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REVIEW ARTICLE

A Novice Approach for the Beginners of the Professional Medical Researchers: An Introduction

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ABSTRACT

Globalising the research by the transformation of the research practices using the latest research tools (Roots of the Educational Research –Redefined) is the motto of the present day and in this regard a review showing six sigma as an add-on for the combined studies of the service – quality with the living –Standards with the descriptive statistics in mind had been considered through this research practice and the approach. The main objective of this research is to provide know-how for budding researchers from the field of the medical to expand their skills towards online tools and techniques.

Keywords: Descriptive statistics, FOSS, Interdisciplinary research, Six sigma, Service quality.

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INTRODUCTION

This is to introduce the modern methods of the research practices using the latest tools and techniques of the research. This paper is going to run through the roots of the research for a better understanding for the professional medical researchers to carry-out the primary type of research work and to lead towards the secondary type of research work as well with-out too much of researching effort. The motto is to introduce the beginner with the fundamentals of the research, research types and the methodology to carry –out the research, practice using free and open sources (FOSS). This also provides the data updated till date and to be considered as factual for the better understanding for the upcoming professionals of the fields of inter-disciplinary research. The data collected for this kind of research is of the primary research type and then calls for conversion to the secondary type.

All the organizations, individuals or businesses use the soft wares as a form to communicate with the whole world of the research in the form of the apps or the free and the open source softwares. Six sigma had been proved to the best for producing the results for outsourced projects with increased validity, reliability and reduction in all the other science, technical, engineering and mathematical aspects.

But there still lies some gaps in the areas of academic research and developments in terms of the successful stories count. The reason could be due to the misconceptions and the disbelief that Six Sigma when as an add-on could not produce the desired results for the applications, theories, policies, practices and administrative implications.

A software development frame needs to be used to develop very high-quality service engineering processes using the different methodologies of the six sigma which means that conducting the studies on the current arts and calibers of the six sigma in the services sector had been neglected due to certain reasons or defects. The ultimate goal of the day for any organization lies in the Six Sigma philosophy as an add-on for zero-defect services and customer delight.

Misconceptions associated with the six sigma are hereby tabulated as a ready reckoner for the future researchers.Some of the misconceptions about the six sigma (Table 1).

Customer orientation is the basis for the organization's learning that results in superior value attributions and greater customer satisfaction (Sinkula, Bakar& Noordwier, 1997; Slater & Narven, 1995). But the question and the equation here is to check the implemented strategies for the development that could lead to the orientation of six sigma for the service

Table 1: Mis-conceptions on six –sigma

Misconception1- The whole company is supposed to adopt the six sigma.
Misconception2-Six sigma is only applicable to the manufacturing sector.
Misconception3-six sigma is all about the statistics only.
Misconception4-any other not cited.

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Table 2: Benefits of six sigma for the service industries

Organization	*Benefits*
Citi-Bank Group	Reduced callbacks by the 80%. External callbacks by 85%. Reduced credit processing time by 50%. Reduced credit decision cycle time from three days to one day. Reduced statement processing time by from 28 days to 15 days.
Morgan Chase	Reduced flaws in the customers' facings. Increased customer satisfaction. Improved efficiency. Improved cycle times.
British Telecom	Increased levels of customer satisfaction. More robust and effective processes. Creation of common languages for businesses. Reduced capital expenditure. Significant fault reduction. Improved repairs management.

industries as well Further, there is also a need to develop some of the new and advanced optimization tools for the intermediaries perspective as well. There is a need to continuously measure the service quality gaps using monitoring tools.

Six sigma for the service processes

The ultimate power of the six sigma lies in the fact that this is a disciplined approach to improve the products/processes/services/activities in the service sector and the service industries as well.Six sigma is much beyond the quality initiatives like TQM for the industries also.

Hoerl & Snee (2002) explained the below-mentioned rudimentary principles of statistical thinking, namely,

- Variability is almost in all the processes.
- The creation of the data is essential in almost all situations.
- Strategies are to be developed for the reduction/elimination in all the aspects of variations

The above-mentioned were based upon service-oriented companies. And the following were the below-mentioned benefits for service-oriented organizations:

Inputs for any DMAIC process

- Integration of the human and the process issues of the process improvement.
- Data-driven decision and measurement.
- Management leadership commitment.
- Statistical thinking and application of quality tolls and techniques.
- Linking six-sigma with the business's strategies.
- Influence of the bottom line and customer satisfaction.
- Common Six Sigma performance indicators (KPI's):
- Cost of the poor quality.
- DPMO.
- Process Capability.
- Time to respond to customer complaints.
- Processing Times.
- Delivery times and the speed of the delivery.
- Waiting time to obtain the services.
- Services reliability.
- Accuracy of the information provided to the customers.

Key success factors (KSF's)

- Strong Leadership.
- Management Commitment.
- Organisatioon Culture change.
- Aligning the six-sigma projects to the corporate business objectives.
- Selection of the team members and the teamwork
- Six Sigma training.
- Key Ingredients:
- Uncompromised support.
- Commitment from the top management.
- Well-designed education.
- Training programmes.
- Cooperative environment.
- Back-up from the facilitators.
- Availability of the resources.
- Rigorous project management approach.
- Development of the framework to indicate which tool or technique to use & when, etc.

Benefits of successful completion of the six sigma (Table 2)

- Improved customer satisfaction.
- Reduced defect rate in the service processes.
- Reduced variability of key success processes.
- Improved culture with the attitude of the continuous improvement of the service process performances.
- Reduced process cycle times.
- Achievement of faster service deliveries.
- Reduced service operational costs.
- Increased market share.
- Critical success factors:
- Linking six-sigma with business strategies.
- Customer focus.
- Project management skills.
- Management commitment and involvement.
- Organisation infrastructure.
- Understanding of the six-sigma methodology.
- Project selection and prioritization.
- Integration of six-sigma with financial accountability.
- Management of the culture change.
- Training and education.
- Project tracking and reviews.
- Incentive programs.
- Companywide commitments.

Types of the validity for the six sigma

- Known groups validity
- Longitudinal validity.
- Concurrent validity.
- Construct validity.
- Content validity.
- Criterion validity.
- Discriminant validity.

Table 3: Qualified levels of six sigma

Levels	*Qualified for*
Champions	Fully trained business leaders responsible for the promotion and the direction of the six sigma strategies, selection of the critical projects and deployments.
Master Black Belts	Fully trained quality leaders responsible for the six sigma implementation, trainings, monitoring and the results.
Black Belts	Fully trained experts who are experienced in leading improvement teams.
Green Belts	Fully trained experts in six sigma tools and the methodologies deployed in the six sigma projects.
Team Members	Individuals supporting the specific projects working teams in their areas.

Reliability

Test-Retest, gold standards, internal consistency, sensitivity, specificity, floor effect, intra-class correlation coefficient and Cronbach's alpha.

Qualified Levels of Six Sigma (Table 3)

- GAPS in Six Sigma
- Difference between the consumer expectations and quality determinants, management perceptions of such consumer expectations.
- Difference between the management's perceived quality determinants and service specifications.
- Difference between the quality specifications and the actual service deliverables.
- Difference between the actual service delivery and the company's external communications about the service deliveries.
- Difference between the expected service and the perceived services.
- The dimensions of the service quality depend upon the brand image, past experiences, industry standards, expected services, and perceived services.

Process Mapping Techniques for the Mapping of Six Sigma and the Service Quality

A process mapping shows and displays the sequential steps that are involved in converting the specific format into the required output, With the below-mentioned features; namely, waste of correction, waste of processing, waste of conveyance, waste of motions, waste of waiting, waste of over-production, waste of waiting.

The process is to be mapped as the same happens actually and the process should be taken across the organizations. The intentions of all the people involved in the process is to be carried out. The beginning and the end of the process is to be defined. The process mapping should be done at the highest level. Questioning is to be carried out at all levels (Table 4).

FMEA –An Introduction

Identify the potential failures and the failure modes. Rate the severity of the effects. Identify the potential causes. Evaluate objectively the probability of occurrence

Literature Review

By definition, research is a critical examination or careful examination for seeking the facts or the principles with universal reliability and validity.

According to B. W. Tuckman (1978), research is characterized by the below-mentioned keywords (Table 5):

Keywords

Replacability; Systems; Logic; Reductibility; Empiricalness; Transmittability

Sources of the Problems

Conflicts, contradictions, incongruities, points of controversy, contested conclusions, suggestions, completed research works, uncompleted research works, gaps, deficiencies in the explanations, past theories, consultations, schools, colleges, class-rooms, technological ranges, social disputes, social discussions, social developments, lectures, seminars, conferences, colloquiums, symposiums, colleagues, etc.

Areas of the Research Problems

Curriculums, textbooks, syllabi, administration, development, skills, guidance, counseling, measurements, aids, equipment, methods, teacher's notes, history, philosophy, psychology, socio-economics, comparative techniques, etc.

Any scientific approach of research involves seven elements as quoted by downing in his research, namely,

Meta-analysis

Statistical analysis that combines or integrates the results of several independent studies considered by the analyst and which are to be combinable.:The reasoning of any research process is done by the below mentioned methods (Table 6).

Table 4: Research simplified

Sl No.	Stages
1	Selection of a Problem
2	Formulation of a Problem
3	Definition of the Problem
4	Attack on the Problem
5	Collection of What is Known (Available Data)
6	Collection of What is Un-known (Un-available Data)
7	Findings Collection
8	Interpretation of the Findings
9	Formulation of the Conclusions/Results/Discussions
10	Recommendations
11	Framing of the Thesis
12	Emergence of Thesis

Table 5: Steps and the keywords

Steps	*Keywords*
1	Purposeful Observation
2	Analysis & Synthesis
3	Selective Research
4	Hypothesis
5	Verification by Inference
6	Verification by Experimentation
7	Verification by Reasoning

Table 6: The reasoning of any research process

Method of agreement	*Method of disagreement*	*Method of concomitant variation*	*Method of residues*	*Joint Method of Agreement*

Table 7:IMRADT-details

Introduction	Why was this work undertaken?
Methods	How was that done?
Results	What did you find?
Abstract	Summary of the complete work
Title	Mixture of the keywords

- Avoid the time and expense of conducting the studies repeatedly.
- Make the interventions more objective and accurate.
- Identify the areas of insufficient research.
- Increases the power of the statistics.
- Obtains more information from the available data.
- One or more of the statistical techniques could be applied.
- Multi-directional studies provide more answers for similar kinds of studies.

Difference between the Primary Research and the Secondary Research

- The primary research is based upon the Questions/ Hypothesis whereas the Secondary Research is based upon the Questions/Objectives.
- Primary research requires a criteria for the selection of the subjects whereas secondary research requires criteria for the selection of the studies.
- The primary research is based upon the study population whereas the Secondary research is based upon the study programmes.
- The primary research is based upon sampling whereas the Secondary research is based upon data extraction.

The narrative reviews are the functions of the broad questions, unspecified resources, unspecified selections, variable appraisals, qualitative synthesis and sometimes evidence-based inferences.

The systematic reviews are the functions of the focused questions, specified resources, uniformly applied selections, critical appraisals, quantitative synthesis and fully evidence-based interferences.

Any research work should move across the IMRADT i.e. continuous rotation of the questions across the 6 W's & 2H's (what, when, where, who, why, how & how much) (Table 7).

Different types of the Analysis

- Sub-Group Analysis
- Quality Assessment
- Cumulative meta-analysis
- Meta-Regression results
- Sensitivity Analysis
- Cross Design Synthesis

Publication Bias

The same could be used for the areas of consumer technology, arts, healthcare, media, social entrepreneurship, finance, industry, retail, entertainment, sports, and e-commerce.

Some of the pioneers in the fields of six sigma are Bill Smith, Bob Galvin and Jack Germaine.

Six sigma has got roots of business strategy, measurement system, problem-solving approach, disciplined change process, a measure of consistency and also the 18th letter of the alphabet. Basically, sigma is the spread of the mean or the average of any process or procedure.

The six sigma is a problem solving approach which includes the journey through the practical problems, statistical problems, statistical solution and the practical solutions.

The generally accepted phases of the Six Sigma include the DMAIC- Define, Measure, Analyse, Improve and the Control phases (Table 8).

Research Methodology

The questionnaire was prepared and the results were collected for the research statements. The outcomes of the results were as obtained in a,b,c,d,e,f: (Table 9).

Two sample t-test using the Excel

When the means of the two groups are to compared(i.e. when the two samples of each of the groups consists of the subjects that are not related), then the excel two sample t-test procedure is to be adopted to perform the suitable calculations.

H0: M1 equals to M2 (mean scores are the same)

HA:M1 is not equal to M2 (mean scores are not the same)

Tabulation for the Hypothesis Test (Table 10)

Procedure in Excel

Tools menu

Table 8 : DMAIC

Define	*Measure*	*Analyze*	*Improve*	*Control*
Customer's impression on the service provider.	Improvements essential for the achievement. Best practices for the measurement. Trust on the out-put data.	Position possessed by the service provider. Other area Improvements essential for the achievement. The factors that make the difference.	Identifying the roots of the problem. The essential steps to predict the output. The necessary controlling measures.	The trust on the in-process data. The goal reached so far. The procedures required to sustain the improvements.

Table 9: Outcomes of the hypothesis test

Decision	*True*	*False*
Fail to reject the null hypothesis	Correct Decision	Type II error
Reject the null hypothesis	Type I Error	Correct Decision

Table 10: Hypothesis test procedure

Group-1		*Group-2*	
Group	Scores	Group	Scores

Table 11: Tabulation for the measure of the correlation

Sl No.	*Correlation coefficient (r)*	*Type of the relationship*	*Objective*
1	Equal to (-1)	Negative	Y = f(X) X- Variable
2	Equal to (0)	Lack of the Correlation	
3	Equal to (+1)	Positive	
4	Greater than 80	Significant Correlation	
5	Less than 20	Insignificant Correlation	

- Data Analysis
- T-Test
- Highlight the input range of the Variables -1
- Highlight the input range of the Variables-2
- Click OK.

If the *p-value* is lesser than 0.05, then this provides the evidence to reject the null hypothesis.

If the *p-value* is greater than 0.05, then this provides the evidence to accept the null hypothesis.

Steps for transforming the gaps for the improvement

- Prioritization of the opportunities for the improvement of the processes.
- Generating the alternatives and then evaluating and selecting the best solutions.
- Identification of the potential problems and the obstacles that are to be encountered for the implementation of the solutions.
- After mapping out the 7M's ie. manpower, machinery,

Table 12:

https://admin.typeform.com/form/1038251/fields/

Research Statement No.	*Research Statement*	*Average Rating*	*How Many Have Answered*	*Maximum Answers Attemptcount*
1	He/she should believe that "Teaching is a profession which teaches all the other professions.	3.95	22	22 Out of 73 Attempts
2	He/she should believe that ROME was not built in one day but was built day by day.	4.38	21	22 Out of 73 Attempts
3	He/she should believe that "winner never quit and the quitters never win ".	4.19	21	22 Out of 73 Attempts
4	He/she should remember that the "the ends justify the means " is still relevant for today.	3.71	21	22 Out of 73 Attempts
5	He/she should believe that winning the competition is not always necessary, rather he/she should enjoy the same also.	4.05	21	22 Out of 73 Attempts
6	He/she would like to possess very rare and he antique things than others.	3.52	21	22 Out of 73 Attempts
7	He/she should believe that the progress of his/her depends upon the others as well	3.71	21	22 Out of 73 Attempts
8	He/she would wish to be recognized for his/her own consignments.	3.86	21	22 Out of 73 Attempts
9	He/she would like to possess their own transport.	3.25	20	22 Out of 73 Attempts
10	He/she should believe that maintain good relations with the others is very very important.	3.90	21	22 Out of 73 Attempts
11	He/she should keep in mind that sharing things with the others is not wise.	3.05	21	22 Out of 73 Attempts
12	He/she should believe that doing socially useful productive work is better than outstanding work.	3.76	21	22 Out of 73 Attempts
13	He/she should forgo one's own interests for the society as a thing of the past.	3.33	13	22 Out of 73 Attempts
14	He/she should undergo immediate gratification of the senses.	3.35	14	22 Out of 73 Attempts
15	He/she should work on an assignment just before it is due.	3.24	21	22 Out of 73 Attempts
16	He/she should first serve one's own ends rather than the service to the same society.	2.95	21	22 Out of 73 Attempts

17	He/she should like the routine tasks rather than the challenging and the innovative one's.	2.86	21	22 Out of 73 Attempts
18	He/she should never think that hard-work is the way to achieve one's goals.	2.70	20	22 Out of 73 Attempts
19	He/she should not pay attention to the ideas put forward by the people who are not trustworthy.	3.10	21	22 Out of 73 Attempts
20	He/she should wish the betterment of their family and do the resourceful all the time.	3.71	21	22 Out of 73 Attempts
21	He/she should should wish for their stand easily.	3.85	21	22 Out of 73 Attempts
22	He/she should not give up their stand easily.	3.38	21	22 Out of 73 Attempts
23	He/she gets the dedication and the determination for achieving the goals from the hurdles.	4.10	21	22 Out of 73 Attempts
24	The worldly comforts are made for enjoying, so he/she should enjoy the same upto the maximum extent possible.	3.67	21	22 Out of 73 Attempts
25	In the present day world, only the fittest survives.	4.24	21	22 Out of 73 Attempts
26	He/she feels happy when the others follow his/her instructions.	3.86	21	22 Out of 73 Attempts

materials, methods, measurement, money, management.

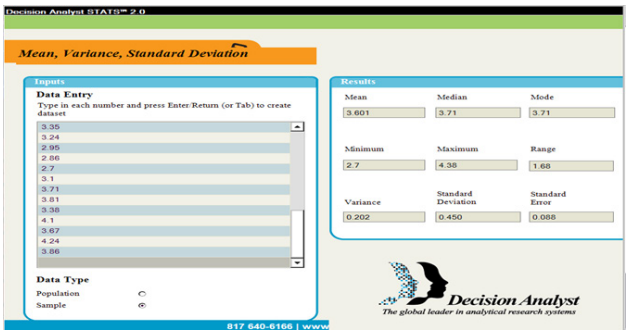
- Then the translation of the improvements opportunities into the quantitative and the qualitative aspects.

Analyze the Deliverables

- Project status form
- Metric Graphs
- Detection of the major causes and the root causes.
- Data collection for the Hypothesis testing.
- Project Plan
- Transformation and Translation of the Practical Theory
- Statement of the Practical theories
- Analysis plan for proving/disproving the Hypothesis
- Hypothesis tests for the X's Root Causes.

Conclusion on the Hypothesis Test.

Regression Analysis is used to construct the relationship between a dependant variable(X's) and the independent variable (Y's) and one/more independent or predictor variables(X's).



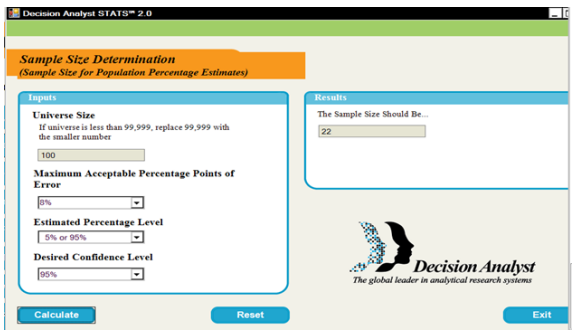
Mean is 3.601; Median is 3.71; Mode is 3.71; Minimum Value is 2.7; Maximum Value is 4.36; Range is 1.68; Variance is 0.202; Standard Deviation is 0.450; Standard Error is 0.088.

Figure 1: Analysis for the first thirteen questions

The ultimate goal is to deliver the values of the parameters for a function that could cause the functions to best fit the set of the data observations. Finally a mathematical model or a formula is obtained. The linear or the curvilinear relationship is obtained to showcase the relationship.

Mean is 3.601; Median is 3.71; Mode is 3.71; Minimum Value is 2.7; Maximum Value is 4.36; Range is 1.68; Variance is 0.195; Standard Deviation is 0.442; Standard Error is Not Applicable.

Figure 2: Analysis for the second thirteen questions



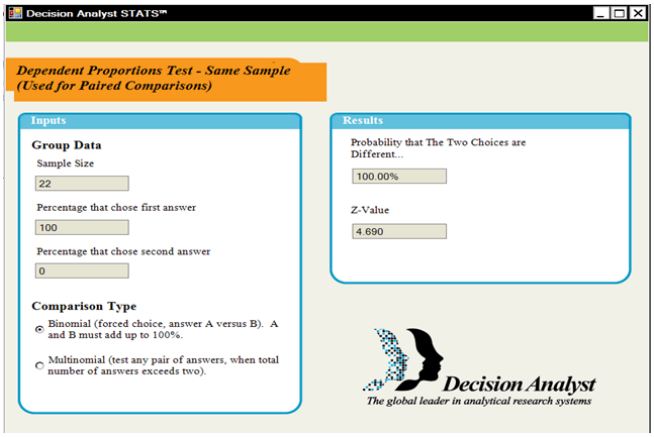
The Universe=100; Maximum error percentage points of Error = 8%; Estimated percentage level = 5%,Desired Confidence Level= 95% and the sample size for the same = 22.

Figure 3: Sample Size Determination

The correlation is the measure of the strength of the association between the two qualitative or the two quantitative variables. The correlation is measured by the PEARSON Correlation coefficient (r) i.e. product-moment correlation.

Research Findings

The research findings were as mentioned below for the purpose of providing the results to the tests that were conducted.



Group Data =22, Comparison type : Binomial, Z-Value: 4.690

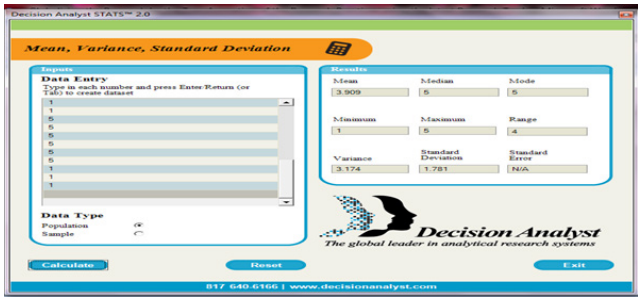
Figure 4: Dependant Proportion Test

Table 13 : Maximum number of ratings on a scale of 1-5

Research statement number	*Maximum ratings count*	*Research statement number*	*Maximum ratings count*
1	7	14	2
2	6	15	3
3	4	16	2
4	2	17	2
5	4	18	2
6	2	19	4
7	2	20	4
8	4	21	3
9	1	22	2
10	5	23	2
11	3	24	2
12	3	25	4
13	3	26	5

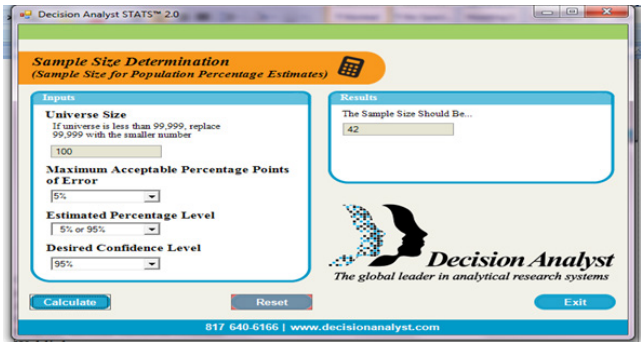
Mean is 3.909; Median is 6; Mode is 8; Minimum Value is 1; Maximum Value is 5; Range is 4; Variance is 3.325; Standard Deviation is 1.823; Standard Error =0.389.

Figure 5: Mean, Variance & Standard Deviation



Mean is 3.909; Median is 6; Mode is 8; Minimum Value is 1; Maximum Value is 5; Range is 4; Variance is 3.325; Standard Deviation is 1.823; Standard Error =0.389.

Figure 6: Mean, Variance & Standard Deviation



The Universe=100; Maximum error percentage points of Error = 5%; Estimated percentage level = 5%,Desired Confidence Level= 95% and the sample size for the same = 42.

Figure 7: Sample Size Determination

Table 14: Survey analysis

Total visits	*Responses*	*Completion rate*	*Devices used*	*Remarks*
73	22	30%	Pc's & Laptops, Smartphones Tablets	Pc's & Laptops Were Used Most

Table 15: Devise –wise analysis

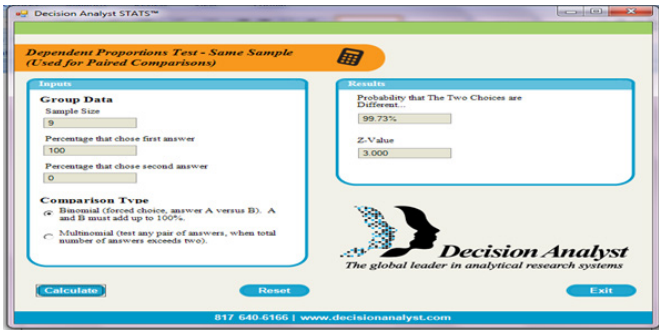
Device name	Total visits	Responses	Average time of completion	Remarks (%)
Pc's & Laptops	41	16	03:53	56
Smartphones	31	06	02:23	01
Tablets	01	00	00:00	42

Table 16: Build-design-configure-distribute-analyze

Build				
Short-text	*Multiple choice*	*Long-text*	*Picture choice*	*Statement*
Question group	Drop down	Yes/no	E-mail	Rating
Date	Opinion scale	Legal	Number	Website
Design				
Colours		Fonts		Background image
Configure				
General		Integrations		Self-notifications
Respondent – notifications		Progress widget		Messages
Distribute				
Share your typeform		Launch in a pop-up		Embed in a webpage
Url		Facebook		Twitter
Google		Linkedin		Bufferapp
Analyze				
Metrices	Results	Google analytics	Reports	

Table 17: Maximum number of ratings on A scale of 1-5

Research statement number	*Maximum ratings count*	*Research statement number*	*Maximum ratings count*
1	7	14	2
2	6	15	3
3	4	16	2
4	2	17	2
5	4	18	2
6	2	19	4
7	2	20	4
8	4	21	3
9	1	22	2
10	5	23	2
11	3	24	2
12	3	25	4
13	3	26	5

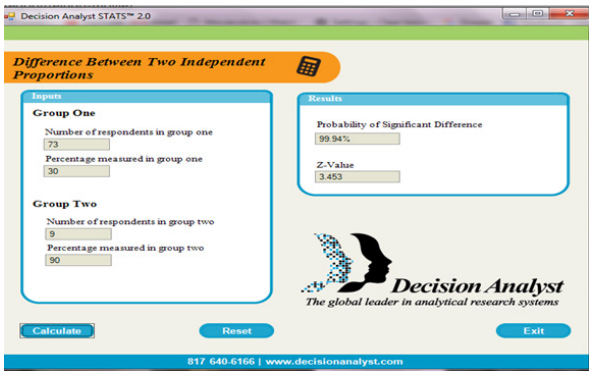


Probability of the significant Difference=99.73 The z-score is 3.000.

Figure 8: Difference between two independent proportions

Table 18: Service quality questionnaire -results

S. No.	*Exp*	*Maximum ratings count*	*S. No.*	*Per*	*Maximum ratings count*
1	E1	5	1	P1	5
2	E2	5	2	P2	5
3	E3	5	3	P3	4
4	E4	5	4	P4	5
5	E5	5	5	P5	5
6	E6	5	6	P6	5
7	E7	5	7	P7	5
8	E8	5	8	P8	5
9	E9	5	9	P9	5
10	E10	5	10	P10	1
11	E11	1	11	P11	1
12	E12	1	12	P12	1
13	E13	1	13	P13	1
14	E14	5	14	P14	5
15	E15	5	15	P15	5
16	E16	5	16	P16	5
17	E17	5	17	P17	5
18	E18	5	18	P18	3
19	E19	5	19	P19	3
20	E20	1	20	P20	1
21	E21	1	21	P21	1
22	E22	1	22	P22	1



Probability of the significant Difference=99.94% The z-score is 3.453.

Figure 9: Difference between two independent proportions

The T-score is 2.387. Probability of significant difference:97.67

Figure 10: Difference between two independent proportions(Mutually Exclusive)

And the other relevant results are as follows:

Analysis

Steps Involved

Comparative Analysis

The greater the magnitude of T (it can be either positive or negative), the greater the evidence against the null hypothesis that there is no significant difference. The closer T is to 0, the more likely there isn't a significant difference. A z-score and a t-score are both used in hypothesis testing. If the sample size is above 30, use the z-score provided, the standard deviation is known and if not, use the t-score where there is no need to obtain the standard deviation.

Conclusion

From the above research, this could be concluded that online tools could be very well used for the purpose of doing research that relates to the field of medical practice. In the above, the research was started for a survey and the findings were obtained from the online tools and the techniques of research.

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