



International Journal of Innovative Research in Engineering & Multidisciplinary Physical Sciences

Multidisciplinary • **P**eer **R**eviewed • **O**ne
Open **A**ccess • **W**idely **I**ndexed • **B**i-monthly **I**nternational
Journal • **S**ince 2013

VOLUME 9
ISSUE 2

March-April 2021

 ijirmps.org

 editor@ijirmps.org

 +91 87 585 383 22

E-ISSN 2349-7300



9 772349 730016

Vejalpur, Ahmedabad - 380051, Gujarat, India.

The **International Journal of Innovative Research in Engineering & Multidisciplinary Physical Sciences (IJIRMPSS)** is a **multidisciplinary, bi-monthly, online, peer reviewed, widely indexed, openly accessible international journal** and helping researches to share their research information **since 2013**.

Our aim is to explore advances in research pertaining to applied, theoretical and experimental technological studies. The goal is to promote scientific information interchange between researchers, developers, engineers, students and practitioners working all around the world. We provide an opportunity for practitioners and educators of all fields to exchange research evidence, models of best practice and innovative ideas.

Research Areas

As a multidisciplinary journal, we are accepting Research work from all branches of **Engineering**, all branches of **Ph.D.**, all fields of **Medical & Pharmacy**, all branches of **Business Administration (MBA)**, all disciplines of **Physical Sciences** and all streams of **Computer Applications (MCA)**.

Here is the wider list of all the disciplines:

- Engineering
- Medical / Pharmacy
- Business Administration
- Physical Science
- Computer Applications
- Arts
 - Drawing
 - Fashion
 - Movies / Music / TV
- Biology
 - Agriculture / Botany
 - Bio + Chemistry
 - Genetics / Molecular
 - Geology
 - Medical / Physiology
 - Zoology
- Chemistry
 - Petroleum
 - Pharmacy
- Computer
 - Artificial Intelligence / Simulation / Virtual Reality
 - Automation / Robotics
 - Data / Information
 - Design
 - Electronics
 - Logic
 - Network / Security
- Mathematics
 - Economy / Commerce
 - Logic
 - Maths + Physics
 - Statistics
- Sociology
 - Administration / Law / Management
 - Archaeology / History
 - Banking / Finance
 - Data / Information / Statistics
 - Economics
 - Education
 - Geology
 - Health
 - Home Science
 - Intelligence / Security
 - Journalism / Media
 - Linguistic / Literature
 - Philosophy / Psychology / Religion
 - Politics
 - Sports
 - Tourism / Transport
- Physics
 - Astronomy
 - Civil Engineering
 - Electric
 - Energy
 - Mechanical Engineering
 - Nano Technology / Nuclear

INDEX

Page

- Research Paper Id: 809** **1**
Level and Type of Social Support among Senior Secondary School Students of Kashmir Valley: An Exploratory Study
Author(s): Aadil Mohd Akhooon
Country: India
DOI: [10.37082/IJIRMPS.2021.v09i01.001](https://doi.org/10.37082/IJIRMPS.2021.v09i01.001)
- Research Paper Id: 844** **12**
Effect of Employees' Nonmonetary Motivational Factors on Job Performance in Public Institutions: A Case of Arusha City Council, Tanzania
Author(s): Benson James Lyimo, Mercyline Lema
Country: Tanzania
- Research Paper Id: 860** **17**
Quality Control Analysis using Six Sigma (DMAIC) Method to Reduce Post Pin Isolator Reject in PT XYZ in Firing Section
Author(s): Doddy Agustandi
Country: Indonesia

Level and Type of Social support among senior secondary school students of Kashmir Valley: An exploratory study

Aadil Mohd Akhoun (M.A Education)

School of Education,
Lovely Professional University, Phagwara Punjab.

Abstract: The study was conducted to find the level and type of Social support among senior secondary school students of Kashmir valley. Social support is a kind of support which we are getting from our friends, family members, neighbours and society. In order to obtain accurate and relevant data descriptive survey method and stratified random sampling technique was used in the present study. The sample size of the study was 202 senior secondary school students from Baramulla district of Kashmir valley. In order to collect data Social support scale developed by Vishal Sood and Arti Anand (2015) The objective of the study was to analyze the level of Social support and to find the differences in Social support with respect to gender and type of school. Null hypothesis were framed in order to test the objectives. Statistical techniques like mean, percentage, standard deviation and t-test were used. The results of the study revealed that maximum of the senior secondary school students are having average level of family, teacher, peer and online support. There is no significant difference between male and female senior secondary school students in their family, teacher, online and in overall social support, but there is significant difference between male and female senior secondary school students in peer support. There is no significant difference between government and private senior secondary school students in their perceived family, teacher, peer and social support.

Keywords: Social support

INTRODUCTION

Social support can be defined as any kind of help that an individual receives from the society. It can come from various things such as family, friends, neighbours, co-workers. Social support plays an important role in our daily life. We are human beings and we need support from our family members, friends, neighbours, particularly when we are in trouble and are facing problems. Social support is a process of communication which results in enhancing handling strategies, high sense of worth all the way. People who have broad friendship circle are having higher confidence and greater satisfaction with their daily lives and it also plays an important role in functioning of the body, on the other hand people who have no or very less friend circle tends to be hesitant, lazy, introvert, and they do not care what is going in his outside world.

A strong social support leads to better coping understanding and also develop good interpersonal skills. Social anxiety is one of the major problems in students who are not well adjusted in the society. He/She may not be able to complete group tasks or he/she may not feel comfortable while asking help in classroom. Generally slow learners often face more problems as compared to other students (Gurnurg, 2006).

Social support is an aspect that can help the individuals to cope up with the stressful situations (Nahid and Sarkis, 1994). Social support is an unstable relationship through the replacement of emotional and social assets to make people perceive being loved and to support good mental health (Cohen and Wills, 1985). Social support is a method through which an individual acquires an important ability from important members such as siblings, peers, and parents (Wills, 1997). Social support refers to a support that helps an individual to control the situation efficiently (Hunt, 1997). Social support refers to the process of communication in relationships that helps an individual in reducing stress and completes the given task (Gottlieb, 2000).

Social support could come up with a range of sources, such as members in the family, friend circle, romantic relations, pets, society ties, and colleagues. We have generally two types of sources in social support i.e., natural support which is family and friends and another is formal source i.e. mental health specialists and society organizations. The social support is known to be an essential factor useful in a various coping strategies. Social support plays an important role in our daily life. In addition social support from friend circle gives a very good retort to matrimonial stress, because they were not as much worried. Early family support and social support has been identified as important variable to develop helpful parental relationships and also have benefits to students from college and university levels (Taylor, 1990).

Schaefer, Coyne, and Lazarus (1981) explained five types of social support. They are:

1. Emotional maintain: Emotional hold is the offering of empathy, concern, affection, care, faith, receiving, closeness, back-up, or caring.
2. Esteem support: Is statement that boosts an individual's self-esteem so that they can handle their problems effectively or perform a desirable job.
3. Network support: Network is communication that reminds people that they are not alone in whatever position they are facing.

4. Information support: It is the condition of counsel, direction, suggestion, or helpful information to somebody. These kinds of knowledge have prospective to assist others in solving problems.

5. Tangible hold up: Tangible support is the condition of economic aid, material goods, and any kind of services, also called instrumental support.

Female offer extra social support to others and are extra busy in their social networks. Evidence has also supported the notion that female may be superior provider of social support. In addition to being more involved in the giving of support, female are also extra likely to seek out of social support to deal with stress.

Many researchers found that boy's behaviours are generally more unfriendly, with a lesser amount of consider to crash their coping may have upon others, and women are extra pro social-active with significance stress on how their coping affects public around them.

Adelman and Albrecht (1987) explained social support as spoken and nonverbal language in receivers and senders which minimizes uncertainty in relation to the position, oneself, others, or the connection to enlarge a view of individuals directed in one's own experiences.

According to Gottlieb (2000) defined the procedure of social support is contact which results in enhancing managing strategies, high self-esteem, and capability all the way through actual or alleged contacts of physical, psychological and social resources.

Heller (1779) conducted the research in which he suggested that person with high social support can cope up with the environmental stress skilfully. He also found that people with high social support are having low psychological stress; similarly people with low social support have high psychological stress. Zhang (2012) examined that students who have less acculturative stress, they have a better adjustment and also have very low level of depression. Moreover, when students experienced a high level of stress, study exposed that perceived social support functions as a moderator for the connection between acculturative stress and depression. Park et al. (2012) concluded that social support affects our Health positively; three moderating factors must be kept in view (1) Support approving norms, (2) Support requiring situations, (3) Support accepting personal style.

Erkan Isik (2013) conducted a study in which he found that that social support from family, friends and other neighbours positively and locus of control was harmfully connected with occupational outcome potential. Results also found that social support was the unique important predictor of occupational outcome expectation. Azita and Vali (2016) found that there is a direct relationship between social support and academic adjustment and also direct relationship was verified between practical support and social adaptation among different types of academic support.

OBJECTIVES OF THE STUDY

The objectives formulated for the present study were:-

1. To analyze the level and type of social support among senior secondary school students.
2. To find the differences in social support with respect to gender and type of school.

HYPOTHESES

In the light of forgoing objectives following null hypothesis were framed for the present study:-

1. There exists no significant difference in social support of male and female senior secondary school students.
2. There exists no significant difference in social support of government and private senior secondary school students.

METHOD

The present study is descriptive in nature so descriptive survey method was used. The sample consists of 202 senior secondary school students from government and private schools affiliated to state board of school education (BOSE). The investigator used stratified random sampling in order to collect data from different senior secondary schools. For data collection Social support scale developed by Mrs. Indira Dhull and Ms. Sangeeta Godara in (2015) was used. The social support scale consists of 40 items out of which 3 items were negative items. It has four parts namely family support, teacher support, friends support and online support, all the four parts consists of 10 items each. Family support is a kind of support which we are getting from our parents and siblings in order to solve certain problem of an individual. Teacher support also plays an important role in motivating the student. Apart from these, internet also plays an essential role as a source of social support.

RESULTS AND ANALYSIS

Analysis of data means studying the tabulated data in order to determine the inherent facts. It involves breaking up of complex factors into simpler parts and putting them in new arrangement for the purpose of interpretation.

The distribution of scores showing the levels of the levels of Social support among senior secondary school students is given in table 1.

Table 1: showing the levels of Family support among senior secondary school students

Levels	Frequency	Percent
High	1	.5
Above average	28	13.9
Average	149	73.8
Below average	22	10.9
Low	2	1.0
Total	202	100.0

To study the level of Social support among senior secondary school students the investigator collected the information from six senior secondary school students from one district in Kashmir. Table shows the five levels of family support namely High, above average, average, below average, and low. It is clear from the table 3.8 that 0.5% of senior secondary students are having high family support, 13.9% of senior secondary students are having above average level of family support and 73.8% of senior secondary students are having average level of family support. Table further revealed that 10.9% of senior secondary students are having below average level of family support, and only 1.0% of senior secondary students are having low level of family support. So it can be interpreted that maximum of senior secondary students are getting average level of family support.

Table 2: showing the levels of Teacher support among senior secondary school students

Levels	Frequency	Percent
Extremely high	2	1.0
Above average	6	3.0
Average	182	90.1
Below average	8	4.0
Low	4	2.0
Total	202	100.0

Table shows the five levels of Teacher support namely Extremely High, above average, average, below average, and low. It is clear from the table 4.8 that 1.0% of senior secondary students are having high Teacher support, 3.0% of senior secondary students are having above average level of Teacher support and 90.1% of senior secondary students are having average level of Teacher support. Table 2 also revealed that 4.0% of senior secondary students are having below average level of Teacher support, and only 2.0% of senior secondary students are having low level of Teacher support. So it can be interpreted that maximum of senior secondary students are getting average level of Teacher support.

Table 3: showing the levels of peer support among senior secondary school students

Levels	Frequency	Percent
Extremely high	1	.5
Above average	19	9.4
Average	170	84.2
Below average	10	5.0
Low	2	1.0
Total	202	100.0

Table shows the five levels of Peer support namely Extremely High, above average, average, below average, and low. It is clear from the table 4.0 that .5% of senior secondary students are having high Peer support, 9.4. % of senior secondary students are having above average level of Peer support and 84.2% of senior secondary students are having average level of Peer support, the Table also revealed that 5.0% of senior secondary students are having below average level of Peer support, and only 1.0% of senior secondary students are having low level of Peer support. So it can be interpreted that maximum of senior secondary students are getting average level of Peer support.

Table 4: showing the levels of online support among senior secondary school students

Levels	Frequency	Percent
Above average	3	1.5
Average	186	92.1
Below average	13	6.4
Total	202	100.0

Table 4 shows the three levels of online support namely above average, average, and below average. It is clear from the Table that 1.5% of senior secondary school student's possess above average level of online support, 92.1% of senior secondary school students are having average level of online support and 6.4% of senior secondary school students are having below average level of online support. Table also revealed that none (0%) of senior secondary students reported extremely high, high and extremely low online support. So it can be interpreted that maximum of senior secondary school students are getting average level of online support.

Table 5: showing the levels of Social support among senior secondary school students

Levels	Frequency	Percent
Above average	18	8.9
Average	167	82.7
Below average	14	6.9
Low	2	1.0
Extremely low	1	.5
Total	202	100.0

Table 5 shows the five levels of social support namely above average, average, below average, below average, low, and extremely low. It is clear from the table 5 that 8.9% of senior secondary school students are having above average level of social support, 82.7% of senior secondary school students are having average level of social support and 6.9% of senior secondary school students are having below average level of social support. Table 5 further revealed that 1.0% of senior secondary school students are having low level of social support, 0.5% of senior secondary school students are getting extremely low level of social support. So it can be interpreted that maximum of senior secondary students are getting average level of social support.

The distribution of scores for male senior secondary school students on the variable Social support is given in table 6.

Table 6: showing the levels and percentage of male senior secondary students in all dimensions of Social support

LEVELS	No of Students	SSFS	SSTS	SSPS	SSOS	SST
Extremely High	N	1	1	0	0	8
	%	0.99	0.99	0	0	7.92
High	N	2	1	0	0	0
	%	1.98	0.99	0	0	0
Above average	N	10	2	6	1	0
	%	9.90	1.98	5.94	0.99	0
Average	N	73	90	85	94	82
	%	72.27	89.10	84.15	93.06	81.18
Below average	N	13	5	8	6	9
	%	12.85	4.95	7.92	5.94	8.9
Low	N	2	2	2	0	2
	%	1.98	1.98	1.98	0	1.98
Extremely low	N	0	0	0	0	0
	%	0	0	0	0	0

Table 6 shows percentage distribution of male senior secondary school students in seven decreasing levels of Social support namely extremely high, high, above average, average, below average, low and extremely low. For Family support results revealed that

0.99% of male senior secondary school students reported extremely high Family support, 1.98% of male senior secondary school students reported high level of Family support and 9.90% of male senior secondary school students reported above average level of Family support. Table 6 further revealed that 72.27% of male senior secondary school students reported average level of Family support, 12.85% of senior secondary school students reported below average level of Family support, and only 1.98% of male senior secondary school students reported low level of Family support.

In the same way in Teacher support 0.99% of male senior secondary school students reported extremely high Teacher support, 0.99% of male senior secondary school students reported high level of Teacher support, and 1.98% of male senior secondary school students reported above average level of Teacher support. Table 6 further revealed that 89.10% of male senior secondary school students reported average level of Teacher support, 4.95% of senior secondary school students reported below average level of Teacher support, and only 1.98% of male senior secondary school students reported low level of Teacher support.

In the same way in Peer support 5.94% of male senior secondary school students reported above average level of Peer support, 84.15% of male senior secondary school students reported average level of Peer support and 7.92% of male senior secondary school students reported below average level of social support. Table 6 further revealed that 1.98% of male senior secondary school students reported low level of Peer support.

In the same way in online support 0.99% of male senior secondary school students reported above average level of online support, 93.06% of male senior secondary school students reported average level of online support, and 5.94% of male senior secondary school students reported below average level of online support. Table 6 further showed that none (0%) of the male senior secondary school students reported extremely high, high and extremely low level of online support.

In the same way in Social support 7.92% of male senior secondary school students reported extremely high level of Social support, 81.18% of male senior secondary school students reported average level of Social support and 8.9% of male senior secondary school students reported below average level of social support. Table 6 also revealed that 1.98% of male senior secondary school students reported low level of Social support and none (0%) of the male senior secondary school students reported high and extremely low level of Social support.

Table 7: showing the levels and percentage of female students in all types of perceived social support

LEVELS	No of Students	SSFS	SSTS	SSPS	SSOS	SST
Extremely High	N	0	1	1	0	0
	%	0	0.99	0.99	0	0
High	N	0	0	0	0	0
	%	0	0	0	0	0
Above Average	N	16	4	13	2	10
	%	15.84	3.96	12.87	1.98	9.90
Average	N	76	92	85	91	85
	%	75.24	91.08	84.15	90.09	84.15
Below Average	N	9	3	2	8	5
	%	8.9	2.97	1.98	7.92	4.95
Low	N	0	1	0	0	1
	%	0	0.99	0	0	0.99
Extremely Low	N	0	0	0	0	0
	%	0	0	0	0	0

Table 7 shows percentage distribution of female senior secondary school students in seven decreasing levels of Social support namely extremely high, high, above average, average, below average, low and extremely low. For friend support results revealed that 15.84% of female senior secondary school students reported above average level of Family support, 75.24% of female senior secondary school students reported average level of Family support, and only 8.9% of female senior secondary school students reported below average level of Family support. Table also revealed that none (0%) of the female senior secondary school students reported extremely high, high, low, and extremely low level of Family support.

In the same way in teacher support 0.99% of female senior secondary school students reported extremely high level of teacher support, 3.96% of female senior secondary school students reported above average level of teacher support and 91.08% of female senior secondary school students reported average level of teacher support. Table 7 further revealed that 2.97% of female senior secondary school students reported below average level of teacher support, and only 0.99% of female senior secondary school students showed low level of teacher support.

In the same way in peer support 0.99% of female senior secondary school students reported extremely high level of peer support, 12.87% of female senior secondary school students reported above average level of peer support and 84.15% of female senior secondary school students reported average level of peer support. Table 7 further revealed that 1.98% of female senior secondary school students showed below average level of peer support and none of the (0%) of female senior secondary school students reported below average, low and extremely low level of peer support.

In the same way in online support 1.98% of female senior secondary school students reported above average level of peer support, 90.09% of female senior secondary school students reported average level of peer support and 7.92% of female senior secondary school students reported below average level of social support. Table 7 also revealed that none (0%) of senior secondary school students reported extremely, high, low and extremely low level of peer support.

Likewise in Social support 9.90% of female senior secondary school students reported above average level of Social support, 84.15% of female senior secondary school students reported average level of Social support and 4.91% of female senior secondary school students reported below average level of Social support. Table 7 also revealed that 0.99% of female senior secondary school students showed low level of Social support and none (0%) of the female senior secondary school students reported extremely high, high, and extremely low level of Social support.

Table 8: showing the levels and percentage of government senior secondary students in all the four dimensions of perceived social support

LEVELS	No of Students	SSFS	SSTS	SSPS	SSOS	SST
Extremely High	N	0	80	5	0	0
	%	0	79.20	4.95	0	0
High	N	0	0	0	0	0
	%	0	0	0	0	0
Above Average	N	23	3	13	77	18
	%	22.77	2.97	12.87	76.23	17.82
Average	N	21	7	65	12	34
	%	20.79	6.93	64.35	11.88	33.66
Below Average	N	55	8	18	8	40
	%	54.45	7.92	17.82	7.92	39.60
Low	N	2	3	0	4	9
	%	1.98	2.97	0	3.96	8.91
Extremely low	N	0	0	0	0	0
	%	0	0	0	0	0

Table 8 shows percentage distribution of government senior secondary school students in seven decreasing levels of Family support namely extremely high, high, above average, average, below average, low and extremely low. For Family support results revealed that 22.77% of government senior secondary school students showed above average level of Family support, 20.79% of government senior secondary school students reported average level of Family support, and only 54.45% of government senior secondary school students reported below average level of Family support and only 1.98% of government senior secondary school students reported low level of Family support. Table 8 further revealed that none (0%) of government senior secondary school student reported extremely high, high, and extremely low level of Family support.

In the same way in teacher support 79.20% of government senior secondary school students showed extremely high level of teacher support, 2.97% of government senior secondary school students showed above average level of teacher support and 6.93% of government senior secondary school students reported average level of teacher support. Table 8 also revealed that 7.92% of government senior secondary school students reported below average level of teacher support and 2.97% of government senior secondary school students reported low level of teacher support and none (0%) government senior secondary school students reported extremely low level of teacher support.

In the same way in peer support 4.95% of government senior secondary school students showed extremely high level of online support, 12.87% of government senior secondary school students reported average level of peer support and 64.35% of government senior secondary school students reported average level peer support. Table 8 further showed 17.82% of government senior secondary school students reported below average level of peer support and none (0%) of government senior secondary school students reported high, low and extremely low level of peer support.

In the same way in online support 76.23% of government senior secondary school students showed above average level of online support, 11.88% of government senior secondary school students showed average level of online support and 7.92% of government

senior secondary school students reported below average level of online support. Table 8 also showed that 3.96% of government senior secondary school students reported low level of online support and none (%) of government senior secondary school students reported in extremely high, high and extremely low level of online support.

In the same way in social support 17.82% of government senior secondary school students showed above average level of social support, 33.66% of government senior secondary school students reported average level of social support, and 39.60% of government senior secondary school students reported below average level of social support. Table 8 also revealed that 8.91% of government senior secondary school students reported low level of social support and (0%) of government senior secondary school students reported extremely high, high and extremely low level of social support.

Table 9: showing the levels and percentage of private senior secondary students in all the four dimensions of social support

LEVELS	No. of Students	SSFS	SSTS	SSPS	SSOS	SST
Extremely High	N	0	0	16	0	0
	%	0	0	15.84	0	0
High	N	0	0	0	0	0
	%	0	0	0	0	0
Above Average	N	12	9	8	1	7
	%	11.88	8.91	7.92	0.99	6.93
Average	N	62	84	75	90	84
	%	61.38	83.16	74.25	89.10	83.16
Below Average	N	15	4	0	10	10
	%	14.85	3.96	0	9.90	9.90
Low	N	12	4	2	0	0
	%	11.88	3.96	1.98	0	0
Extremely low	N	0	0	0	0	0
	%	0	0	0	0	0

Table 9 shows percentage distribution of female senior secondary school students in seven decreasing levels of Family support namely extremely high, high, above average, average, below average, low and extremely low. For family support results revealed that 11.88% of private senior secondary school students showed above average level of family support, 61.38% of private senior secondary school students reported average level of social support and 14.85% of private senior secondary school students reported below average level of social support the Table 1.9 further exposed that 10.89% of private senior secondary school students reported low level of family support and none (0%) of the private senior secondary school students reported extremely high, high and extremely low level of family support.

In the same way in teacher support 8.91% of private senior secondary school students showed above average level of teacher support, 83.16% of private senior secondary school students reported average level of SSTS and 3.96% of private senior secondary school students reported below average level of teacher support, the Table 9 also exposed that 3.96% of private senior secondary school students reported low level of social support and none (0%) reported extremely high, high and extremely low level of teacher support.

In the same way in peer support 15.84% of private senior secondary school students reported extremely high level of peer support, 7.92% of private senior secondary school students showed above average level of peer support and 74.25% of private senior secondary school students reported average level of peer support, the Table 9 also revealed that 1.98% of senior secondary school students reported low level of peer support and none (0%) of private senior secondary school students reported high, below average and extremely low level of peer support.

In the same way in online support only 0.99% of private senior secondary school students showed above average level of online support, 89.10% of private senior secondary school students reported average level of online support and 9.90% of private senior secondary school students reported below average level of online support, the Table 9 also revealed that none (0%) of private senior secondary school students reported extremely high, high, low and below average level of online support.

In the same way in social support only 6.98% of private senior secondary school students showed above average level of social support, 83.16% of private senior secondary school students reported average level of social support and 9.90% of private senior secondary school students reported below average level of social support, the Table 9 further revealed that (0%) of private senior secondary school students reported extremely high, high, low and extremely low level in social support.

Table 10: showing the difference of male and female students in their Family support

SSFS	Gender	N	Mean	SD	Df	t-value	p-value
	Male	101	22.85	3.12	200	1.93	.055
	Female	101	23.68	2.99			

Not significant at 0.05

It is obvious from the table 10 that mean score of female (23.68) senior secondary school students is greater than the mean score of male (22.85) senior secondary school students. The SD for male and female students is 3.12 and 23.68 the t- value is 1.93 which is not significant at 0.05 levels ($p > 0.05$). So the null hypothesis stated that there exists no significant difference between male and female senior secondary school student in their family support is accepted. So it can be interpreted that female students are getting high family support as compared to male students.

Table 11: showing the difference of male and female students in their Teacher support

SSTS	Gender	N	Mean	SD	Df	t-value	p-value
	Male	101	22.63	4.37	200	1.57	.117
	Female	101	23.59	4.29			

Not significant at 0.05

It is clear from the table 11 that the mean score of male and female students is 22.63 and 23.59 respectively. The SD for male and female students is 4.37 and 4.29 the t- value is 1.57 which is not significant at 0.05 levels ($p > 0.05$). So it can be interpreted that there is no significant difference between male and female senior secondary school students in their teacher support. So the null hypothesis stated that there exists no significant difference between male and female senior secondary school student in their teacher support is accepted.

It is obvious from the table 11 that mean score of female (23.59) senior secondary school students is greater than the mean score of male (22.63) senior secondary school students. So it can be interpreted that female students are getting high teacher support as compared to male students.

Table 12: showing the difference of male and female students in their Peer support

SSPS	Gender	N	Mean	SD	Df	t-value	p-value
	Male	101	20.68	3.17	200	3.00.**	.003
	Female	101	22.05	3.28			

Significant at 0.01**

It is clear from the table 12 that the mean score of male and female students is 20.68 and 22.05 respectively. The SD for male and female students is 3.17 and 3.28 and the t- value is 3.00 which is significant at 0.01 levels ($p < 0.05$). So the null hypothesis stated that there exists no significant difference between male and female senior secondary school student in their peer support is not accepted. So it can be interpreted that there is significant difference between male and female senior secondary school students in their Peer support.

Further, it is obvious from the table 12 that mean score of female (20.68) senior secondary school students is greater than the mean score of male (22.05) senior secondary school students in their Peer support. So it can be interpreted that female students are getting high peer support as compared to male students.

Table 13: showing the difference of male and female students in their online support

SSOS	Gender	N	Mean	SD	Df	t-value	p-value
	Male	101	21.17	3.47	200	1.06	.289
	Female	101	20.63	3.67			

Not significant at 0.05

It is obvious from the table 13 that mean score of male (21.17) senior secondary school students is greater than the mean score of female (20.63) senior secondary school students. The SD for male and female students is 3.47 and 3.67 the t- value is 1.06 which is not significant at 0.05 levels ($p > 0.05$). So it can be interpreted that there is no significant difference between male and female senior secondary school students in their online support. So the null hypothesis stated that there exists no significant difference between male and female senior secondary school student in their online support is accepted.

It is clear from the table 13 that the mean score of male and female students is 21.17 and 20.63 respectively. So it can be interpreted that male students are getting high online support as compared to female students.

Table 14: showing the difference of male and female students in their Social support

SST	Gender	N	Mean	SD	Df	t-value	p-value
	Male	101	79.48	22.35	200	0.176	.860
	Female	101	78.89	24.68			

Not significant at 0.05

It is clear from the table 14 that the mean score of male and female students is 79.48 and 78.89 respectively. The SD for male and female students is 22.35 and 24.68 the t- value is 0.176 which is not significant at 0.05 level ($p>0.05$). So it can be interpreted that there is no significant difference between male and female senior secondary school students in their social support. So the null hypothesis stated that there exists no significant difference between male and female senior secondary school student in their social support is accepted.

Further, it is obvious from the table 14 that mean score of male (79.48) senior secondary school students is greater than the mean score of female (78.89) senior secondary school students. So it can be interpreted that male students are getting high social support as compared to female students.

Table 15: showing the difference of govt and private students in their Family support

SSFS	Gender	N	Mean	SD	Df	t-value	p-value
	Government	102	23.55	2.76	200	1.31	.190
	Private	100	22.98	3.36			

Not Significant at 0.05

It is clear from the table that the mean score of private and government students is 23.55 and 22.98 respectively. The SD for government and private students is 2.76 and 3.36 the t- value is 1.31 which is not significant at 0.05 levels ($p>0.05$). So the null hypothesis stated that there exists no significant difference between government and private senior secondary school student in their family support is accepted. So it can be interpreted that there is no significant difference between government and private senior secondary school students in their family support.

Further, it is obvious from the table that mean score of government (23.55) senior secondary school students is greater than the mean score of private (22.98) senior secondary school students. So it can be interpreted that government senior secondary school students are getting high family support as compared to private senior secondary school students.

Table 16: showing the difference of govt and private students in their Teacher support

SSTS	Gender	N	Mean	SD	Df	t-value	p-value
	Government	102	23.60	4.74	200	1.60	.110
	Private	100	22.62	3.84			

Not Significant at 0.05

It is clear from the table 16 that the mean score of government and private students is 23.60 and 22.62 respectively. The SD for government and private students is 4.74 and 3.84 the t- value is 1.60 which is not significant at 0.05 levels ($p>0.05$). So it can be interpreted that there is no significant difference between government and private senior secondary school students in their teacher support. So the null hypothesis stated that there exists no significant difference between government and private senior secondary school student in their teacher support is accepted.

Further, It is obvious from the table 16 that mean score of government (23.60) senior secondary school students is greater than the mean score of private (22.62) senior secondary school students. So it can be interpreted that government senior secondary school students are getting high teacher support as compared to private senior secondary school students.

Table 17: showing the difference of govt and private students in their Peer support

SSPS	Gender	N	Mean	SD	Df	t-value	p-value
	Government	102	21.34	3.08	200	0.101	.920
	Private	100	21.39	3.51			

Not Significant at 0.05

It is clear from the table that the mean score of government and private students is 21.34 and 21.39 respectively. The SD for government and private students is 3.08 and 3.51 the t- value is 0.101 which is not significant at 0.05 levels ($p>0.05$). So the null hypothesis stated that there exists no significant difference between government and private senior secondary school student in their Peer support is accepted. So it can be interpreted that there is no significant difference between government and private senior secondary school students in their Peer support.

Further, it is obvious from the table 17 that mean score of private (21.39) senior secondary school students are greater than the mean score of government (21.34) senior secondary school students. So it can be interpreted that private senior secondary school students are getting high peer support as compared to government senior secondary school students.

Table 18: showing the difference of govt and private students in their online support

SS0S	Gender	N	Mean	SD	Df	t-value	p-value
	Government	102	21.68	3.32	200	3.18**	.002
	Private	100	20.11	3.66			

Significant at 0.01**

It is clear from the table 18 that the mean score of government and private students is 21.68 and 20.11 respectively. The SD for government and private students is 3.32 and 3.66 the t- value is 3.18 which is significant at 0.01 levels ($p<0.05$). So the null hypothesis stated that there exists no significant difference between government and private senior secondary school student in their online support is not accepted. So it can be interpreted that there exist significant difference between government and private senior secondary school students in their online support.

Further, it is evident from the table 18 that the mean score of government (21.68) senior secondary school students is greater than the mean score of private (20.11) senior secondary school students. So it can be interpreted that government senior secondary school students are getting high online support as compared to private senior secondary school students.

Table 19: showing the difference of govt and private students in their Social support

SST	Gender	N	Mean	SD	Df	t-value	p-value
	Government	102	78.68	25.74	200	0.309	.758
	Private	100	79.70	21.05			

Not Significant at 0.05

It is clear from the table 19 that the mean score of government and private students is 76.68 and 79.70 respectively. The SD for government and private students is 25.74 and 21.05 the t- value is 0.309 which is not significant at 0.05 levels ($p>0.05$) So it can be interpreted that there is no significant difference between government and private senior secondary school students in their Social support. So the null hypothesis stated that there exists no significant difference between government and private senior secondary school student in their Social support is accepted.

Further, It is obvious from the table that mean score of private (79.70) senior secondary school students are greater than the mean score of government (76.68) senior secondary school students. So it can be interpreted that private senior secondary school students are getting high Social support as compared to government senior secondary school students.

CONCLUSION

- Maximum of senior secondary school students are having average level of social support. Majority of male, female, private, whereas government senior secondary school students reported average level of social support reported below average level of social support.
- Maximum of senior secondary students are having average level of family support. Majority of male, female and private reported average level of Family support while government senior secondary school students reported below average level of Family support.
- Maximum of senior secondary students are having average level of Teacher support. Majority of male, female and private senior secondary school students reported average level of Teacher support whereas government senior secondary school students perceived extremely high level of teacher support.
- Maximum of senior secondary students are having average level of Peer support. Majority of male, female, government as well as private senior secondary school students reported average level of Peer support. As maximum private senior secondary school students reported low online support, parents and teachers should check what these students are viewing on internet. As the sites they might be using are not leading to support in reducing their anxiety. Further the teachers the teachers should focus on the problems of students in educational institutions and provide them solutions so that students can be able to take initiative for their overall well being.
- Male and Female senior secondary school students do not differ significantly in their family, teacher and online support but differ significantly in their peer support. They do not differ significantly in their social support. Female are found to perceive more support from their peer as compared to male.male

REFERENCES

- [1] Heller, A. (1779). Relationship between Social Support and Psychological Stress. *Journal of health and social behavior*, pp.53-79.
- [2] Isik, E. (2013). Perceived Social Support and Locus of Control as the Predictors of Vocational Outcome Expectations. *Educational Sciences: Theory and Practice*, 13(3), 1426-1430.
- [3] Park, J., Kitayama, S., Karasawa, M., Curhan, K., Markus, H. R., Kawakami, N., & Ryff, C. D. (2013). Clarifying the links between Social Support and Health: Culture, Stress, and Neuroticism Matter. *Journal of Health Psychology*, 18(2), 226-235.
- [4] Turkpour, A., & Turkpour, V. M. (2016). Social and Academic Support and Adaptation to College: Exploring the Relationships between Indicators' College Students. *International Education Studies*, 9(12), 53.
- [5] Zavatkay, D. A. (2014). *Social Support and Community College Student Academic Persistence*. University of Hartford.

Websites

www.ijhssnet.com.

www.newcastle.edu.au

Effect of Employees' Nonmonetary Motivational Factors on Job Performance in Public Institutions: A Case of Arusha City Council, Tanzania

¹Benson Lyimo, ²Mercyline Lema

¹Analyst, ²Student,
Research and Publication,
Olva Academy, Arusha, Tanzania

Abstract: The study was carried out to examine the effect of employees' nonmonetary motivational factors on job performance in Arusha City Council. This study used quantitative approach and descriptive survey design was used as research design. Simple random sampling method was used in this research to guarantee fair representation and widespread results for the general population. The type of data collected was primary data and the collection tool was a self-administered questionnaire given to selected sample respondents from Arusha City Council. Data was analyzed and presented in tables and figures with the help of descriptive analysis under SPSS version 25. The findings revealed positive relationship between Recognition and Rewards and Job Performance. The findings showed positive relationship between Job Security and Job Performance. Also, the study unveiled that there is significant relationship between Training and Job Performance. This study recommends that Tanzania's government formulate labor policies to ensure that employees in the organizations for which they are working are treated with utmost importance and to address their requirements not only for money, but also nonmonetary by their organizations, which recognize them and allow their autonomy.

Keywords: Rewards, Recognition, Job Security, Training, Job Performance

I. INTRODUCTION

Motivation is energizing and is the big explanation that any living creature, including human beings, is relocated. Since motivation would keep employees firmly and joyfully committed to their activities. The existence of motivational variables in those organizations is one of the reasons why workers and thus businesses thrive.

The motivation concept describes the difference between workers with the same abilities, expertise and resources to operate in a particular organization under the same circumstances and trained to succeed in a different manner. Such workers do their work in such a way that comparatively more attempts need to be made to attempt to do the job they are asked to do^[1]. Improved efficiency is also guided by the company's motivated workers^[2].

The understanding of the motivational factors that contributes to improved workforce performance will enable tailored techniques for continuous improvement to be applied^[3]. Bolman & Deal (2018) found that if employees are unhappy with their jobs, their performance will be decreased and that behaviour, such as absenteeism, resistance and actions that impair their success, which would lead to loss of productivity and efficiency in the organization^[4].

Performance is considered to be related with the concepts of ability, opportunity, and motivation^[5]. Motivation is the desire and ability to do so. Where other criteria are met Incentive really does increase results. It has an advantage over the others, though, that while chances and willingness to improve stagnant and difficult for the workers, morale can be improved by some means. It is also evident that the ability to succeed would not yield the necessary outcomes in case of lack of potential and opportunity. Motivated workers work actively and creatively to fulfil the goals and priorities of the company.

As a result, one of today's companies' biggest obstacles is to maintain consistently motivated workers. Many studies have found that praising workers are one of the best ways to empower employees. Motivators for the work place are split into monetary and nonmonetary rewards. When it comes to monetary incentives, private companies are deemed to have more capability in terms of finance resources to motivate their employees than the public organizations. Nonmonetary incentives promote employees' excellent job performance through opportunities^[6]. Nonmonetary incentives and rewards give workers self-appreciation and personal recognition, including a friendly atmosphere, flexible working hours, training, new and difficult opportunities, perks such as free phone calls, free transportation, bonus benefits for outstanding staff, pension, free lunch and health insurance. These benefits are often referred to as rewards, because they satisfy the internal needs of the employee such as appreciation, self-esteem and fulfilment.

1.1 NEED FOR THE STUDY

In the Arusha City Council workers are driven by incentives like any other organization. The business needs to reward its workers for creating a competitive atmosphere that is successful. This is one of the essential to high job performance for organizations. Some workers have strong monetary incentive and some have nonmonetary incentives such as gratitude, praise and recognition (Diyego, 2017). However, effect of employees' nonmonetary motivational factors on job performance in Arusha City Council is not well understood and this was the force of this study. This research work aimed to ascertain the practice of nonmonetary motivational factors in the Arusha City Council and its effects over employees' job performance. The findings will provide valuable insight on this problem filling the existing knowledge gap.

II. OBJECTIVES OF THE STUDY

The general objective of this study was to examine the effect of employees' nonmonetary motivational factors on job performance in Arusha City Council. Specific objectives of this study were;

- i. To assess the effect of recognition and reward programs on job performance at Arusha City Council
- ii. To investigate the effect of job security on job performance at Arusha City Council
- iii. To determine the effect of training on job performance at Arusha City Council

III. LITERATURE REVIEW

This chapter provides the literatures review from different studies in order to capture ideas which guided the development of this study:

Maslow Hierarchy of Needs Theory

Maslow's (1943) hierarchy of needs proposes that individuals must fulfil their lower-order needs (basic needs such as water and housing, safety, belonging, and esteem) before being motivated to fulfill the higher-order need for self-actualization^[7]. Normally, the theory of needs developed by Maslow is always captured in a pyramidal shape in which the basic needs are situated at the bottom while the higher needs at the top. This portends the order of importance of the needs. Physiological needs are the most vital and widest among them and were placed at the base of the pyramid. An individual goes through the hierarchy beginning with the most basic needs that is physiological needs which include food, air, sleep, shelter, clothing, salaries for employees etc. Such needs are basic and hence absolutely essential to sustain life. Until the physiological needs are fulfilled, the other needs above the hierarchy will not be considered^[8]. This is very important point to note considering that in most organizations most of the lower level employees fall at this level of the Maslow's hierarchy. The second most basic need is for employees to feel safe and secure. Employees who feel insecure at the work place or who feel like are in harm which could be environmentally or mentally will not be in a position to perform their work above expectation. Instead, they get demotivated and this drives them to look for job offers in other companies^[9].

Social Needs refers to the need for friendships, team togetherness, belonging to associations, clubs or other groups and the need to give and get love are all social needs. Employees are concerned on matters of esteem needs which include self-respect, achievement, attention, recognition and reputation. They generally need the feeling that others will think better of them or others will appreciate their efforts at the work place. This is why motivation is crucial to excellent employee performance and when at this level of the hierarchy; it mainly concerns nonmonetary rewards such as recognizing or praising an employee for good performance in presence of the other employees^[9]. Self-Actualization is the highest level of Maslow's hierarchy where people are looking in to their full potential, purpose, truth, wisdom and justice. A very small percentage of employees ever reach this point. In an organization, such individuals are very few and may include top management such as company proprietors and directors. Therefore, the theory was suitable in understanding the effect of employees' nonmonetary motivational factors on job performance in Arusha City Council.

Alderfer's ERG Theory

Alderfer (1989) ERG Theory was developed between 1961 and 1978, during which the theorist empirically tested data to hone the theory's major tenets and published scholarly material^[10]. ERG is a motivational construct concerned with understanding the factors that contribute to individual human behavior. ERG theory groups human needs into three broad categories: Existence, Relatedness, and Growth (ERG). Existence needs combine the physiological and safety needs of Maslow's model such as the need for food, shelter, and safe working conditions. The existence needs are satisfied by material incentives. These needs include the basic survival needs of human beings, needs for physical and psychological safety from threats to people's existence and wellbeing. Relatedness needs include social and esteem needs, which are derived from other people. According to Sarkar (2016) the relatedness needs include relationships with other people, receive public recognition, and feel secure around people^[11]. These needs are satisfied by personal relationships and social interactions. Growth needs consist of a person's self-esteem through personal achievement as well as the concept of self-actualization. These needs are similar to Maslow's self-actualization needs. This need involves persons making creative efforts to achieve full potential in the existing environment. These needs will be satisfied only if an individual involves himself in the activities of the organization and searches for new challenges and opportunities. ERG theory offers a more flexible approach to understanding employee's nonmonetary motivational factors.

IV. METHODOLOGY

This study adopted a case study design which is concerned with describing the characteristics of a particular individual or group^[12]. Arusha City Council was a case study as far as this study is concerned. The study employed a quantitative research approach. According to Creswell (2009), quantitative methods involve the processes of collecting, analysing, interpreting and writing the results of a study using various designs including survey and experimental research design^[13]. The study was conducted at Arusha City Council. The motive for choosing this study area it is because there is allegation that Arusha City Council is not performing better because employees are not motivated. Thus, researcher wanted to carry out this study at Arusha City Council to testify the facts. This study used sample size of 78 respondents.

Primary and Secondary data were collected in this study. Instrument used to collect primary data was a self-administered questionnaire provided to chosen sample participants from the Arusha City Council. This questionnaire was both open and closed-ended and included a list of statements on which participants were requested to freely identify their degree of agreement or disagreement in their respective rooms by using the five-point Likert scale to determine the attitude of assigning points 1,2,3,4 and 5 to terms of strong disagreement, disagreement, neutrality, agreement and strong agreement as in the order of the numbers. Documentary review refers to the review of various materials from sources such as Internet, reports and Policies. For the purpose of this study, the published articles and researches conducted by other researches have been reviewed and secondary data collected.

Data was collected, processed and analyzed using Statistical Package for Social Sciences (SPSS) version 25. Descriptive and Inferential data analysis was conducted. Descriptive analysis demonstrated how recognition and rewards, job security and training affect the job performance. Also, inferential analysis was used to demonstrate the relationship between nonmonetary motivational factors and job performance with aid of correlation and regression analysis.

V. ANALYSIS AND INTERPRETATION

Study findings sought to investigate the relationship between Recognition and rewards, Job Security, Training and Job Performance. The results were as follows;

Table 1: Correlations

		Correlations		
		Recognition Rewards	Job Security	Training
Job Performance	Pearson Correlation	.217	.348**	.640
	Sig. (2-tailed)	.006	.002	.008
	N	78	78	78

Data in table above depict positive relationship between Recognition and Rewards and Job Performance ($r = 0.217$, $N=78$). The findings showed positive relationship between Job Security and Job Performance ($r = 0.348$, $N=78$). The findings show that there is significant relationship between Training and Job Performance ($r = 0.640$, $N=78$).

A linear regression analysis was conducted to effect of employees' nonmonetary motivational factors on job performance in Arusha City Council. Table 7 below shows the results of the model summary showing how much of the variation in job performance (dependent variable) was accounted for by employees' nonmonetary motivational factors (independent variable).

Table 2 Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.724 ^a	.524	.152	7.30422

a. Predictors: (Constant), Training, Job_Security, Recognition_Rewards

Coefficient of determination (r^2) in the model summary explains 52.4% of the independent variables. This implies that independent variables under *Training, Job Security, Recognition and Rewards*, explain only 52.4% of the characteristics of employees' nonmonetary motivational factors that affecting job performance. The coefficient of determination is significant because 47.6% of variations are brought about by characteristics not captured in the independent variables.

Table 3 ANOVA

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	897.940	3	299.313	5.610	.002 ^b
	Residual	3948.021	74	53.352		
	Total	4845.962	77			

a. Dependent Variable: Job_Performance
b. Predictors: (Constant), Training, Job_Security, Recognition_Rewards

In order to test whether the regression model fitted in the data was significant or valid, an ANOVA test was generated. According to the results, the regression model was found to be statistically significant as evidenced by, $F(3, 74) = 77$, $p < .05$.

Table 4.8 above displays the ANOVA results.

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	44.611	6.945		6.423	.000
	Recognition Rewards	.187	.311	-.086	-.601	.049
	Job Security	.588	.195	-.424	-3.021	.003
	Training	.549	.228	.295	2.407	.019

a. Dependent Variable: Job_Performance

Using the results above, we have the regression equation as: $(Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \alpha)$

$$Y = 44.611 + 0.187X_1 + 0.588X_2 + 0.549X_3 + 6.945\alpha$$

Whereby Y = Job Performance; X1 = Recognition Rewards; X2 = Job Security; X3 = Training

According to the regression equation established, taking all factors into account with constant at zero, outcomes will be 44.611. Taking all other independent variables at zero, recognition rewards increase Job Performance by 0.187. While Job Security will result in 0.588 increase in job performance and Training to employees will result in a 0.549 increase in job performance. Therefore, this implies that, Recognition and Rewards programmes, Job security training have a positive relationship on job performance at Arusha City council.

VI. RESULTS AND DISCUSSION

Study finding uncovered that there is between Recognition and Rewards and Job Performance ($r = 0.217$, $N=78$). Recognition and Rewards is crucial improving job performance. This is because recognized employees can sustain higher levels of efficiency and give a company an incentive to make more profits. However, recognizing workers regularly can be very costly. Rose (2018) suggests that recognition of workers within an organization contributes to a crucial effect on job performance. If appreciation as a prize is successfully used, it increases the efficiency of workers. In the real sense, employees have often taken recognition as part of what they perceive; it leads to improved work, which in turn leads to better results and the productivity of an organization. Arusha City council should know that employees must not only be recognized and rewarded for their organizational efforts towards the success of a company. If staff move outside their workplace by willingly delivering social services at their local hospitals, contributing annually to their food banks or mentoring college students in order to be able to face up to the rigors, then recognition and reward of these initiatives will lead to making jobs more valued than just being employees.

Findings of this study designed positive relationship between Job Security and Job Performance ($r = 0.348$, $N=78$). These findings are in line with Eline (2016) that employees are satisfied when they have secured job, and this leads to a reduced chance of employee turnover^[14]. Job security assures the retirement safety of workers, which increases confidence in the company that eventually guarantees retention. Employees who no longer feel they can rely on companies for security at work show a higher degree of stress^[15]. Conso (2018) posited that missed targets, poor performances and bad results are a common scenario in cases where the employee believes his job is not secured^[16]. Arusha City Council has to make sure that provision of job security to employees does not avert their performance rather than boost it up.

Findings indicated that there is significant relationship between Training and Job Performance ($r = 0.640$, $N=78$). Training opportunities need to be quickly made accessible to improve job performance and organization effectiveness. This is because learning opportunities permit workers to improve their employment in an organization. Aktar et al. (2017) posited that providing learning opportunities to employees is among ways of attract workers, and thus improve their performances^[15]. This therefore calls for Arusha City Council Authority to ensure employees are supplied with adequate training which will make them technically and socially competent and capable of career development into specialist departments or management positions.

VII. CONCLUSION

Conclusions were drawn on the basis of research objectives. The study concluded that there is positive relationship between Recognition and Rewards and Job Performance ($r = 0.217$, $N=78$), there is positive relationship between Job Security and Job Performance ($r = 0.348$, $N=78$) and there is significant relationship between Training and Job Performance ($r = 0.640$, $N=78$). To elicit the best performance from employees, there is need for some sort of motivation beyond the weekly pay check. At Arusha City Council, Employees who work hard should be recognized and appreciated for their contribution. If this is not achieved, the dedicated worker will quickly seek an organisation that recognize and rewards them for all their wonderful achievements. Workers have needs that a workplace ought to fulfil in order to avoid demotivation or distraction from work. Therefore, Arusha City Council needs to place emphasis on nonfinancial motivators to retain, attract, increase workers' performance, satisfaction and commitment.

Abbreviations and Acronyms (Heading 2)

ACC	-	Arusha City Council
ANOVA	-	Analysis of Variance
df	-	Degree of Freedom
ERG	-	Existence Relatedness Growth
SPSS	-	Statistical Package for Social Science

VIII. ACKNOWLEDGMENT

I would like to give out my special thanks to Almighty God for giving me strengths, good healthy and courage to overcome obstacles and challenges towards accomplishing this project. I also thank all who in one way or another assisted me in doing my research report.

REFERENCES

- [1] D. Ramprasand, "Impact of Reward and Recognition on Job Satisfaction and Motivation" vol. 2, pp. 23-32, 2013
- [2] P. Oosthuizen, "The Role of Monetary and Non Monetary Incentives in the Work Place as Influenced by Career Stage", Gainesvills: USA, 2015
- [3] Unterweger et al., "Motivation of health workers and associated factors in public hospitals of West Amhara, northwest Ethiopia" Patient preference and adherence, vol. 15 (10), pp. 159-169, 2017
- [4] Bolman, Deal V. L., " An analysis of performance appraisal practices in the public sector: a review and recommendations", Public Personnel Management Journal, vol. Vol. 12, pp. 258-67, 2018
- [5] A. Ivance, "Reward management: a handbook of remuneration strategy and practice", 5th ed., Kogan Page, London, 2018
- [6] Ballentine A., McKenzie N., Wipocki A., Kepner K., "The role of monetary and non monetary incentives in the workplace as influenced by career stage", Retrieved August 25, 2020, 2003
- [7] A. Maslow, "A Theory of Human Motivation" Psychological Review, vol. 50, pp. 370-396, 1943
- [8] E. M. A, "Impact of reward on employee's performance in a selected manufacturing companies in Ibadan, Oyo State, Nigeria" International Journal of Arts and Commerce, vol. 2(2), pp. 27-32, 2016
- [9] V. Tanner, "Value of training on motivation among health workers in Narok County, Kenya", Pan African Medical Journal, pp. 23(1), 261, 2018
- [10] R. Alderfer, "Pay for Performance: Evaluating Performance Appraisal and Merit Pay", National Academies Press, 1989
- [11] P. Sarkar, "What is ERG Theory? What are the advantages and disadvantages of ERG theory?", 2016
- [12] C. R. Kothari, "Research Methodology: Methods and Techniques", 2nd Revised Edition, New Age International Publishers Ltd., New Delhi, 2004
- [13] J. Creswell, "Research Design Qualitative, Quantitative, and Mixed Methods Approaches", 3rd ed., Sage Publications, Thousand Oaks, CA, 2009
- [14] Evans et al, "Effects of contingent and noncontingent rewards and control on intrinsic motivation", Organization Behaviour and Human Performance, Vols. No 8, pp. 217-229, 2017
- [15] Artz H., Kaya A, "The Benefits of Tangible Non-Monetary Incentives: Four Psychological Processes Tip the Scales in Favor of Tangible Non Cash Incentives", IJMSM, vol. 2, pp. 1-13, 2014
- [16] A. Conso, "Impact of financial and non-financial rewards on employee motivation", Middle-East journal of scientific research, vol. 21 (10), pp. 1776-86, 2018
- [17] Aktar et al., "Human resource management: An Expository Approach", Pumark Nigeria Limited, Lagos, NG, 2017
- [18] T. Diyego, "Reward and Incentive Compensation and Organizational Performance: Evidence from the Semi-conductor Industry", Sage Publications, Dallas, TX, 2017

QUALITY CONTROL ANALYSIS USING SIX SIGMA (DMAIC) METHOD TO REDUCE POST PIN ISOLATOR RIJECT IN PT XYZ (FIRING SECTION)

Doddy Agustiandi

Mercu Buana University
Bekasi, Indonesia

Abstract: This study aims to find the type of defect, along with find the main causes and providing suggestions for improvements in reducing the number of failed products in production processes of firing sections. This study uses a *Six Sigma* methodology approach with tools such as *Fishbone diagrams*, *Pareto diagrams*, *Brainstroming* and *Histograms*. This research is a quantitative descriptive exploratory method. The results of this study indicate the types of product failures, namely Skirt Lip Crack, Inner Skirt Crack and Broken Body. Then there are several causes of product failure is : the auger in the pugmill machine is worn, the dimensions of the Honggote (HG) shape in the forming and seizure sections are not matching, vaccum finishing is not stable, and there is no measurement of the twist of the Yobigote (YG) twist. Then, corrective actions were taken in the form of repairing the extruder and finishing machines, training the operators, making new SOPs, making checksheets and checklists for control. The conclusion of this research is that quality control using the six sigma method can reduce the rejection level and increase the six sigma level. The suggestion is the need for further research to be able to increase the six sigma level.

Keywords: *Six Sigma*, *Quality Improvement*, *Fishbone Diagram*, and *Ceramic Insulator*

I. INTRODUCTION

The company is one of the industries in the manufacturing sector engaged in medium voltage ceramic insulators, namely the production of 12.5 kN pin post insulators and 70 kN suspensions. In April 2020, the company targets a rijk level in the firing is 2.5 % while the failure rate for pin post in the finishing sections is 10.12%. Thus it is necessary to control the quality of production so that production defects can be reduced and product quality is maintained.

Researchers chose quality control using Six Sigma because "Six Sigma is a new management tool used to improve Total Quality Management, very focused on quality control by exploring the company's overall production system which aims to eliminate production defects" (SHIFT Indonesia, 2017). Six Sigma is considered better than other methods such as Total Quality Management (TQM), TQM is a method for implementing and managing overall quality improvement activities in an organization (Usman).

Many researchers have previously researched quality control using the Six Sigma (DMAIC) method in various industries but only a few have researched quality control using the Six Sigma method in the ceramic insulator industry. Previous researchers explained the application of Six Sigma in the water industry (Didiharyono, Marsal & Bakhtiar, 2018), the application of six sigma in the electronic goods industry, namely the Blue-Ray Disc Player (Dony Arief Widiatmoko), the application of six sigma in the car painting industry (Mohhamed A Rahman, AKM Mohiuddin & Hanani Abdullah, 2015), the application of six sigma in the construction industry (Molly Thomas & I.Porcia, 2017).

This study will analyze any failures in the production section of pin post ceramic insulators, as well as find the main causes of the failure of the product and provide suggestions for its repair. This research is also to determine the value of SQL (Sigma Quality Level) in the production section of pin post ceramic insulators.

II. LITERATURE REVIEW

A. Control

Control is an activity carried out to monitor activities and ensure that the actual performance carried out is as planned (Vincent Gasperz, 2005).

B. Quality

Quality is a philosophy that involves all elements of activities carried out by all people in the company that are continuous to achieve a degree of quality and achieve consumer expectations (Achmad.H.S, 2003).

C. Defect

Defect is a condition in which a product is declared to have failed or does not meet the requirements set by the company or customer (Burhan, 2015).

D. Six Sigma-Introduction and overview

At the end of 1970, Dr. Mikel Harry, a senior engineer at Motorola's Government Electronics Group, started an experiment to solve the problem using statistical analysis. Using Motorola's GEG is starting to show dramatic improvements: products are designed and produced faster at less cost. He then wrote this method in a paper entitled "The Strategic Vision for Accelerating Six Sigma Within Motorola", Dr. Mike Harry was then assisted by Richard Schroeder, a former Motorola executive, to develop a data-driven change management concept. The result of this collaboration is a simple quality measurement tool, which later became a philosophy of business progress, known as Six Sigma.

Six sigma is a management tool used to replace Total Quality Management (TQM) which is very focused on quality control by exploring the company's overall production system (Achmad Sutawijaya & Lenny Nawangsari, 2019). The six sigma method has been widely applied in order to improve performance, such as the manufacturing industry (Linderman, et al., 2003), health and safety (Rimantho & Cahyadi, 2016; Sanjit, et al., 2011), environmental management systems (Calia, et al., 2009).

III. RESEARCH METHODOLOGY

The research methodology used in this research is a case study research with the aim of describing the application of Six Sigma to the ceramic manufacturing industry. Case study-based research engages facilitators to study and work with case study companies.

This study uses primary data and secondary data. Primary data is data that is directly obtained and collected in the research area, such as: the condition of the materials used, work instructions and data of employees who work in the production department. Meanwhile, secondary data is data obtained from indirect sources that have been previously prepared and used for the research process, such as process flow data and employee competency matrices.

Data collection techniques using interviews, observation (direct observation) and documentation. The samples in this study were all internal reports on the production section of pin post ceramic insulators. In analyzing the data using the help of the Minitab 18 application and the Six Sigma calculator.

IV. RESEARCH RESULTS

1. Define Phase

This phase defines the project by identifying critical customer needs and linking them to business needs.

a. Process Flow

A process flow diagram is a diagram showing the general flow of plant processes and equipment. Figure 1 shows a flow diagram of the pin post ceramic insulator production process.

b. SIPOC Diagram

The SIPOC (Supplier, Input, Process, Output and Customer) diagram is a tool for identifying the flow of raw materials, machinery, production processes, finished product output until the receipt of goods by the customer. Figure 2 shows a SIPOC diagram for a pin post insulator section firing.

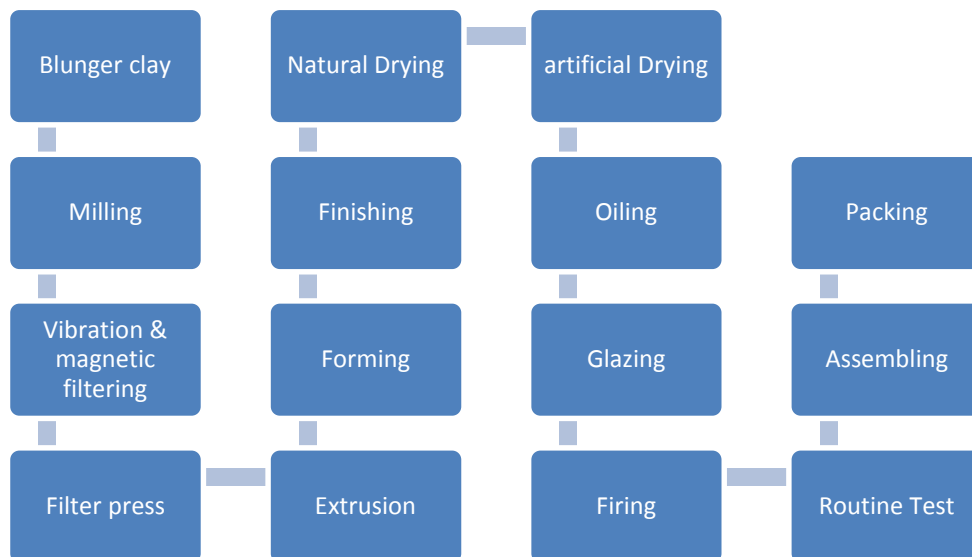


Fig 1: Process Flow of Making Ceramic Pin Post Insulators

c. Critical to Quality (CTQ)

In the Critical To Quality (CTQ) production process, namely the requirements / judgments from QC to achieve customer satisfaction so that there are no complaints from the previous process. Table 1 shows the Critical to Quality (CTQ) production of ceramic post pin insulators in part and Table 2 and Figure 3 show the definition of the type of product defect.

d. Identification of Problems

At this stage the researchers collected data and identified problems that occurred in the quality of the pin post product. Table 3 shows the data for April 2020, there were products that failed in pin post production in finishing section by 10.12% and the target company value for rejuvenation level. Thus it is necessary to control the quality of production so that production defects can be reduced and product quality is maintained.

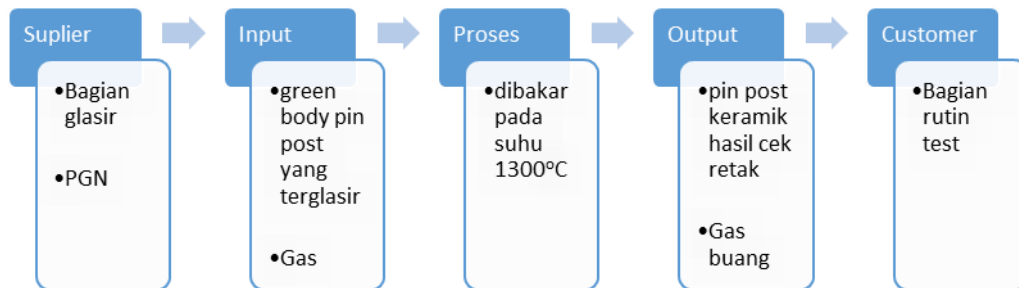


Fig 2 : SIPOC diagram produces Pin Post ceramic insulator

Table 1: CTQ section

Firing Section		
Quality characteristics	Performance Requirement	Type of defect
Compatibility of visual conditions	Nothing cracked	RA RL1 RL2 RD1 RD2 RBR RDR RRT RK TB PB LM RRA
	Brown color and glaze defects according to standard provisions.	C.GLZ

Table 2 : Defect Definition Table

No	Code	Name Reject	Definition
1	Form	Reject form forming	The flak from forming because the shape does not match the image on the leg (tilted leg / dent)
2	Slip	Slip	When it is formed by the finishing machine, the finishing knife stops halfway when it forms.
3	RA	Cracked Head	Cracks at the edge of the upper leaf for the marking part of the pin post
4	RBR	Cracked Lip Skirt	The crack in the middle arch in the skirt from the pin post
5	RRT	Crack Middle Skirt	The crack in the center of the radius in the skirt.
6	RRA	Top Radius Crack	The crack in the first neck from the top of the pin post
7	RK	Cracked Legs	Crack the base of the leg of the pin post
8	KTR	Dirt	Dirt sticking to the pin post surface but the dirt comes from the burning kiln.
9	RD1	1st Leaf Crack	That is, the cracked edge of the first leaf
10	RD2	2nd Leaf Crack	Namely the crack at the edge of the second leaf
11	RL1	1st Neck Crack	The crack in the first neck from the top of the pin post
12	RL2	2nd Neck Crack	The crack in the second neck from the top of the pin post
13	PB	Broken Body	That is, the pin post is split in two, between the leg and the body or between the first neck and the second neck with the feet
14	RDR	Crack In Skirt	Cracks in the radius in the skirt, into the body (sideways and not in the middle of the radius)
15	LM	Laminate	Cracks in the body of the pin post. The fractions looked twisted
16	SOMPEL	Sompel	That is a small fraction in a certain part of the pin post
17	PUNTIRAN	Twist	The twisted fracture of the leg due to the forming / pugmill
18	TB	Paste Material	The remaining material that sticks during the forming process (usually attached to the inside of the pin post skirt)
19	PK	Broken leg	The pinpost leg was broken with the body and skirt
20	PL1	1st neck fracture	Fracture of the first neck from above the pin post as a result of mechanical stress
21	PL2	2nd neck fracture	Fracture in the second neck from the top of the pin post as a result of mechanical stress
22	C.GLZ		<p>Spot without glaze or insert small objects on the glaze layer and small holes. Where the provision is that the total glaze defect area in each insulator unit must not exceed:</p> $100x \frac{D \times F}{2000} \quad \text{mm}^2$ <p>And every single glaze defect must not exceed:</p> $50x \frac{D \times F}{20000} \quad \text{mm}^2$ <p>D = largest diameter of the insulator F = The creepage distance of the insulator So for pin posts, the total glaze defects must not exceed: $100 \times 170 \times 534 / 2000 = 4539 \text{ mm}^2$ And every single glaze defect must not exceed: $50 \times 170 \times 534 / 20000 = 226,95 \text{ mm}^2.$</p>

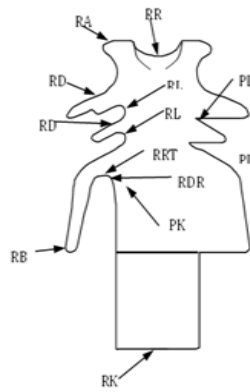


Fig 3 : Types of Pin Post defects

Table 3 : Production data of pin post insulators in April 2020 and company defect target.

Bagian Proses	April 2020			Target Rijek
	Total produksi	Rijek	% Rijek	
Finishing	20.750	232	1,12	0,40%
Natural Drying	21.556	532	2,47	0,50%
Oiling	21.013	1.767	8,41	3,50%
Firing	19.152	0	0,00	2,50%
Rutin Test	15.830	147	0,93	0,80%

e. Project Chapter

In making a project chapter, the most important thing is to make a goal statement. The objective statement must be specific and measurable, because it becomes the basis for improvement efforts (Desai et al., 2014). Then the goal statement is seen in table 4.

2. Measure Phase

The measure phase consists of finding and executing the data that has been collected to establish the basics of improvement and measuring the CTQ as the target process and calculating the sigma level value.

a. Production Control Chart

To create a control chart and binomial capabilities of each production section, researchers used the help of the Minitab 18 application. Figure 4: shows the control chart and capabilities in the finishing, natural drying, oiling, combustion and routine test sections.

Table 4 : Project Chapter

PROJECT CHAPTER	
BUSINESS CASE	OPPORTUNITY STATEMENT
Production rejects in April 2020 in several parts of the production did not reach the target set by the company, in section : <ul style="list-style-type: none"> • Finishing section reject is 1.18% while the target is 0.4% • Natural drying section reject is 2.46% while the target is 0.5% • Oiling section reject is 8.4% while the target is 3.5% • Firing section reject is 10.1% while the target is 2.5% • Routine Test reject is 0.92 while the target is 0.8%. 	The production reject in April 2020 in several parts of the production did not reach the target set by the company, as a result, production in April lost as much as: <ul style="list-style-type: none"> • finishing section: 149 pcs (0.78% of April 20 production) • natural drying section: 424 pcs (1.96% of April 20 production) • oiling section: 1,029 pcs (4.9% of April 20 production) • firing section: 1,130 pcs (7.6% of April 20 production) • routine test section: 19 pcs (0.12% of production April 20).
GOAL STATEMENT	PROJECT SCOPE
"Reducing the pin post production flux in the finishing section from 1.12% to 0.4%, the natural drying portion from 2.49% to 0.5%, the oiling portion from 8.41% to 3.5%, the combustion portion of 10.21% to 2.5% and the routine test portion from 0.93% to 0.8%, at the end of semester 1".	Scope : Production in the finishing section, natural drying, oiling, firing and routine tests

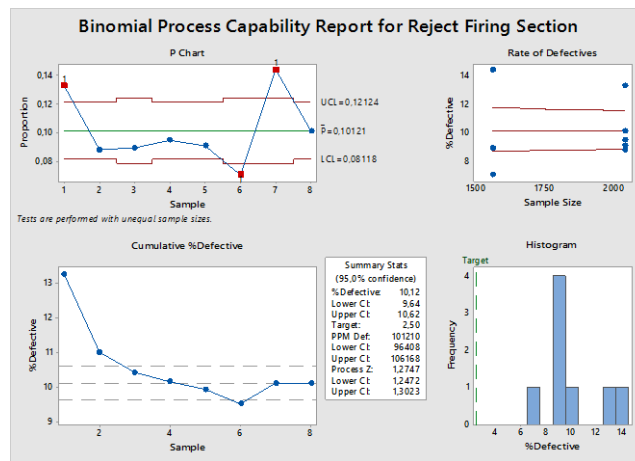


Fig 4 : control chart and capabilities in the finishing, natural drying, oiling, combustion and routine test sections.

b. Calculating the Sigma Leve

In calculating the value of DPO and DPMO using historical data for April 2020, which shows the capability of the process before repair. Measurement of the six sigma level with the help of the six sigma calculator application. Table 5. shows the results of the calculation of DPO, DPMO and six sigma level.

Table 5 : The six sigma calculation results table

Proses	DPO	DPMO	Level Sigma
Finishing	0,011180723	11180,723	3,78
Natural Drying	0,024679904	24679,904	3,47
Oiling	0,084090801	84090,801	2,88
Firing	0,101209677	101209,677	2,77
Rutin test	0,009286166	9286,166	3,85

3. Analyze Phase

In the Analyze Phase, the root cause of the problem is determined using the Pareto diagram from the QC data and fishbone diagrams.

a. Pareto Diagram

The Pareto chart is a tool that can determine which improvements need priority.

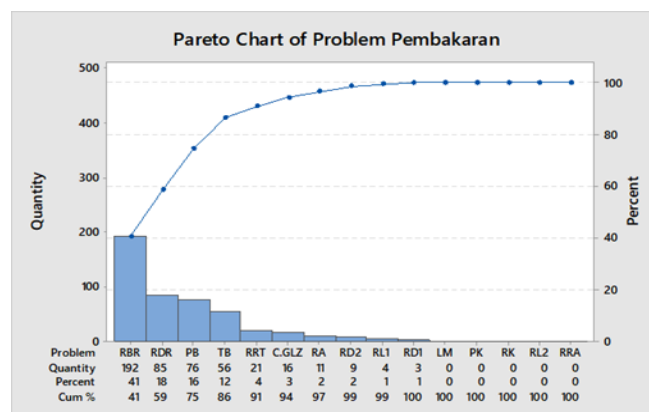


Fig 4 : Pareto diagram parts of finishing, natural drying, oiling, burning and routine tests.

b. Fishbone Diagram

In finding the source of the cause of the defect, this study conducted direct interviews with sources who were considered to be experts to obtain information about the causes of potential defects, then a Fishbone Diagram was made to be able to determine the causes of the defect. After that, from the possible root cause fishbone diagram, discussions and field observations were made to obtain the root cause. The figure in the appendix 1 shows a fishbone diagram by section.

4. Improve Phase

At the Improve phase, an analysis of corrective actions will be carried out to overcome the problem of reducing pin post insulator pressure, then calculating the back using the 5W1H concept (Why, When, Who, Where, What and How). Table 6 shows 5W1H to solve the root cause.

5. Control Phase

The control phase in the DMAIC approach is about maintaining the changes made in the improve phase. Table 7 is a control to maintain the changes made in the problem improvement phase.

a. Analysis capabilities

Capability analysis is a comparison of process performance after repair with specified requirements and before repair. Appendix 2 shows the analytical capabilities of each section.

b. Calculates the six sigma level

After getting the data from the results of the improve, the DPMO calculation is done again to determine the next performance. Table 8 shows the results of the calculation of the six sigma level after the improve phase.

Tabel 6 : Table 5W1H

No	Penyebab	Why	What	Where	When	Who	How
1	Vacuum in the finishing part is not stable (too big or small)	Because the vacuum duct is clogged with residual dirt	Vacuum lines cleared and operator finishing at briefings	in the finishing section	18-May-20	Maintenance	Vacuum finishing line cleaning and routine maintenance checks
2	The auger pugmill or extruder has worn more than 5 mm	Because 45,597 km have been used, it needs maintenance	Repair of the auger and maintenance standards were established	in the extruder	08-Jun-20	Maintenance	Repair of the auger by patching worn augers and making a pugmill wear checkset that converts from pcs to m for periodic maintenance
3	Operators in entering the feeder into the mold forming as long as it is not perpendicular.	Because the going in forming is not perpendicular because the pugmill operator is in a hurry to put the going into the lorry.	Pugmill operators are trained to put the going so as not to tilt.	on the pugmill section	08-Jun-20	Operator pugmill	Pugmill operator training for laying down and consistent monitoring of work by the Head of Formation.
4	Between the HG in the forming section and the seized part in the finishing section, the dimensions don't match	By checking the results of the forming form are placed in seized, the result is that the lip of the skirt does not reach the confiscated stoper.	Repairs are carried out for confiscation and standards are made for maintenance.	in the finishing section	25-Jun-20	Finishing and maintenance operators	Use the checksheet for use of HG and confiscated molds and check the similarity of dimensions of confiscated and HG after each use of 20,000 pcs for maintenance
5	There is no torsional measurement for YG mold results	Because the most recent measurement is sufficient as a reference for checking the measured measurements.	Dilakukan pengecekan untuk puntiran YG dan operator diberi training.	in the forming section	23-Jun-20	Forming operator, Head of forming and QC	Making a check sheet for YG measurement and setting the rotation standard for YG, namely 90 degrees.

No	Control	Tool	How to often	Checking	Who
1	Vaccum	Maintenance checklist	Monthly	Vaccum duct	Maintenance
		Production checklist	Daily	Work consistency	Head of Forming Section
2	Auger	Extruder usage checksheet	Monthly	Length x production pcs	Maintenance
3	Consistent insertion of going into mold forming	Production checklist	Daily	Work consistency	Head of Forming Section
4	HG compatibility with sita	Production checklist	Weekly	Number of production	Forming operators, finishing and forming technicians.
5	YG twist	YG checking checksheet	Daily	Degree of twisting	Forming operator, Head of forming and QC

Table 7 : Table control after improvement

Table 8 : The table is the calculation result of DPO, DPMO and six sigma level after the upgrade stage.

Proses	DPO	DPMO	Level Sigma
Finishing	0,002962963	2962,963	4,25
Natural Drying	0,003800601	3800,601	4,17
Oiling	0,031134374	31134,374	3,93
Firing	0,018872549	18872,549	3,58
Rutin test	0,002576828	2576,828	4,3

From the table, it is found that the results of the improvements that have been made can reduce the DPMO value, in the firing section from 101209.67 to 18872.54. Meanwhile, there was an increase in the sigma value, in the firing section from 2.77 to 3.58.

V. CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that:

In the firing section, rijk occurs: RDR (inner skirt crack), RBR (skirt lip crack) and PB (broken body). With the main causes, namely: the pugmill machine is worn out, the dimensions of the Honggote (HG) shape in the forming and seizure sections are not matching, vaccum finishing is not stable, and there is no measurement of the twist of the Yobigote (YG) twist. The reasons for this were repaired as follows: cleaning the vaccum ducts in the finishing section are kept clean from material impurities, auger repairs by patching worn augers and periodic maintenance, repair of Sita and HG to match the radius and periodic maintenance and routine checking twist of YG and making new SOPs.

Using the Six Sigma method has a positive effect on the quality of the products produced. This is shown by increasing the six sigma level.

REFERENCES

- Arini T. Soemohadiwidjojo 2017, *Six Sigma Metode Pengukuran Kinerja Perusahaan Berbasis Statistik*. Jakarta : Raih Asa Sukses.
- Vicent Gaspersz 2008, *The Executive Guide To Implementing Lean Six Sigma*. Jakarta : PT Gramedia Pustaka Utama.
- Murdifin Haming & Mahfud Nurnajjamuddin 2007, *Manajemen Produksi Modern Operasi Manufaktur dan Jasa*, Jakarta : PT. Bumi Aksara.
- Achmad H Sutawidjaya & Lenny C Nawangsari 2019, *Strategi Operasi & Proses Manajemen*, Jakarta : Lembaga Pengkajian Dan Pengembangan Sumber Daya, Bengkulu.
- Humiras Hardi Purba, S.T., M.T. & Siti Aisyah, S.T., M.T 2017, *Quality Improvement and Lean Six Sigma*. Yogyakarta : Expert.
- Michael L. George, David Rowlands, Mark Piece, John Maxey 2005, *Lean Six Sigma Pocket Toolbook*. Unites states : McGraw-Hill.
- C. Tri Hendradi, *Statistik Six Sigma dengan minitab panduan cerdas insiatif kualitas*. Yogyakarta : CV. ANDI

Yanto, *Statistikinferensi untuk penelitian dengan minitab*. Yogyakarta : CV. ANDI

Erdi Hermawan (2018). *Analisis Pengendalian Kualitas Dengan Pendekatan Metode Six Sigma (studi kasus di PT XYZ)*.

Fidin Saptaja (2018). *Analisa Penurunan Tingkat Reject Claim Plate Bengkok*.

Sulkhan (2018). *Rekayasa Perbaikan Kualitas Proses Plating Melalui Implementasi Metode Six Sigma*.

Hani Sirine, Elisabeth Penti Kurniawati 2017, 'Pengendalian Kualitas Menggunakan Metode Six Sigma (Studi Kasus pada PT. Diras Concept Sukoharjo)', *AJIE - Asian Journal of Innovation and Entrepreneurship* Vol. 02, No. 03.

Didiharyono, Marsal, Bakhtiar 2018, 'Analisa Pengendalian Kualitas Produksi Dengan Metode Six Sigma Pada Industri Air Minum PT Asera Tirta Posidonia, Kota Palopo', *Jurnal Sainsmat*, Halaman 163-176 Vol. VII, No.2

Dino Rimantho, Desak Made Mariani 2017, 'Penerapan Metode Six Sigma Pada Pengendalian Kualitas Air Baku Pada Produksi Makanan', *Jurnal ilmiah Teknis Industri*, ISSN: 1412-6869 e-ISSN: 2480-4038.

Ismi Wulandari, Merita Bernik 2016, 'Penerapan Metode Pengendalian Kualitas Six Sigma Pada Heyjaacker Company', *EkBis: Jurnal Ekonomi dan Bisnis*, Vol. 1, No. 2. Halaman 222 – 241.

Endi Haryanto dan Bonivasius Prasetya Ichtiarto 2019, 'Analisa Punurunan Cacat (Defect) Cat Bintik Debu Dengan Metodologi Six Sigma Pada Proses Painting Produk Fuel Tank Di PT. SSO Tangerang', *Jurnal Penelitian dan Aplikasi Sistem & Teknik Industri (PASTI)* Vol. XIII, No. 3.

Dony Arief Widiatmoko dan Waseso Segoro 2015, 'Aplikasi 6 Sigma Dalam Menurunkan Malfunction Defect Di Pengetesan Elektrikal (AC Transient Test) Pada Tahapan Pengembangan Produk Blu-Ray Disc Player (Studi Kasus Di Perusahaan Manufaktur Elektronik)', *Jurnal MIX*, Volume V, No. 3

Benny Ferdyan 2015, 'Analisis Peningkatan Kualitas Manufacture Switchgear SM6 Dengan Metode DMAIC untuk mengurangi Tingkat Manufacture Defect Rate (MDR) Di PT. Schneider Electric Indonesia Cikarang Plant', *Jurnal OE*, Volume VII, No. 2.

A.Kumaravadivel, U.Natarajan 2011, 'Empirical study on employee job satisfaction upon implementing six sigma DMAIC methodology in Indian foundry- A case study', *International Journal of Engineering, Science and Technology*, Vol. 3, No. 4, 2011, pp. 164-184.

Mohamed A Rahman, A.K.M. Mohiuddin, and Hanani Abdullah 2015, 'Painting Process Improvement Through Six Sigma Approach In A Malaysian Vechile Assembly Company', *Advanced Materials Research* Vol. 1115 (2015) pp 596-600.

K.Srinivasan, S. Muthu, N.K.Prasad, G.Satheesh 2014, 'Reduction of paint line defects in shock absorber through Six Sigma DMAIC phases', *12th GLOBAL CONGRESS ON MANUFACTURING AND MANAGEMENT, Procedia Engineering 97 (2014) 1755 – 1764*.

Javedhusen Malek, Darshak Desai 2015, 'Reducing Rejection/Rework In Pressure Die Casting Process By Application Of DMAIC Methodology Of Six Sigma', *International Journal for Quality Research* 9(4) 577–604

Darshak A.Desai and Aurangzeb Javed Ahmed Shaikh, 2018, 'Reducing failure rate at high voltage (HV) testing of insulator using Six Sigma methodology', *International Journal of Productivity and Performance Management*, Volume 67 Issue 5, 31 May 2018.

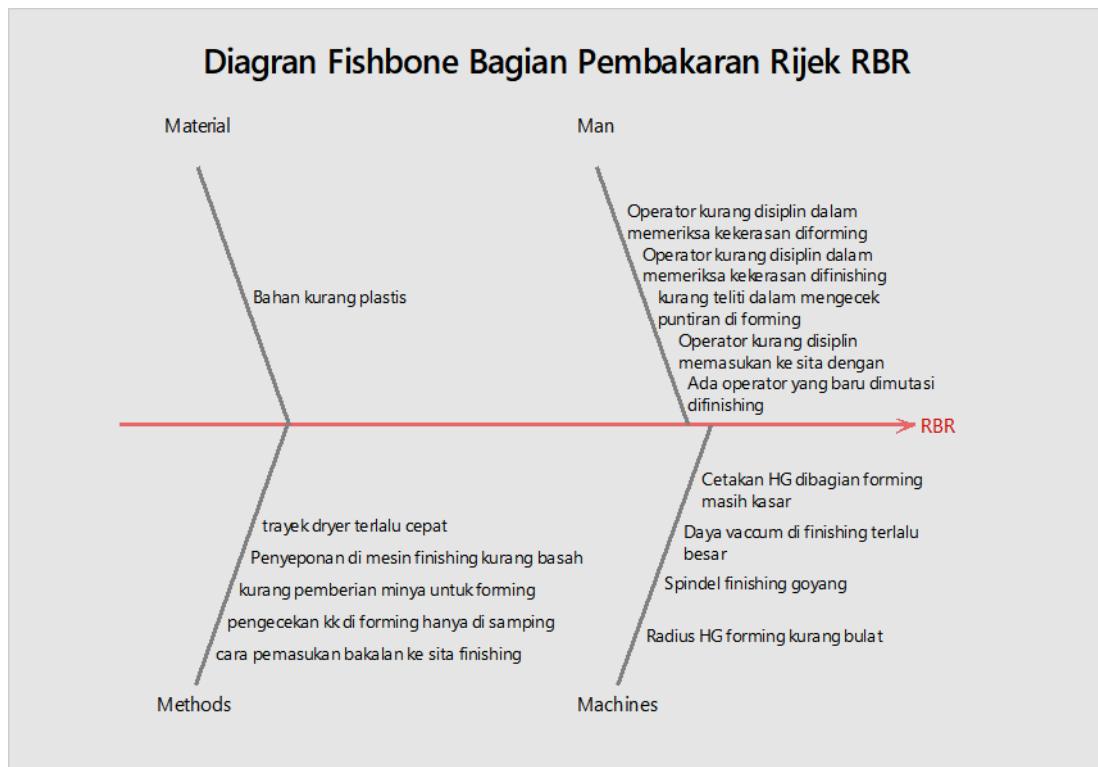
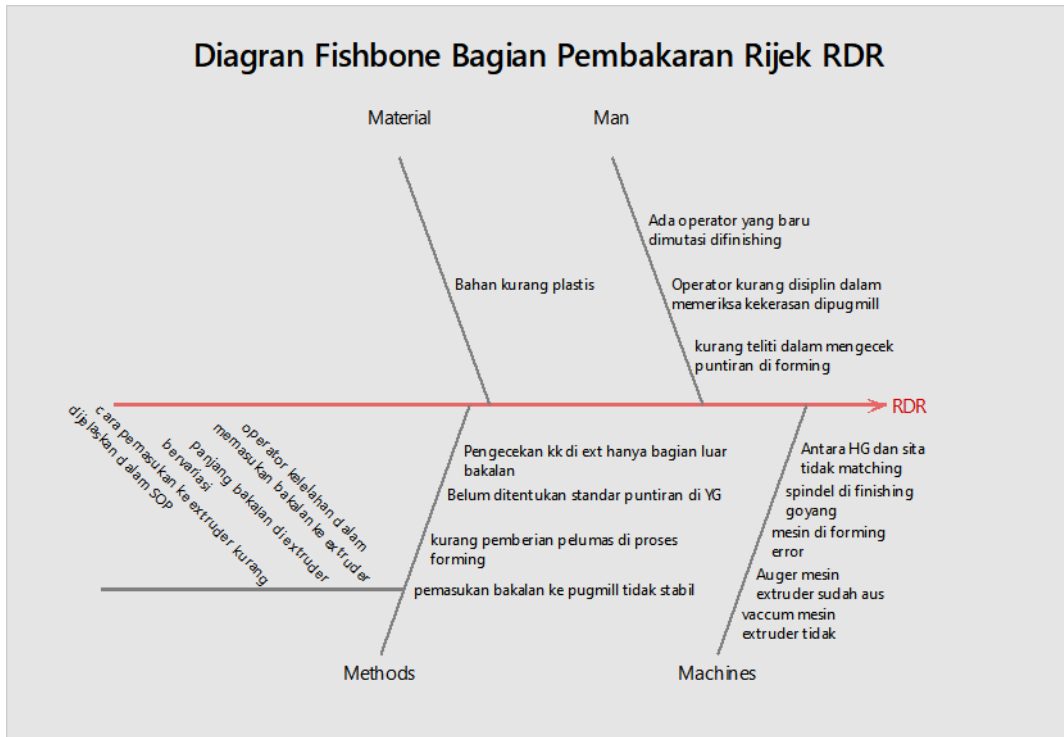
Sachin S, Dileepal J 2017, Six Sigma Methodology for Improving Manufacturing Process in Faundry Industry, *International Journal of Advanced Engineering Research and Science (IJAERS)*, Vol-4, Issue-5

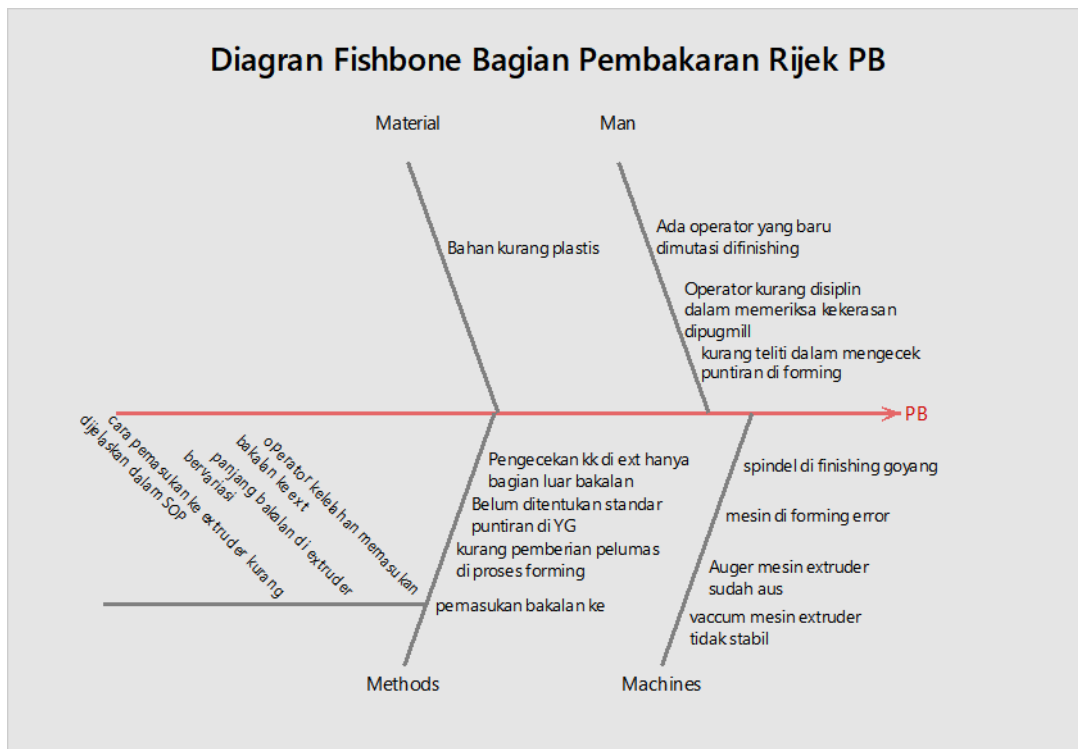
M.Shanmugaraja and M. Nataraj, N. Gunasekaran 2011, Quality and productivity improvement using six sigma and Taguchi methods, *Int. J. Business Excellence*, Vol. 4, No. 5.

Jirasukprasert, P. , Garza-Reyes, J. A. , Kumar, V. and Lim, M. K. (2014), 'A Six Sigma and DMAIC application for the reduction of defects in a rubber gloves manufacturing process', *International Journal of Lean Six Sigma*, volume 5 (1): 2-21.

- Sharma, G. V. S. S.; Rao, P. Srinivasa; Babu, B. Surendra 2018, 'Process capability improvement through DMAIC for aluminum alloy wheel machining', *Journal of Industrial Engineering International*, ISSN 2251-712X, Springer, Heidelberg, Vol. 14, Iss. 2, pp. 213-226.
- Ankit Dubey, Sonam Yadav 2016, 'Implementation of six sigma DMAIC methodology in precast industry for quality improvement', *International Research Journal of Engineering and Technology (IRJET)*, Volume: 03 Issue: 11.
- S. Sriram, A. Revathi 2016, 'Implementation of Six Sigma Concepts in Construction Project for Ensuring Quality Improvements', *International Journal of Innovative Research in Science, Engineering and Technology*, Vol. 5, Issue 4.
- Suraj Dhondiram Patil, M M Ganganallimath, Roopa B Math, Yamanappa Karigar 2015, 'Application of Six Sigma Method to Reduce Defects in Green Sand Casting Process: A Case Study', *International Journal on Recent Technologies in Mechanical and Electrical Engineering (IJRMEE)*, Volume: 2 Issue: 6.
- Molly Thomas, L. Porcia 2017, 'Effectiveness of Implementation of Lean Six Sigma Techniques in Construction', *International Journal of Advances in Science Engineering and Technology*, Volume-5, Issue-3, Jul.-2017.
- K. Srinivasan, S. Muthu, S. R. Devadasan & C. Sugumaran 2016, 'Enhancement of sigma level in the manufacturing of furnace nozzle through DMAIC approach of Six Sigma: a case study', *Production Planning & Control The Management of Operations*, <http://dx.doi.org/10.1080/09537287.2016.1143130>.
- YA Rochman and A Agustin 2017, 'Minimization of Defective Products in The Department of Press Bridge & Rib Through Six Sigma DMAIC Phases', *IOP Conf. Series: Materials Science and Engineering* 215 (2017) 012035.
- Safrizal, Muhajir 2016, 'Pengendalian Kualitas dengan Metode Six Sigma', *Jurnal Mamanajemen Dan Keuangan*, VOL.5, NO.2.
- Nur Ainah 2015, 'Definisi Pengendalian, Fungsi dan Tujuan Pengendalian', diakses pada 21 April 2020, <http://nurarinahidayah.blogspot.com/2015/03/definisi-pengendalian-fungsi-dan-tujuan.htm>.
- Budi Kho 2019, 'Ilmu Manajemen Industri Pengertian Six Sigma dan Tahapan DMAIC', diakses pada 21 April 2020, <https://ilmumanajemenindustri.com/pengertian-six-sigma-5-tahapan-six-sigma-dmaic/>.
- Margie Subahagia Ningsih, Esmi Mada 2018, Metode Six Sigma untuk Mengendalikan Kualitas Produk Surat Kabar di PT X, *JURITI PRIMA (Jurnal Ilmiah Teknik Industri Prima)*, Vol.2; No.1.

APPENDIX 1





APPENDIX 2

