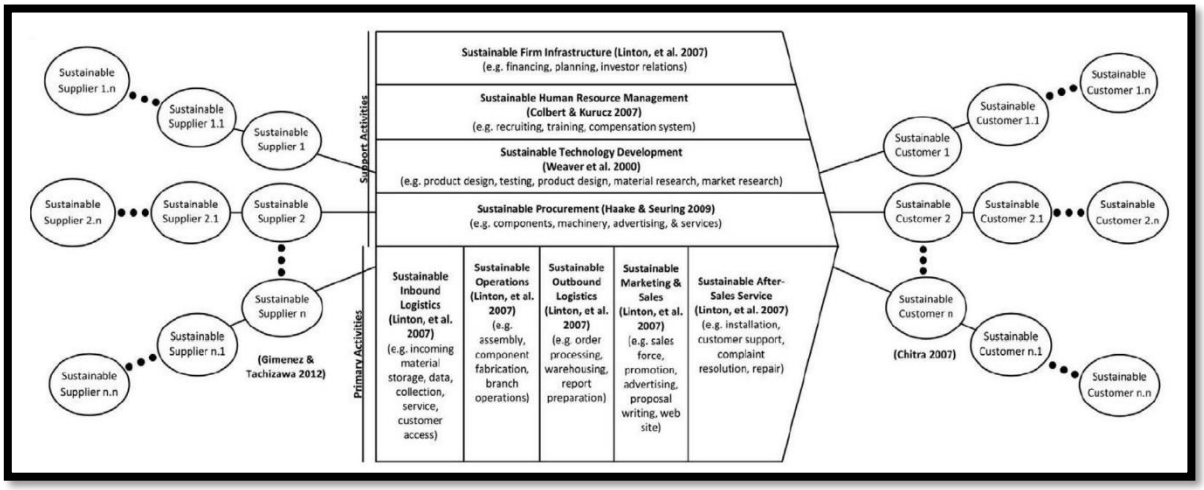


Figure 2: Proposed Sustainable ERP Value Chain with Modules

Source: Goldston, 2020

Buzby *et al.* (2002) further explore the benefits of applying lean principles to the specific business process of quotations to reducing the total cycle time with solutions and remedies to the quotation process to provide exceptional customer service. It is evident that lean principles can be implemented beyond the normal manufacturing process but also to business processes to link business processes through the ERP system to improve organisational efficiency. Spring, Faulconbridge & Sarwar (2022) proceed to identify the benefits of an automated billing calculation model that helps improve on billing accuracy while useing AI automation to relieve professionals from repetitive tasks to focus on delivering core professional services. Seemingly ERPs help organisations to improve resource availability for specific tasks to optimise and improve performance. According to Srivastava, Pandey & Sabui (2004) the effective use of ERPs will allow more effective information exchange between various parties, therefore enabling processes like quotation for additional revenue creation to be more efficient.

Industry 4.0 connect businesses to high levels of flexibility with information and control integration to automate processes however it is primarily used in manufacturing industry, (Stojkic, Veza & Bosnjak, 2015). Mucheleka & Halonen (2015) find that the use of ERP systems within the healthcare industry has not been widely reported. As a result, one can see that the use of ERP systems would enable organisations in the healthcare sector to implement significant changes to processes that would allow for improved utilization of resources. This would result in improved productivity and profitability if applied to service organisations' service delivery.

Mucheleka & Halonen (2015) suggest that ERP software can aid in identifying problems and provide possible solutions to help improve revenue and managerial reports all while reducing risks and predicting specific outcomes. Mucheleka & Halonen (2015) further discussed that with the effective use of ERP systems businesses within the healthcare industry can reduce the duplication of work and improve the quality of healthcare rendered. Therefore this can improve resource availability in the event of an increase in PM activities like with the acceptance of

proactive quotations for PM. Fiaz, Ikram & Ilyas (2018) reveal that ERP systems have a positive influence on service, information and system quality within the healthcare industry; it allows for better resource allocation with smart scheduling to reduce unnecessary travel through optimised planning, thus improving and optimising organisational performance.

To ensure the successful implementation and usage of ERP Fiaz, Ikram & Ilyas (2018) highlight various factors that play a role and these include: managing the project, teamwork, senior management support, change management as well as the ERP system support team composition. Peppard & Ward (2016) expand on this by identifying organisational culture, governance, the economic environment and governmental regulations as challenges for implementing ERP systems. Goldston (2020) continue to support successful implementation of ERP by reviewing managerial theories such as transformational and servant leadership styles. Goldston (2020) identified that portraying transformational leadership traits, management can encourage, inspire, influence and empower team members towards common objectives of the successful implementation of ERP. Therefore, with successful implementation of ERP and managerial support, employees can be inspired and empowered towards a common goal of PCSD like proactive quotations for planned maintenance to improve revenue.

2.3.4. CONCLUSION

The researcher is in agreement with (Buzby *et al.,* 2002; Spring, Faulconbridge & Sarwar, 2022; Srivastava, Pandey & Sabui, 2004; Stojkic, Veza & Bosnjak, 2015; Mucheleka & Halonen, 2015 and Fiaz, Ikram & Ilyas, 2018) that when ERP systems are used within service organisations to effectively support, manage and optimise customer facing resources, organisation will gain a competitive advantage. However, to the best of the researcher's knowledge there is a gap in the literature with regards to the application of ERP systems to specific business

processes such as proactive quotations for planned maintenance to improve revenue generation.

2.4. BUSINESS PROCESS MANAGEMENT

2.4.1. INTRODUCTION

Within organisations there exists various processes (like resource planning and quotations) within each department that links to an activity or a customer interaction in some or other way, (Helo & Hao, 2022). Each of these business processes need to be planned, developed, implemented and managed just like proactive quotations for PM to improve organisational revenue.

2.4.2. DEFINITION

BPM is defined as an all-inclusive approach to positioning organisational processes with customer requirements to improve effectiveness and productivity, (Klun & Trkman, 2018). Klun & Trkman (2018) indicate that there can be a predicament that anything can contribute to BPM since every activity is part of a process. Therefore, proactive quotations for PMs for non-contract customers can be regarded as a business process that need to be managed within the organisation's CRM and ERP.

2.4.3. BUSINESS PROCESS MANAGEMENT

To understand how proactive quotations for additional PMs are affected by BPM we need to understand the history of BPM. According to Lizano-Mora, Palos-Sanchez & Aguayo-Camacho (2021) BRM can be reviewed within three waves:

1. The first wave can be regarded as the origin of BPM was founded in the proposed management theory of Taylor (1911) in the early 20th century.

2. The second wave was considered to follow in the mid-1990s by reengineering business processes as argued by Davenport (1993).
3. The third wave is considered to have started in the early 21st century where technical methods and advances and synchronisation of previous work were amalgamated to a single discipline known as Business Process Management.

Lizano-Mora, Palos-Sanchez & Aguayo-Camacho (2021) discussed that BPM as a discipline focus on improving organisational efficiency through the management of individual and combined processes. Similar to this, proactive quotations for PM as a business process might help to improve revenue and efficiency.

Benedict (2013) argues that BPM is more than just a management of processes but rather that it is a complex discipline that includes methods, policies, roles, goals, objectives, and tools for thorough analysis, planning, execution, control, continuous improvement, and process management. Suša Vugec, Ivančić & Milanović Glavan (2019) conducted a major literature review in 2013 and until 2020 no quantitative work was identified to support pure BPM as a research topic, (Lizano-Mora, Palos-Sanchez & Aguayo-Camacho, 2021). Lizano-Mora, Palos-Sanchez & Aguayo-Camacho (2021) found that between 2000 and 2020 more than 44,500 articles, 2,500 keywords and 118 different authors contributed to the strength of BPM as a field of study and it's correlations with other management topics. Lizano-Mora, Palos-Sanchez & Aguayo-Camacho (2021) further identified that the emergence of new technologies like Internet of Things, Industry 4.0, Cloud Computing and Artificial Intelligence improved the annual growth rate of BPM research by 16.53%. It is evident that BPM as a management principle combines various policies, processes and technologies within business to improve organisational performance and efficiency similar to proactive quotations for PM to capture missed revenue.

Abdulkader *et al.* (2020) think that the degree of strategic value exchange between primary and support activities, the degree of the environment's connection to the firm through innovation transfer (both inbound and outbound), and the degree of BPM

openness all influence the source of competitive advantages and shared value. Abdulkader *et al.* (2020) conceptualise the value chain of BPM where open innovation in the form of inbound and outbound innovation align with the primary and secondary activities of the organisation's business model and innovation model. In parallel to this the business model and innovation model aligns with BPM and BPM Innovation through the strategic alignment of the operational application of the strategic flow to model value creation, value chain processes and value captured from a business process perspective.

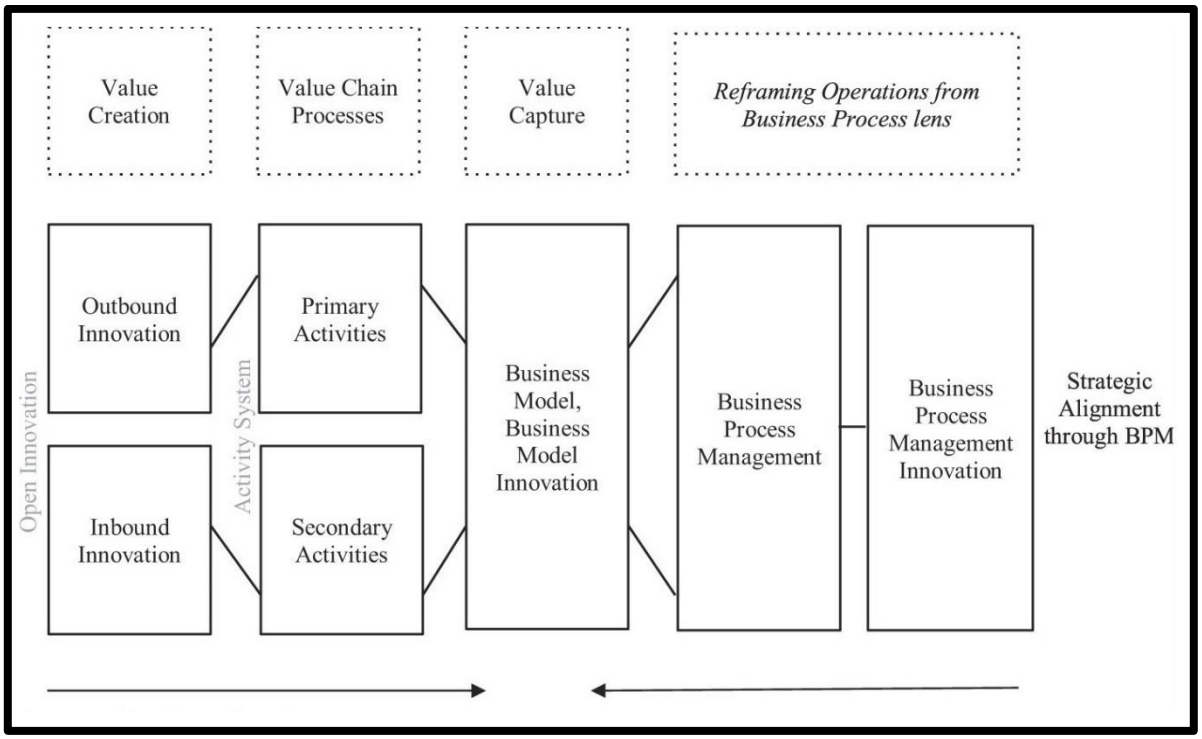


Figure 3: A Conceptual Value System of BPM

Source: Abdulkader *et al.,* 2020

Klun & Trkman (2018) focus on the body of literature and the fundamental themes within BPM but doesn't consider the possibility of a proactive approach towards BPM. When further assessing the application of BPM Handayani & ER (2019) regard the implementation as complex with various technical and non-technical aspects. These aspects will range from a series of related independent process activities from a specific business function to process modelling, deployment, optimisation and management. According to (Handayani & ER, 2019 and Klun & Trkman, 2018), focus is placed on the life cycle of these processes like aligning them with strategic key performance indicators. Based on this it is evident that the literature just reviewed in this section, shows that BPM is critical for process and performance improvements however it does not review its application towards proactive quotations for PMs on medical devices for non-contract customers.

Organisations need to move from a reactive approach to a more proactive approach when attempting to address BPM. Poll *et al*. (2018) coined the notion of *process forecasting* as an umbrella notion for future-orientated BPM techniques and methods. Poll *et al*. (2018) discuss the need for process forecasting to identify and prevent process related problems while grasping process-related opportunities to reduce inactivity and improve efficiency. It would appear as though this will provide high level guidance in identifying problems and possible opportunities within processes. Poll *et al.* (2018) did not test the efficiency of a specific business processes, like the application of proactive quotations for PMs to generate additional revenue. Poll *et al*. (2018) further mention that process forecasting is still in its early stages and that further research will be required. The application of process forecasting on an organisational level will most likely yield improvements and is more than likely to stabilise inconsistent processes.

Handayani & ER (2019) define non-technical processes within BPM that affect the social media implementation of small, medium and micro-organisations (SMME) and the findings indicate no change in SMME performance. In contrast to Handayani & ER (2019), Pranata *et al.* (2023) found when combining solid management principles with a BPM approach in business relationships, organisations are able to achieve common goals and improve organisational performance. Further to this Klun & Trkman (2018,p. 786) found that BPM shifted form a holistic organisational improvement strategy to: "introverted optimizations within a particular BPM subgroup" but do not dwell deeper into specifics. In line with Klun & Trkman (2018), this research hyper-focus on proactive quotations to improve organisational revenue.

2.4.4. CONCLUSION

The researcher is in agreement with (Poll *et al.,* 2018; Pranata *et al.,* 2023; Handayani & ER, 2019 and Klun & Trkman, 2018) that BPM improvements or process forecasting will be helpful when applied within the healthcare sector, especially with PCSD. It is evident that business processes provide structure, order and discipline within organisations through optimisation and prevention methods, (Poll *et al*., 2018). To the best of the researcher's knowledge there exists literature on the broader use of BPM and its benefits however there seems to be a gap with the implementation of a proactive approach within service delivery like proactively sending quotation for PMs to improve revenue.

2.5. PROACTIVE CUSTOMER SERVICE DELIVERY

2.5.1. INTRODUCTION

From a simplified perspective one can say that organisation can either sell products, services or a combination of both. Products in the modern society can range from

physical goods to digital tools to help automate business processes, (Helo & Hao, 2022). Within the healthcare industry field services can be rendered on site or remotely by skilled resources to solve problems, upgrade systems or finetune specific products to ensure optimal performance, (Shohet & Lavy, 2004). These services rendered need to be positive and provide more value to customers.

2.5.2. DEFINITION

To understand the need for PCSD we first need to define it. According to Rank *et al.* (2007), proactive service delivery is defined as people providing self-initiated, persistent, long-term-focused services above and beyond clearly stated performance standards. It would appear as if the focus of the service delivery has an emphasis on long-term services that are initiated proactively to improve performance, similar to that of proactive service quotations for PM for non-contract customers to ensure the uptime and reliability for the equipment while capturing missed revenue.

2.5.3. PROACTIVE CUSTOMER SERVICE DELIVERY

Rank *et al.* (2007) argue that proactive service goes beyond the prescribed task to proactively develop solutions to anticipate customer demands while Tian *et al.* (2019) argue that proactive service attempts to form customer perceptions of service quality while increasing customer satisfaction. According to Jabłoński, (2019) positive customer experiences can lead to a competitive advantage and loyalty. Sehgal & Gupta (2020) argue that new services opportunities like proactive quotations can be obtained through integrating business resources and interactions with customers. The majority of the existing research is focused on conceptual and qualitative studies revolving around efficiency and creating value through service methods but it's focus is not on PCSD. Poll *et al*. (2018) recommend a shift within firms to prevent service failures and to improve upon customer service experiences.

This approach seeks to predict service failures and take action to prevent them from occurring. The recommendations by (Sehgal & Gupta, 2020; Jabłoński, 2019 and Poll *et al.,* 2018) are in the right direction but there is no application of PM quotations to assess its potential in revenue creation.

Sehgal & Gupta (2020) argue that in order for organisations to gain a competitive advantage they need to adopt a proactive customer-orientated service delivery model through incremental or radical innovation. Sehgal & Gupta (2020) further discussed the impact of proactive customer service delivery amongst peers and between machinery and even third-party organisations. The discussion revolved around risk mitigation and innovation through PCSD particularly with co-production processes to improve the overall quality of care for patients. Sehgal & Gupta (2020) discuss this application in the form of reminders of medical prescriptions to customers to collect their chronic medication. Sehgal & Gupta (2020) identified that a proactive customer-orientated approach will provide a competitive advantage but it does not assess its impact on revenue when applied to a specific business process like proactive quotations for PMs.

Further to this Bhuyan *et al.* (2020) focus on healthcare IT and recommends the transition from reactive to proactive service delivery. Bhuyan *et al.* (2020) advise policy makers within healthcare organisations to strengthen their cybersecurity to proactively prevent the increasing threat of cybercrimes. It is evident that being proactive is better than fixing issues from a reactive stance. According to Shin *et al.* (2017) within the field services possible failures can be identified and parts proactively ordered to schedule and plan the repair for a specific date and time once the parts arrive. Evidently doing this will reduce the total down time to a few hours. In contrary to the proactive preventive repair above, when systems fail, they will require an assessment to identify the cause, parts need to be ordered and the repairs to be completed once the parts arrive. This can take days if not weeks to complete the repairs depending on part availability and logistical delays. This is consistent

with the findings from Shin *et al.* (2017) that proactivity increase customer satisfaction while reactivity decrease customer satisfaction. Shin *et al.* (2017,p. 166) stated: “Customers prefer and value proactivity over reactivity in post-sales service contexts”.

Jauhari, Singh & Kumar (2017) mention that proactive field service engineers use their own initiative to be proactive instead of waiting to be prompted to action and they include pro-customer and pro-team initiatives like:

- Information sensing; proactively sharing customer need information with the key decision maker.
- Knowledge sharing; continuously sharing knowledge with team members to better equipment each other for future service encounters.
- Collaboration; partnering with team mates to proactively provide fast and reliable service delivery.
- Proactive self-development; proactively learning new skill for superior job performance.
- Ownership; owning tasks that require regular follow up and customer communication.
- Initiative; proactively suggesting ideas and solutions for potential customer problems.

Proactive field service engineers exceed customer expectations through customer service delivery catering for customer specific needs, (Jauhari, Singh & Kumar, 2017). With a practical application of proactive customer service delivery Delana, Savva & Tezcan (2021) argue that two conditions need to be met before PCSD can materialize:

- From a customer perspective they need to be flexible with timing and willing to accept being serviced proactively.
- From a system perspective customer service needs need to be predicted accurately.

(Jauhari, Singh & Kumar, 2017 and Delana, Savva & Tezcan, 2021) did focus their research on proactive customer service delivery but not in the healthcare industry nor on a specific business process like quotations for PMs. The researcher is however in agreement to this proactive service delivery principles that quotations for PMs are planned at a time that is convenient to the customer to proactively improve the reliability and uptime of their equipment by ensuring that the systems as maintained properly to prevent breakdowns.

2.5.4. CONCLUSION

For the literature above it is evident that the organisational shift from reactivity to proactivity has numerous benefits. This study seeks to measure the impact on revenue that this principle of proactivity will have when applied to quotations for PMs to capture missed revenue. What (Helo & Hao, 2022; Shohet & Lavy, 2004; Rank *et al.,* 2007; Tian *et al.,* 2019; Jabłoński, 2019; Sehgal & Gupta, 2020; Poll *et al*., 2018 and Jauhari, Singh & Kumar, 2017) said resonate with the researcher's thinking that proactive customer service delivery will improve customer satisfaction through improved service delivery and reliability of equipment.

2.6. CONCEPTUAL FRAMEWORK

For proactive quotations for PM to be successful, organisations need to ensure synchronised interactions between Enterprise Resource Management (ERP) systems, Customer Relationship Management (CRM) systems, Business Process Management (BPM), and Proactive Customer Service Delivery (PCSD).

To ensure a symbiotic relationship exists between these a conceptual framework can be outlined as follows:

- Enterprise Resource Planning (ERP) Systems:

    - Core functionalities for managing various business activities and resources.
    - Integration of financial, human resources, supply chain, and other operational data.
    - Streamlining business processes and improving efficiency through data analysis and automation.
- Customer Relationship Management (CRM) Systems:
    - Centralized customer data repository for managing interactions and relationships.
    - Tracking customer behaviour, preferences, and purchase history.
    - Facilitating personalized communication and effective marketing strategies.
- Business Process Management (BPM):
    - Systematic approach to optimize business processes and workflows.
    - Aligning organisational goals with customer requirements for enhanced productivity.
    - Continuous monitoring, analysis, and improvement of key processes to achieve strategic objectives.
- Proactive Customer Service Delivery (PCSD):
    - Anticipating customer needs and providing timely solutions.
    - Utilising data-driven insights to personalize services and enhance customer experience.
    - implementing preventive measures and efficient communication to address potential issues before they arise.

Integrating and synchronising these systems within organizational operations can yield several benefits, including:

- Enhanced data visibility and accessibility across departments.

- Improved customer satisfaction through personalized interactions and proactive support.
- Streamlined and optimized business processes, leading to increased efficiency and reduced operational costs.
- Effective resource allocation and planning, resulting in better decision-making and strategic development.
- Strengthened customer retention and loyalty through consistent and proactive service delivery.

The successful implementation of this integrated framework relies on:

- Robust data management and analysis capabilities.
- Seamless communication and collaboration between different departments and teams.
- Regular monitoring, evaluation, and adjustment of strategies to meet evolving customer needs and market dynamics.
- Ongoing training and development to ensure the effective utilisation of these systems and tools within the organization.

Figure 4 below is the researcher’s proposal for a conceptual framework for organisations to align ERP, CRM, BPM and PCSD.

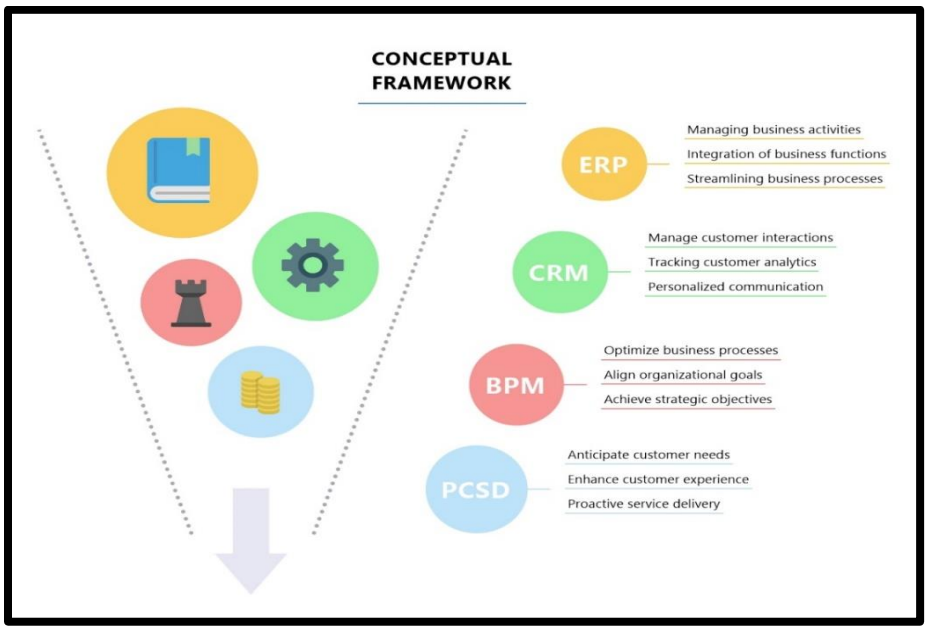


Figure 4: Conceptual Framework

Source: Author Own

The conceptual framework funnels the management of business activities, the integration of business function and streamlining business processes of the ERP with the management of customer interactions with personalised communication while tracking customer analytics using the CRM. The framework then further funnels business process optimisation, aligning organisational goals and achieving strategic objectives through BPM practices while anticipating customer needs with proactive service delivery to enhance the overall customer experience through PCSD practices. The end result should reflect proactivity in every aspect of the organisation.

2.7. CONCLUSION

Based on the literature reviewed (in the context of the healthcare industry) there exists a gap in proactive customer service delivery, particularly concerning the enhancement of quotations as a business process to improve revenue generation.

This enhancement refers to the implementation of a symbiotic relationship between organisational ERP, CRM, management techniques like BPM combined with the implantation of PCSD tasks and behaviours throughout each of these. Tasks like reminding and providing proactive quotations for PMs on medical devices to non-contract customers. This study seeks to improve revenue generation through the application of the above conceptual framework with proactive quotations for PM to capture missed revenue.

The next chapter will review the research methodology used to assess the effects of proactive quotations for planned maintenance to capture missed revenue.

3. CHAPTER 3 - RESEARCH METHODOLOGY

3.1. INTRODUCTION

An all-encompassing summary of the research methods used in this study is provided in this chapter. An outline of important factors to take into account while starting a research study is provided. According to Leavy (2022), the research methodology is the blueprint outlining how to carry out the objectives of the study and guarantee that the data gathering procedure is conducted in a coordinated and controlled manner. It serves as the research process's architectural plan or blueprint and will eventually dictate how the investigation is conducted. Taherdoost (2016) concurs further, that in order for research to produce the intended results, it must take a methodical and clear approach. The goal of this study was to calculate the revenue-generating effect that proactive quotes for scheduled maintenance would have. In order to measure the effect of PCSD on revenue, the research was concentrated on the service division of a healthcare organization and attempted to forecast the result of PM quotations that can be proactively given to clients.

The research objectives are:

1. To identify if additional revenue can be made through proactive planned maintenance quotations for non-contract customers within the healthcare industry of South Africa.
2. To evaluate the effect on revenue with a follow up quotation for equipment that requires annual PMs, six months after the initial quotation was rejected.
3. To assess the effect on revenue by proactively requoting customer on all expired quotations.
4. To measure the magnitude of the predicted increased revenue streams on the annual financial target for this organisation's service division using year 2022 as a basis.

The data collection and analysis consisted of a four-stage process in order to answer the research question and meet its objectives:

- Stage 1: Extract the first dataset from the organisation's CRM and ERP to obtain the entire research population of non-contract customer equipment and extract the relevant sample group.
- Stage 2: Extract a second dataset from the organisation's CRM and ERP consisting of all the quotations generated for the year of 2022 and filter it only to relevant quotations for PMs. Thereafter a predictive model was built that can predict the outcomes of proactive PMs using the second dataset. The predictive model will provide a ratio of the outcome of quotations (accepted, rejected or expired).
- Stage 3: Apply this ratio to the first dataset to obtain the predicted proactive PM results.
- Stage 4: Use descriptive statistics to identify and apply the mean labour costs and fixed travel costs to the data obtained from stage 3 to calculate the additional income that might be achieved through proactive PM quotations to enable the researcher to answer the research questions.

These results allowed the researcher to answer the research questions to assess the potential for additional revenue that can be gained through proactive PM quotations of non-contract customers.

3.2. RESEARCH METHODOLOGY

3.2.1. THE RESEARCH ONION

Figure 5, The Research Onion, guides this research design and was developed by Saunders, Lewis & Thornhill (2009). In the context of this study on the acceptance, rejection, and expiration of planned maintenance quotes, the research philosophy aligns with positivism to focus on scientific rational with objective methods. From an ontological perspective Leavy (2022) describes positivism as assuming an objective reality that exists independently of individuals. In the context of this study, this would mean that there are objective factors and reasons that influence the acceptance, rejection, or expiration of planned maintenance quotes. From an epistemological perspective Leavy (2022) describes positivism as emphasizing empirical observation and the scientific method. The researcher would collect quantitative data on various factors (predictors) and analyse them statistically to derive patterns and relationships that can explain the outcomes of interest.

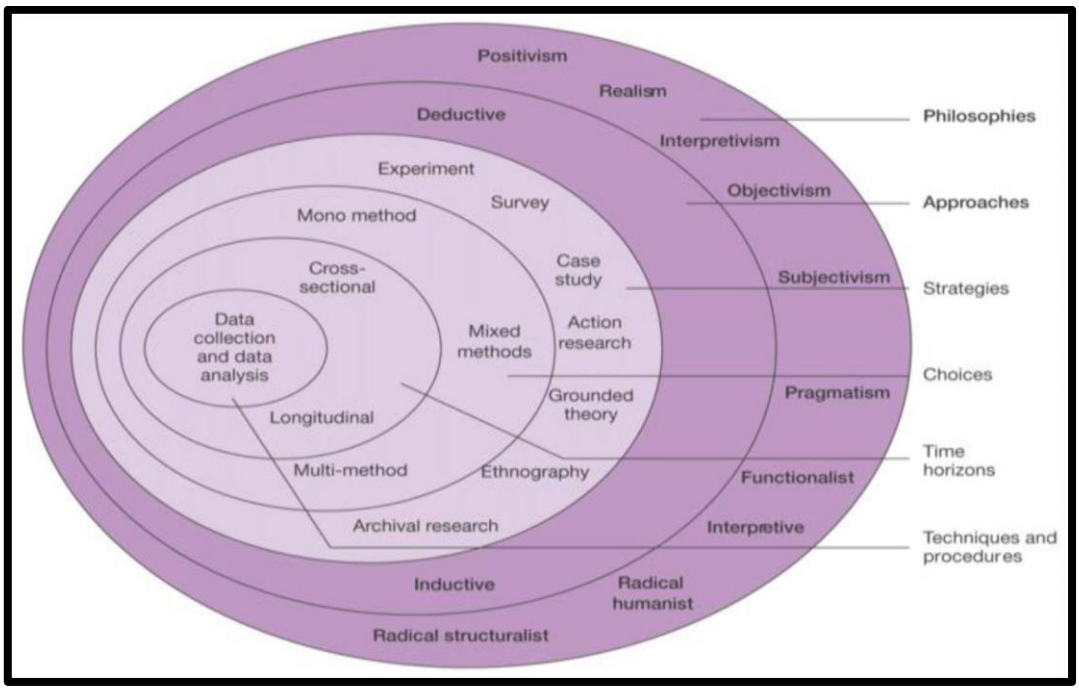


Figure 5: The Research Onion

Source: Saunders, Lewis & Thornhill, 2009

This study applied both an inductive and deductive approach. Initially the approach was inductively inclined to reason from the bottom up using the outcome (accepted, rejected or expired) of quotations for the year of 2022 to derive a predictive model that provided a ratio for these outcomes. The approach was then shift to deductive that reasoned from the top down to examine the outcome of the predictive model that was applied to the data with relation to the research questions.

3.2.2. RESEARCH METHOD

Leavy (2022) summarizes research design into various different designs; Quantitative research design, Qualitative research design and Mixed methods research design. Quantitative research attempts to measure the precise nature of a

variable while qualitative research seeks to obtain an understanding through detailed description, (Cooper & Schindler, 2014). Qualitative research stresses the subjective experiences and circumstances of individuals to obtain a deeper knowledge of a phenomenon, whereas quantitative research concentrates on numerical data and statistical analysis to uncover patterns and linkages. Both approaches are essential to the research process and are frequently combined to offer a thorough grasp of challenging research issues. In a single study or research effort, mixed methods research combine qualitative and quantitative research methodologies. By combining the advantages of qualitative and quantitative approaches, this methodology enables researchers to develop a more thorough understanding of a certain phenomenon. Through the integration of different methodologies, scholars can gather, examine, and construe information from several angles, therefore augmenting the comprehensiveness and profundity of the study outcomes.

For the purpose of this research the strategy of a quantitative approach was adopted as a mono method of choice to quantify the additional revenue that can be made through proactive quotations. Within quantitative research there are descriptive and inferential statistics. This research was a predictive research that sought to study the relationship between various nominal, ordinal and ratio/scale variables to predict the outcome of PM quotes presented to customers proactively. For this reason, inferential statistics was the most suitable method to build a predictive model to quantify the effects of proactive PM quotations for non-contract customers. From a time-horizons perspective, this study was based on a longitudinal perspective where the outcome of quotations for PMs are studied over a period of a year, (Saunders, Lewis & Thornhill, 2009). The next section of this chapter will dive into the research population and sample selected.

3.3. POPULATION AND SAMPLE FRAMEWORK

3.3.1. POPULATION

A service organisation within the healthcare industry in South Africa was the site of the investigation. This organisation's name has been omitted from the study due to confidentiality and protection of intellectual property. This research sought to quantify the effect of proactive quotations on revenue, hence there was no participants involved and the study used secondary data extracted from the organisation's CRM and ERP. The research population was the entire install base of medical devices for this organisation within South Africa. The entire install base of 3025 devices will constitute for the secondary data that was collected. This data was extracted in-line with stage 1 of the data collection and analysis of this research. This data was filtered to focus only on systems that are billable (non-contract or expired warranty customers). This data was an interpreted version of the raw data, (Cooper & Schindler, 2014) and it consisted of 2007 systems that served as the research population. The next section discussed the sample group that was extracted from the research population.

3.3.2. SAMPLE

Within research, probability and non-probability sampling are the two processes that researchers use for sampling, (Firdaus, Zulfadilla & Caniago, 2021). Simple random sampling, cluster sampling, systematic sampling, and stratified sampling are the four sub-divisions of probability sampling, which is a random selection of a population. Every component or element in the population has an equal chance of being chosen at random in a simple random sampling. Using a broad population, the researcher selects groups or clusters at random and uses them as a sample or cluster in the cluster sampling method. Additionally, the stratified sampling technique entails the selection of a sample from various population segments or subgroups. On the other hand, every K^{th} case is selected by the researcher from a population directory in a systemic sample, (Ali, 2020). When using non-probability sampling, the researcher

selects samples from a wide population by making conscious decisions or passing judgment. Non-probability sampling comes in three primary varieties. The first type is referred to as inadvertent or convenient sampling. Purposive sampling is the name given to the second kind, and quota sampling is the name given to the third. The unintentional sampling method involves the researcher using readily available data for research purposes. In order to generate the sample through purposive sampling, researchers also carefully consider judgments about the cases that share distinguishing characteristics within the population. In order to obtain data, researchers purposefully establish quota in each of the population's segments, (Ali, 2020).

Evidently so, the sample framework was extracted from all of these billable systems using stratified random sampling, because it involves dividing the population into distinct subgroups, or strata, based on certain characteristics that made this method the most suitable and relevant to the research or study. These subgroups are the hours required to complete a PM visit as well as the number of PMs required per annum for each system. This approach was used to ensure that the sample obtained was representative of the entire population, particularly when the population was diverse and exhibited different characteristics, (Berndt, 2021). According to Saunders, Lewis & Thornhill (2009), some situations require a minimum sample size to ensure the study has a high level of confidence and a low margin of error. With this research we assumed a 5% margin of error and a 95% level of confidence that was required. Based on the assumptions above a minimum sample size of 343 samples were required but for simplicity's sake a sample of 672 was extracted using stratified random sampling as the sample group. This is in line with stage 1 of the data collection and analysis. Table 1 below captured the minimum sample required as well as the selected sample group size that was extracted for this research.

Table 1: Minimum Sample Required

Description	Contribution
Percentage of population belonging to non-contract customers	66,34%
Percentage of population not belonging to non-contract customers	33,65%
Level of confidence required	95% certain
Margin of error required	5%
Total population	2007 systems
Minimum sample size required	343
Total sample group selected	672 systems

Source: Author Own

For stage 2, all of the quotations for the year of 2022 were extracted from the organisation's CRM and ERP and filtered to only contain PM quotations. Here a census sampling method was used where the entire population of 267 quotations were used to build the predictive model. This enabled the researcher to provide a comprehensive and accurate representation of the population, (Berndt, 2021). This sample group assisted this research to assess if additional income was generated from proactive PM quotations for non-contract customers. The next section discussed the data collection instruments that were used in this research.

3.4. DATA COLLECTION INSTRUMENTS

The quantitative data collected to assess proactive revenue creation was directly extracted from the CRM and ERP. This data consisted of two datasets as described in stage 1 and 2 of the research data collection and analysis. Stratified random sampling, which includes splitting the population into discrete subgroups, or strata, depending on specific characteristics, was used to extract the sample framework from each of these chargeable systems. This approach was the most appropriate and pertinent for this research or study. The subgroups consist of the amount of time

needed to finish a PM visit and the total number of PMs needed annually for every system.

For the second quantitative dataset, the organization's CRM and ERP were used to extract all of the quotations for the year 2022, and was filtered to only include PM quotations. Here, a census sampling technique was applied, and the predictive model was constructed using all 267 quotations from the population. This ensured the model was relevant to the topic of proactive PMs by removing data from corrective maintenance, upgrade and installation quotations. It is important to note that these quotations were reactive and were created and sent upon customer requests. This model allowed the researcher to assess the validity of proactive quotations for PM for non-contract customers. The next topic reviewed the analysis of the data.

3.5. DATA ANALYSIS

This study aimed to predict the outcomes of proactive quotation for PM and its impact on revenue. According to Stevens (1946), there are four categories of measurement: nominal and ordinal (categorical data) as well as interval and ratio (numerical data). Cooper & Schindler (2014) further classifies nominal and ordinal measurements as categorical data and interval and ratio measurements as numerical data. Leedy, Ormrod & Johnson (2014) discussed that nominal data is the characteristics of a group with no inherent order like gender or ethnicity while ordinal data has a qualitative characteristic that has a natural rank or order like income levels. Interval data is naturally measured in numbers with equal spaces and an order like credit scores or temperature while ratio data is numerical data with order and equal distances between points such as weight, height and length, (Leedy, Ormrod & Johnson, 2014).

For this research both categorical and numerical data was collected. The dependant variable, the status of the quotations (accepted, rejected or expired) was nominal

data with three categories while the independent variables were a mixture of categorical (with multiple categories each) and numeric data. The independent variables were the income generated by the different system types (ordinal data); the price of the quotations (ordinal data) and the hours required to complete the PM on that equipment type (ratio). By applying these variables to a statistical model, it allowed the researcher to assess the effect of proactive PM quotes to generate additional revenue.

To build a model, researchers rely on both descriptive and inferential statistics. Descriptive statistical approaches are employed to describe quantifiable attributes of a given group of entities, such as individuals, libraries, circulation data, and periodical pricing, (Ali, 2020). The total, counts and percentages in subsets, the median, the arithmetic and geometric means, the range, and the standard deviation are some of the attributes that are commonly utilized. Descriptive statistical methods involve calculating these features' numerical values, summarizing them, and presenting them in tables, graphs, charts, and other visual aids, (Wyllys, 1978). Wyllys (1978) continues to discuss that the core of inferential statistics techniques is the process of looking at a sample of data on a group of entities of interest (referred to as a "population"). Using the evidence in the sample, one can then draw conclusions about a feature of the population. The objectives are to draw valid conclusions, steer clear of false conclusions, and understand the likelihood that a given inference is right, (Mehrad & Zangeneh, 2019). To do this, the typical approach is to clearly establish a hypothesis about a population feature. Next, a statistical method is used to the sample data, and the conclusion is made on whether or not to accept the hypothesis.

Mishra *et al.* (2019,p. 297) said: "Selection of appropriate statistical method depends on the following three things: Aim and objective of the study, Type and distribution of the data used, and Nature of the observations (paired/unpaired)". Mishra *et al.* (2019) mention that descriptive statistical methods work best for numerical data while inferential statistics is best suited for categorical data. Due to

the categorical nature of the study's variables, inferential statistics was the best suited method to build a predictive model for proactive PM quotations to generate additional income. According to Cooper & Schindler (2014), with inferential statistics, various methods exist like T-tests, analysis of variance, correlation analysis. Table 2 below is a summary of semi-descriptive and inferential statistical methods.

Table 2: Semi-Descriptive and Inferential Statistical Methods

Description	Statistical methods	Data type
To predict the outcome variable using independent variables	Binary Logistic regression analysis	Outcome variable (two categories), Independent variable (s): Categorical (≥2 categories) or Continuous variables or both
To predict the outcome variable using independent variables	Multinomial Logistic regression analysis	Outcome variable (≥3 categories), Independent variable (s): Categorical (≥2 categories) or continuous variables or both
Area under Curve and cutoff values in the continuous variable	Receiver operating characteristics (ROC) curve	Outcome variable (two categories), Test variable : Continuous
To predict the survival probability of the subjects for the given equal intervals	Life table analysis	Outcome variable (two categories), Follow-up time : Continuous variable
To compare the survival time in ≥2 groups with *P*	Kaplan—Meier curve	Outcome variable (two categories), Follow-up time : Continuous variable, One categorical group variable
To assess the predictors those influencing the survival probability	Cox regression analysis	Outcome variable (two categories), Follow-up time : Continuous variable, Independent variable(s): Categorical variable(s) (≥2 categories) or continuous variable(s) or both
To predict the diagnostic accuracy of the test variable as compared to gold standard method	Diagnostic accuracy (Sensitivity, Specificity etc.)	Both variables (gold standard method and test method) should be categorical (2 × 2 table)

Source: Adapted from Mishra *et al.,* 2019

Table 2 review the statistical methods with a short description as well as the data types used with each of those statistical methods.

Based on the table 2, the researcher is in agreement with Mishra *et al.* (2019), that the best suited method was the application of multinomial logistic regression due to the nature of the variables selected. In agreement with stage 2 of the data collection and analysis for this research, the regression analysis enabled the researcher to predict the outcome using the independent variables for similar scenarios. The focus was on ensuring the model is significantly relevant while obtaining a high predicted ratio for the dependant variable to assess if proactive quotations for PMs would generate additional revenue.

For stage 3 of the data collection and analysis of this research, this ratio for the predicted outcome of the dependant variable (accepted, rejected and expired) was applied to the sample. The application of the predictive model, modelled the outcome of proactive quotations for PMs for these non-contract systems over the period of 2022. To answer all of the research questions, rejected quotations for systems that require annual PMs were requoted six months later and expired quotations were requoted the following month to obtain the final count of predicted & accepted proactive PM quotation for the year of 2022. Lastly, for stage 4 of the data collection and analysis of this research, these results were used to assess how these proactive quotations affected the revenue for the year of 2022 to answer all the research questions. Descriptive statistics was used to identify and apply the mean labour costs and fixed travel costs to the final predicted accepted PM quotations to calculate the additional income that might be achieved through proactive PM quotations to enable the researcher to answer the research questions. It is important to note that all the data was collected, assessed and interpreted, using IBM SPSS statistical software, by the researcher.

3.6. VALIDITY, RELIABILITY AND TRUSTWORTHINESS

Taber (2018) considers a stable measure of data over a variety of conditions that yield consistent results as being reliable. The reliability of the data was ensured through data validation and consistency checks through data sampling and testing. Further reliability was ensured through collaborating with the organisation's ERP specialists to identify and prevent any possible data issue. The results must be repeatable and consistent in order to be reliable. Validity was assured by the researcher with the use of randomization and subgroups. The validity was further assured by the researcher with the rigorous design of the study; the data was not modified or tampered with but filtered to be directly relevant to the topic of proactive PM quotes for revenue generation, thus managing bias and the integrity of the data. Ultimately supporting the credibility and trustworthiness of the research. Given the significance of the study to the business, the research only concentrated on variables that offer value, such as choosing non-contract customers for the population and sample group and selecting only PM quotations to build the predictive model, in order to assure data authenticity and consistency. Care was taken to ensure that the data collecting instrument only extracted what is relevant and intended in order to provide an answer to the study questions in order for the results to be categorized as valid and trustworthy.

3.7. ETHICAL CONSIDERATIONS

Fleming (2002), underline the significance of ethical considerations as selecting appropriate research methods by using thorough ethical considerations when conducting research. For this study there was no human participants involved and it was aimed to bring about more-good, than harm. The organisation, its customers, personal information and researcher in this study were all protected from harm and informed permission was sought from the organisation to use their data. Their right to privacy was protected and respected and will thus remain anonymous. The researcher upheld full transparency throughout its process and it was

conducted in a socially and ethically acceptable manner. Approval to collect and use the organisation's data was granted and the necessary approval documents was attached to the application to the REC.

Prior to data collection, a clearance certificate from the UNISA SBL REC was obtained to confirm that the ethical guidelines are being followed. The research was validated to ensure that it was free from plagiarism on a platform called Turn-it-in and the validation report was attached in the annexure in the final report. The research was aimed at providing insights and recommendations to the research questions that will be factual, honest, objective, confidential, anonymized and of a respectful manner such that it protects the organisation's intellectual property.

3.8. CONCLUSION

This chapter of the research outlines the comprehensive research methodology, starting with an introduction emphasizing the importance of a methodical approach. The study's goal was to assess the revenue impact of proactive quotes for scheduled maintenance in the healthcare service division. The research objectives included identifying additional revenue, evaluating the effect of follow-up quotations, assessing the impact of re-quoting expired quotations, and measuring the predicted revenue increase for the organization's service division. The methodology incorporated the Research Onion model by Saunders, Lewis & Thornhill (2009), aligning with positivism for a scientific, objective focus. Both inductive and deductive approaches were applied, transitioning from outcomes to predictive models. The study adopted a quantitative research design, utilizing inferential statistics and a predictive research approach. The population consisted of medical devices in a South African healthcare organization, with a sample derived through stratified random sampling. The data collection involved extracting information from the CRM and ERP systems, with a focus on billable customers and planned maintenance quotations for a predictive model. The data analysis employed multinomial logistic

regression to predict outcomes and assess their impact on revenue, with a longitudinal perspective over 2022. Validity, reliability, and trustworthiness were ensured through rigorous study design, collaboration with ERP specialists, and careful data selection. Ethical considerations prioritized data protection, transparency, and confidentiality, with approval obtained from the organization and UNISA SBL REC. The study aimed to provide factual, objective insights while safeguarding intellectual property and maintaining ethical standards throughout the research process.

In conclusion, the research titled ***The Effect of Proactive Quotations for Planned Maintenance on Revenue,*** aimed to use the findings to contribute to the limited body of knowledge on proactive customer service delivery and further provide insights into the feasibility of automating repetitive low-value business processes to improve the productivity and effectiveness of professional skills and resources.

The next chapter will review the research results and its importance with regards proactive quotations to planned maintenance to capture missed revenue.

4. CHAPTER 4 - RESEARCH RESULTS

4.1. INTRODUCTION

This chapter discussed the analysis, findings and results of the research. The findings were explained with relation to the research questions. The predictive model tried to quantify the accuracy of how well it could predict the outcome of proactive PM quotations. The structure focused on the 4 stages of the data collection and analysis as explained in the previous chapter.

This chapter aims to review the various stages of the data collection and analysis; the predictive modelling; application of the model to the sample group; application of the costing to the adjusted hours of the sample group and the findings of the research results.

4.2. QUANTITATIVE DESCRIPTIVE AND INFERENTIAL STATISTICS

4.2.1. STAGE 1 – POPULATION AND SAMPLE GROUP EXTRACTION

Table 1 shows the entire install base of 3025 systems which was extracted and filtered to find 2007 non-contract customer that account for the population group of this research. The install base covered the entire South African region that assessed the entire demographic region for this organisation, in this country. Table 1 below provide information on what Saunders, Lewis & Thornhill (2009) argue the minimum sample group need to be calculated.

Table 1: Minimum Sample Required

Description	Contribution
Percentage of population belonging to non-contract customers	66,34%
Percentage of population not belonging to non-contract customers	33,65%
Level of confidence required	95% certain

Margin of error required	5%
Total population	2007 systems
Minimum sample size required	343
Total sample group selected	672 systems

Source: Modified from Saunders, Lewis & Thornhill, 2009

As per table 1, the minimum sample group was calculated to 343 units. A sample group of 672 units were extracted using stratified random sampling, to find a balanced representation of each subgroup/strata in the population. The sample group constituted for 33.5% of the population group. The sample group result was multiplied to represent the entire population group to simulate a 100% response rate.

Figure 6 below provided a graphical representation of the distribution of the strata.

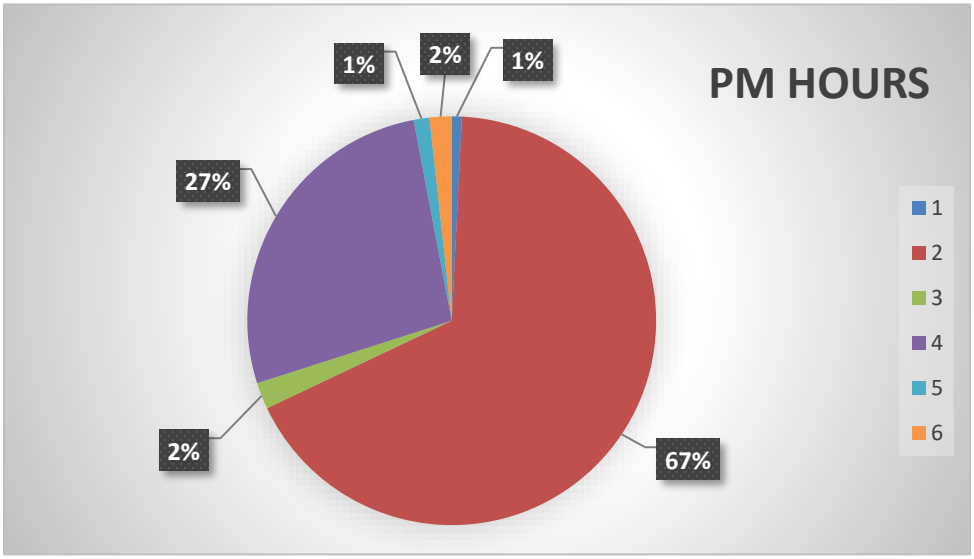


Figure 6: Sample Group Strata Distribution

Source: Author Own

The distribution was clustered by the subgroup of hours required to complete a PM. 67% of the distribution belonged to systems that require 2 hours to complete a PM; 27% belonged to systems that require 4 hours to complete a PM; 2% belonged to systems that require 6 hours to complete a PM; 2% belonged to systems that require 3 hours to complete a PM; 1% belonged to systems that require 1 hour to complete a PM and 1% belonged to systems that require 5 hours to complete a PM.

The next topic discusses the predictive model that was built from the second dataset that was extracted from the organisation's CRM and ERP.

4.2.2. STAGE 2 – PREDICTIVE MODELLING

The sample for the model consisted of a total of 267 quotes that comprised of the following:

- 95 accepted quotes, 109 expired quotes and 63 rejected quotes;
- with prices ranging from 60.00 USD to 4,875.00 USD for a service;
- PM hours ranging from 1 to 6 hours to complete (depending on the type of system);
- and the income that each of these systems can generate within a twelve-hour shift, ranging from 1,839.00 USD to 15,141.10 USD.

4.2.2.1. INCOME AS A VARIABLE

The income generated by each of these devices was added as a variable as a general assumption that the higher the income generated by the system, the higher the priority to ensure its uptime. The average procedure times are as well as their costs were listed below in figure 3.

Table 3: Average Income and Number of Scans in a Typical 12 Hour Shift

Scan	Time per scan	Cost per scan	Frequency in a 12-hour shift	Income
CT Chest without Contrast	12	$ 223,20	60	$ 14 712,00
CT Abdomen and Pelvis with Contrast	17	$ 376,09	42	$ 14 712,00
MRI Brain Whole without Contrast	50	$ 535,34	14	$ 8 214,20
MRI Abdomen Whole without Contrast	45	$ 541,89	16	$ 8 214,20
US Retroperitoneal Complete	19	$ 58,73	38	$ 1 839,00
US Abdomen Complete	24	$ 47,83	30	$ 1 839,00
XR Chest	8	$ 32,22	90	$ 3 984,50
XR Bone Density Hip Pelvis	15	$ 99,26	48	$ 3 984,50
Mammogram Screening Tomosynthesis Bilateral	15	$ 87,59	48	$ 3 984,50
PET CT Skull to Mid-thigh	148	$ 729,47	5	$ 3 555,40
Cardiac Catheterisation - Digital Monoplane	90	$ 1 608,84	8	$ 15 141,10
Cardiac Catheterisation - Digital Biplane	90	$ 2 175,40	8	$ 15 141,10

Source: Adopted from (Government Employees Medical Scheme, 2023 and Raghavan *et al.* 2019)

The frequency indicated the number of procedures that can be completed in a twelve-hour shift while the income indicated the typical income that specific modality can generate within a twelve-hour shift.

4.2.2.2. MULTINOMIAL LOGISTIC REGRESSION MODEL

Table 4 shows the main effects multinomial logistic regression model was built using:

- the status of the quotations (outcome of the quotations; accepted, rejected or expired) as the dependant variable;
- the price (price quoted for a PM in USD) as an independent variable, factor;
- income (the income these specific systems would generate within a daily, twelve-hour shift in USD) as an independent variable, factor;
- and the hours (hours required to complete the PM) as an independent variable, covariate.

The model was built using a confidence level of 95% and the intercepts were excluded. Without intercepts, the coefficients of the predictor variables provided a direct interpretation in terms of log odds ratios. Each coefficient represented the change in the log-odds of one category of the dependent variable relative to a reference category for a one-unit change in the predictor, keeping other predictors constant. This simplified the interpretation of the model, especially because the focus was primarily on the effects of the predictor variables rather than the baseline probabilities. Second to this, the researcher was interested in testing the specific effects of income, price, and hours on the log-odds of the dependent variable's categories, without the potential influence of intercepts. By excluding intercepts, the researcher was able to focus more directly on these specific contrasts.

Table 4: Multinomial Logistic Regression model, variables

Name	Variable type	Model variable
Status	Nominal	Dependant
Price	Ordinal	Independent, Factor
Income	Ordinal	Independent, Factor
Hours	Ratio	Independent, Covariate

Source: Author Own

For this predictive model the reference category was the expired quotations. Expressing the multinomial logistic regression model using the specified variables, the general form of the model would look like this:

Let:

- Y be the dependent variable "Status" with categories Y_1, Y_2, *and* Y_3.
- X_1 be the ordinal predictor “Income”
- X_2 be the ordinal predictor “Price”
- X_3 be the continuous predictor “Hours”

For a multinomial logistic regression model predicting Y, the log-odds of each category relative to a reference category (in this scenario, a custom category - Expired) can be modelled as:

- Log-odds for Y_1 (Reference category):

$$\text{logit}(P(Y = Y_1)) = \alpha_1 + \beta_{11}X_1 + \beta_{12}X_2 + \beta_{13}X_3$$

- Log-odds for Y_1 :

$$\text{logit}(P(Y = Y_2)) = \alpha_2 + \beta_{21}X_1 + \beta_{22}X_2 + \beta_{23}X_3$$

- Log-odds for Y_1 :

$$\text{logit}(P(Y = Y_3)) = \alpha_3 + \beta_{31}X_1 + \beta_{32}X_2 + \beta_{33}X_3$$

Where:

- α_1, α_2 and α_3 are intercepts for the three categories of Y. In the model $\alpha = 0$ because the intercepts are excluded.
- β_{11}, β_{12}, β_{13}, etc., are the coefficients associated with each predictor variable for each category of Y.

This model structure represents the baseline multinomial logistic regression model predicting the log-odds of the three categories of "Status" based on the predictors "Income", "Price", and "Hours".

4.2.2.3. MODEL FITTING INFORMATION

For the multinomial logistic regression model with the specific predictors X_1 (Income), X_2 (Price), and X_3 (Hours) predicting a dependent variable Y (Status) with three categories Y_1, Y_2, and Y_3, the likelihood function L for the model would be:

$$L(\beta) = \prod_{i=1}^{n} \prod_{j=1}^{3} P(Y_{ij} = 1)^{I(Y_i = Y_{ij})}$$

Where:

- β represents the vector of all coefficients in the model.
- n is the number of observations.
- Y_{ij} is an indicator that equals 1 if observation i belongs to category j of the dependent variable Y, and 0 otherwise.
- $I(\cdot)$ is an indicator function.
- $P(Y_{ij} = 1)$ is the predicted probability of observation i belonging to category j, given the predictors and the current model coefficients.

In practice, software packages like R, SPSS or Stata use optimization algorithms to find these coefficient values. The likelihood function $L(\beta)$ represented the joint probability of observing the given data. The goal of model fitting is to find the values of the coefficients β that maximize this likelihood function, indicating the most probable set of coefficients given the observed data.

The model fitness was assessed using the Chi-square statistics. The Chi-square value was 298,557 and the p-value was less than 0.05. This proves that there was a significant relationship between the dependant variable and independent variables in the final model.

Model Fitting Information

Model	Model Fitting Criteria -2 Log Likelihood	Likelihood Ratio Tests Chi-Square	df	Sig.
Null	373,414			
Final	74,857	298,557	204	<,001

Figure 7: Model Fitting Information

Source: IBM SPSS Statistical Results

4.2.2.4. GOODNESS-OF-FIT

In the context of this multinomial logistic regression, both the Pearson goodness-of-fit test and the Deviance goodness-of-fit test were used to assess the adequacy of the model.

Pearson's chi-square (χ^2) statistic for each cell in the contingency table (formed by the observed and expected frequencies) was calculated as:

$$\chi^2 = \frac{(O-E)^2}{E}$$

Where:

- was the observed frequency.
- *E* was the expected frequency under the model.

The total χ^2 statistic for the entire model was the sum of these values across all cells. For a model with adequate fit, the observed frequencies should not significantly differ from the expected frequencies, resulting in a nonsignificant χ^2 test.

Deviance was the measure analogous to the residual sum of squares in the linear regression and was given by:

$$\text{Deviance} = -2 \times (\text{Log-Likelihood}_{\text{full}} - \text{Log-Likelihood}_{\text{saturated}})$$

Where:

- $\text{Log-Likelihood}_{\text{full}}$ was the log-likelihood of the model with predictors.
- $\text{Log-Likelihood}_{\text{saturated}}$ was the log-likelihood of a saturated model that perfectly fits the data.

The deviance measured how much better the saturated model fits the data compared to the model with predictors. A smaller deviance indicated a better fit. Additionally, the difference in deviance between two nested models followed a chi-square distribution, which can be used to test the significance of adding additional predictors to a model.

The Pearson (14,435) and Deviance (18,342) goodness-of-fit statistic tests prove that the model was a good fit because the tests were not statistically significant with a p value greater than 0.05.

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	14,435	38	1,000
Deviance	18,342	38	,997

Figure 8: Goodness-of-Fit

Source: IBM SPSS Statistical Results

4.2.2.5. PSEUDO R-SQUARE

Some software packages and statistical methods offer pseudo-R-squared measures to provide a sense of the variance explained by the model, relative to a null (intercept-only) model. In this study IBM SPSS was used. When interpreting these measures, it was essential to consider their limitations and to use them in conjunction with other model diagnostics and goodness-of-fit tests to assess the adequacy of the model. For this multinomial logistic regression, the researcher used McFadden's R-squared, Cox and Snell R-squared and Nagelkerke (also known as Cragg & Uhler) R-squared as the pseudo-R-squared measure, which was defined as:

McFadden's R-squared:

$$R^2_{McFadden}=1 - \frac{Log-Likelihood_{full}}{Log-Likelihood_{null}}$$

Where $Log\text{-}Likelihood_{full}$ was the log-likelihood of the model with predictors and $Log\text{-}Likelihood_{null}$ was the log-likelihood of the null model.

Cox & Snell R-squared:

$$R^2_{Cox\ \&\ Snell}=1 - \left(\frac{Log-Likelihood_{full}}{Log-Likelihood_{null}}\right)^{\frac{-2}{n}}$$

Where n was the sample size.

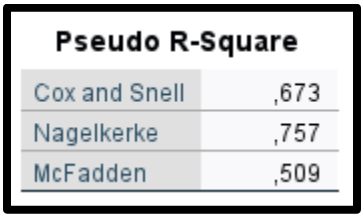
Nagelkerke R-squared:

$$R^2_{Nagelkerke}= \frac{R^2_{Cox\ \&\ Snell}}{1-\exp\left(\frac{-2}{n}\right)}$$

Where n was the sample size.

For all these measures a value closer to 1 indicated that the model explains a larger proportion of the variance, relative to a null model. Unlike the R-squared in linear regression, these pseudo-R-squared values have different scales and should be interpreted with caution. They provide a measure of goodness-of-fit but don't represent the proportion of variance explained in the same way that R-squared does in linear regression.

The Pseudo R-Square measures the Cox and Snell (0.673), Nagelkerke (0.757) and McFadden (0.509). The model accounts for 50.9% to 75.7% of the variance and represented a high level of correlation.



Pseudo R-Square	
Cox and Snell	,673
Nagelkerke	,757
McFadden	,509

Figure 9: Pseudo R-Square

Source: IBM SPSS Statistical Results

4.2.2.6. LIKELIHOOD RATIO TESTS

The likelihood ratio test was used in the context of multinomial logistic regression to test the significance of predictors in the model. To test the significance of a single predictor (or a set of predictors) in the model, the researcher compared a model that included the predictor(s) to a reduced model that excludes them. The likelihood ratio test statistic was again given by the formula above, comparing the full model (with all predictors) to a reduced model (without the predictor(s) of interest).

$$G^2 = -2\times(\text{Log-Likelihood}_{\text{all predictors}} - \text{Log-Likelihood}_{\text{predictors of interest}})$$

A significant result suggested that the model with more parameters fit the data significantly better than the simpler model or that the predictors added to the model was significant. The degrees of freedom for the chi-square distribution in these tests were typically equal to the difference in the number of parameters between the two compared models.

The likelihood ratio test proved that the independent or predictor variables like income and price were significant while hours were near significant, which proved that they contributed significantly to the final model.

Likelihood Ratio Tests

Effect	Model Fitting Criteria: -2 Log Likelihood of Reduced Model	Likelihood Ratio Tests: Chi-Square	df	Sig.
Hours	78,775[a]	3,918	2	,141
Price	340,522	265,665	190	<,001
Income	94,191	19,334	10	,036

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. Unexpected singularities in the Hessian matrix are encountered. This indicates that either some predictor variables should be excluded or some categories should be merged.

Figure 10: Likelihood Ratio Tests

Source: IBM SPSS Statistical Results

4.2.2.7. RESULTS

The individual relationships between the dependant and independent variables can be found in Appendix A. This section covered an overview of the most relevant relationships that were statistically the most significant or near significant. The reference category was “Expired".

Table 5: Results of the Multinomial Logistic Regression Model

Status		B	Std. Error	Wald	df	Sig.	Exp(B)
Accepted	Hours	-1,253	1,003	1,560	1	0,212	0,286
	[Price= 143,00]	66,261	2,204	903,673	1	0,000	59784299951127000000000000000,000
	[Price= 153,00]	65,162	2,351	768,503	1	0,000	19928099983740500000000000000,000
	[Price= 204,00]	64,637	2,013	1030,588	1	0,000	11795189389024900000000000000,000
	[Price= 207,00]	66,548	2,047	1056,509	1	0,000	79712399934960000000000000000,000
	[Price= 217,00]	66,037	2,051	1036,232	1	0,000	47827439960977100000000000000,000
	[Price= 318,00]	65,855	2,455	719,801	1	0,000	39856199967481100000000000000,000
	[Price= 460,00]	65,855	2,242	863,042	1	0,000	39856199967481100000000000000,000
Rejected	Hours	0,741	0,658	1,271	1	0,259	2,099

Source: Author Own

4.2.2.8. INTERPRETATION OF THE RESULTS

This section interpreted the relationships that were statistically significant or near significant. Table 5 has a summary of these results and appendix A has the complete table of all these results.

Among the accepted quotations, the price of 143 USD had a significant impact on the outcome of accepted quotations. As the price ($b = 66,261$, $Wald = 903,673$, $p < 0.05$) increase by 1 unit the odds ratio/probability to increase the acceptance of quotations compared to the rejected and expired PM quotations more than 5.978E+28 times. The more quotes sent to customers at a price range of 143 USD the more these quotes will be accepted.

Among the accepted quotations, the price of 153 USD had a significant impact on the outcome of accepted quotations. As the price ($b = 65,162$, $Wald = 768,503$, $p < 0.05$) increase by 1 unit the odds ratio/probability to increase the acceptance of quotations compared to the rejected and expired PM quotations more than 1.993E+28 times. The more quotes sent to customers at a price range of 153 USD the more these quotes will be accepted.

Among the accepted quotations, the price of 204 USD had a significant impact on the outcome of accepted quotations. As the price ($b = 64,637$, $Wald = 1030,588$, $p < 0.05$) increase by 1 unit the odds ratio/probability to increase the acceptance of quotations compared to the rejected and expired PM quotations more than 1.180E+28 times. The more quotes sent to customers at a price range of 204 USD the more these quotes will be accepted.

Among the accepted quotations, the price of 207 USD had a significant impact on the outcome of accepted quotations. As the price ($b = 66,548$, $Wald = 1056,509$, $p < 0.05$) increase by 1 unit the odds ratio/probability to increase the acceptance of quotations compared to the rejected and expired PM quotations more than 7.971E+28 times. The more quotes sent to customers at a price range of 207 USD the more these quotes will be accepted.

Among the accepted quotations, the price of 217 USD had a significant impact on the outcome of accepted quotations. As the price (b = 66,307, Wald = 1036,232, p < 0.05) increase by 1 unit the odds ratio/probability to increase the acceptance of quotations compared to the rejected and expired PM quotations more than 4.783E+28 times. The more quotes sent to customers at a price range of 217 USD the more these quotes will be accepted.

Among the accepted quotations, the price of 318 USD had a significant impact on the outcome of accepted quotations. As the price (b = 65,855, Wald = 719,801, p < 0.05) increase by 1 unit the odds ratio/probability to increase the acceptance of quotations compared to the rejected and expired PM quotations more than 3.986E+28 times. The more quotes sent to customers at a price range of 318 USD the more these quotes will be accepted.

Among the accepted quotations, the price of 460 USD had a significant impact on the outcome of accepted quotations. As the price (b = 65,855, Wald = 863,042, p < 0.05) increase by 1 unit the odds ratio/probability to increase the acceptance of quotations compared to the rejected and expired PM quotations more than 3.986E+28 times. The more quotes sent to customers at a price range of 460 USD the more these quotes will be accepted.

Further to this, among accepted quotations, the hours required to complete PMs had a near significant impact on the outcome of accepted quotations. As the hours (b = -1,253, Wald = 1,560, p = 0.212) increase by 1 unit the odds ratio/probability decrease the acceptance of quotations compared to rejected or expired PM quotations more than 0,286 times. The less hours needed to complete the PMs the more likely these quotations are to be accepted.

It is also interesting to note that among the rejected quotations, the hours required to complete PMs had a near significant impact on the outcome of rejected quotations. As the hours (b = 0,741, Wald = 1,271, p = 0.259) increase by 1 unit the odds ratio/probability increase the rejection of quotations compared to expired or accepted PM quotations more than 2,099 times. The more hours needed to complete the PMs the more likely these quotations are to be rejected. It would appear as if the income had no significant impact on quotations being accepted or rejected. Among both the accepted and rejected quotations, all the remaining variables has a non-significant impact on the outcome of accepted and rejected PM quotations.

4.2.2.9. CLASSIFICATION / PREDICTED RESULTS OF THE MODEL

From the initial total sample of 267 quotes; it consisted of 95 accepted quotes, 109 expired quotes and 63 rejected quotes. From figure 11 it is evident that the entire prediction model was 72.7% accurate with individual accuracies of 88.4% for accepted, 74.3% for expired and 46.0% for rejected. Figure 11 provided a complete overview of the percentage correct predicted to provide an overview of the entire model accuracy.

Classification

Observed	Predicted			Percent Correct
	Accepted	Expired	Rejected	
Accepted	84	10	1	88,4%
Expired	24	81	4	74,3%
Rejected	21	13	29	46,0%
Overall Percentage	48,3%	39,0%	12,7%	72,7%

Figure 11: Classification

Source: IBM SPSS Statistical Results

Table 6 was the actual ratio for the status of the quotations that was sent to customers.

Table 6: Actual Ratio for the Status of Quotations

Hours per PM	Accepted	Expired	Rejected	Number of systems
1	0%	100%	0%	1%
2	36%	34%	30%	56%
3	55%	36%	9%	4%
4	33%	51%	16%	25%
5	45%	45%	10%	7%
6	25%	50%	25%	6%
Total	32%	53%	15%	

Source: Author Own

According to Appendix B, Table 7 was extracted from the result obtained from the IBM SPSS model with predictions filtered according to hour require per PM visit.

Table 7: Predicted Ratio for the Status of Quotations

Hours per PM	Accepted	Expired	Rejected	Number of Systems
1	23,6%	58,3%	18,2%	6
2	34,8%	31,4%	33,8%	450
3	54,5%	34,4%	11,1%	14
4	41,9%	41,4%	16,6%	181
5	44,4%	44,4%	11,1%	9
6	30,0%	32,7%	37,3%	12
Total	39%	40%	21%	

Source: Author Own

The results from the prediction in table 7, when compared to table 6, indicated an increased prediction for accepted quotations of 7% up to 39%; a decrease in predicted expired quotation of 13% down to 40% and an increase of rejected quotation of 6% up to 21%. It is important to note that the prediction is 72.7% accurate based on figure 11.

The next section of the research applied these predicted outcomes of the proactive PM quotations to the primary dataset's sample framework that was extracted during stage 1 of the data collection and analysis.

4.2.3. STAGE 3 – APPLICATION OF THE PREDICTED RESULTS

In this section the researcher applied the predicted results from table 7 to the main dataset (sample group) as per Appendix C to obtain the predicted quotation status/outcome (accepted, expired or rejected). The initial predictions were applied, as per table 8, across the entire dataset to assess the research according to the research objectives to see if additional revenue could be generated through proactive PM quotations. Appendix E provides additional information regarding the labour hours required and the frequency of PMs required per annum as per the sample group.

Table 8: The Predicted Outcome of Proactive PM Quotations – Accepted Quotations

Hours per PM	Total PMs	Accepted	Expired	Rejected	Accepted	Expired	Rejected
1	6	24%	58%	18%	1	4	1
2	450	35%	31%	34%	157	141	152
3	14	55%	34%	11%	7	5	2
4	450	42%	41%	17%	189	186	75

5	28	44%	44%	11%	13	12	3
6	12	30%	33%	37%	4	4	4
Total	960				371	352	237

Source: Author Own

According to Table 8, it was predicted that an additional 371 PM quotations would have been accepted; 352 PM quotations expired and 237 PM quotations rejected that require different PM hours to complete. It is evident that the majority of the non-contract customers' equipment require PM that either take 2 or 4 hours to complete. The results from table 8 was used to provide further insight into research question 1. Table 9 introduced the predicted outcomes of proactive PM quotations for expired quotations when applied to the 352 expired quotes from table 8.

Table 9: The Predicted Outcome of Proactive PM Quotations – Expired Quotations

Hours per PM	Total PMs	Accepted	Expired	Rejected	Accepted	Expired	Rejected
1	4	24%	58%	18%	4	1	2
2	141	35%	31%	34%	141	49	44
3	5	55%	34%	11%	5	3	1
4	186	42%	41%	17%	186	78	77
5	12	44%	44%	11%	12	6	5
6	4	30%	33%	37%	4	1	2
Total	352				138	131	83

Source: Author Own

As can be seen from table 9, it was predicted that an additional 138 PM quotes were accepted, 131 quotes expired and 83 quotes were rejected. The results from table 9 was used to provide further insight into research question 2.

As per appendix E, it is important to note that these medical devices have different PM intervals ranging from 1 to 4 PMs per annum with different hours required to

complete them, depending on the modality and model type. Table 3, has some examples of these modality types. Table 10 introduced the predicted outcomes of proactive PM quotations for rejected quotations for systems (that only require 1 PM per annum) when applied to the 237 rejected quotations from table 8.

Table 10: The Predicted Outcome of Proactive PM Quotations – Rejected Quotations

Hours per PM	Total PMs	Accepted	Expired	Rejected	Accepted	Expired	Rejected
1	0	24%	58%	18%	0	0	0
2	80	35%	31%	34%	80	28	25
3	1	55%	34%	11%	1	1	0
4	34	42%	41%	17%	34	14	14
5	2	44%	44%	11%	2	1	1
6	2	30%	33%	37%	2	0	1
Total	119				44	41	34

Source: Author Own

As can be seen from table 10, it was predicted that an additional 44 PM quotations were accepted, 41 quotations expired and 34 quotations were rejected. The results from table 10 were used to provide further insight into research question 3. The combined additional accepted quotations from table 8, 9 and 10 were used to provide further insight into research question 4.

The next section of the research applied the average labour and travel costs to the predicted accepted quotations to answer the 4 research questions.

4.2.4. STAGE 4 – APPLICATION OF THE DESCRIPTIVE STATISTICS; RESULTS

Within this section the researcher calculated the mean labour cost per hour; made some assumptions based on travel costs and applied these costs to the predicted accepted PMs for the 3 categories based of the results of table 8, 9 and 10.

To simplify the research, the researcher chose to adapt the labour and travel costs to calculated and assumed estimates. The mean labour rate across all the modalities were used to simply the calculations while the average travel was fixed to a 2 hour round trip for each PM. Table 11 below shows the calculated mean cost and assumed travel cost.

Tabel 11: Average Labour; Descriptive Statistics

Modality	Labour Cost per Hour
Analogue Rad, Rad Mobile	$ 125.42
Mammo RF	$ 136.82
Vascular	$ 152.50
Digital RAD, OEC, Digital Mobile	$ 125.42
CT	$ 152.50
MR	$ 154.21
U/S Lunar (BMD)	$ 102.62
NM	$ 138.53
Mean Labour Cost per Hour	**$ 136.00**
Travel Costs (2 Hour Round Trip)	**$ 236.41**

Source: Author Own

According to table 11 the mean labour cost per hour was $ 136.00, United States Dollar (USD) and the travel cost for each PM was $ 236.41. These results were applied to the further calculations in the research to answer the research questions.

Table 12 below shows the calculated, predicted additional revenue from accepted quotations when applied to the sample group.

Table 12: The Predicted Income of Proactive PM Quotations – Accepted Quotations

Hours	Qty	Travel	Total Per Modality	Accepted Total
1	1	1	$ 372.41	
2	157	157	$ 79,821.30	
3	7	7	$ 4,510.93	
4	189	189	$ 147,499.41	
5	13	13	$ 11,913.49	
6	4	4	$ 4,209.70	
Total	**371**			**$ 248,327.24**

Source: Author Own

It is evident from table 12 that an additional $ 248,317.24 was predicted as additional revenue that could have been captured through proactive PM quotes being sent to the sample group. Table 13 below shows the calculated, predicted additional revenue from expired quotations when applied to the sample group.

Table 13: The Predicted Income of Proactive PM Quotations – Expired Quotations

Hours	Qty	Travel	Total Per Modality	Expired Total
1	1	1	$ 372.41	
2	49	49	$ 24,912.38	
3	3	3	$ 1,933.25	
4	78	78	$ 60,872.77	
5	6	6	$ 5,498.53	
6	1	1	$ 1,052.42	

Total	**138**			**$ 94,641.78**

Source: Author Own

It is evident from table 13 that an additional $ 94,641.78 was predicted as additional revenue that could have been captured through proactive PM quotes being sent to the sample group by requoting expired quotations. Table 14 below shows the calculated, predicted additional revenue from rejected quotations when applied to the sample group.

Table 14: The Predicted Income of Proactive PM Quotations – Rejected Quotations

Hours	Qty	Travel	Total Per Modality	Rejected Total
1	0	0	$ -	
2	28	28	$ 14,235.65	
3	1	1	$ 644.42	
4	14	14	$ 10,925.88	
5	1	1	$ 916.42	
6	0	0	$ -	
Total	**44**			**$ 26,722.37**

Source: Author Own

It is evident from table 14 that an additional $ 26,722.37 was predicted as additional revenue that could have been captured through proactive PM quotes to the sample group where annual service quotes were rejected and requoted 6 months later.

The next section of the research will discuss the research results.

4.3. DISCUSSION OF THE RESEARCH RESULTS

This section reviewed the research findings and answered the research questions. The researcher assessed the accumulated revenue from table 12, 13 and 14 on a sample group level as well as a population group level in an attempt to answer the 4 research questions. Table 15 is a summary of the results.

Table 15 below reviewed the predicted accepted, expired, rejected and total revenue that the organisation in this research could have gained.

Table 15: The Predicted Accepted, Expired, Rejected and Total Profit

Income	Sample Group	Population Group	Percentage of the Target Revenue
Predicted Accepted	$ 248,327.24	$ 741,655.90	
Predicted Expired	$ 94,641.78	$ 282,657.81	
Predicted Rejected	$ 26,722.37	$ 79,809.22	
Total	$ 369,691.39	$ 1,104,122.94	
Contract Revenue		$ 9,037,965.58	58,7%
Non-Contract Revenue		$ 3,113,979.43	20,2%
Options & Upgrades Revenue		$ 3,021,062.04	19,6%
Organisational Total Revenue - 2022		$ 15,173,007.06	98,6%
Organisational Target Revenue - 2022		$ 15,391,842.32	
Predicted Accepted - Total Revenue		$ 15,914,662.96	103,4%
Predicted Expired - Total Revenue		$ 15,455,664.87	100,4%
Predicted Rejected - Total Revenue		$ 15,252,816.28	99,1%
Predicted Total Revenue - 2022		$ 16,277,130.00	105,8%

Source: Author Own

Table 15 concluded that there was predicted additional revenue to be made through proactive PM quotes to non-contract customers. When applied to the entire

population group (2007 devices) to assess the impact on the organisation's entire non-contract customer install base, it was predicted that the following revenues could have been made:

- Accepted quotations – $ 741,655.90
- Expired quotations - $ 282,657.81
- Rejected quotations - $ 79,809.22
- Total quotations - $ 1,104,122.94

The organisation achieved a total revenue for 2022 of $ 15,173,007.06 (98.6% of the target - $ 15,391,842.32). With the support of proactive quotes for PMs the organisation could have made an increased 7.2% on revenue, $ 16,277,130.00 (5.8% more than the target revenue). There is great evidence that proactive quotations for PMs would improve organisational revenue. The results are alined with (Jauhari *et al*., 2017 and Cong *et al.,* 2020), PCSD is crucial to customer satisfaction and is related to revenue generation. From table 15 it was evident that proactive PM quotes predicted an improved organisational revenue and the results answered research question 1, 2, 3 and 4; there is additional revenue to be captured through accepted, expired and rejected proactive PM quotations.

The entire organisational install base consisted of 3025 systems with 1018 on contract or under warranty while 2007 systems as billable non-contract systems. The minority of these 1018 systems (33.7% of the install base) generate 58.7% of the total revenue for the year of 2022 while the majority of the non-contract systems generate 20.2% of the revenue. It is evident that SLAs are very profitable and underutilised. With the support of proactive PM quotes the non-contract revenue would have increased by an additional 35.5% to $ 4,218,102.37.

The results of these proactive PM quotations to capture missed revenue, was further aligned with the literature from (Bumblauskas *et al.,* 2017; Patel, 2016; Buzby *et al*., 2002; Lee *et al*., 2022; Shin *et al*., 2017; Sehgal, 2020 and Ye, Lyu & He, 2019)

that focused on improving, automating and supporting certain aspects of the quotation process.

4.4. CONCLUSION

A multinomial logistic regression model was built that predicted the outcome of PM quotations for non-contract customers to capture additional revenue with an accuracy of 72.7%. The predicted outcome was applied to the sample group and the results were evaluated and successfully answered the 4 research questions. It is evident that proactive PM quotations for non-contract customers would have improved the organisation's revenue. The researcher is of the opinion that the organisation has room for improvement to convert more non-contract customer to contracts customer to improve their revenue.

The next chapter discussed the research results, conclusions, limitations, future research and recommendations. Chapter 5 is followed by the references and appendices.

5. CHAPTER 5 - RESEARCH CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1. INTRODUCTION

This chapter covers the conclusions, recommendations, limitations and future considerations of this research as derived from the previous chapters of this research. It reviews the research problem statement and methodology as well as the research objectives. Lastly this chapter conclude this research to support (Jolly *et al.,* 2019); the suggestions made to the field of expertise and the progress of the investigation are a crucial component of every research study.

5.2. CONCLUSION

5.2.1. CONCLUSIONS BASED ON THE PROBLEM STATEMENT

Customers prefer service providers to initiate the first contact to be proactive, (Shin *et al*., 2017). This suggests that many organizations are reactive, waiting for customers to initiate services rather than offering them proactively. This finding is supported by several studies, including those by (Sehgal & Gupta, 2020 and Ye, Lyu & He, 2019). While many of these studies highlight the benefits of proactive service delivery in various industries without specifically addressing the potential revenue from proactive quotations for planned maintenance, this research seeks to quantify the benefit of proactive PM quotations to non-contract customers to capture missed revenue.

Spring, Faulconbridge *et al.* (2022) found that automating or enhancing repetitive or low-value tasks can help firms perform better while providing professional services. Through an analysis of the effects of enhanced maintenance scheduling and engagement with non-contract customers on revenue streams, this study aimed to offer important insights into the viability, efficacy, and financial consequences of introducing proactive customer service delivery strategies on business operations in

the healthcare industry such as proactive PM quotations. As state in chapter 1, the research problem was identified as:

There is a lack of proactive quotations for planned maintenance of medical devices for non-contract customers thereby organisations are missing out on additional revenue.

Concluding the results have shown that there is a lack of proactive quotations for PM and organisations are missing out on revenue. It is proven that additional revenue could have been gained if a PCSD approach was adopted.

5.2.2. CONCLUSION ON THE RESEARCH QUESTIONS AND OBJECTIVES

It is evident that additional research is required pertaining to the incorporation of PCSD with CRM and ERP with the support and integration of BPM principles.

5.2.3. FINDINGS FROM RESEARCH QUESTION AND OBJECTIVE 1

The research question 1 was: Can proactive planned maintenance quotations to non-contract customers within the healthcare industry of South Africa provide additional revenue?

The corresponding objective was achieved by concluding that table 12 and 15, acknowledged that additional revenue can be made through proactive planned maintenance quotations for non-contract customers within the healthcare industry of South Africa. For the whole population group a total increase in revenue of $ 741,655.90 was predicted, confirming that objective 1 for this research was met through additional revenue creation.

5.2.4. FINDINGS FROM RESEARCH QUESTION AND OBJECTIVE 2

The research question 2 was: What effect would follow-up PM quotation have (six months after the initial quote) on revenue for customer systems that require only an annual PM but rejected the initial quotation?

The corresponding objective was achieved by concluding that table 14 and 15, confirmed a positive effect on revenue with follow up quotations for equipment that requires annual PMs, six months after the initial quotation was rejected. For the entire population group a total increase in revenue of $ 79,809.22 was predicted, confirming that objective 2 for this research was met with a positive impact on revenue improvement.

5.2.5. FINDINGS FROM RESEARCH QUESTION AND OBJECTIVE 3

The research question 3 was: What effect will proactive requoted expired quotations have on revenue?

The corresponding objective was achieved by concluding that table 13 and 15, reaffirms the improvement on revenue by proactively requoting customer on all expired quotations. For the population group in its entirety a total increase in revenue of $ 282,657.81 was predicted, confirming that objective 3 for this research was achieved through proactively requoting expired PM quotes.

5.2.6. FINDINGS FROM RESEARCH QUESTION AND OBJECTIVE 4

The research question 4 was: How can the additional revenue affect future financial results of the service division within this organisation based on the results for the year of 2022?

The corresponding objective was achieved by concluding that table 15, confirmed the magnitude of the predicted increased revenue streams on the annual financial target for this organisation's service division using year 2022 as a basis. For the entire population group a total increase in revenue of $ 1,104,122.94 was predicted, for accepted quotes, requoting expired quotes as well as requoting rejected quotes for systems that require an annual PM 6 months later; confirming that objective 4 for this research had a positive impact with a 7.2% increase on revenue and a 35.3% increase on non-contract revenue.

The results of the research on proactive PM quotations prove that organisations can capture missed revenue.

5.3. LIMITATIONS

It was identified that the research has the following limitations:

- Reactive data was used to generate the quotations for the predictive model; clients called and asked for quotes for PMs. Based on the ratio of accepted, rejected, and expired quotations, this offered some insight into the anticipated result; nevertheless, the results of these quotes were dependent on reactive service delivery data. This was done in light of the researcher's restricted resources in terms of time and scope, but it can serve as a starting point for longer-term research on proactive quotations in the future.
- Owing to restrictions and limitations, this study was limited to using data from the year of 2022. This produced a relatively small sample of 267 workable quotations, which may have an impact on the model's accuracy. These quotes were 100% relevant as they were only PM quotes however and they were all reactive as identified previously. Nevertheless, it can operate as a basis for further research to broaden the scope to proactive quotations over a longer timeframe.

- Since this data was taken from a certain time period, a number of macro- and microeconomic factors may have an impact on how the quotations turn out. The researcher strongly recommends that a comparable study be conducted at least every four to five years to confirm its accuracy in order for this study to be relevant with reliable data.
- Despite the fact that the demographic group is made up of the install equipment across the nation, this only applies to the equipment of one healthcare organization in South Africa. Furthermore, due to time constraints and limited access to international data, the study was only undertaken nationally rather than internationally. It also makes room for more research in the future.
- There may be some subjectivity because the researcher works for the organization. When developing the predictive model, the researcher solely employed quantitative data that is unaffected by outside influences in order to mitigate this risk.

5.4. RECOMMENDATIONS

Based on the finding of this study the following recommendations can be suggested:

- Proactive quotations can't be done without an effective operating CRM and ERP. Hence, organisations should reassess and align their internal value chain to change its focus towards generating value for customers through proactive tasks and service delivery with interdepartmental, CRM and ERP alignment through proactive BPM practices.
- Organisations need to consider automating monotonous low-skilled tasks such as generating quotations to free up skilled resources for skilled and challenging work. These automated tasked need to be geared towards proactive customer service delivery similar to proactive quotations for PM to capture missed revenue.

- It was identified in chapter 4 that SLAs / contracts are very profitable and in the case of this organisation, underutilised. Organisations need to adopt a proactive approach towards their SLAs to provide more value to customers to improve SLA adoption and revenue generation.
- Organisations should consider adopting and promoting culture improvement plans that train and educate staff with the necessary soft-skills and principles to change their behaviours and business approach from reactive to proactive, similar to proactive quotations for PMs.

5.5. FUTURE RESEARCH

This research identified numerous areas for future research:

- This research was limited to reactive data. The researcher would suggest conducting similar research but with proactive data over a longer period of time to assess the predictive model's accuracy using proactive data instead of reactive data.
- This research was limited to quantitative data. Qualitative studies on a similar topic can be considered, like:
    - Conducting both a qualitative and quantitative study to obtain customer insights and recommendations, as well as their feedback to help improve the model accuracy or to align business processes to create additional value for customers;
    - Identifying how PCSD and the change in system reliability will affect customer revenue.
- This quantitative study was very specific to proactive quotations for PM of non-contract customer. Similar quantitative studies can be considered, like:
    - Assessing the effect of proactive PMs on: the current field service team's utilization, customer satisfaction and additional revenue

originating from corrective work that would be identified during proactive PMs;
    - Reviewing how these proactive PMs will affect the equipment uptime and downtime for contractual obligations and system reliability and performance.
- This study was limited to a single organisation within a single business sector in one country. The researcher would suggest to consider expanding this study to other business processes, organisations, business sectors and even international markets to assess the impact of PCSD and business process improvements.
- Due to time constraints this study was limited to a smaller quotation sample group for the predictive model. The quotations sample group can be increased to identify if there are additional variables that might me more significant to provide more accurate predictions.
- This process of PM quotations is currently a manual process within the organisation of this research. It might be worth assessing the financial feasibility to automate these and similar monotonous low-activity tasks using AI to allow highly qualified staff to focus their skills on more critical tasks. A parallel study can be done to assess the process improvement after it's been automated.

5.6. CONCLUSION

This research was undertaken to identify if there is additional revenue to be captured through proactive PM quotations for non-contract customers. The study was conducted within the service division of an organisation in South Africa, in the healthcare sector. The main objectives were to assess the impact that proactive PM quotation have on revenue. It further aimed to identify if additional revenue could be captured by proactively requoting expired and rejected quotations. The findings concluded that additional revenue can be made.

The findings will will assist senior management within various departments to implement corrective measure and initiatives to transition the organisation from a reactive business model to a proactive approach. The results will provide guidance on revenue capture, customer satisfaction opportunities and business improvement ideas. In closure, this research answered the research questions and supports the principle of proactivity throughout the entire organisation.

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7. APPENDICES

7.1. APPENDIX A: THE PREDICTED MULTINOMIAL LOGISTIC REGRESSION MODEL RESULTS

Parameter Estimates							
Status[a]		B	Std. Error	Wald	df	Sig.	Exp(B)
Accepted	Hours	-1,253	1,003	1,560	1	0,212	0,286
	[Price=60,00]	20,624	4099,901	0,000	1	0,996	905513627,629
	[Price=63,00]	49,367	2690,891	0,000	1	0,985	2752162388864500000000,000
	[Price=107,00]	84,006	8739,905	0,000	1	0,992	3044453477850700000000000000000000000,000
	[Price=109,00]	34,175	8377,183	0,000	1	0,997	694779316138575,000
	[Price=115,00]	82,524	4164,611	0,000	1	0,984	691265119301511000000000000000000000000,000
	[Price=135,00]	84,006	8739,905	0,000	1	0,992	3044453477850740000000000000000000000,000
	[Price=140,00]	84,006	8739,905	0,000	1	0,992	3044453477850700000000000000000000000,000
	[Price=143,00]	66,261	2,204	903,673	1	0,000	597842999511270000000000000000,000
	[Price=153,00]	65,162	2,351	768,503	1	0,000	199280999837405000000000000000,000
	[Price=168,00]	84,006	8739,905	0,000	1	0,992	3044453477850740000000000000000000000,000

	[Price=169,00]	49,482	9041,219	0,000	1	0,996	3088450228831820000000,000
	[Price=204,00]	64,637	2,013	1030,588	1	0,000	11795189389024900000000000000,000
	[Price=207,00]	66,548	2,047	1056,509	1	0,000	797123999349600000000000000000,000
	[Price=214,00]	21,622	9155,293	0,000	1	0,998	2455651775,954
	[Price=217,00]	66,037	2,051	1036,232	1	0,000	47827439960977100000000000000,000
	[Price=221,00]	15,685	9041,219	0,000	1	0,999	6485926,587
	[Price=225,00]	84,006	8739,905	0,000	1	0,992	3044453477850650000000000000000000000,000
	[Price=253,00]	84,006	8739,905	0,000	1	0,992	30444534778507000000000000000000000000,000
	[Price=258,00]	47,704	8739,906	0,000	1	0,996	5217740022650120000000,000
	[Price=266,00]	47,704	8739,906	0,000	1	0,996	521774002265008000000,000
	[Price=268,00]	48,784	3601,278	0,000	1	0,989	1536571554102240000000,000
	[Price=274,00]	51,988	5551,547	0,000	1	0,993	378441656137232000000000,000
	[Price=286,00]	65,855	12360,093	0,000	1	0,996	39856199967481600000000000000,000
	[Price=289,00]	34,589	2314,670	0,000	1	0,988	1051897587531850,000

	[Price=300,00]	84,006	8739,905	0,000	1	0,992	3044453477850700000000000000000000000,000
	[Price=308,00]	84,006	8739,905	0,000	1	0,992	30444534778506500000000000000000000000,000
	[Price=318,00]	65,855	2,455	719,801	1	0,000	3985619996748110000000000000000,000
	[Price=324,00]	51,988	9041,219	0,000	1	0,995	378441656137240000000000,000
	[Price=327,00]	51,492	6444,923	0,000	1	0,994	23045012607027800000000,000
	[Price=338,00]	50,735	9041,219	0,000	1	0,996	10811097166784300000000,000
	[Price=341,00]	21,622	9155,293	0,000	1	0,998	2455651775,954
	[Price=350,00]	65,855	12360,093	0,000	1	0,996	3985619996748050000000000000000,000
	[Price=376,00]	50,735	9041,219	0,000	1	0,996	10811097166784500000000,000
	[Price=377,00]	65,855	12360,093	0,000	1	0,996	3985619996748110000000000000000,000
	[Price=395,00]	47,704	8739,906	0,000	1	0,996	5217740022650150000000,000
	[Price=396,00]	65,855	12360,093	0,000	1	0,996	3985619996748160000000000000000,000
	[Price=401,00]	66,671	3575,881	0,000	1	0,985	900819621056075000000000000000,000
	[Price=413,00]	48,540	3321,939	0,000	1	0,988	1203903345135020000000,000

	[Price=423,00]	49,186	4164,611	0,000	1	0,991	22979847052500700000000,000
	[Price=433,00]	65,855	12360,093	0,000	1	0,996	3985619996748160000000000000000,000
	[Price=445,00]	47,704	8739,906	0,000	1	0,996	5217740022650190000000,000
	[Price=447,00]	16,096	3308,471	0,000	1	0,996	9778006,844
	[Price=451,00]	51,988	9041,219	0,000	1	0,995	378441656137243000000000,000
	[Price=460,00]	65,855	2,242	863,042	1	0,000	3985619996748110000000000000000,000
	[Price=470,00]	84,006	8739,905	0,000	1	0,992	3044453477850700000000000000000000000000,000
	[Price=474,00]	16,320	4656,270	0,000	1	0,997	12241667,335
	[Price=482,00]	51,988	9041,219	0,000	1	0,995	378441656137251000000000,000
	[Price=485,00]	53,702	4620,681	0,000	1	0,991	2100264318556760000000000,000
	[Price=493,00]	47,704	8739,906	0,000	1	0,996	5217740022650190000000,000
	[Price=514,00]	33,185	2314,670	0,000	1	0,989	258380573783310,000
	[Price=515,00]	65,855	12360,093	0,000	1	0,996	3985619996748110000000000000000,000
	[Price=556,00]	47,704	8739,906	0,000	1	0,996	5217740022650190000000,000

	[Price=577,00]	19,359	2565,311	0,000	1	0,994	255501823,811
	[Price=581,00]	55,173	9582,784	0,000	1	0,995	9146421526564420000000000,000
	[Price=597,00]	16,428	3865,856	0,000	1	0,997	13633943,066
	[Price=615,00]	15,685	9041,219	0,000	1	0,999	6485926,587
	[Price=624,00]	84,006	8739,905	0,000	1	0,992	3044453477850650000000000000000000000,000
	[Price=627,00]	65,855	12360,093	0,000	1	0,996	3985619996748160000000000000000,000
	[Price=633,00]	16,747	3482,855	0,000	1	0,996	18762057,835
	[Price=636,00]	65,855	12360,093	0,000	1	0,996	39856199967481100000000000000000,000
	[Price=637,00]	19,819	9764,952	0,000	1	0,998	404654397,152
	[Price=674,00]	15,685	9041,219	0,000	1	0,999	6485926,587
	[Price=678,00]	-16,484	9764,952	0,000	1	0,999	6,935E-08
	[Price=711,00]	33,836	12574,959	0,000	1	0,998	495433628162357,000
	[Price=738,00]	51,988	9041,219	0,000	1	0,995	378441656137240000000000,000
	[Price=749,00]	14,432	9041,219	0,000	1	0,999	1852861,106

	[Price=768,00]	16,364	9582,784	0,000	1	0,999	12792810,876
	[Price=776,00]	-10,634	2825,382	0,000	1	0,997	2,409E-05
	[Price=782,00]	19,819	7560,510	0,000	1	0,998	404654397,152
	[Price=823,00]	18,191	9041,220	0,000	1	0,998	79474966,967
	[Price=858,00]	-16,484	9764,952	0,000	1	0,999	6,935E-08
	[Price=888,00]	15,685	9041,219	0,000	1	0,999	6485926,587
	[Price=915,00]	15,685	9041,219	0,000	1	0,999	6485926,587
	[Price=921,00]	84,006	8739,905	0,000	1	0,992	3044453477850740000000000000000000000,000
	[Price=965,00]	17,582	3329,519	0,000	1	0,996	43246627,543
	[Price=993,00]	49,779	4786,156	0,000	1	0,992	415765423848238000000,000
	[Price=1007,00]	3,667	8745,141	0,000	1	1,000	39,115
	[Price=1010,00]	36,342	12574,959	0,000	1	0,998	6070770414155260,000
	[Price=1014,00]	25,669	8739,907	0,000	1	0,998	140536274023,597
	[Price=1028,00]	51,988	9041,219	0,000	1	0,995	378441656137243000000000,000

	[Price=1038,00]	-16,484	9764,952	0,000	1	0,999	6,935E-08
	[Price=1053,00]	33,836	12574,959	0,000	1	0,998	495433628162357,000
	[Price=1067,00]	-14,607	5536,811	0,000	1	0,998	4,532E-07
	[Price=1146,00]	22,875	9155,293	0,000	1	0,998	8595990866,158
	[Price=1204,00]	15,685	9041,219	0,000	1	0,999	6485926,587
	[Price=1268,00]	19,819	9764,952	0,000	1	0,998	404654397,152
	[Price=1290,00]	22,875	9155,293	0,000	1	0,998	8595990866,158
	[Price=1411,00]	1,667	13104,970	0,000	1	1,000	5,297
	[Price=1482,00]	22,875	9155,293	0,000	1	0,998	8595990866,158
	[Price=1553,00]	-13,428	9155,294	0,000	1	0,999	1,473E-06
	[Price=1900,00]	15,685	9041,219	0,000	1	0,999	6485926,587
	[Price=2014,00]	-16,484	9764,952	0,000	1	0,999	6,935E-08
	[Price=2967,00]	-16,484	9764,952	0,000	1	0,999	6,935E-08
	[Price=3411,00]	51,988	9041,219	0,000	1	0,995	378441656137243000000000,000

	[Price=4302,00]	47,704	8739,906	0,000	1	0,996	5217740022650190000000,000
	[Price=4875,00]	51,988	9041,219	0,000	1	0,995	3784416561372430000000000,000
	[Income=1839,00]	-63,349	0,000		1		3,074E-28
	[Income=3555,40]	-32,010	3929,859	0,000	1	0,994	1,254E-14
	[Income=3984,50]	-28,825	2314,671	0,000	1	0,990	3,031E-13
	[Income=8214,20]	1,541	2726,437	0,000	1	1,000	4,670
	[Income=14712,00]	4,597	4355,268	0,000	1	0,999	99,214
	[Income=15141,10]	0[c]			0		
Rejected	Hours	0,741	0,658	1,271	1	0,259	2,099
	[Price=60,00]	-21,011	4369,955	0,000	1	0,996	7,499E-10
	[Price=63,00]	-22,037	4369,956	0,000	1	0,996	2,688E-10
	[Price=107,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10

	[Price=109,00]	-2,865	7346,009	0,000	1	1,000	0,057
	[Price=115,00]	-5,774	6036,596	0,000	1	0,999	0,003
	[Price=135,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10
	[Price=140,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10
	[Price=143,00]	-23,136	4369,956	0,000	1	0,996	8,960E-11
	[Price=153,00]	-39,514	5662,659	0,000	1	0,994	6,909E-18
	[Price=168,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10
	[Price=169,00]	-18,954	13109,858	0,000	1	0,999	5,865E-09
	[Price=204,00]	-23,514	4369,956	0,000	1	0,996	6,136E-11
	[Price=207,00]	-21,932	4369,955	0,000	1	0,996	2,987E-10
	[Price=214,00]	-4,907	13541,457	0,000	1	1,000	0,007
	[Price=217,00]	-23,359	4369,956	0,000	1	0,996	7,168E-11
	[Price=221,00]	-38,588	9771,512	0,000	1	0,997	1,743E-17
	[Price=225,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10

	[Price=253,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10
	[Price=258,00]	-40,594	9771,513	0,000	1	0,997	2,346E-18
	[Price=266,00]	-40,594	9771,513	0,000	1	0,997	2,346E-18
	[Price=268,00]	-23,136	4369,956	0,000	1	0,996	8,960E-11
	[Price=274,00]	-20,437	8367,823	0,000	1	0,998	1,331E-09
	[Price=286,00]	-4,291	9771,512	0,000	1	1,000	0,014
	[Price=289,00]	-20,408	4369,954	0,000	1	0,996	1,370E-09
	[Price=300,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10
	[Price=308,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10
	[Price=318,00]	-39,111	6036,596	0,000	1	0,995	1,033E-17
	[Price=324,00]	-20,437	13109,858	0,000	1	0,999	1,331E-09
	[Price=327,00]	-20,274	9490,538	0,000	1	0,998	1,567E-09
	[Price=338,00]	-19,696	13109,858	0,000	1	0,999	2,795E-09
	[Price=341,00]	-4,907	13541,457	0,000	1	1,000	0,007

	[Price=350,00]	-4,291	9771,512	0,000	1	1,000	0,014
	[Price=376,00]	-19,696	13109,858	0,000	1	0,999	2,795E-09
	[Price=377,00]	-4,291	9771,512	0,000	1	1,000	0,014
	[Price=395,00]	-40,594	9771,513	0,000	1	0,997	2,346E-18
	[Price=396,00]	-4,291	9771,512	0,000	1	1,000	0,014
	[Price=401,00]	-6,406	5320,954	0,000	1	0,999	0,002
	[Price=413,00]	-23,541	4369,956	0,000	1	0,996	5,973E-11
	[Price=423,00]	-22,443	4369,956	0,000	1	0,996	1,792E-10
	[Price=433,00]	-4,291	9771,512	0,000	1	1,000	0,014
	[Price=445,00]	-40,594	9771,513	0,000	1	0,997	2,346E-18
	[Price=447,00]	-21,167	4369,954	0,000	1	0,996	6,419E-10
	[Price=451,00]	-20,437	13109,858	0,000	1	0,999	1,331E-09
	[Price=460,00]	-39,111	5269,583	0,000	1	0,994	1,033E-17
	[Price=470,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10

	[Price=474,00]	-20,066	4369,954	0,000	1	0,996	1,929E-09
	[Price=482,00]	-20,437	13109,858	0,000	1	0,999	1,331E-09
	[Price=485,00]	-21,785	7065,877	0,000	1	0,998	3,459E-10
	[Price=493,00]	-40,594	9771,513	0,000	1	0,997	2,346E-18
	[Price=514,00]	-22,302	4369,954	0,000	1	0,996	2,062E-10
	[Price=515,00]	-4,291	9771,512	0,000	1	1,000	0,014
	[Price=556,00]	-40,594	9771,513	0,000	1	0,997	2,346E-18
	[Price=577,00]	-21,657	4369,955	0,000	1	0,996	3,933E-10
	[Price=581,00]	-24,359	13109,859	0,000	1	0,999	2,637E-11
	[Price=597,00]	-22,569	4369,955	0,000	1	0,996	1,578E-10
	[Price=615,00]	-38,588	9771,512	0,000	1	0,997	1,743E-17
	[Price=624,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10
	[Price=627,00]	-4,291	9771,512	0,000	1	1,000	0,014
	[Price=633,00]	-21,575	4369,954	0,000	1	0,996	4,269E-10

	[Price=636,00]	-4,291	9771,512	0,000	1	1,000	0,014
	[Price=637,00]	-39,349	14972,930	0,000	1	0,998	8,142E-18
	[Price=674,00]	-38,588	9771,512	0,000	1	0,997	1,743E-17
	[Price=678,00]	-57,501	12157,413	0,000	1	0,996	1,066E-25
	[Price=711,00]	-2,286	9771,512	0,000	1	1,000	0,102
	[Price=738,00]	-20,437	13109,858	0,000	1	0,999	1,331E-09
	[Price=749,00]	-37,847	9771,512	0,000	1	0,997	3,658E-17
	[Price=768,00]	-41,027	9771,512	0,000	1	0,997	1,521E-18
	[Price=776,00]	-22,600	4369,955	0,000	1	0,996	1,531E-10
	[Price=782,00]	-39,349	12157,413	0,000	1	0,997	8,142E-18
	[Price=823,00]	-40,071	9771,513	0,000	1	0,997	3,957E-18
	[Price=858,00]	-57,501	12157,413	0,000	1	0,996	1,066E-25
	[Price=888,00]	-38,588	9771,512	0,000	1	0,997	1,743E-17
	[Price=915,00]	-38,588	9771,512	0,000	1	0,997	1,743E-17

	[Price=921,00]	-22,443	13109,859	0,000	1	0,999	1,792E-10
	[Price=965,00]	-39,869	8769,679	0,000	1	0,996	4,844E-18
	[Price=993,00]	-3,497	6053,602	0,000	1	1,000	0,030
	[Price=1007,00]	-21,178	4369,955	0,000	1	0,996	6,343E-10
	[Price=1010,00]	-3,769	9771,512	0,000	1	1,000	0,023
	[Price=1014,00]	-4,449	12360,093	0,000	1	1,000	0,012
	[Price=1028,00]	-20,437	13109,858	0,000	1	0,999	1,331E-09
	[Price=1038,00]	-57,501	12157,413	0,000	1	0,996	1,066E-25
	[Price=1053,00]	-2,286	9771,512	0,000	1	1,000	0,102
	[Price=1067,00]	-56,051	9452,365	0,000	1	0,995	4,541E-25
	[Price=1146,00]	-5,649	13541,457	0,000	1	1,000	0,004
	[Price=1204,00]	-38,588	9771,512	0,000	1	0,997	1,743E-17
	[Price=1268,00]	-39,349	14972,930	0,000	1	0,998	8,142E-18
	[Price=1290,00]	-5,649	13541,457	0,000	1	1,000	0,004

	[Price=1411,00]	-21,198	12157,413	0,000	1	0,999	6,219E-10
	[Price=1482,00]	-5,649	13541,457	0,000	1	1,000	0,004
	[Price=1553,00]	-23,800	10343,361	0,000	1	0,998	4,611E-11
	[Price=1900,00]	-38,588	9771,512	0,000	1	0,997	1,743E-17
	[Price=2014,00]	-57,501	12157,413	0,000	1	0,996	1,066E-25
	[Price=2967,00]	-57,501	12157,413	0,000	1	0,996	1,066E-25
	[Price=3411,00]	-20,437	13109,858	0,000	1	0,999	1,331E-09
	[Price=4302,00]	-40,594	9771,513	0,000	1	0,997	2,346E-18
	[Price=4875,00]	-20,437	13109,858	0,000	1	0,999	1,331E-09
	[Income=1839,00]	20,960	4369,954	0,000	1	0,996	1266692506,126
	[Income=3555,40]	21,393	4369,954	0,000	1	0,996	1954113893,524
	[Income=3984,50]	17,471	4369,953	0,000	1	0,997	38699899,214

	[Income=8214,20]	1,941	5531,650	0,000	1	1,000	6,969
	[Income=14712,00]	35,642	8450,843	0,000	1	0,997	3015018860430980,000
	[Income=15141,10]	0[c]			0		
a. The reference category is: Expired.							
b. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.							
c. This parameter is set to zero because it is redundant.							

Parameter Estimates			
Status[a]		95% Confidence Interval for Exp(B)	
		Lower Bound	Upper Bound
Accepted	Hours	0,040	2,041
	[Price=60,00]	0,000	.[b]
	[Price=63,00]	0,000	.[b]
	[Price=107,00]	0,000	.[b]
	[Price=109,00]	0,000	.[b]
	[Price=115,00]	0,000	.[b]
	[Price=135,00]	0,000	.[b]
	[Price=140,00]	0,000	.[b]
	[Price=143,00]	795016976964779000000000000,000	44957059084345100000000000000000,000
	[Price=153,00]	198914760500793000000000000,000	19964791348924300000000000000000,000
	[Price=168,00]	0,000	.[b]
	[Price=169,00]	0,000	.[b]

	[Price=204,00]	227954921896409000000000000,000	610324583323497000000000000000,000
	[Price=207,00]	144140960737989000000000000,000	440823113073394000000000000000,000
	[Price=214,00]	0,000	.[b]
	[Price=217,00]	857980690521361000000000000,000	266610197466202000000000000000,000
	[Price=221,00]	0,000	.[b]
	[Price=225,00]	0,000	.[b]
	[Price=253,00]	0,000	.[b]
	[Price=258,00]	0,000	.[b]
	[Price=266,00]	0,000	.[b]
	[Price=268,00]	0,000	.[b]
	[Price=274,00]	0,000	.[b]
	[Price=286,00]	0,000	.[b]
	[Price=289,00]	0,000	.[b]
	[Price=300,00]	0,000	.[b]

	[Price=308,00]	0,000	.[b]
	[Price=318,00]	32443342974278100000000000,000	48962792678524300000000000000000,000
	[Price=324,00]	0,000	.[b]
	[Price=327,00]	0,000	.[b]
	[Price=338,00]	0,000	.[b]
	[Price=341,00]	0,000	.[b]
	[Price=350,00]	0,000	.[b]
	[Price=376,00]	0,000	.[b]
	[Price=377,00]	0,000	.[b]
	[Price=395,00]	0,000	.[b]
	[Price=396,00]	0,000	.[b]
	[Price=401,00]	0,000	.[b]
	[Price=413,00]	0,000	.[b]
	[Price=423,00]	0,000	.[b]

	[Price=433,00]	0,000	.[b]
	[Price=445,00]	0,000	.[b]
	[Price=447,00]	0,000	.[b]
	[Price=451,00]	0,000	.[b]
	[Price=460,00]	492464937086729000000000000,000	3225644215900940000000000000000,000
	[Price=470,00]	0,000	.[b]
	[Price=474,00]	0,000	.[b]
	[Price=482,00]	0,000	.[b]
	[Price=485,00]	0,000	.[b]
	[Price=493,00]	0,000	.[b]
	[Price=514,00]	0,000	.[b]
	[Price=515,00]	0,000	.[b]
	[Price=556,00]	0,000	.[b]
	[Price=577,00]	0,000	.[b]

	[Price=581,00]	0,000	.[b]
	[Price=597,00]	0,000	.[b]
	[Price=615,00]	0,000	.[b]
	[Price=624,00]	0,000	.[b]
	[Price=627,00]	0,000	.[b]
	[Price=633,00]	0,000	.[b]
	[Price=636,00]	0,000	.[b]
	[Price=637,00]	0,000	.[b]
	[Price=674,00]	0,000	.[b]
	[Price=678,00]	0,000	.[b]
	[Price=711,00]	0,000	.[b]
	[Price=738,00]	0,000	.[b]
	[Price=749,00]	0,000	.[b]
	[Price=768,00]	0,000	.[b]

	[Price=776,00]	0,000	.[b]
	[Price=782,00]	0,000	.[b]
	[Price=823,00]	0,000	.[b]
	[Price=858,00]	0,000	.[b]
	[Price=888,00]	0,000	.[b]
	[Price=915,00]	0,000	.[b]
	[Price=921,00]	0,000	.[b]
	[Price=965,00]	0,000	.[b]
	[Price=993,00]	0,000	.[b]
	[Price=1007,00]	0,000	.[b]
	[Price=1010,00]	0,000	.[b]
	[Price=1014,00]	0,000	.[b]
	[Price=1028,00]	0,000	.[b]
	[Price=1038,00]	0,000	.[b]

	[Price=1053,00]	0,000	.[b]
	[Price=1067,00]	0,000	.[b]
	[Price=1146,00]	0,000	.[b]
	[Price=1204,00]	0,000	.[b]
	[Price=1268,00]	0,000	.[b]
	[Price=1290,00]	0,000	.[b]
	[Price=1411,00]	0,000	.[b]
	[Price=1482,00]	0,000	.[b]
	[Price=1553,00]	0,000	.[b]
	[Price=1900,00]	0,000	.[b]
	[Price=2014,00]	0,000	.[b]
	[Price=2967,00]	0,000	.[b]
	[Price=3411,00]	0,000	.[b]
	[Price=4302,00]	0,000	.[b]

	[Price=4875,00]	0,000	.[b]
	[Income=1839,00]	3,074E-28	3,074E-28
	[Income=3555,40]	0,000	.[b]
	[Income=3984,50]	0,000	.[b]
	[Income=8214,20]	0,000	.[b]
	[Income=14712,00]	0,000	.[b]
	[Income=15141,10]		
Rejected	Hours	0,579	7,615
	[Price=60,00]	0,000	.[b]
	[Price=63,00]	0,000	.[b]
	[Price=107,00]	0,000	.[b]
	[Price=109,00]	0,000	.[b]

	[Price=115,00]	0,000	.[b]
	[Price=135,00]	0,000	.[b]
	[Price=140,00]	0,000	.[b]
	[Price=143,00]	0,000	.[b]
	[Price=153,00]	0,000	.[b]
	[Price=168,00]	0,000	.[b]
	[Price=169,00]	0,000	.[b]
	[Price=204,00]	0,000	.[b]
	[Price=207,00]	0,000	.[b]
	[Price=214,00]	0,000	.[b]
	[Price=217,00]	0,000	.[b]
	[Price=221,00]	0,000	.[b]
	[Price=225,00]	0,000	.[b]
	[Price=253,00]	0,000	.[b]

	[Price=258,00]	0,000	.[b]
	[Price=266,00]	0,000	.[b]
	[Price=268,00]	0,000	.[b]
	[Price=274,00]	0,000	.[b]
	[Price=286,00]	0,000	.[b]
	[Price=289,00]	0,000	.[b]
	[Price=300,00]	0,000	.[b]
	[Price=308,00]	0,000	.[b]
	[Price=318,00]	0,000	.[b]
	[Price=324,00]	0,000	.[b]
	[Price=327,00]	0,000	.[b]
	[Price=338,00]	0,000	.[b]
	[Price=341,00]	0,000	.[b]
	[Price=350,00]	0,000	.[b]

	[Price=376,00]	0,000	.[b]
	[Price=377,00]	0,000	.[b]
	[Price=395,00]	0,000	.[b]
	[Price=396,00]	0,000	.[b]
	[Price=401,00]	0,000	.[b]
	[Price=413,00]	0,000	.[b]
	[Price=423,00]	0,000	.[b]
	[Price=433,00]	0,000	.[b]
	[Price=445,00]	0,000	.[b]
	[Price=447,00]	0,000	.[b]
	[Price=451,00]	0,000	.[b]
	[Price=460,00]	0,000	.[b]
	[Price=470,00]	0,000	.[b]
	[Price=474,00]	0,000	.[b]

	[Price=482,00]	0,000	.[b]
	[Price=485,00]	0,000	.[b]
	[Price=493,00]	0,000	.[b]
	[Price=514,00]	0,000	.[b]
	[Price=515,00]	0,000	.[b]
	[Price=556,00]	0,000	.[b]
	[Price=577,00]	0,000	.[b]
	[Price=581,00]	0,000	.[b]
	[Price=597,00]	0,000	.[b]
	[Price=615,00]	0,000	.[b]
	[Price=624,00]	0,000	.[b]
	[Price=627,00]	0,000	.[b]
	[Price=633,00]	0,000	.[b]
	[Price=636,00]	0,000	.[b]

	[Price=637,00]	0,000	.[b]
	[Price=674,00]	0,000	.[b]
	[Price=678,00]	0,000	.[b]
	[Price=711,00]	0,000	.[b]
	[Price=738,00]	0,000	.[b]
	[Price=749,00]	0,000	.[b]
	[Price=768,00]	0,000	.[b]
	[Price=776,00]	0,000	.[b]
	[Price=782,00]	0,000	.[b]
	[Price=823,00]	0,000	.[b]
	[Price=858,00]	0,000	.[b]
	[Price=888,00]	0,000	.[b]
	[Price=915,00]	0,000	.[b]
	[Price=921,00]	0,000	.[b]

	[Price=965,00]	0,000	.[b]
	[Price=993,00]	0,000	.[b]
	[Price=1007,00]	0,000	.[b]
	[Price=1010,00]	0,000	.[b]
	[Price=1014,00]	0,000	.[b]
	[Price=1028,00]	0,000	.[b]
	[Price=1038,00]	0,000	.[b]
	[Price=1053,00]	0,000	.[b]
	[Price=1067,00]	0,000	.[b]
	[Price=1146,00]	0,000	.[b]
	[Price=1204,00]	0,000	.[b]
	[Price=1268,00]	0,000	.[b]
	[Price=1290,00]	0,000	.[b]
	[Price=1411,00]	0,000	.[b]

	[Price=1482,00]	0,000	.[b]
	[Price=1553,00]	0,000	.[b]
	[Price=1900,00]	0,000	.[b]
	[Price=2014,00]	0,000	.[b]
	[Price=2967,00]	0,000	.[b]
	[Price=3411,00]	0,000	.[b]
	[Price=4302,00]	0,000	.[b]
	[Price=4875,00]	0,000	.[b]
	[Income=1839,00]	0,000	.[b]
	[Income=3555,40]	0,000	.[b]
	[Income=3984,50]	0,000	.[b]
	[Income=8214,20]	0,000	.[b]

	[Income=14712,00]	0,000	.[b]
	[Income=15141,10]		
a. The reference category is: Expired.			
b. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.			
c. This parameter is set to zero because it is redundant.			

7.2. APPENDIX B: THE PREDICTED QUOTATIONS STATUS BASED ON PM HOURS, INCOME AND QUOTATION PRICE

Observed and Predicted Frequencies								
Hours				Frequency			Percentage	
				Observed	Predicted	Pearson Residual	Observed	Predicted
1,00	1839,00	204,00	Accepted	0	0,471	-0,944	0,0%	47,1%
			Expired	1	0,455	1,095	100,0%	45,5%
			Rejected	0	0,074	-0,283	0,0%	7,4%
		776,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	2	1,421	0,902	100,0%	71,1%
			Rejected	0	0,579	-0,902	0,0%	28,9%
2,00	1839,00	60,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,579	-0,847	0,0%	19,3%
			Rejected	3	2,421	0,847	100,0%	80,7%
		63,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	2	2,000	0,000	40,0%	40,0%
			Rejected	3	3,000	0,000	60,0%	60,0%
		107,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		115,00	Accepted	1	1,000	0,000	50,0%	50,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	50,0%	50,0%
		135,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%

		140,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		143,00	Accepted	3	3,000	0,000	50,0%	50,0%
			Expired	2	2,000	0,000	33,3%	33,3%
			Rejected	1	1,000	0,000	16,7%	16,7%
		153,00	Accepted	1	1,000	0,000	33,3%	33,3%
			Expired	2	2,000	0,000	66,7%	66,7%
			Rejected	0	0,000	0,000	0,0%	0,0%
		168,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		204,00	Accepted	3	2,529	0,327	21,4%	18,1%
			Expired	8	8,545	-0,299	57,1%	61,0%
			Rejected	3	2,926	0,049	21,4%	20,9%
		207,00	Accepted	18	18,000	0,000	42,9%	42,9%
			Expired	9	9,000	0,000	21,4%	21,4%
			Rejected	15	15,000	0,000	35,7%	35,7%
		217,00	Accepted	12	12,000	0,000	46,2%	46,2%
			Expired	10	10,000	0,000	38,5%	38,5%
			Rejected	4	4,000	0,000	15,4%	15,4%
		225,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		253,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		258,00	Accepted	0	0,000	0,000	0,0%	0,0%

			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		266,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		268,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	2	2,000	0,000	66,7%	66,7%
			Rejected	1	1,000	0,000	33,3%	33,3%
		286,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		300,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		308,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		318,00	Accepted	1	1,000	0,000	50,0%	50,0%
			Expired	1	1,000	0,000	50,0%	50,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		350,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		377,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		395,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%

			Rejected	0	0,000	0,000	0,0%	0,0%
		396,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		401,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,001	100,0%	100,0%
		413,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	3	3,000	0,000	75,0%	75,0%
			Rejected	1	1,000	0,000	25,0%	25,0%
		423,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	50,0%	50,0%
			Rejected	1	1,000	0,000	50,0%	50,0%
		433,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		445,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		460,00	Accepted	2	2,000	0,000	50,0%	50,0%
			Expired	2	2,000	0,000	50,0%	50,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		470,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		493,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%

		515,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		556,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		624,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		627,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		636,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		921,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		4302,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
	3555,40	60,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,134	-0,394	0,0%	13,4%
			Rejected	1	0,866	0,394	100,0%	86,6%
		577,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,228	-0,543	0,0%	22,8%
			Rejected	1	0,772	0,543	100,0%	77,2%
		597,00	Accepted	0	0,000	0,000	0,0%	0,0%

			Expired	1	0,424	1,166	100,0%	42,4%
			Rejected	0	0,576	-1,166	0,0%	57,6%
		633,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,214	-0,522	0,0%	21,4%
			Rejected	1	0,786	0,522	100,0%	78,6%
		768,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
	3984,50	169,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		289,00	Accepted	1	0,955	0,218	100,0%	95,5%
			Expired	0	0,037	-0,195	0,0%	3,7%
			Rejected	0	0,009	-0,093	0,0%	0,9%
3,00	3984,50	327,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		338,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		376,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		447,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,626	-1,137	50,0%	81,3%
			Rejected	1	0,374	1,137	50,0%	18,7%
		474,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	0,592	0,831	100,0%	59,2%

			Rejected	0	0,408	-0,831	0,0%	40,8%
		514,00	Accepted	2	1,889	0,133	66,7%	63,0%
			Expired	1	1,035	-0,042	33,3%	34,5%
			Rejected	0	0,076	-0,280	0,0%	2,5%
		749,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		993,00	Accepted	1	0,730	0,607	100,0%	73,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,269	-0,607	0,0%	26,9%
4,00	3555,40	581,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1067,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	2	2,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
	3984,50	109,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		221,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		274,00	Accepted	3	3,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		289,00	Accepted	2	2,045	-0,045	50,0%	51,1%
			Expired	1	0,963	0,043	25,0%	24,1%
			Rejected	1	0,991	0,010	25,0%	24,8%

		324,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		327,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		401,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		447,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	4	3,374	0,598	80,0%	67,5%
			Rejected	1	1,626	-0,598	20,0%	32,5%
		451,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		474,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,408	-0,831	0,0%	40,8%
			Rejected	1	0,592	0,831	100,0%	59,2%
		482,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		485,00	Accepted	2	2,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		514,00	Accepted	3	3,111	-0,076	30,0%	31,1%
			Expired	6	5,965	0,022	60,0%	59,7%
			Rejected	1	0,924	0,083	10,0%	9,2%
		577,00	Accepted	0	0,000	-0,001	0,0%	0,0%

			Expired	1	0,772	0,543	100,0%	77,2%
			Rejected	0	0,228	-0,543	0,0%	22,8%
		597,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	3	3,576	-0,936	75,0%	89,4%
			Rejected	1	0,424	0,936	25,0%	10,6%
		615,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		633,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	4	3,786	0,223	80,0%	75,7%
			Rejected	1	1,214	-0,223	20,0%	24,3%
		674,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		711,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		738,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		776,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	3	3,587	-0,966	75,0%	89,7%
			Rejected	1	0,413	0,966	25,0%	10,3%
		888,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		915,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%

			Rejected	0	0,000	0,000	0,0%	0,0%
		965,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	2	2,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		993,00	Accepted	0	0,269	-0,607	0,0%	26,9%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	0,730	0,607	100,0%	73,0%
		1007,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	0,677	0,690	100,0%	67,7%
			Rejected	0	0,323	-0,690	0,0%	32,3%
		1028,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1053,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		1204,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1900,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		3411,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		4875,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%

	8214,20	214,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		341,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
5,00	8214,20	577,00	Accepted	1	1,000	0,001	100,0%	100,0%
			Expired	0	0,000	-0,001	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		776,00	Accepted	0	0,000	-0,001	0,0%	0,0%
			Expired	2	2,000	0,001	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1146,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1290,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1482,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1553,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
	14712,00	637,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		678,00	Accepted	0	0,000	0,000	0,0%	0,0%

			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		782,00	Accepted	2	2,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		858,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		965,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1007,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		1038,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1067,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1268,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1411,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		2014,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%

			Rejected	0	0,000	0,000	0,0%	0,0%
		2967,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
6,00	3984,50	60,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	0,287	1,575	100,0%	28,7%
			Rejected	0	0,713	-1,575	0,0%	71,3%
		109,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%
		401,00	Accepted	1	1,000	0,001	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	-0,001	0,0%	0,0%
		485,00	Accepted	2	2,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		776,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	2	1,991	0,011	66,7%	66,4%
			Rejected	1	1,009	-0,011	33,3%	33,6%
		823,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	1	1,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1007,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,323	-0,690	0,0%	32,3%
			Rejected	1	0,677	0,690	100,0%	67,7%
		1010,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	1	1,000	0,000	100,0%	100,0%

	15141,10	776,00	Accepted	0	0,000	0,000	0,0%	0,0%
			Expired	4	4,000	0,000	100,0%	100,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
		1014,00	Accepted	1	1,000	0,000	100,0%	100,0%
			Expired	0	0,000	0,000	0,0%	0,0%
			Rejected	0	0,000	0,000	0,0%	0,0%
The percentages are based on total observed frequencies in each subpopulation.								

7.3. APPENDIX C: SAMPLE GROUP – PRIMARY DATA SET

				2022											
				1	2	3	4	5	6	7	8	9	10	11	12
Product Modality	**Hours**	**Freq**	**Month**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
MG	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
MG	1	1	12	0	0	0	0	0	0	0	0	0	0	0	1
MG	1	1	2	0	1	0	0	0	0	0	0	0	0	0	0
MG	1	1	7	0	0	0	0	0	0	1	0	0	0	0	0
XR	1	1	6	0	0	0	0	0	1	0	0	0	0	0	0
MG	1	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
XR	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0

US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
XR	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
XR	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0

US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
XR	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0

US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0	0

US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0

US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1

US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
XR	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0

US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
NM and PET	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0

US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1

US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
XR	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
XR	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0

US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
XR	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0

US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
XR	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
XR	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0

US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
XR	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
XR	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0

US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
XR	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0

US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
XR	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0

US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
XR	2	1	11	0	0	0	0	0	0	0	0	0	0	1	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
NM and PET	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0

US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	5	0	0	0	0	1	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	7	0	0	0	0	0	0	1	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	6	0	0	0	0	0	1	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1
US	2	1	10	0	0	0	0	0	0	0	0	0	1	0	0
US	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	9	0	0	0	0	0	0	0	0	1	0	0	0
US	2	1	12	0	0	0	0	0	0	0	0	0	0	0	1

US	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0
US	2	1	8	0	0	0	0	0	0	0	1	0	0	0	0
NM and PET	3	1	12	0	0	0	0	0	0	0	0	0	0	0	1
NM and PET	3	1	12	0	0	0	0	0	0	0	0	0	0	0	1
NM and PET	3	1	6	0	0	0	0	0	1	0	0	0	0	0	0
NM and PET	3	1	3	0	0	1	0	0	0	0	0	0	0	0	0
MG	3	1	5	0	0	0	0	1	0	0	0	0	0	0	0
MG	3	1	9	0	0	0	0	0	0	0	0	1	0	0	0
NM and PET	3	1	8	0	0	0	0	0	0	0	1	0	0	0	0
NM and PET	3	1	9	0	0	0	0	0	0	0	0	1	0	0	0
NM and PET	3	1	4	0	0	0	1	0	0	0	0	0	0	0	0
XR	3	1	12	0	0	0	0	0	0	0	0	0	0	0	1
NM and PET	3	1	11	0	0	0	0	0	0	0	0	0	0	1	0
NM and PET	3	1	11	0	0	0	0	0	0	0	0	0	0	1	0
MG	3	1	2	0	1	0	0	0	0	0	0	0	0	0	0
NM and PET	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	5	1	0	0	0	1	0	0	0	1	0	0	0
XR	4	1	4	0	0	0	1	0	0	0	0	0	0	0	0
MR	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
MR	4	3	7	0	0	1	0	0	0	1	0	0	0	1	0
XR	4	2	1	1	0	0	0	0	0	1	0	0	0	0	0
CT	4	3	3	0	0	1	0	0	0	1	0	0	0	1	0
CT	4	3	3	0	0	1	0	0	0	1	0	0	0	1	0
MG	4	2	4	0	0	0	1	0	0	0	0	0	1	0	0

CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
XR	4	1	3	0	0	1	0	0	0	0	0	0	0	0	0
MG	4	2	3	0	0	1	0	0	0	0	0	1	0	0	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
MR	4	3	2	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
MR	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	10	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
XR	4	1	11	0	0	0	0	0	0	0	0	0	0	1	0
CT	4	3	10	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	8	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	1	8	0	0	0	0	0	0	0	1	0	0	0	0
US	4	1	10	0	0	0	0	0	0	0	0	0	1	0	0
MR	4	3	8	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	2	0	1	0	0	0	1	0	0	0	1	0	0
MR	4	3	7	0	0	1	0	0	0	1	0	0	0	1	0
CT	4	3	5	1	0	0	0	1	0	0	0	1	0	0	0

NM and PET	4	2	1	1	0	0	0	0	0	1	0	0	0	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
MG	4	2	10	0	0	0	1	0	0	0	0	0	1	0	0
CT	4	3	11	0	0	1	0	0	0	1	0	0	0	1	0
CT	4	3	2	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	10	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
XR	4	2	2	0	1	0	0	0	0	0	1	0	0	0	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	5	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	1	12	0	0	0	0	0	0	0	0	0	0	0	1
XR	4	1	7	0	0	0	0	0	0	1	0	0	0	0	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
XR	4	1	3	0	0	1	0	0	0	0	0	0	0	0	0
CT	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0
XR	4	1	9	0	0	0	0	0	0	0	0	1	0	0	0
MR	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	2	6	0	0	0	0	0	1	0	0	0	0	0	1
CT	4	3	3	0	0	1	0	0	0	1	0	0	0	1	0
XR	4	1	10	0	0	0	0	0	0	0	0	0	1	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
US	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0
MR	4	3	5	1	0	0	0	1	0	0	0	1	0	0	0

CT	4	3	3	0	0	1	0	0	0	1	0	0	0	1	0
CT	4	3	8	0	0	0	1	0	0	0	1	0	0	0	1
NM and PET	4	2	8	0	1	0	0	0	0	0	1	0	0	0	0
MG	4	2	8	0	1	0	0	0	0	0	1	0	0	0	0
CT	4	3	11	0	0	1	0	0	0	1	0	0	0	1	0
XR	4	2	4	0	0	0	1	0	0	0	0	0	1	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
US	4	1	11	0	0	0	0	0	0	0	0	0	0	1	0
CT	4	1	8	0	0	0	0	0	0	0	1	0	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0
XR	4	1	12	0	0	0	0	0	0	0	0	0	0	0	1
CT	4	3	11	0	0	1	0	0	0	1	0	0	0	1	0
XR	4	1	3	0	0	1	0	0	0	0	0	0	0	0	0
MR	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	2	3	0	0	1	0	0	0	0	0	1	0	0	0
XR	4	1	7	0	0	0	0	0	0	1	0	0	0	0	0
NM and PET	4	4	1	1	0	0	1	0	0	1	0	0	1	0	0
XR	4	1	11	0	0	0	0	0	0	0	0	0	0	1	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	4	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	1	7	0	0	0	0	0	0	1	0	0	0	0	0
CT	4	3	10	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0

XR	4	2	8	0	1	0	0	0	0	0	1	0	0	0	0
NM and PET	4	2	1	1	0	0	0	0	0	1	0	0	0	0	0
MR	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	1	12	0	0	0	0	0	0	0	0	0	0	0	1
XR	4	1	9	0	0	0	0	0	0	0	0	1	0	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	1	12	0	0	0	0	0	0	0	0	0	0	0	1
NM and PET	4	4	9	0	0	1	0	0	1	0	0	1	0	0	1
NM and PET	4	2	2	0	1	0	0	0	0	0	1	0	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
NM and PET	4	2	3	0	0	1	0	0	0	0	0	1	0	0	0
MR	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	3	0	0	1	0	0	0	1	0	0	0	1	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
MR	4	3	10	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	1	9	0	0	0	0	0	0	0	0	1	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
MG	4	2	8	0	1	0	0	0	0	0	1	0	0	0	0
XR	4	1	11	0	0	0	0	0	0	0	0	0	0	1	0
CT	4	3	2	0	1	0	0	0	1	0	0	0	1	0	0
MR	4	4	5	0	1	0	0	1	0	0	1	0	0	1	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	1	7	0	0	0	0	0	0	1	0	0	0	0	0
CT	4	3	4	0	0	0	1	0	0	0	1	0	0	0	1

CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	8	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
US	4	1	11	0	0	0	0	0	0	0	0	0	0	1	0
CT	4	3	3	0	0	1	0	0	0	1	0	0	0	1	0
CT	4	3	10	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	11	0	0	1	0	0	0	1	0	0	0	1	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
XR	4	2	9	0	0	1	0	0	0	0	0	1	0	0	0
CT	4	3	3	0	0	1	0	0	0	1	0	0	0	1	0
XR	4	1	9	0	0	0	0	0	0	0	0	1	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	5	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	2	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	8	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	1	7	0	0	0	0	0	0	1	0	0	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	2	0	1	0	0	0	1	0	0	0	1	0	0
MR	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
MG	4	2	11	0	0	0	0	1	0	0	0	0	0	1	0
CT	4	3	4	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	2	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0

CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	2	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	1	2	0	1	0	0	0	0	0	0	0	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
CT	4	1	8	0	0	0	0	0	0	0	1	0	0	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
XR	4	1	5	0	0	0	0	1	0	0	0	0	0	0	0
CT	4	3	10	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	3	0	0	1	0	0	0	1	0	0	0	1	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	5	1	0	0	0	1	0	0	0	1	0	0	0
MG	4	2	11	0	0	0	0	1	0	0	0	0	0	1	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
XR	4	1	7	0	0	0	0	0	0	1	0	0	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	1	4	0	0	0	1	0	0	0	0	0	0	0	0
CT	4	3	12	0	0	0	1	0	0	0	1	0	0	0	1
MG	4	2	10	0	0	0	1	0	0	0	0	0	1	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
XR	4	1	4	0	0	0	1	0	0	0	0	0	0	0	0
NM and PET	4	2	6	0	0	0	0	0	1	0	0	0	0	0	1
CT	4	3	9	1	0	0	0	1	0	0	0	1	0	0	0
MG	4	2	6	0	0	0	0	0	1	0	0	0	0	0	1
XR	4	2	9	0	0	1	0	0	0	0	0	1	0	0	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0

CT	4	3	1	1	0	0	0	1	0	0	0	1	0	0	0
XR	4	2	1	1	0	0	0	0	0	1	0	0	0	0	0
CT	4	3	5	1	0	0	0	1	0	0	0	1	0	0	0
XR	4	2	9	0	0	1	0	0	0	0	0	1	0	0	0
CT	4	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	4	3	8	0	0	0	1	0	0	0	1	0	0	0	1
XR	4	2	4	0	0	0	1	0	0	0	0	0	1	0	0
CT	4	3	10	0	1	0	0	0	1	0	0	0	1	0	0
MR	5	4	1	1	0	0	1	0	0	1	0	0	1	0	0
CT	5	3	1	1	0	0	0	1	0	0	0	1	0	0	0
CT	5	3	5	1	0	0	0	1	0	0	0	1	0	0	0
CT	5	3	7	0	0	1	0	0	0	1	0	0	0	1	0
US	5	3	6	0	1	0	0	0	1	0	0	0	1	0	0
CT	5	3	1	1	0	0	0	1	0	0	0	1	0	0	0
CT	5	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	5	3	9	1	0	0	0	1	0	0	0	1	0	0	0
CT	5	3	9	1	0	0	0	1	0	0	0	1	0	0	0
MG	6	1	4	0	0	0	1	0	0	0	0	0	0	0	0
XR	6	1	6	0	0	0	0	0	1	0	0	0	0	0	0
XR	6	1	5	0	0	0	0	1	0	0	0	0	0	0	0
XR	6	1	11	0	0	0	0	0	0	0	0	0	0	1	0
XR	6	1	3	0	0	1	0	0	0	0	0	0	0	0	0
XR	6	1	10	0	0	0	0	0	0	0	0	0	1	0	0
XR	6	1	3	0	0	1	0	0	0	0	0	0	0	0	0
XR	6	1	6	0	0	0	0	0	1	0	0	0	0	0	0
XR	6	1	9	0	0	0	0	0	0	0	0	1	0	0	0
XR	6	1	11	0	0	0	0	0	0	0	0	0	0	1	0

XR	6	1	3	0	0	1	0	0	0	0	0	0	0	0	0	0
MG	6	1	6	0	0	0	0	0	1	0	0	0	0	0	0	0
TOTAL				123	77	78	61	80	86	50	65	121	70	48	101	

7.4. APPENDIX D: SECONDARY DATA FOR THE PREDICTIVE MODEL (RESPONSE PROFILE)

Income - USD	Hours	Status	Price - USD
1839	2	Rejected	207
8214,2	5	Expired	776
8214,2	5	Expired	776
3984,5	4	Expired	776
1839	2	Expired	204
3984,5	6	Rejected	1010
1839	2	Expired	204
3984,5	4	Rejected	474
3555,4	4	Expired	1067
1839	2	Accepted	207
1839	2	Rejected	63
3555,4	4	Expired	1067
8214,2	5	Accepted	577
8214,2	5	Expired	1553
8214,2	5	Accepted	1482
3984,5	4	Accepted	485
1839	2	Expired	217
3984,5	4	Accepted	401
3984,5	4	Accepted	274
3984,5	4	Expired	965
3984,5	4	Rejected	289
3984,5	4	Expired	514
3984,5	4	Accepted	289
3984,5	4	Expired	965

3984,5	4	Accepted	274
3984,5	4	Expired	514
3984,5	4	Accepted	327
3984,5	4	Accepted	274
3984,5	4	Expired	514
3984,5	3	Accepted	327
3984,5	4	Rejected	514
3984,5	6	Expired	823
1839	2	Rejected	217
1839	2	Rejected	217
1839	2	Rejected	217
1839	2	Accepted	253
1839	2	Expired	258
1839	2	Expired	266
1839	2	Accepted	207
3984,5	6	Expired	776
8214,2	5	Accepted	1290
8214,2	5	Accepted	1146
1839	2	Accepted	207
3984,5	3	Accepted	514
1839	2	Accepted	460
1839	2	Rejected	207
1839	2	Rejected	207
1839	2	Rejected	207
1839	2	Rejected	207
3984,5	2	Accepted	169

1839	2	Rejected	286
3555,4	2	Rejected	60
3555,4	2	Rejected	577
3984,5	4	Accepted	4875
1839	2	Rejected	60
1839	2	Rejected	413
1839	2	Rejected	207
1839	2	Rejected	396
1839	2	Accepted	143
1839	2	Accepted	207
8214,2	4	Accepted	341
8214,2	4	Accepted	214
3984,5	3	Expired	749
1839	2	Expired	207
3984,5	3	Accepted	338
3984,5	4	Expired	221
3984,5	4	Accepted	289
3984,5	6	Rejected	109
3984,5	3	Accepted	514
3984,5	4	Accepted	514
3984,5	4	Rejected	447
3984,5	4	Expired	577
1839	2	Expired	217
1839	1	Expired	204
3984,5	3	Accepted	376
1839	2	Expired	207

1839	2	Expired	217
3984,5	4	Rejected	633
3984,5	4	Expired	1900
1839	2	Rejected	63
14712	5	Expired	2014
3984,5	4	Expired	633
3984,5	4	Expired	633
3984,5	4	Expired	633
1839	2	Rejected	207
1839	2	Accepted	207
1839	2	Accepted	140
1839	2	Expired	143
1839	2	Expired	493
1839	2	Expired	153
3984,5	6	Accepted	485
1839	2	Expired	217
1839	2	Accepted	204
3984,5	6	Accepted	485
1839	2	Accepted	207
14712	5	Accepted	637
14712	5	Accepted	782
14712	5	Accepted	782
1839	2	Accepted	217
1839	2	Accepted	207
1839	2	Expired	4302
3984,5	6	Expired	60

1839	2	Expired	445
1839	2	Accepted	168
1839	2	Rejected	433
1839	2	Rejected	60
1839	2	Rejected	423
1839	2	Expired	207
1839	2	Expired	413
1839	2	Rejected	207
1839	2	Expired	217
3984,5	2	Accepted	289
1839	2	Rejected	60
1839	2	Accepted	207
3984,5	4	Expired	888
3984,5	4	Expired	674
3984,5	4	Expired	1007
3555,4	2	Expired	768
3555,4	2	Expired	597
3984,5	3	Rejected	447
3984,5	3	Expired	447
3984,5	6	Rejected	776
3984,5	6	Expired	776
3555,4	4	Accepted	581
14712	5	Expired	678
14712	5	Accepted	965
1839	2	Expired	460
1839	1	Expired	776

1839	2	Rejected	204
1839	2	Rejected	207
1839	2	Accepted	217
1839	2	Rejected	377
1839	2	Rejected	636
3984,5	4	Expired	615
1839	2	Expired	556
1839	2	Accepted	217
1839	2	Expired	207
1839	2	Accepted	207
1839	2	Accepted	217
1839	2	Rejected	401
1839	2	Rejected	63
1839	2	Expired	460
1839	2	Accepted	207
3984,5	4	Expired	776
3984,5	4	Expired	776
3984,5	4	Rejected	1053
3984,5	4	Expired	597
3984,5	4	Expired	447
3984,5	4	Expired	447
3984,5	4	Accepted	324
3984,5	4	Expired	447
3984,5	4	Accepted	482
3984,5	4	Expired	597
3984,5	4	Rejected	993

3984,5	4	Expired	597
3984,5	4	Expired	447
3555,4	2	Rejected	633
15141,1	6	Accepted	1014
15141,1	6	Expired	776
1839	2	Expired	217
1839	2	Accepted	207
1839	2	Expired	217
1839	2	Expired	63
1839	2	Accepted	300
1839	2	Accepted	115
3984,5	4	Accepted	451
3984,5	4	Accepted	1028
1839	2	Expired	63
1839	2	Expired	395
1839	2	Expired	268
1839	2	Rejected	115
1839	2	Rejected	515
1839	2	Accepted	217
1839	2	Accepted	107
1839	2	Accepted	217
1839	2	Accepted	217
3984,5	4	Expired	915
1839	2	Accepted	153
1839	2	Accepted	470
1839	2	Rejected	207

1839	2	Rejected	207
1839	2	Rejected	204
1839	2	Expired	413
1839	2	Expired	143
1839	2	Accepted	143
1839	2	Expired	217
1839	2	Accepted	204
1839	2	Expired	204
1839	2	Expired	207
3984,5	4	Rejected	711
1839	2	Expired	207
1839	2	Expired	207
15141,1	6	Expired	776
1839	2	Accepted	204
1839	2	Expired	413
1839	2	Rejected	207
1839	2	Accepted	217
3984,5	4	Accepted	738
1839	2	Accepted	207
1839	2	Rejected	207
3984,5	6	Rejected	1007
3984,5	4	Rejected	597
1839	2	Accepted	217
1839	2	Accepted	207
15141,1	6	Expired	776
15141,1	6	Expired	776

1839	2	Accepted	207
1839	2	Expired	318
1839	2	Expired	217
1839	2	Expired	217
1839	2	Rejected	350
1839	2	Rejected	143
1839	2	Expired	423
1839	2	Accepted	207
1839	2	Rejected	204
1839	2	Expired	207
14712	5	Expired	1038
14712	5	Expired	2967
14712	5	Expired	1067
3984,5	3	Expired	474
3984,5	4	Expired	633
1839	2	Rejected	268
1839	2	Accepted	460
1839	2	Accepted	308
1839	2	Rejected	627
1839	2	Accepted	624
1839	2	Accepted	207
1839	2	Rejected	207
1839	2	Accepted	207
1839	2	Accepted	143
1839	2	Rejected	217
3984,5	4	Accepted	485

1839	2	Accepted	225
1839	2	Expired	153
3984,5	4	Rejected	109
1839	2	Accepted	135
1839	2	Rejected	207
1839	1	Expired	776
3984,5	3	Accepted	993
1839	2	Accepted	207
1839	2	Accepted	217
1839	2	Accepted	318
1839	2	Accepted	921
1839	2	Accepted	217
1839	2	Accepted	217
14712	5	Rejected	1411
1839	2	Expired	204
3984,5	6	Accepted	401
1839	2	Expired	204
1839	2	Expired	204
1839	2	Expired	204
1839	2	Expired	204
3984,5	4	Expired	1204
3984,5	4	Accepted	3411
3984,5	4	Expired	514
3984,5	4	Expired	514
3984,5	4	Expired	514
3984,5	4	Rejected	776

1839	2	Expired	268
14712	5	Rejected	1007
14712	5	Accepted	1268
3984,5	3	Expired	514
3984,5	4	Expired	289
3984,5	4	Accepted	514
3984,5	4	Accepted	514
14712	5	Expired	858
1839	2	Expired	207

7.5. APPENDIX E: GENERAL MODALITY SPECIFIC PM INTERVALS AND HOURS

Modality	Hours per PM	PM Frequency per Annum
MG	1	1
XR	1	1
US	2	1
XR	2	1
NM and PET	2	1
NM and PET	3	1
MG	3	1
XR	3	1
CT	4	3
XR	4	1
MR	4	3
XR	4	2
MG	4	2
US	4	1
NM and PET	4	2
CT	4	1
NM and PET	4	4
MR	5	4
CV	5	3
MG	6	1
XR	6	1

7.6. APPENDIX F: TURN-IT-IN SIMILARITY INDEX REPORT

Similarity Report

PAPER NAME	AUTHOR
Thesis - Rev 8 - Turnitin submission.pdf	GERT HENDRIK JOUBERT

WORD COUNT	CHARACTER COUNT
29168 Words	172219 Characters
PAGE COUNT	**FILE SIZE**
129 Pages	1.3MB
SUBMISSION DATE	**REPORT DATE**
Dec 21, 2023 11:40 AM GMT+2	Dec 21, 2023 11:42 AM GMT+2

26% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

- 19% Internet database
- 14% Publications database
- Crossref database
- Crossref Posted Content database
- 23% Submitted Works database

Summary

7.7. APPENDIX G: ETHICAL CLEARANCE CERTIFICATE

UNISA university of south africa

Graduate School of Business Leadership_RERC

Ref #: 2023_SBL_MBA_070_SD-1733
Name: Mr Gert Joubert
Student #: 14789663

Date: 13/11/2023

Dear: Mr Gert Joubert

Decision: Ethics Approval from November 2023 to December 2024

Researcher: Mr Gert Joubert

60 Glenhove Road

Johannesburg

14789663@mylife.unisa.ac.za 0829551175

Supervisor: DR Chekani Nkwaira nkwaic@unisa.ac.za

THE EFFECT OF PROACTIVE QUOTATIONS FOR PLANNED MAINTENANCE ON REVENUE

Qualification: MBA - Master of Business Administration

Thank you for the application for research ethics clearance by the Graduate School of Business Leadership_RERC for the above-mentioned research study Ethics approval is granted for two years.

The **low-risk application** was **reviewed** by Graduate School of Business Leadership_RERC on 13 November 2023 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Graduate School of Business Leadership_RERC.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after the expiry date (December 2024). Submission of a completed research ethics progress report will constitute an application for renewal, for Ethics Research Committee approval.

Additional Conditions

1. Disclosure of data to third parties is prohibited without explicit consent from Unisa.
2. De-identified data must be safely stored on password protected PCs.
3. Care should be taken by the researcher when publishing the results to protect the confidentiality and privacy of the university.
4. Adherence to the National Statement on Ethical Research and Publication practices, principle 7 referring to Social awareness, must be ensured: "Researchers and institutions must be sensitive to the potential impact of their research on society, marginal groups or individuals, and must consider these when weighing the benefits of the research against any harmful effects, with a view to minimising or avoiding the latter where possible." Unisa will not be liable for any failure to comply with this principle.

Note

The reference number 2023_SBL_MBA_070_SD -1733 should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Kind regards,

NBWMlitwa

Prof N Mlitwa
Chair of Graduate School of Business Leadership_RERC
E-mail: wiltonb@unisa.ac.za

Prof P Msweli
Executive Dean / By delegation from the Executive Dean of Graduate School of Business Leadership_RERC
E-mail: mswelp@unisa.ac.za

7.8. APPENDIX H: LETTER OF CONSENT TO SUBMIT

The Programme Administrators: MBL and MBA Research report
Graduate School of Business Leadership
P O Box 392
UNISA
0003

STUDY LETTER OF CONSENT TO SUBMIT RESEARCH REPORT

Consent is hereby given to:

Student name Gert Hendrik Joubert

Student number 14789663 to submit his/her research report in its final form.

Name of study leader Dr C, Nkwaira Date: 24 Dec 2023

Study leader signature _____

The student acknowledges that the study leader provided sufficient feedback and that s/he took the responsibility to attend to the feedback in a way that satisfies the requirements for a mini-dissertation on the MBL and MBA level.

Student signature.....Date: 24 Dec 2023

Students must obtain signed consent from their supervisors before submission of the final report.
Research reports should be submitted on the EDS as required.
Ethical clearance certificate and Turn it in Similarity Index should be included in two (2) ring bound copies that must be submitted before or on **30 November 2022** to:

Me Marietjie Holzhauzen (MBA)
Unisa SBL, Midrand