Examining the Challenges of Six Sigma Implementation in Human Resource Management: A Case of Information Technology Sector

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Abstract

Aim: The current research is examining the challenges of Six Sigma implementation in human resource management (HRM), in the Information Technology (IT) sector.

Design/Method: The current research has used the primary quantitative method. The researcher utilised the close-ended questions that was developed according to the hypothesis and objectives of the study. The sample size chosen for the research was 250 respondents and the participants were employees and managers of organisations in the Information Technology sector. The current research has used the correlation, regression and interactive regression modelling.

Findings/Results: The main challenges that have been identified are fear of change, lack of leadership commitment, incomplete training and strategical issues. The organisational culture also plays a role in the form of moderator on the aforementioned factors. The findings of the research revealed that lack of leadership, issues in strategy and fear of change were the main challenges that affected the Six Sigma implementation in human resource management. The research recommends that human resource personnel should need to take relevant measures to resolve the challenges and ensure effective implementation of the Six Sigma technique.

Keywords: *Six Sigma, Human resource Management, Information Technology, Challenges of Six Sigma*

Introduction

In the modern era, Six Sigma implementation in Human Resource Management Practices has played an essential role in the development and growth of an organisation (Kaswan & Rathi 2019). However, it is evident from most of the studies that Six Sigma implementation in HRM has significantly helped the organisations in providing a quality and value outcome (Yadav, Seth & Desai, 2018; Vaishnavi & Suresh, 2020). Likely Yadav, Seth and Desai (2018) in their study indicated that Six Sigma implementation helps HR through providing excellence in the process of day to day delivery and reducing the number of defects. In addition, the implementation of Six Sigma also helps the management in solving the queries, and in recording employees' data and information (Kaswan & Rathi 2019). Similarly, Vaishnavi and Suresh (2020) in another study indicated that Six Sigma implementation help HR in recording accurate employee data, and it helps in detecting and minimising the errors. Moreover, it also helps HR to use the resources effectively and efficiently. Thus, from the prior studies, it has been identified that Six Sigma implementation plays an essential role in HRM practice, and it helps the organisation to mitigate the number of errors and defects. But in fewer studies, it has been empirically examined the challenges that occur in the Six Sigma implementation in HRM.

Therefore, this study aims to empirically analyse the challenges that occur in Six Sigma implementation and its impact on the HRM. Hence to achieve this aim following objectives have been designed.

- The role and significance of Six Sigma implementation in HRM

- To determine the challenges of Six Sigma implementation and their influence on Human Resource Management.
- To suggest the strategies that can help in minimising the challenges of Six Sigma implementation

The core of this research is focused on HRM practices, especially in the context of information technology sector. Therefore, information and data have been collected regarding the challenges in the implementation of Six Sigma in HRM through considering the information technology sector. Thus, the current research provides an emphasised discussion on the challenges that occur in the implementation of Six Sigma and its impact on the HRM, and how the management can overcome and mitigate these challenges.

Literature Review and Hypothesis Development

Six Sigma implementation in HRM has a significant contribution to the development and growth of the organisation (Kaswan & Rathi 2019). Despite these, many organisations have been failed or collapsed due to the challenges that occur in the implementation of Six Sigma in HRM practices (Kaswan & Rathi, 2021). However, in previous studies, it has been found that there are various challenges in Six Sigma implementation such as incomplete training of Six Sigma methodology, lack of leadership commitment, issues in strategy, and fear of change, and organisation culture etc (Madhani, 2021; Galli & Kaviani, 2018; Kaswan & Rathi, 2021).

Incomplete training of Six Sigma is considered as one of the major challenges in successful implementation of Six Sigma in HRM (Kaswan & Rathi, 2021) As Shamsi and Alam (2018) in their study indicated that most of the employees in an organisation have lack of awareness about the usage of Six Sigma and its implementation in HRM practices. The author further suggested that training and education can provide a clear understanding of the tools of Six Sigma implementation. According to Galli and Kaviani (2018), lack of training is considered a challenging factor that brings obstacles in implementing Six Sigma in HRM successfully. The author further indicated that for successful implementation of Six Sigma in HRM, organisations need to adopt the belt program that starts from the top to bottom of an organisation according to the requirements and needs. Similarly, Madhani (2021) in their study has also indicated that lack of training and awareness about the Six Sigma implementation in HRM brings challenges in successful implementation of Six Sigma in HRM. Thus it is essential that organisations continuously involve in providing training, identify the responsibilities of the individual, and adapt to the changes and trends in the Six Sigma approach.

Hypothesis 1: The Incomplete training of Six Sigma methodology has a significant effect on HRM practices.

Lack of leadership commitment is considered as another major challenge in the implementation of Six Sigma in HRM practices (Antony et al., 2018). Likely, Galli and Kaviani (2018) in their study indicated that lack of leader commitment at a different level of the Six Sigma implementation brings challenges and conflicts within an organisation. Similarly, Madhani (2021) indicated that lack of leadership commitment is considered a main cause of failure when it comes to the deployment of Six Sigma in HRM practices. The author further evaluated that for the successful implementation of Six Sigma management must adopt the effective leadership style in deciding the role and responsibilities of the employees dedicated to the project. Therefore, for the successful implementation of Six Sigma in HRM it is required that management must consider effective leadership to allocate the resources, time, money, and talent and money to the project.

Hypothesis 2: Lack of leadership commitment has a significant effect on the HRM practices

Issues in strategy are also considered as a major cause of failure in Six Sigma implementation (Davis & Fifolt, 2018). As in most of the studies it has been found that lack of strategies raises controversy and critics in Six Sigma implementation (Madhani, 2021; Antony et al., 2018). Similarly, Galli and Kaviani (2018) in their study indicated that lack of strategies is the major obstacle that occurs during the implementation of Six Sigma in HRM. The author further evaluated that management have confusion and lack of awareness about how to implement Six Sigma and what strategies and plan need to adapt to a large number of employees and organisation. Therefore, to resolve the issues in strategy and for the successful utilisation of Six Sigma tools, an organisation must analyse and accept the weakness and strengths of the organisation.

Hypothesis 3: Issues in strategy has a significant effect on HRM practices.

Fear of change is another big hurdle that is faced by organisations in the deployment of Six Sigma in HRM practices (Laureani & Antony, 2021). According to Davis and Fifolt (2018), Six Sigma implementation bring changes in the operation, administration, and management of the organisation, and as result, it leads to uncertainty, changes in the lives at work, and daily routine of the workers. The author further evaluated that these uncertainties and changes within an organisation make the employees' future unpredictable, and they enter in panic mode. Similarly in their study indicated that fear of change increases the uncertainties in the employees' lives. Moreover, it also brings changes in strategies, management, company reorganizations, and increased digitization and fear of job loss (Shamsi & Alam, 2018). Thus fear of changes while implementation of Six Sigma in HRM practices is undesirable and ineffective. Therefore, management needs to adopt the policies and measures that create an environment where employees can express their feeling and potential regarding challenges, and difficulties in changes.

Hypothesis 4: Fear of change has a significant effect on HRM practices.

Organizational culture plays a substantial role in any organisation, and it helps HR to resolve the issues and challenges within an organisation (Laureani & Antony, 2021). According to Shamsi and Alam (2018), changes in organisational culture provide tools and techniques that overall improve the management of the organisation. The author further evaluated that it brings clarity within the process of the HR, and it helps them in adopting the changes within an organisation, and as a result, it increases the quality and value of services. Thus to ensure the sustainability of the Six Sigma implementation in HRM the organisation must consider the changes in organisation culture.

Hypothesis 5: Organisation culture moderate with challenges in Six Sigma implementation has a significant effect on the HRM practices

Theoretical Framework
Some numerous theories and models can be taken into account regarding the challenges in six sigma implementation. Moreover, these theories have been able to provide guidance and proper understanding for the successful implementation of Six Sigma in HR practices (Tourais & Videira, 2019). In the current study Institutional theory is most relevant to the topic.

This theory was proposed by Lawrence & Suddaby, back in 2006 which suggest that organisations should continuously strive and effort for the efficient allocation of resources and fitness with the changes in the environment and climate (Popkova, 2018). According to Zhao

et al. (2017), this institutional theory can help the management in enhancing and improving their leadership skills and strategic decision making in HRM practices. In the words of Wang, Li, and Zhao (2018) institutional theory help the HRM to accomplish the goals and objective of the organisation through adapting the external pressure and changes.
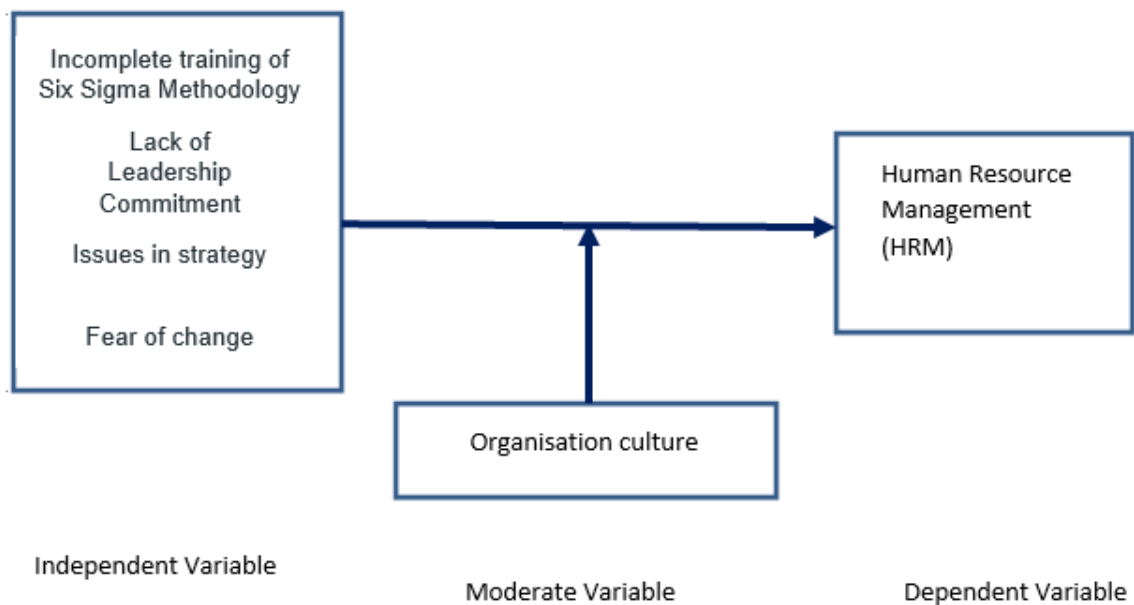
Conceptual Framework

Figure 1 Conceptual Framework

Methodology

The research philosophy is described as a belief through which ways in which data regarding a particular phenomenon is collected, analysed and utilised (Bryman, 2016). Bryman further stated that the idea of knowledge might appear to be profound, with the researcher engaging in knowledge creation to complete the study. There are two types of research philosophies, which are positivism and interpretivism. The current research has utilised positivism because it helped the researcher in gaining factual knowledge through observation. The challenges that occurs related to the implementation of Six Sigma in human resource management has been assessed through quantifiable observations, in which the focus is on verified data and facts. Any biasness is eliminated and not considered in this particular approach.

The research design is described as a general plan regarding what measures that researcher will take to answer the research questions (Patten & Newhart, 2017). There are two types of research design, which are qualitative and quantitative. The current study has made use of

quantitative design, which mainly describes and measures the level of occurrences on the basis of numbers and calculations. The purpose of utilising quantitative research design is that it allows the researcher to collect the numerical data related to assessing the number of challenges that occurs in implementing the six sigma in human resource management. The idea here was to exhibit the relationships that exists between Six Sigma and human resource management through the use of variables and applying statistical techniques.

The data collection is described by Chu and Ke (2017), as the process of collecting information from sources that are relevant to the research problem, helps in testing the hypothesis and evaluating the outcomes. There are two types of data collections methods, which are secondary and primary. The current research has used the primary quantitative method, which is data collected based on mathematical calculations in various formats. The researcher utilised the close-ended questions that was developed according to the hypothesis and objectives of the study. The sample size chosen for the research was 250 respondents and the participants were employees and managers of organisations in the Information Technology sector.

The data analysis technique is described as converting raw data into readable data for the reader (Sekaran & Bougie, 2019). There are diverse forms of data analysis techniques, such as thematic, correlation, regression, and so on. The current research has used the correlation, regression and interactive regression modelling. The purpose of utilising correlation is that it allowed the researcher to observation the association existing between variables; while the regression and interactive regression helped in gaining information about the impact of each challenge on the human resource management, and highlighting the role of moderator variable on the challenges of Six Sigma and the human resource management.

The ethical norms were also maintained in the current researcher. The researcher made certain to take consent from the relevant parties that were made part of the researcher, through the use of survey questionnaire. The researcher further ensured that any kind of secondary source data that was used for the purpose of literature review, was cited with the author's name and due credit was given for using the information in the current work.

Analysis

Descriptive Analysis

Descriptive statistics are described as brief descriptive coefficients that summarises a given data set that can be either a representation of the entire population or a sample of a population (George & Mallery, 2016). George and Mallery further stated that descriptive statistics are broken down into measures of central tendency and measures of variability. The descriptive statistics comprises of mean, median, mode, standard deviation, variance, minimum and maximum variables.

Table 1 - Descriptive Statistics

	FEAR OF CHANGE	HRM	INCOMPLETE TRAINING	ISSUES IN STRATEGY	LEADERSHIP COMMITMENT	ORGANISATION CULTURE
Mean	0.986000	1.398000	1.705000	1.486000	1.621000	1.202000
Median	1.000000	1.000000	1.500000	1.375000	2.000000	1.000000

Maximum	3.500000	4.000000	3.750000	4.000000	4.000000	3.750000
Minimum	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Std. Dev.	0.836422	0.933855	0.744609	0.959158	0.958008	0.862363
Skewness	0.520744	0.265715	0.006894	0.183968	0.154718	0.407503
Kurtosis	2.714177	2.683124	2.850235	2.431019	2.301605	2.734434
Jarque-Bera	12.14990	3.987806	0.235621	4.782471	6.078190	7.653739
Probability	0.002300	0.136163	0.888865	0.091517	0.047878	0.021778
Sum	246.5000	349.5000	426.2500	371.5000	405.2500	300.5000
Sum Sq. Dev.	174.2010	217.1490	138.0562	229.0760	228.5273	185.1740
Observations	250	250	250	250	250	250

Table 1 shows that the mean value of independent variables. The mean value of fear of change is 0.986, mean value of HRM is 1.398, mean value of incomplete training is 1.705, mean value of leadership commitment is 1.62 and mean value of organisation culture is 1.20. This shows that the average respondents is inclined towards agree. The standard deviation reveals the measures of variability. From Table 1, it is observed that std. dev. of fear of change is 0.836, std. dev. of HRM is 0.933, std. dev. of incomplete training is 0.744, std. dev. of issues in strategy is 0.959, std. dev. of leadership commitment is 0.958 and std. dev. of organisation culture is 0.862. It has been observed the mean value of standard deviation is inclined towards agree.

Correlation

Correlation

Probability	HRM	FEAR OF CHANGE	INCOMPLETE TRAINING	ISSUES IN STRATEGY	LEADERSHIP COMMITMENT	ORGANISATION CULTURE
HRM	1					
FEAR OF CHANGE	0.890	1				
INCOMPLETE	0.741	0.735	1			

TRAINING						
ISSUES IN STRATEGY	0.985	0.887	0.734	1		
LEADERSHIP COMMITMENT	0.964	0.921	0.733	0.984	1	
ORGANISATION CULTURE	0.965	0.951	0.788	0.954	0.957	1

Correlation analysis is a simple association that is observed between variables that are part of the research. The value range within this analysis is from 0 to 1, which can be either positive or negative. The positive value range that there is direct association, while the negative value range reveals that there is inverse association. Solutions (2016) highlighted that there are three forms of correlation, which are weak, moderate and high. The range of value from 0.1 to 0.3 is considered to be weak association, the range of value from 0.3 to 0.7 is considered to be moderate association, and the range of value from 0.7 to 1 is considered to be high association.

Table 2 - Correlation

Table 2 shows the correlation of the variables that were part of the research. In relation to HRM, the value of fear of change is 0.980, incomplete training is 0.7641, issues in strategy is 0.985, leadership commitment is 0.964 and organisation culture is 0.965. The values reveal that there is high association among all variables and HRM. In relation to fear of change, the values of incomplete training is 0.735, issues in strategy is 0.887, leadership commitment is 0.921, and organisation culture is 0.951. The values reveal that there is high association among all variables and fear of change.

In relation to incomplete training, the value of issues in strategy is 0.734, leadership commitment is 0.733 and organisation culture is 0.788. The values reveal that there is high association among all variables and incomplete training. In relation to issues in strategy, the value of leadership commitment is 0.984 and organisation culture is 0.954. The values reveal that there is high association among all variables and issues in strategy. In relation to leadership commitment, the value of organisation culture is 0.957 which reveals that a high association exists here.

Regression
Regression analysis is described as the link that exists between two variables. The notion is to discover the association that exists in variables under consideration.

Table 3 - Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.042	0.029	1.455	0.147
INCOMPLETE TRAINING	0.022	0.019	1.158	0.248
ISSUES IN STRATEGY	***1.181	0.057	20.772	0.000
FEAR OF CHANGE	***0.174	0.031	5.667	0.000
LEADERSHIP COMMITMENT	***-0.376	0.067	-5.647	0.000

R-squared = 0.97   Adjusted R-squared = 0.97

*Significant at 10%; **Significant at 5%; ***Significant at 1%

Table 3 reveals that only 3 variables revealed that there is significant impact of human resource management. The threshold value is 0.5, which means that the values below 0.5 is considered to be significant; while any value that is above 0.5 is considered to be insignificant. The issues in strategy value is 0.000, fear of change value is 0.000, and leadership commitment value is 0.000. The aforementioned values reveal that all of them are having a significant impact on human resource management in the information technology sector.

Interactive Regression Model
In the regression model, the interaction effect mainly occurs when the effect of an independent variable on a dependent variable changes (Moon & Weidner, 2017). It is imperative to that the change that occurs is usually dependent on values of one or more other independent variables. The moderator that has been included within this model is organisation culture.

Table 4 - Interactive Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.152	0.034	4.404	0.000
FEAR OF CHANGE	0.026	0.047	0.562	0.574
FEAR OF CHANGE ORGCULTURE	0.018	0.036	0.497	0.620
INCOMPLETE TRAINING	***-0.091	0.030	-3.098	0.002
INCOMPLETE TRAINING ORGCULT	***0.099	0.019	5.165	0.000
ISSUES IN STRATEGY	***1.223	0.097	12.577	0.000
ISSUES IN STRATEGY ORGCULT	***-0.151	0.071	-2.118	0.035

LEADERSHIP COMMITMEN T	***-0.386	0.114	-3.399	0.001
LEADERSHIP COMMITMEN T ORGCULT	0.104	0.088	1.186	0.237

R-squared = 0.97   R-squared = 0.97

*Significant at 10%; **Significant at 5%; ***Significant at 1%

Table 4 reveals that within the interactive regression model, there are five variables that are having a significant impact on the human resource management. It is imperative to note that there are positive significant impact as well as inverse significant impact. The incomplete training value of -0.091, issues in strategy organisation culture value of -0.151, and leadership commitment value of -0.386 are showing inverse significant impact on the human resource management. The incomplete training through organisation culture value of 0.099 and issues in strategy value of 1.223 are showing a positive significant impact on the human resource management.

Discussion and Hypothesis Assessment Summary
Table 5 - Hypothesis Summary

S.No.	Hypothesis	Status
1.	The incomplete training of Six Sigma methodology has a significant effect on the HRM practices	Rejected
2.	Lack of leadership commitment has a significant effect on the HRM practices	Accepted
3.	Issues in strategy has a significant effect on the HRM practices	Accepted
4.	Fear of change has a significant effect on the HRM practices	Accepted
5.	Organisation culture moderate with challenges in Six Sigma implementation has a significant effect on the HRM practices	Partially Accepted

Table 5 shows the hypothesis summary of the current research. The first hypothesis of the research was that incomplete training of Six Sigma methodology has a significant effect on the HRM practices. The findings of the research revealed that the incomplete training had no effect on the HRM practices as the regression findings showed the value of this variable was higher than the required threshold level, due to which the hypothesis was rejected. Davis and Fifolt (2018) highlighted that incomplete training of Six Sigma methodology is vital for the completion of projects having quantifiable outcomes; however, it does not have any impact on the HRM practices. This means that if an individual has no training of using Six Sigma methodology, it would not affect his way of working in the HRM practices.

The remaining hypothesis of the research showed a different result than that of the first one. The second hypothesis of lack of leadership, the third hypothesis of issues on strategy and the third hypothesis of fear of change were described as having a significant effect on the HRM practices. The findings of the research revealed that all the aforementioned variables had a significant effect on the HRM practices as the regression findings revealed that the value of each variable were lower than the threshold value, leading to all three hypothesis being accepted. Kaswan and Rathi (2019) asserted that HRM practices are significantly affected, if there is lack of leadership commitment, fear of change and issues existing in implementing a strategy. An environment of doubt is created leading to an atmosphere that the HRM practices are not carried out efficiently.

The fifth and last hypothesis of the research was about the organisation culture moderate with challenges in Six Sigma implementation has a significant effect on HRM practices. The findings of the research revealed that this particular hypothesis was partially accepted, which means that some sub-factors of this hypothesis were accepted and some were rejected. The sub-factors that were accepted were incomplete training organisational culture and issues in strategy organisational culture. The aforementioned aspect reveals that organisational culture can lead to resolving the issue of incomplete training as well as issues in strategy, making it easier to implement the Six Sigma technique. Shamsi and Alam (2018) stated that organisational culture helps with making improving the knowledge process as well as ensure that there is improvement in the area of adopting Six Sigma technique efficiently. However, Vaishnavi and Suresh (2020) contemplated that organisational culture cannot be relied upon for effective implementation of Six Sigma. In some cases, it tends to become difficult to make employees understand that a new change is vital or to ensure that leadership commit to the new strategy. This is verified in the current research findings, which revealed that fear of change and leadership commitment were sub-factors that were not accepted as part of the hypothesis of organisation culture.

Conclusion

The focus of the current research was to examine the challenges of Six Sigma implementation in human resource management, focusing on the information technology sector. The research discovered that a series of challenges tend to occur for human resource management when implementing Six Sigma, which were incomplete training of Six Sigma methodology, lack of leadership commitment, issues in strategy, and fear of change. The method used in the researcher was primary quantitative approach. The correlation findings of the research revealed that all the aforementioned factors had high association with the human resource management, which means that all of them occurred as a challenge which needed to be resolved. It has been observed from the findings that issues in strategy, fear of change and leadership commitment had a significant impact on the human resource management. This means that through linear regression, the aforementioned three factors are challenges that human resource management would need to resolve, while implementing the Six Sigma technique. On the other hand, the inclusion of organisation culture in the equation revealed through the interactive regression that incomplete training and issues in strategy were the main challenges that made it difficult for the human resource management to incorporate the Six Sigma procedure.

Future Implications

The subject and the scope of this research is emphasised on the challenges of Six Sigma implementation in human resource management, in the Information Technology sector. The

findings of the research revealed that fear of change, incomplete training, and issues in strategy and leadership commitment were the main challenges that were identified in the implementation aspect of Six Sigma for the human resource management. Considering the aforementioned finding, the current research would be helpful in implementing strategies to resolve the challenges of Six Sigma for the human resource management. One of the key aspect noticed in the current research was the inclusion of organisation culture as a moderator, which also showed to be affecting the identified challenges and the human resource management. In relation to this, organisations in the information technology sector would need to ensure that they are implementing strategies that aligns the organisation culture and Six Sigma implementation leading to a positive impact on the human resource management.

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Appendix

Questionnaire
Demographic Variables

Gender:

0= Female

1= Male

2=Prefer not to say

Age:

0=18-29 years

1=30-39 years

2=40-49 years

3=50-59 years

4=60 years and above

Employment status

      0=Full time

      1=Part time

      2=Casual

Questionnaire

Variables of the Study

Variable/ Codes	0	1	2	3	4
Incomplete training of Six Sigma Methodology	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Incomplete training leads to low information about six sigma methodology					
Incomplete training leads to resistance in change in using six sigma methodology					
Incomplete training leads to employee not being able to use data-driven approach of six sigma methodology					

Incomplete training leads to not have a clear idea about scope of six sigma methodology					
Lack of Leadership Commitment					
Lack of leadership commitment leads to employees not acceptable a new method of working easily					
Lack of leadership commitment leads to opting for quick results and using quick fixes to deal with issues					
Lack of leadership commitment leads to performance being decreased of employees causing demotivation					
Lack of leadership leads to complete failure of using six sigma efficiently.					
Issues in strategy					
The issue of not improving the value in strategy leads to failure in job satisfaction					
The issue of not cooperating among employees leads to strategy failing completely.					
The issues in strategy exists owing to not using any tools or methods					
The issues in strategy occurs as Six Sigma does not experiment with other methodologies					
Fear of change					
Fear of change occurs when lack of knowledge exists related to Sig Sigma					
Fear of change occurs when early failure occurs in implementation of Six Sigma					
Fear of change occurs when resources are not utilised in the best way for implementing Six Sigma					
Fear of change occurs when a perception of difficulty in implementing Six Sigma is built					
Organisational culture					
Six sigma helps in changing organisational culture, in light of beliefs and behaviours of employees					

Six sigma helps in bringing a problem-solving aspect in organisational culture					
Six sigma helps in bringing the aspect of knowledge process and improvement in organisational culture					
Organisation culture is improved through project work and training of Six Sigma					
Human Resource Management					
HRM practices are further improved with elimination of variation through Six Sigma					
HRM practices stay within acceptable quality and performance level owing to Six Sigma implementation					
HRM practices become efficient as Six Sigma help with identifying gap analysis					
HRM practices are able to analyse budgets owing to Six Sigma implementation					