

**ROLE OF DEFENSE SPENDING, MYTHS AND REALITIES;
A CASE OF PAKISTAN AERONAUTICAL COMPLEX**



M Phil Thesis

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14/MPhil-DS/PIDE/2013

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**Department of Development Studies
Pakistan Institute of Development Economics
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List of abbreviations

ARF	Aircraft Rebuild Factory
ARDL	Auto regressive distributive Lag
AMF	Aircraft Manufacturing Factory
APF	Avionics Production Factory
CKD	Completely Knocked Down Kits
GOH	Grand overhaul
MRF	Mirage Rebuild Factory
MRO	Maintenance, repair and overhaul
MPP	Metal parts Production
OEM	Original Equipment Manufacturer
PAF	Pakistan Air Force
PAC	Pakistan Aeronautical Complex
SKD's	Semi knocked down Kits
TOT	Transfer Of Technology
HRD	Human Resource Development
CATIC	China National Aero-Technology Import & Export Corporation
CNE	civilian Non-entitled
PACIT	Pakistan Aeronautical complex Institute of Technology
QEC	Quick Engine Exchange
VHF	Very High Frequency
UHF	Ultra high Frequency
GPS	Global positioning System

NAVCOM

Navigation communicator

Grifo

a name of a Radar

MPDR

Mobile pulse Doppler Radar

MODP

Ministry of defense Production

MOF

Ministry of finance

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Dedicated to my Loving Parents

Abstract

Pakistan's defense spending and defense production have been under extreme criticism from different sections of the society. Sometimes the criticism is not based on valid arguments and verifiable evidence. Defense sector and defense industry on the other hand is a very important part of the national security policy and the economy. Therefore there is a need to study the critique on the defense industry of Pakistan in order to inform a better policy, by finding answers attached to the myths related to the defense production of Pakistan and what the realities are. The major defense production comprises of Heavy Industries Taxila, Pakistan Ordnance Factories and Pakistan Aeronautical Complex, however, the entire defense production sector is out of the scope of this study. In this study the case of Pakistan Aeronautical Complex (PAC) has been analyzed.

The previous studies have relied heavily on econometric techniques and have taken defense expenditure as a whole. The various spillover effects and the positive externalities generated by the defense sector have been overlooked by the existing literature. The study has analyzed PAC Kamra in detail and in-depth. Findings suggest that PAC Kamra is contributing to Human resource development, R&D, and is providing sound foundations for Aeronautical and Aviation industry of Pakistan. The study also found that PAC has a potential to give Pakistan Export quality products which can bring in the much needed foreign exchange. And on the basis of these findings the study concluded that the criticism levelled against PAC Kamra is not valid and this entity of national strategic importance should therefore be safeguarded from ill-informed and unwarranted critique. The study is both descriptive and exploratory, the study used different techniques of Purposive sampling where the high ranking officials of PAC served as the key informants. The findings are based on the open ended semi structured interviews. The study analyzed the answers of the respondents with openly available information and has then given conclusions after a thorough analysis.

This study found that PAC has numerous activities and is full fledged industry. All the major activities of PAC are reported. A historical account of the PAC is given, discussing how it has progressed. Key informants emphasized that the Pakistan's Defense expenditure is determined by the threat perception and hostility at the borders along with internal security situation. The study also found that PAC Kamra is saving millions of foreign Exchange by providing valuable

activities and indigenous production of aviation products. Lastly, study found that PAC has immense Export potential.on the basis of these contributions of Kamra, the study finds that criticism directed at PAC is not justified.

Chapter 1: INTRODUCTION.

Pakistan's defense spending and the indigenous defense production activities have remained under immense criticism from the research community, the academia, and the press. There is a perception that the defense spending has been the prime reason behind the bad performance of the socio-economic sector of Pakistan. Yes, Pakistan is a resource-constrained economy and optimal allocation to all the sectors has never remained an easy task. However, the importance of defense sector for the survival of an economy and a nation cannot be overlooked. Defense sector provides us with deterrence which can be defined as the suppression of temptation of an attack by potential aggressor.

Defense sector and the defense industry also have other external and spillover effects in the form of Employment, Human Resource Development (HRD), and producing skilled labor, improving technology and creating import substitution. These effects remained underemphasized in the literature pertaining to Pakistan rather Pakistan defense spending and defense industry has always faced criticism from different circles. Pakistan Air force (PAF) and Pakistan Aeronautical Complex (PAC) Kamra are no exception to the criticism. The critics generally have only highlighted the defense sector and defense production from a spending and expenditure angle, while the feedback of the defense sector and defense industry to the society and the economy have never been analyzed in the case of Pakistan. Therefore, this study attempts to analyze the criticism at Pakistan defense spending and defense production, by taking PAF and PAC Kamra as a case study,¹.

PAF is the air wing of Pakistan armed forces. It was established in 1947 with the objective to safeguard Pakistani airspace and to assist Pakistan Army and Pakistan Navy; its two relatively senior sister services. Though the air force is smaller in size, compared to army and navy, but the cost as well as effectiveness of its weapons makes it equally significant as army and navy.

PAC Kamra is Pakistan's only facility which produces Aviation products. PAC Kamra provides Maintenance, Repair and Overhaul known as MRO activities. It also provides for the refurbishing of airframes and wings. Most of the aviation products used by PAF are produced at

¹ Since time and resource constraints don't allow us to have an in-depth analysis of the entire defense sector and defense production industry of Pakistan

PAC. PAC also manufactures aircrafts which includes the Mushak, which is PAF's premiere non-Jet trainer. Pakistan has also exported a number of Mushak to other countries and the Mushak has also been upgraded now to fit the needs of the Pakistani air force and the international market as well. PAC has recently acquired the capability of manufacturing JF-17 thunder, which is Pakistan's low cost multi role jet fighter. Other activities of PAC include the manufacturing of RADARs, the integration of weapon systems, avionics suite and other technical and engineering activities. PAC Kamra has to keep a trained and skilled work force for the operations like any other industry. PAC Kamra is an industrial complex comprising four major factories. The factories include Aircraft Rebuild Factory (ARF), Mirage Rebuild Factory (MRF), Aircraft manufacturing factory (AMF) and Avionics production Factory (APF).

ARF provides the maintenance, repair, and overhaul of the aircrafts of Pakistan Air Force. It keeps Pakistan's fighter Jets battle ready at all times. Pakistan is the largest user of Mirages and MRF is dedicated to the maintaining, repairing and overhauling of the entire Mirage fleet of PAF. Other than that, the MRF also provides MRO services for engines of C-130, propeller of C-130, the engines of F-16 as well. AMF was established with the aim to manufacture trainer Aircrafts such as the Mushak. Latest products of AMF include the super Mushak, the K8 and the 3.5-generation fighter jet, the JF-17 thunder. Finally, APF was the last of the factories established; its primary function is to provide avionics support and maintenance to the Air Craft. APF, also maintains repairs and manufactures Radars for Aircrafts as well as ground Radars.

This study is Based on conducting Key informant interviews and purposive sampling technique was adopted for it. The key informants were senior PAF and PAC officials; whom guided us to various aspects and sensitivities of defense spending and also helped us get the right data sets for analysis. Unlike previous studies, This study has provided an in-depth analysis of the issue due to our unique methodology and its qualitative and descriptive nature.

1.2 Significance of the study

Pakistan defense spending and defense production has been criticised by studies such as Siddiqua (1980), Siddiqua (1999) and Siddiqua (2007) Chawla (2001) the print and electronic media, the numerous news articles appearing every day. The studies have gained immense importance and are frequently quoted by Civil servants, policy makers, researchers and academia and the press.

Other note-able studies claiming Pakistan's spending on defense as the cause of Pakistan's socio economic ills include Khilji (1997), Chawla (2001), Shahbaz and Talat (2013), (Faiz *et al.*, 2013). Among these studies Siddiqa (1999) has criticised in detail the Case of Kamra although the evidence provided is not substantial. The studies argue that Pakistan should cut defense spending and indigenous production of arms and aircraft should be abandoned as according to the finding of Siddiqa (1999) , PAC and its indigenous products are a total failure, a burden on national economy and waste of resources. Moreover these studies are also in consensus on the issue of defense-welfare tradeoff. Therefore there was a need to analyze the validity of the critique.

Pakistan Air Force is equally subject to criticism by press, ill-informed intellectuals and even allegedly under influence from foreign agencies. In the absence of first hand evidence, criticism for sake of criticism takes place. Critics are always welcome in a free world but it needs to be based on some scientific information. A national project, like JF-17 project, is an ample example where it is criticized unjustly. The cost of fighter aircraft in the market is very high, probably the most costly commodity and with JF-17 Thunder fighter jet, PAF is seeking a certain replacement, which would be free from international politics (as happened in the case of F-16 deals with USA). The study is also significant because it will help other researchers to further probe the issue, since no such document on PAC is available. The thesis has provided a bridge between uniform Personnel of PAF and PAC and the research community. This will also serve as an important information for others, who are interested in doing research on Pakistan defense industry. This study is an attempt in this direction to address such misconceptions by discussing welfare impact of defense expenditure with special reference to Pakistan Air force and Kamra.

People are hostile towards the things that they are ignorant of , and I believe that , this is one of the reason why there is huge criticism at the defense production of Pakistan. The thesis has introduced PAC in detail. It has shown the potential of PAC and the products of Pac and the role it is playing towards the well being of national defense and national defense industry.

Background

Countries, which are economically advanced, have strong defense industry, and aviation industry has trillion dollars share. Defense industry in general and aviation industry in particular provide sound foundations for other industries. Turkey has an Aviation industry earning 906 million USD while USA has 364 billion USD. US Aviation industry earned 89.6 billion USD from its exports in 2010, while this industry is employing 1.05 million people directly and around two million indirectly through induced employment. To dig further, US Aviation industry thus earns a revenue of 302.4 billion USD which is 308,364 USD per employee out of which the employees paid 38 billion USD as Government taxes (excluding indirect taxes) while the industry paid a total of 14 billion USD in Corporate taxes (Deloitte, 2012; Dassault, 2015) and sales of the industry contributing 5.2 % to US GDP. Therefore, there is dire need to explore the impact of PAC Kamra towards aeronautic and avionic aspects and its welfare impact because Pakistan is no exception when the countries mentioned above are highlighted. In fact, for industrial development, strength of avionics and aviation industry do matter. Therefore, PAC Kamra has been selected as a case study.

The Euro-Fighter and JF-17 Thunder

In 1986 work on the Euro Fighter began. It is a joint project of three companies namely Alenia Aermacchi, Airbus Group and BAE Systems. Its development began because of the joint efforts of UK, Germany, Italy and Spain. Due to political reasons, France had left this consortium and started developing its own “*Rafael*”. The first prototype of the Euro-fighter flew in 1994 and its first batch was inducted in European air forces in 2003. Germany, Austria Italy, Saudi Arabia, and Oman have inducted the Eurofighter into their Air forces. It is an agile fighter aircraft and has had its combat debut in 2011 Libya air strikes.

To have a complete cost benefit analyses of the Euro Fighter, its impact on Employment, Technology spin-offs, balance of payments need to be analyzed (Hartley, 2006). Typhoon program has created Jobs across Europe in 400 European companies. The number of jobs created by the typhoon, directly and indirectly together amount to around 100,000 to 105,000. The distribution of the Jobs in 2006 was such that UK had 40,000 jobs, Germany and Italy 20,000 each and while Spain had 25,000 of the total jobs created by the Typhoon program. (Hartley,

2007). Most of the Jobs created by the typhoon are highly skilled and highly paid jobs. These can be also be used in the motorcar industry, electronic industry and Airbus 380 work.

Apart from jobs, the Eurofighter (typhoon) has had a great technology spin-off effect on the Civilian industry. For example the engine technology, the carbon fiber technology, the flight control system etc. there are spinoff in form of business practices and even in the racing car industry.

Typhoon has had a very huge Impact on the Balance Of Payment of Europe. It has not only strengthened the European industrial base in aerospace engineering but has also reduced Europe's dependence on USA.in 2006 alone , the euro fighter had 90 export orders amounting to 9.5 billion euros. Hartley (2007) claims that the typhoon has saved 33.5-54 billion Euros for the European customers, basing the higher estimate on the assumptions that typhoon was the least-cost solution and the lower estimate on the assumption of purchase of USF-15 e and F18E/F aircraft. On the total the Eurofighter has saved, roughly 43 – 64 billion Euros.

The JF-17 thunder is a product of PAC and it is a agile aircraft suited for the needs of PAF. This aircraft has been jointly developed by PAC and CATIC. The aircraft has been entered to service by Pakistan Air force. Just like the Euro=fighter, the impact of JF0-17 thunder was analyzed by the study.

This attempt may be the first of its kind however it may be an addition to the work done by the pioneers and it will further broaden the avenues for further research by other scholars in this direction

Theoretical Framework

Lower income countries, such as Pakistan can increase their economic growth alongside strengthening defense capability and military muscle by increasing defense budget Deloitte (2015). Military Keynesianism Points out that the government can increase economic growth by increasing defense spending (Khilji *et al* 1997). Defense spending may influence growth through direct military jobs (Kentor & Kirck 2008) , jobs created through defense industry such as aerospace industry (Hartley 2007) and also indirect provision of social services to the general public in form of defense schools and hospitals. Hartley (2006) points out to the R&D spillover effects of Defense industry on the civil aviation industry, the motor car industry and the

electronics industry while discussing the Eurofighter. Paul Dunne (2001) is of the opinion that defense spending as an engine of growth is justified if and only if, the provision of such opportunities can be better exploited by defense spending rather than through direct provision by the civil Government. Aerospace industry requires talent and very skilled human resource. To have good quality human resource, the firm should be able to provide competitive salary enough to attract skilled human resource and must also have adequate provisions for human resources development. (DASSAULT 2015) (Hartley 2007). In addition, R&D is a very crucial area on which the competitiveness of the corporation depends Hartley (2007).

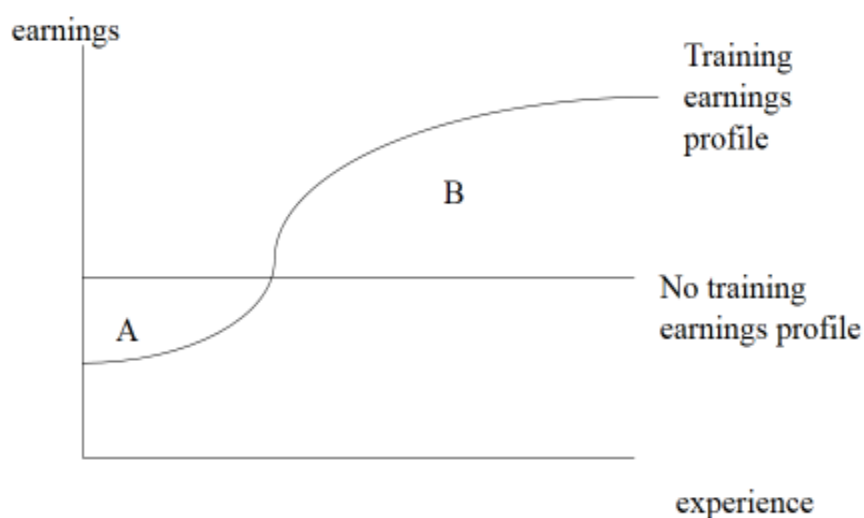
Studies that establish positive relationship between defense spending and economic growth present defense industry as the one of the supportive arguments, they believe that defense industry creates employment, gives export potential, earns foreign exchange and has technological spinoff effects on the economy. Benoit (1973 and 1978), (Weede 1986) (Moon 1986) (Ando 2009) are some of the studies explaining this relationship.

Industry of any form not only provides goods or services but also has a lot of allied and external benefits. It creates demand for skilled labor, human resource development, employment, incentives for research and development, innovation and its impact extends beyond its own market area to others. i.e. it becomes the reason for other industries to flourish. Indigenous industry has a number of other benefits as well. It helps utilize the domestic human resource in the right direction apart from providing import substitution industrialization (ISI). The domestic and indigenously produced products, might be expensive compared to the imported or may lack certain attributes in quality but the impact of indigenous production extends far beyond the cost benefit analysis. It creates huge opportunities for investment, employment, and technical advancement. Defense industry is no exception. It has a huge potential to create jobs, export potential, R&D development and along with it creating ISI and enhancing a country's self-reliance (Benoit, 1973 and 1978) (Hartley, 2006 and 2007).

The skilled training required for industry has to be, attained by an individual through a specialized program for which the cost is borne by the individual. When a certain individual joins the job, for the first few years he or she has to compensate for the cost of training. This shrinks his or her economic profit. However, if this training is provided by the employer and is

free of cost then the individual has an economic profit far higher than what he or she would have had, if the training cost had been borne by him or her. (see Figure 2.2)

The training decision



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Figure 1.2

There are certain other expenses for which the individual skilled labor has to plan. For instance the schooling and health expenditures of the family. If he has to admit his children in a good school and would want to have excellent medical care for the family, this will certainly reduce his profit but if he is provided, with good schooling at very low cost and free medical care. Alongside that, the employer also provides the individual with accommodation for his family. All these things amount to welfare.

Public spending like all other forms of spending has an opportunity cost. There is a bulk of literature pertaining to defense-welfare spending trade off. Notable studies include (Deger 1986) (Khilji *et al* 1997) (Anwar *et al* 2012). These studies unanimously agree that increasing defense spending, will divert resources from social and welfare needs to the defense sector. Given the principle economic concept of opportunity cost, this sounds a valid result. The questions that need to be asked is that whether this diversion is justified? In what cases is it a rational choice?

Can the defense sector in some manner pay back to the society in order to trade-off for the spending that is diverted to it? If the defense sector is able to provide better health care and educational facilities at a low cost then it is better to provide some of the educational services and other social services through the defense sector. This will not only reduce the burden on the overall economy but also contribute to strengthening of national defense alongside maintaining a considerable balance, through the pay-back to the society.

PAC comprises of four factories. These four factories require highly skilled labor. The sophistication of the machinery and the sensitivity of production techniques required by Kamra has created certain incentives for people to get those required skills. If PAC is providing training, housing, medical care and schooling then it serves as sufficient evidence to conclude that Kamra is contributing to skilled human resource development.

Secondly, industry creates export potential. With exports come foreign exchange. The foreign exchange is then a source of Economic power and stronger economy. If Kamra has export potential then PAC Kamra can contribute to the growth of the overall economy and the foreign exchange reserves of the Country.

Thirdly, air force is the most decisive player in modern day warfare. Air force needs, JET fighter is the primary weapon that is employed by an air force. Pakistan has been importing fighter aircrafts such as F6, F7, F7pg, Mirage and F16's from countries such as China, France, and the United States. Recently Pakistan has started developing JF-17 Thunder with Chinese assistance. JF-17 Thunder is a product of PAC and is having a much low cost compared to its alternates in global market. Therefore, if by indigenous production we are able to improve our technological base, generate savings, and strengthen national security and obtain an export market then the production of this aircraft is beneficial for Pakistan in more than one ways.

Finally, defense expenditures of Pakistan have come under extreme criticism. Economist and development experts believe that the defense expenditure is determined by the economy; however, that is not the case. Defense expenditure determination is requires a lot of consideration. Various factors need to be considered before determination of defense expenditure.

It is also, believed that defense expenditure has no pay back to the society and that it is an unproductive expenditure. If PAC Kamra is contributing to human resource development skilled labor , export potential, import substitution industrialization and strengthening of national defense then it means Defense expenditure in form of defense industry is paying back to the nation.

1.3 Objectives of the study

The objectives of the study are:

1. To find out the validity of the criticism directed at Pakistan defense production activities by taking Pakistan Aeronautical Complex as a case study.
2. To find out the impact of Pakistan defense spending on the economy, employment and human resource development by examining the case of PAC Kamra.
3. To find out the determinants of defense budget and rationale behind defense production activities and projects such as JF-17 Thunder.
4. To find out the issues and challenges faced by PAC Kamra,

1.4 Research design

The study is designed to explore PAC with reference to the objectives mentioned above. The study is both descriptive and exploratory, the study will use all the different techniques of purposive sampling and the high ranking officials of PAC would serve as our key informants. The respondents for the study have been contacted officially and they have given their consent. Key informant interviews with the top brass would enable us find out the answers to our questions and would clarify the myths and doubts that the academia, the press and the policy makers have regarding defense production activities.

The finding will be based on the open ended semi structured interviews. The study will analyze the answers of the respondents with openly available information and then give conclusions after a thorough analysis.

1.5 Research questions

- What determines Pakistan's defense spending?
- What are the activities of PAC Kamra and does these activities impact the Economy?

- What is Kamra potential as a player in global aeronautical Industry? Does PAC Kamra possess the required technological base to expand its base and undertake commercial ventures?
- What are issues faced by PAC's management and how can those issues be resolved to improve PAC?
- What is the contribution of PAC to HRD?

1.6 Organisation of the study

Following introduction, the second chapter will provide a brief overview of the literature available on this topic, discussing the approaches adopted and its shortcomings. The third chapter will provide the readers with the details adopted of methodology adopted by the study. The fourth chapter will give an overview of Kamra as an aeronautical complex. The details of the activities in Kamra are provided on the basis of my visits to Kamra, interviews with respondents and documents provided to me by different offices in Kamra. The fifth chapter will presents the findings of the study and finally the results and discussions will be provided in chapter 6. A brief analysis of the Pakistani education sector is given in appendix. List of abbreviations is provided in the beginning and references are provided at the End of the Document.

Chapter 2 : LITERATURE REVEIW

The literature does not agree over a certain generalized relationship between defense spending and economic growth. There are various studies, which can be divided them into three broad categories.

- 1) Defense expenditure causes economic growth
- 2) Economic growth causes defense expenditure to rise.
- 3) There is no generalized relationship rather the results are inconclusive

The results of these studies vary on the bases of time period they have analysed, the tests and econometric techniques used and the model specified by them. One angle however, neglected in most of these studies is the geo-political determinants and the sociological factors affecting the defense spending and economic growth nexus.

2.1 Defense spending and economic growth: A positive relationship

The leading study, exploring the defense-growth relationship, is considered to be that of Emile Benoit (1973). This study found a robust positive relationship between defense spending and economic growth for 44 developing countries. Benoit (1978) further augmented the findings of Benoit (1973) by reporting that countries with high defense spending enjoyed a higher economic growth. The study reported that increased military spending will translate into increased employment opportunities, increased health care and technological spill over effects. However, studies such as Ball (1983) and Degar (1986) criticise Benoit's work as being too simplistic and that defense –growth nexus needs to be studied on a case by case approach.

Other studies reporting a positive relationship between defense spending and economic growth include Weede (1986), which found that military spending affects growth and investment positively and plays a major role in Human Resource Development (HRD). The study also found that robust positive relationship exists between defense spending and education. Dixon & Moon (1986) found that military has a positive impact on the provision of basic needs keeping some factors constant. They even went a step further by saying that military controlled governments has no negative impact on the provision of basic needs. Supporting Benoit (1973 & 1978) hypothesis Lai, et al. (2002) found a positive relationship between economic growth and defense spending. The study found that if the defense expenditure is increased, the economy will

experience growth from within. Atesoglu (2004) found that defense expenditure and economic growth has led to increase in employment and growth in Post 9/11 United States and that rise in defense spending in the 21st century will lead to rise in investment and capital accumulation. Yildirim *et al* (2001) also found defense spending to be positively impacting economic growth. Ando (2009), Pempetzoglu (2009) and Mete-Feridun (2011) also support positive relationship between Defense spending and economic growth. Most of these studies such as Benoit (1973 and 1978), Weede (1986), (Lai, et al. 2002) and (Atesoglu 2001) also find defense spending to be causing growth.

2.2 Defense Spending and Economic Growth: A Negative Relationship

Deger (1986) while critically reviewing Benoit (1973 & 1978) found that there exists a trade-off between defense spending and socio-economic sector. Lebovic & Ishaq (1987) reported that military spending diverts resources from socio-economic needs. While acknowledging that defense expenditure is not simply a guns Vs butter choice Khilji (1997) argues that defense spending is negatively affecting Economic growth in case of Pakistan. Badr and Qarn (2003) found that military expenditure negatively effects economic growth. They have used multivariate model to test for causality between military expenditure, civil government spending and economic growth for Israel, Syria and Egypt. Kentor & Kirk (2008) support the same relationship by finding that if spending per soldier is increased it will deter growth per capita. While studying the determinants of Indian defense spending Hou (2009) found negative relationship between defense spending and economic growth and also concluded that there is an enduring Arms race between India and Pakistan and therefore these two countries have diverted resources from socio economic needs.

Anwar *et al* (2012) finds that Pakistan's economic growth is adversely affected by the spending on Defense and that there exists a trade-off between Pakistan's welfare spending and Economic growth. The trade-off between welfare spending and defense expenditure for the case of Pakistan has also been supported by Shahbaz *et al* (2013). Fiaz Hussain *et al* (2012) found that defense expenditure has a very negative impact on the poor segment of the society. The study concludes that defense budget is anti-poor.

2.3 Literature advocating Inconclusive relationship

Biswas and Ram (1986) are of the opinion that military expenditure neither hurts nor boosts economic growth of a country. Looney (1995) did a study of Pakistan to find out the extent to which Pakistan's low saving rate is affected by military expenditure by using Hsiao tests. The study found that Pakistan's low saving rate is caused by its defense spending. The study augments the claim that the relationship between defense spending and economic growth is inconclusive. Khalifa (2002) study examined the relationship between defense expenditure and economic growth for six Gulf countries for the period 1975 to 1999. The study found that there is no definite relationship between the two and also that the political situation of the country plays a role in determining the defense expenditure of the country. Khan (2004) analysed defense expenditure as a macro-economic stabilization tool for the case of Pakistan. The study found that in the case of Pakistan, economic growth and defense spending were unrelated and there was no trade-off between defense and welfare spending in case of Pakistan. Aslam (2007) also support the findings of Khan (2004). Habibullah, et al. (2008) studied the relationship between economic growth and military expenditure in few Asian countries including Pakistan. The study adopted unit root test, panel co-integration test and panel error correction test. Unit root and Panel co-integration tests showed a positive relationship between Growth and defense spending while Panel Correction reported no relationship at all. Therefore, the study reported the relationship between defense spending and economic growth as inconclusive.

These studies have relied solely on regression models. The defense- growth relationship has been analysed solely on the basis of econometric techniques. The common models adopted by the previous studies include panel and cross sectional regression analysis Kentor and Kirk (2008) Hou (2009) Habibullah, et al. (2008), dynamic panel regression technique by Yildirim *et al* (2005) and pooled time series data have been adopted by Lebovic & Ishaq (1987). Other studies have relied on Engel-Granger casualty tests Anwar (2012) Kalyoncu *et al* (2006) and Johansson co-integration tests Khan (2004) Khilji (1997). Endogenous Growth model has been adopted by Lai, et al. (2002) while some studies have used various modifications of the Feder model, Aslam (2007) Ando (2009) are some examples. Multivariate regression analysis has been adopted by Badr and Qarn (2003) and some studies such as Mete Feridun (2011) have used Auto-regressive distributive Lag. Similarly studies such as Tahir (1996) Khalifa (2002) Shahbaz *et al* (2013) &

Faiz et al (2013) have also relied heavily on Econometric techniques like Engel-granger, multi variant error correction model, Ng-Parron unit root test and ARDL.

The review of the methods used makes us conclude that defense-economic growth analysis has relied only on econometric techniques. The studies have failed to take into account the various strategic and political variables affecting defense spending. These studies have considered defense spending as any other government spending.

Studies regarding Pakistan also suffer from the same deficiency. Moreover studies like (Khilji 1997) Shahbaz *et al* (2013) and Faiz *et al* (2013) have criticised Pakistan defense spending. All these studies are in consensus in the issue of trade-off between Pakistan's defense spending and welfare spending. All these studies also advocate defense cut. Siddiqa (1999) have also greatly criticised Pakistan defense spending and defense production. Pakistan Aeronautical complex and Pakistan Air force have also been part of the criticism. However no robust evidence has been provided. The literature has also been silent on the spill over effects of defense spending and the import substitution provided by the defense industry. The literature has also been scant on the technological transfer-taking place as a result of defense production collaboration project between Pakistan and other countries. The impact of defense spending has also not shed any light on the human resource development and the skilled labour generated by Defense production activities and defense services

2.4 Critiques on PAC in the Pakistani Literature

The idea behind "*Pakistan military buildup and Arms procurement*" written by Ayesha Siddiqa can be described as "*Guns kill in more than one way*". This sets the theme for the entire book where in Pakistan military Expenditure, defense procurement and defense production is severely criticized. The book covers the procurement and production activities of Pakistan army, navy, and air force. Ayesha Siddiqa writes that Pakistan's arms production was motivated by a desire of self-sufficiency in arms to avoid "*complete paralyses*". Ayesha also writes that there have not been any spinoffs to the civilian sector nor do our defense production activities have any potential to have a spin off effect. She claims that Pakistan's arms production is characterized by mismanagement, lack of technological knowhow, and lack of the capabilities of the nation in terms of manufacturing sophisticated equipment.

The case is made in the book, that Pakistan's Arms production aims at Import substitution industrialization (ISI) and this proves to be a self-defeating Goal. Reason given by her are that the production activities are limited to the manufacture and assembly of basic equipment, for which there is no sophistication required. The defense industry products of Pakistan according her are substandard, low quality and very un-economical in terms of production. The second reason why she considers the defense production activities as a futile exercise, according to her book, the defense industry only aims at serving the domestic needs of Pakistan and lacks export potential due to which no economies of scale are generated. The only viable defense production according to Ayesha Siddiqi is the products of small arms and ammunition at Pakistan ordinance factories WAH. Another criticism at the defense production activities of Pakistan in her book is of the absence of skilled man power. This dearth of skilled man power is one of the reason behind substandard arms production. she has generalized this for all defense production facilities in Pakistan. she has termed Pakistan defense production to be substandard with no economic spill overs, and lacking in terms of technology and production techniques. According to her Pakistan defense production has not led us to self-reliance as we expected.

She has also mentioned the presence of vested interest lobbies who have some incentives to keep Pakistani arsenal import oriented and want to discourage indigenous production, other issues pointed out by her include overstaffing, political influence of Pakistan Army but those are beyond the scope of this studies.

Ayesha Siddiqi's critique on PAC Kamra

Ayesha Siddiqi claims that PAC is a typically dependent third tier manufacturer. It does not have the capability to produce vital spares and its hand is tied because of its deficiency and inability to produce vital spares. The size of PAC units is sub optimal. She further mentions the incapacity of PAC to give quality overhaul to Mirage 3. She gives the PAC contract with Sagem as a supporting argument.

As far as the Air craft manufacturing capability of the PAC is concerned, Ayesha Siddiqi's study reports that there were many shortcomings in the designs of the trainer aircraft manufactured at PAC. She has written that the indigenous production is costly, and the technology in Pakistan's made trainer aircrafts is very basic. She is also critical of the K8 and reports that Pakistan aeronautical complex has no R&D and design capability. Regarding the APF , Ayesha Siddiqi

reports that it's a small scale factory which can only overhaul a low level I band ground based radar. She writes that the technological expertise of all the four factories at PAC is substandard.

Based on these points she makes the case that PAC like other defense production facilities is a total failure. Pakistan needs to cut back defense production activities. According to her Pakistan should abandon defense production activities and PAC has not made us self-reliant. She also talks about the PAF being the most secretive among the three services. And this secrecy is the reason for less available information for research.

I believe that this criticism is not entirely valid. The fact that we have ventured in the field of Jet fighter production serves as testimony that there is more to probe. Since Ayesha Siddiqa's study is not having any perspective of PAC or the people associated with it directly therefore I have termed her analysis as myths. The current study defines her critique on the potential of PAC as a player in global aeronautical industry, on the quality of Labor, on the TOT and on its capability as a world class organization as "myths". To check the validity of these myths I personally visited Kamra and met with high ranking officials to present their perspective. Since that is firsthand information on the Pakistani Aviation industry therefore I believe that it has presented the reality of what PAC is today.

Chapter 3: METHODOLOGY AND METHODS

3.1 Methodology

It is an exploratory case study. It has served to make PAC, a defense production facility of Pakistan more familiar to the research community. The study has adopted a descriptive and exploratory methodology. The study has described the activities at PAC Kamra and has explored avenues and possibilities of Pakistan defense aviation industry. All the studies presented in the previous section have used regression techniques and have shown no regard for the sensitivities and the political and strategic environment that have an impact on the country's defense budgeting. All the results in the studies are based on qualitative techniques like Error Correction Models, Co-integration and alike. Secondly none of these studies have researched the issues of the defense sector and the channels through which it impacts growth. Therefore there was a need to have firsthand information on the problem. In-order to get such data, in-person interviews with the officials of the Air force were needed because they are the one who send their required budget proposals to the government and then they are the people who reallocate the budget within their organizations according to their requirements. There have also been serious allegations that PAC is not a feasible government venture basing upon an assumption that PAC has not contributed anything to the economy. Critics further argues that Pakistan should never go for making small arms, let alone aircraft manufacturing. Siddiqa (1999), Khan (2004), Hussain and Erum (2012) Shahbaz *et al* (2013) are some of the examples.

As deliberated in the previous sections that these studies have based their analysis on regression models, co-integration techniques and ECM's. None of them have actually taken any firsthand information or primary data and in none of the studies have given any discussion on the sensitivities of the defense spending. Since this study intended to check the validity of Siddiqa (1999) Shahbaz *et al* (2013) Khilji (1997). It was imperative to obtain first hand primary data, which the study did. Such data was then used to analyze what PAC Kamra is all about and how is it linked to growth, development, and progress. To analyze the type of activities provided by PAC to Pakistan and to other armed forces. The major themes of interviews included employment, training of human resource, export potential, and manufacturing of aerospace products. Hence, in-person interviews were the best tool available for this study based upon PAC Kamra and PAF.

3.2 Sampling technique

The study has adopted non-probability sampling technique. The nature of the study demanded a non-random, non-probability sampling. Interviews from specific people who have expertise in the field of defense strategy, management of defense production activities, and management of PAC Kamra were conducted. The insights of these professionals were needed to know the activities going on in Kamra and the way it impacts the aerospace industry of Pakistan. The interviews were designed to know how PAC is contributing to HRD in Pakistan, hence identifying the various channels through which the defense production influences Growth of the Economy.

3.2.1 Details of the Methods and procedures adopted

Our population was PAF and PAC Kamra. The study was interested to know the informations presented by the top brass of the Air force and their response to the criticism on defense production, hence to check the validity of criticisms mentioned earlier. As there are no fixed answers to the questions, therefore, data was obtained using thematic interview guide. There was a list of questions from different thematic areas. These were provided to the respondents beforehand and administered only after obtaining their consent. I conducted different interviews including in-person interviews, Group discussions , telephonic conversations with the respondents after the actual interviews had taken place to clarify ambiguities arising in the transcription. Respondents of the study included high ranking Air-force officials former vice chiefs, serving and retired Air Marshalls, an Air vice Marshall, Air commodores, and group captains. All respondents were the most relevant people because they had served or were serving in Kamra. The respondents were my key informants. They provided me with an insight into Kamra and its various issues. Consent of the respondents was obtained through emails and telephonic contact. The officers were contacted through a proper official channel. The interviews were loose ended and theme based. Important points were jolted down during the interviews. due to the sensitive nature of the issue, no recording mechanism was used. Since defense is a strategic element of national policy and in course of discussion the sensitive information might come to surface which may lead to harming national security. As soon as the interview was conducted it was transcribed and later verified by the respondent In order to get to this objective,

sample was already well defined based on the study's background knowledge of the issue in question. Therefore our method can be termed as an application of Purposive sampling technique. In purposive sampling, the researcher is at liberty to choose the sample that he/she considers more relevant based on his/her knowledge of the research issue. The technique will combine various forms of purposive sampling together in order to be able to get a holistic picture of the issue.

During the interviews with the respondents, the defense spending of Pakistan was discussed from the perspectives of economic, social, political, strategic, development, HRD, Foreign Exchange saving, Defense exports, spill overs from defense to civil sector and TOT.

As the sample consisted of the respondents who had similar backgrounds in-terms of profession, training and education so, in this perspective the sampling technique adopted in this study also resembles Homogenous Purposive sampling (HPS). Since the respondents were senior air force officers so they had shared experiences and training. All of the officers were graduates of Risalpur academy and had under gone similar training and courses. Therefore a flavour of homogenous sampling was also there in the sampling technique.. Most of them have been in advisory capacity to the government so therefore they were expected to give the study an insight of the problems and strengths of Pakistani aerospace industry.

In brief our sampling technique was Purposive Sampling homogenous purposive sampling. We purposively selected a sample of defense experts and defense personal who had served or were serving with PAF and PAC. The selected respondents also had remained connected to the defense production projects such as K8, Mushak, JF-17 thunder and many other projects. Total number of respondents were 18. The details of the persons interviewed are given below:

1. One Former vice chief, who has also served as chairman Kamra and Chief Project director of the JF-17 thunder programme.
2. Two Air marshals Air marshal currently serving at an important post in the JF-17 programme
3. One Air vice Marshall currently serving at very pivotal post at Air force production activities.
4. Member finance serving at Kamra currently.

5. Two Air commodores serving as head of an important PAF projects.
6. An Air commodore serving at the PMO Jf-17 thunder.
7. An air commodore serving at Kamra in a technical role.
8. An air commodore serving in commercial department
9. One Group captain serving at production and procurement department of Air force.
10. Five other group captains who participated in the group discussion with two high ranking Civil servants as well,

3.2 Key Informant interviews

Key informants, in social research are people who can give you firsthand information about the issue. They are people on whom you can rely for identification of issues faced by the population. They are necessary for social research if in-depth analysis of the problem is required, Our key informants were the senior level officers of PAF who were serving or had served at PAC in various roles.

3.2.1 Purpose of key informant interviews.

Key informant interviews were needed because the study aimed at checking that the criticism directed at PAC was valid. The most appropriate people to interview were the very people against whose organization the criticism has been directed. The stuffy was interested to know what they had to offer as response to the criticism.

3.2.2 Selecting of Key Informants

Based on the information available about PAC. I made a narrow list of selected people, who were major stake holders and decision makers at PAC. One of my key informant had also headed Pac for a considerable time. Others were heading various technical, commercial and procurement departments. these people were selected as Key informants based on their ability to give me firsthand information which was unique in nature.

3.2.3 The type of interviews

I used in-person interviews because it helped me reduce the measurement error, information obtained was more reliable and the fact that this information could only be obtained from certain

selected individuals. My respondents served as key informants for the study. Due to the fear of data saturation, I did not increase the sample size.

3.2.4 The interview tool

I used an interview guide based on the type of information I needed. The interview guide consisted of thematic areas. The themes included the activities at PAC, what the various factories are doing, the technological and technical expertise of PAC, the potential, the export prospects and the hurdles faced by PAC. The interviews started with introductory questions, later I asked probing questions and at the end the closing questions were asked to get recommendations.

3.2.5 The documentation method

The documentation method was that of note taking. I took notes while the respondents answered my questions. In addition, sometimes the interview points were jotted down as soon as the interview was over. The interview script was then showed to the respondents to clear the ambiguities. The consent of the respondents was taken for using the information in the thesis.

3.3 The group Discussion

I also conducted a group discussion on the issue of defense spending and defense production. The participants of the focused group discussion included seven members. Five Air force officers and two civil servants. I did attempt to include political personalities too but that could not be made possible. The GD lasted for three hours.

3.4 Units of Data Collection

The key informants of the study served as the study's units of Data collection. The presented by the key informants were than analyzed and based on the information from literature the study made an analysis of the information. That analysis is reported in the Results and discussion chapter.

The narratives of the respondents, the information they presented, the backing they gave to their arguments were the data for the thesis.

3.3 Method of analysis

Due to the sensitivity of the issue and the fact that the interviews were conducted in defense environment I couldn't manage a recording device to transcribe the interviews. The views of the respondents were noted on a pad, and later as soon as the session of interview or the FGD ended I transcribed the interviews and discussions as much as I could to the best of my memory. The views of the respondents were analysed in the light of the theory provided by literature and the facts regarding the issue of defense spending and defense industry.

3.2.2 Validity and reliability of the Methods

Studies like (Olken, 2005; Huberts, 2007; Punch, 2009) make the case that when information is sensitive and of a clandestine nature, the documents or literature available on those issues is not reliable. The case of defense expenditure and defense production activities is no doubt, a case of secret and sensitive nature. The previous studies quoted in our literature review have based their findings on the basis of available data from open access sources. Huberts 2007 support my argument when I say that the available data sources won't give us the true picture of the issue that we are trying to investigate. (Datzer *et al*, 2006) in their studies have adopted survey research but since survey research is tool that works only if we are interested in the perceptions of large number of people , the general public. Since I was interested to study the case of Pakistan Aeronautical complex in detail so I couldn't use the tool of survey. The tool that served my purpose best is the tool of interviews.

Given the sensitive nature of the defense expenditure and defense production activities and the fact that there may be biases from the side of the respondents, I had to assure them confidentiality and it is for this reason that their names and complete details of their position are not provided in the document. Assurance of anonymity did make the respondent comfortable in talking to me and answering my questions. It did benefit me since they were able to freely talk about the issues and challenges they face, the hindrance provided by the bureaucracy and the role that they believed that the political leadership should play.

3.3 Case selection

Pakistan has a few defense production units such as HIT Taxila, POF Wah, and PAC Kamra. There are other small scale manufacturers working in the private sector but they are out of the scope of our study. The sophistication of the aeronautical industry, the quality of skills used there in and the cost of the materials, equipment and infrastructure required make PAC Kamra qualify for being the case of our study.

Chapter 4: FINDINGS

The findings of the study are diverse and cover a broader spectrum. For the purpose of clarity, they are grouped in to categories. The first category of findings is regarding the activities that are undertaken in Kamra. How far has Kamra come and what are the roles and functions of various PAC factories? What they do, and how they do it, these activities are important because they are a symbol of technological expertise and know-how that Kamra has attained in the 30 years of establishment, these activities also save millions of foreign exchange for the country. The misconceptions regarding Kamra have been because the studies have been either unaware of these activities of Kamra, or have ignored them. Therefore the first classification or category of findings is regarding the detailed activities of Kamra. I was able to find them and report these in my thesis through extensive visits to Kamra and detailed interviews with the most relevant people, who served as my key informants.

The second category of findings is regarding the determination of defense budget and the factors that the defense personnel perceive to be behind the defense budget. This section also includes findings regarding the adequacy of PAC's budget. The findings are actually the information given to me by personnel of PAC.

The third category of findings is regarding the issues faced by PAC and the various problems in form of bureaucratic hurdles and non-cooperation of the civilian Government, these issues are of extreme importance and need to be addressed. The issues are reported by the respondents in the FGD and in person interviews.

The fourth section of the findings chapter is regarding the foreign exchange saved by PAC through MRO activities. The cost of OEM and that of PAC are reported. This angle has been missing in the literature that I have reviewed on defense industry in Pakistan and this finding also offers an insight to the potential of PAC. The section also reports the findings regarding Kamra training on human resource and its investment on HRD. How people are trained and what sort of training is given. The section also reports the findings regarding Karma's efforts to retain Human Resource and the incentives provided in terms of education of children, accommodation and health.

The fifth section reports the findings regarding the Kamra technical prowess and skill in form of the JF-17 Thunder.

Pakistan Aeronautical Complex

The Pakistan aeronautical complex (PAC) is Pakistan's only industrial facility that manufactures air defense systems, radars, aircraft equipment, jet trainers, fighter trainers and a fighter aircraft "the JF-17 thunder". It was established in 1972 and at the time it was only an overhaul facility for Chinese F-6 aircraft. "*The journey of a thousand miles, begins with a single step*" and PAC Karma's case is no different. It started out as a small project, by the name of Project 721 and today's Aircraft rebuild factory (ARF) at PAC Kamra is the fully grown tree, the seeds for which were sown in the form of Project 721. ARF provides the maintenance, repair, and overhaul. During the past two decades, the ARF has overhauled over 900 aircrafts while also succeeding at acquiring manufacturing capabilities of various types. ARF is the reason of readiness of PAF's Chinese fleet. Later on to acquire superior ground attack capabilities, PAF acquired Mirages from France. And the induction of these new Mirages to the PAF fleet necessitated the initiation of Project 741, the Aim of this project was to provide MRO for Mirages. Project 741 was later developed into Mirage Rebuild Factory. MRF has overhauled more than 200 Mirages in addition to overhauling and maintaining 1800 hundred ATAR engines, F-100 engines for F-16's and T-56 engines for C-130's.

In 1975 another project by the name of Project 751 was initiated, the goal of this project was to start manufacturing the jet trainer aircraft named "the Mushak". This was a joint collaboration between of PAC with SAAB SCANIA, the Swedish aerospace industrial giant. The project laid the foundation of Aircraft manufacturing factory (AMF). So far it has made hundreds of Mushak aircrafts and has also been able to manufacture its upgraded version "the super Mushak". It has also co-produced the Karakorum 8 (K8) with China and is manufacturing unmanned aerial vehicles (UAV's) and drones. Its most important accomplishment is the achievement of co-production of JF-17 thunder.

In the 1990's Kamra avionics and radar factory was established with the aim to achieve self-reliance in the fields of Air defense systems overhaul. It later on achieved the capability to overhaul the air defense and finally it came to a stage to develop airborne avionics system and this led to its transformation into the Avionics production Factory. It has now acquired the

capability to design, develop and integrate the avionics of the JF-17 thunder and thus it has come a long way.

ARF, MRF, AMF and APF all of them collectively constitute the PAC. These factories have saved millions of foreign exchange by providing MRO facilities, and have earned millions of foreign exchange for the country by exporting its air crafts such as the Mushak, super Mushak, K8 and other aviation products. They have contributed to training and development of human resource, and have been an employer of both skilled and non-skilled workers and thus augmenting human resource, creating incentives and opportunities for the citizens and the corporate sector and has contributed a lot to the nation.

The establishment of the Complex in Kamra has also had a profound impact on the surrounding areas in terms of business opportunities, employment, health care and educational facilities and thus generating huge economies of scale. These are some of the things that should be considered before criticising defense expenditure. The PAC Kamra is discussed in detail below.

4.1 Aircraft Rebuild Factory (ARF)

Pakistani Fleet mainly consisted of F-6's during the sixties. The F-6 aircraft needed to be sent to china and this consumed a big amount of foreign exchange and time. The air force with the approval of Defense production board because of the pressing need to save the maintenance cost and time and the strategic needs of quick and less costly maintenance made the decision to create an indigenous overhaul and repair facility for the Chinese F-6 aircrafts. This facility was developed with the assistance of China in 1972. Kamra was selected among the various options available due to many geological considerations and the scope of Kamra to be extended. The location was an abandoned air field of world war two. The residential colony here, was built on the ruins of bomb dumps. The office of the cantonment executive was also built on the remains of the remains of the Royal Indian Air force's residential colony remains. Kamra was a small village and the exact location of the base was secluded and deserted piece of Land.it was due the establishment of this mega industrial complex that the surrounding village transformed into a city.

The planning and the execution was a tiresome and tough job. The complex needed Technical as well as civil infrastructure calling for well-coordinated efforts by Pakistan and China. The construction had two phases. In the first phase the residential and office accommodation necessary to house the Chinese and Pakistani experts was undertaken and in the second phase the construction for residential colony, roads, and other administrative office buildings was undertaken,

4.1.1 Rolling out of the first F-6 aircraft

In November 1980 the first F-6 aircraft was inducted for the general overhaul. In the general overhaul the aircraft is disassembled and all its parts are examined, refreshed and repaired if necessary. The first overhaul took about a year and in November 1981 ARF rolled out first F-6 that was overhauled indigenously. This Aircraft remained an integral part of PAF until 2002.

The overhauling of this aircraft was a big achievement because not only did it provide for the operational readiness of the PAF but it also provided foundations for the development and growth of Pakistan's aviation Industry. Soon after the F-6 was rolled out, the ARF team used the expertise and training that it got from GOH of F-6 and applied it to the GOH of F-6t, F-5 and A5-3 aircrafts. This is in fact a classic example of acquisition of technology by a developing country and quick growth at a fast pace. ARF at Kamra not only acquired the technology but also the skills to operate that technology and transfer it to others.

4.1.2 Drop tanks production capability

Drop tanks are externally mounted tanks on the two wings of an aircraft. These Tanks provide the aircraft with added oil supply for long missions. These tanks provide the advantage for, because with these tanks the aircraft can better perform because it doesn't require a heavy fuselage if it has mounted drop tanks.

The ARF quickly acquired the capability of manufacturing drop tanks for the F-6 aircraft. It was an 1140 litres drop tank. The system was later upgraded to the manufacturing of 500/800 litres drop tanks for the F7 and F7t. ARF is now producing drop tanks for JF-17 Thunder

4.1.3 F7-p project

A fresh fleet of F7ps was inducted by the PAF in the 80's. With this induction the need for MRO of F7ps was also felt. ARF's capability by that time had grown to a level where in the facilities available for the F6 and other aircrafts were modified for the overhauling of F7s. ARF has since then given MRO facility to entire F7 fleet saving millions of dollars. This venture also made it necessary to increase the strength of the personnel. This venture made Kamra recruit 3500 new employees and the reorganization of the factory into aircraft rebuild group, components rebuild group and production support group.

4.1.4 F-7pg, K-8 and Y-12

When the PAF inducted F-7pg in the year 2002. The option to overhaul them in the same pattern was considered and a contract was signed between CATIC and PAC. By 2006 PAC had enhanced its capability to overhaul repair and maintain F7pg's. The F7p and F7pg programs were merged together. This provided the opportunity of lowering the burden on national exchequer. ARF also successfully overhauled the K8 in 2006. For K8 also, ARF did not make any special investments due to the reason that A5's and FT5's were retiring so the facilities used by these two aircrafts were modified to be used for K8 overhauls. The only investment that ARF had to make was to send a technical team to China to acquire necessary training for the overhauling of the K8. ARF has also successfully overhauled the Y-12 transport aircraft, some of its components were sent to China for repair while the rest of the job was done at ARF.

4.1.5 C-130 Propeller and Quick Engine Exchange Overhaul

Since the factory was originally established and designed for overhaul of F6 aircraft which phased out in 2002 and it had expanded itself enough to provide MRO services to the A5-3, Ft5 and Ft-6 aircraft which also phased out by 2010. This was anticipated in advance and therefore the management wanted best utilize the trained human resource.

The First non-Chinese equipment overhaul that was undertaken by the ARF was that of the C-130. The ARF ventured on the overhauling of C-130 propeller and its QEC overhaul. QEC overhaul consists of installing the original engine, along with desired specs and electrical system. The technical assistance was given by the Original Equipment Manufacturer (OEM) of the C-

130 propeller. The QEC overhaul capability was acquired from MS Derco aerospace USA in 2008 and ARF had successfully produced the first QEC by 2009. ARF produces a large number of QEC's every year since it acquired the capability in 2008.

4.1.6 The Wire Harness Centre

ARF started manufacturing and producing harness material for mirage and other aircrafts. This was possible due to the Rose3 agreement between PAF and SAGEM of France. Under the agreement the Pakistani team went to France to acquire the necessary training for the manufacturing of the harness. The team participated on the design and the manufacturing of the harness cables for MIRAGE and also acquired training of integrating the harness for Mirage-3 upgrade. The team upon coming back to Pakistan participated in the production of cable harnesses. This was a very big feat for the reason that it allowed the Mirage Rebuilt factory to acquire locally made harnesses thus saving foreign exchange, creating employment, boosting local business, achieving self-reliance and creating employment. The Cable harness is as important to the Aircraft as veins are to the body. The cable Harness needs to be of superior quality to protect the wires from the effects of vibrations, jolts and moisture. The fact that you can't fit substandard or below par equipment in the aircraft because you are actually dealing with a human life "the pilot". The fact that our aircrafts are flying, our officer fly them and they need be battle ready at all times is because of the technical and human expertise of our equipment and staff. This it speaks of the level of sophistication that we have achieved.

4.1.7 Mirage retrofit Project

Retrofitting is the addition of a component or a part to a machine that it didn't originally have. In search for new opportunities the ARF embarked upon the innovative task of Alternate Mission Equipment (AME) for Mirage aircrafts. AME is the installation of weapons system and other military hardware on the aircraft depending upon the type of the mission. Pakistan Air force has been the largest operator of mirages therefore it had acquired a lot of AME's from other Air forces and then there was a need to retrofit them so that those AME's could be made ready to be installed on the Aircraft. This project was at all levels indigenously designed and executed. The ARF used its expertise that it had perfected by the overhaul of Chinese AME's for the Pakistani Chinese fleet thus saving a lot of resources and time and at the same time providing a big

contribution to the Aviation industry of Pakistan. This led to the creation of 4th group in the ARF by the name of “weapons system group”. WSR is now responsible for the retrofitting and overhauling of all of PAF’s weapon systems.

4.1.8 Metal parts and cable manufacturing

The manufacturing of the metal parts for the unmanned aerial vehicle “Falco” is undertaken by AMF. The serial production all the components that are required for the assembling the third Falco UAV system has been completed while the Qualification phase of the forth system is presently in development phase. The mirage Air to AIR refuelling is underway at the MRF. The task of manufacturing the cables and metal parts for the project was given to ARF. The kits required have been delivered to the ARF and the metal parts have been inspected by Aerosud and given clearance.

4.1.9 Business Ventures

Sri Lankan Air force

This was the first ever commercial contract given to PAC. Sri Lankan Air force (SLAF) approached PAC for the maintenance and overhauling of F-7, F-t7 and F-t5 aircrafts. PAC took the contract. ARF team was sent to visit the aircrafts and asses the level of repairs needed. The Pakistani team disassembled the aircraft, flew it back to Pakistan. ARF also offered to train the SLAF technicians and engineers during the overhaul process. The SLAF team learnt the overhauling technicalities and working on different weapons systems. All these aircrafts were overhauled and repaired by the ARF. The Test flights were cleared. These aircrafts were again disassembled and flown back to Sri-Lanka. The ARF technicians reassembled the aircrafts and flew it for test flight and after-wards handed it back to the SLAF. This project initiated in 2002 and was completed in 2004. A total of six aircrafts were overhauled and repaired for SLAF.

Project Horus

Due the acquisition of the technical and human capability of ARF to manufacture Cable harness for mirages under the Rose-3 agreement and ARF was given the certification of being a qualified vendor by SAGEM. SAGEM then subcontracted a part of the harness manufacturing of HORUS retrofit for Mirages of Egypt. The task was completed before due date.

Boeing off-set program

In the year 2001, Pakistan international Airlines entered a contract with Boeing. PIA was to be given 11 Boeing aircrafts. one of the clauses of the contract made it mandatory for Boeing to invest in Pakistan. The government of Pakistan at that time, identified PAC (Kamra) and Precision engineering complex (PEC) as two most feasible options. Boeing made a visit PAC Kamra for a accessing the quality of the facilities of PAC. Boeing supplied the required training and Equipment to PAC and by 2007 PAC Kamra was producing parts for Boeing. PAC Kamra was also given Quality management certification by Boeing. The heat and surface treatment facilities required by the activity were improved and for that PAC Kamra also got NADCAP certification. By 2011 over 1400 Boeing parts were manufactured in PAC Kamra. This venture played a significant role in preparing PAC for co-production of JF-17 thunder.

Rewiring of Cobra helicopters

ARF was successful in rewiring the Cobra helicopters for Pakistan Army Aviation Core. The documents for the rewiring were not available even then the ARF technicians were able pull the job by, simply looking to a sample helicopter for reference.

4.2 Mirage rebuild factory (MRF)

Pakistan is the largest operator of rages in the world. Pakistan Air force inducted Mirages into its fleet in the late 60's. These Mirage aircrafts would require Overhauling after 10 to 12 years of their induction. A separate facility for that could provide MRO facilities to the Mirages was planned during the 1973. A facility similar to ARF was to be constructed for the mirages. The lack of resources didn't allow PAC management at that time to make the entire facility at one time. This work was done in different phases. In phase 1 only a limited repair and maintenance facility was established. By the 1980's the facility was upgraded to a complete overhaul facility just in time when the first mirage was due for Overhauling. The factory consists of two groups, the Aircraft group and the engine group. The aircraft group consists of two wings, the structure wing and the aircraft modification cell. The engine group consists of three subgroups. The F-100, T-69 and j-69 engine wings/subgroups.

MRF has played a significant role in saving foreign exchange, training human resource and keeping the mirages battle ready at all times. The entire MRO is solely an indigenous process which is key to self-reliance and development of indigenous Aviation Industry.

4.2.1 GV for the Mirage fleet

GV of an aircraft is done after it has flown for 1800 hours or 10 to 12 years. It is the thorough inspection and overhaul of the aircraft. The process takes from 8 months to one year. After GV-1 the aircraft returns to service for another 10-12 years or 2000 hours. After that the GV2 takes place. After GV2 the aircraft is released for another 2000 hours or 10 years whichever is earlier. And then it is supposed to retire. The entire PAF Fleet of Mirages has undergone there GV1 and GV2. The life span of mirage 3 67-101 EP, and Mirage 3 67-101 have even completed their life span. MRF has even succeeded in retaining mirage in service even after its post GV2 life span is completed. PAF is the only Air force in the world that has maintained the mirage beyond its life span and MRF has played the crucial role of keeping the mirages battle ready. MRF technicians and Engineers worked on the structural analysis of the mirage and consulted the OEM. MRF was able to make a new Gv3 package for the mirages. Interestingly the mirage that was the first to be overhauled was also the first to undergo the GV3 inspection. However later in 2005 the PAF decided to phase out the mirages and so the GV3 plan was abandoned. However to keep the mirage operational MRF decided to devise new package of maintenance for the mirages. The Package was called Mini GV and it was authorized by the OEM. This gave half the lease life to the aircraft but also led to reduction in cost and time.

4.2.2 Components overhaul wing

To support the Overhaul of mirages, it was necessary to maintain facility for components overhaul. This was initiated in 1975 during the early days of PAC. Infrastructure was crated and the necessary equipment was acquired for the components overhaul. PAC contracted **Avions Marcel Dassault-Breguet Aviation** (AMD-BA), a French aviation giant. PAC bought 150 testers from AMD-BA. Testers are equipment to test the components in near operational environments to check that whether the component is in accordance with the standard as prescribed by the OEM or not. Clean room facility was established for the overhaul of sensitive instruments. Clean room is a controlled research and manufacturing room, designed to control an

environment that has low level of pollutants such as dust microbes etc. the Components overhaul facility is producing more than 10000 mirage parts a year and has also embarked upon JF-17 oxygen system testing facility.

4.2.3 D-level facility For SAAB Airliner

With the phasing out of Mirages approaching near MRF, has looked for new opportunities. One of them is the establishment of a facility for inspection of SAAB 2000 Airliner. SAAB 2000 is a non-combat military and civilian transport vehicle. MRF has also acquired system modification capability MRF has now assumed the responsibility of carrying out inspection of the SAAB 2000 Airliner.

4.2.4 Structure wing

Fuselage structural Repair capability

During ground occurrences Aircrafts sometimes sustain damage and therefore structural repairs are required. Such repairs are very costly in-terms of time and cost. Therefore MRF acquired fuselage repair jig from **Avions Marcel Dassault-Breguet Aviation**. Due to the acquisition of this capability MRF has been able to repair 20 Mirages. By the making these Aircrafts operational MRF is not only able to save precious resources like Time and Foreign exchange but is also able to almost a squadron strength at half the cost.

Wing refurbishing facility

When the air-craft ages, the structure experience structural fatigue. To refurbish the wings of the aircraft and to repair the structural defects arising due to age, the Refurbishing facility was established. PAF had acquired used equipment from Australia. This equipment was Production jig but MRF together with Dassault modified it into a Repair jig. The necessary equipment as well as the churning jig was received from France and thus in 1995 Wing refurbishing facility was completely established. Churning JIG is used to accurately fill gaps in the wings. Since its establishment 12 wings have refurbished and 120 mirages have been made free of structural damages.

CNC Pipe forming capability

Before the year 2000, PAC used to import CNC pipes, which was a burden on the PAC procurement as these pipes were very costly. In the year 2000 PAC established indigenous facility for CNC Pipes production. This not only saved cost but also made PAC more self-reliant. MRF produces CNC pipes for not only the Mirage fleet but for other weapons systems of the PAF.

4.2.5 The ROSE Projects

ROSE is an acronym for Retrofit of strike element. It was an agreement between PAC and French avionics giant SAGEM to upgrade mirage 67' avionics system. The first agreement was known as ROSE-1 after its conclusion ROSE-2 agreement was signed under which the PAF acquired the capability of FLIR (Forward looking infrared) night attack capability and then finally under ROSE 3 Transfer of technology also took place. The project saved millions of Foreign exchange for the country and also made Pakistan recognized in the world for its engineering skills. The fact that PAF is flying mirage 67 with the stick of Mirage 2000 is testament to this fact. PAF is still operating mirage while its life span is over. If there had been no indigenous capability inform of MRF today we would have been at a very awkward situation. The fact that PAF is keeping Mirage 67 fully operational justifies the investment done in PAC. If MRF had not been there PAF's strength would half of what it is today. And if MRF had not been there, and the mirage up gradation weren't possible thousands of people would have been unemployed.

MRF is also involved in overhauling different types of engines used by Pakistani aircrafts both combat and non-combat.

4.2.6 Achieving ISO certification

MRF achieved ISO 9000 certification for it being able to maintain international standards. MRF was the first ever defense industry to achieve that status. MRF also acquired AS 9100 certification in 2004.

MRF is nowadays the only facility available for the overhaul and maintenance of mirage is the world. The fact that it has kept PAF's mirage fleet alive and able to adjust to changing roles as evident from the acquisition of facility for SAAB-2000 Air liner and other engines of PAF fleet. MRF has reached appoint where in to adjust to different role little investment of effort and time is needed.

4.3 Aircraft Manufacturing Factory (AMF)

In 1975 a project by the name of Project 751 was initiated. The project aimed at obtaining indigenous capability for Pakistan to manufacture aircraft. This project was by all means the founding stone of the Aviation industry of Pakistan. Before this there had been many plans by the government to venture into Aircraft manufacturing but those plans could never materialize. The fact that aircraft manufacturing was and still is a very sophisticated for which huge investment, infrastructure, and most importantly technical know-how and skills are needed. Pakistan did not possess that level of human resource at that time. With the acquisition of MRO capabilities for f6's and mirages Pakistan had thus acquired sufficient technical knowhow and confidence to take up the task for manufacturing aircraft. PAF was using T6G as its primary trainer aircraft while the army had L19 which was of old age and was due for replacement. MFI-15 was chosen as the perfect replacement. The demand of both of these services was very high. SAAB SCANIA of Sweden, the OEM of MFI-15 thus agreed to help establish the manufacturing capability for Pakistan.

The version of the aircraft adopted by Pakistan was the modified version of MFI-15. It was named the MFI-17 known as MUSHAK in Pakistan. Pakistan signed the first contract for the assembly of MFI-17 aircraft with SAAB in 1974. There were two types of assemblies included in the contract. Assemblies from semi knocked down kits (SKD's) and assemblies from and assemblies from completely knocked down kits (CKD's). SKD's meant assembling the Air craft using sub-assemblies like Wings, horizontal tail, fuselage etc. Assembling from CKD's, meant manufacturing of the various sub-assemblies from imported pieces for that production and then assembling the aircraft.

The project 751 was started in PAF academy in Risalpur. The project was later moved to PAC Kamra and AMF was tasked with the manufacturing. PAC Kamra was selected for it because; it

had the capability to expand. AMF did not go all at once on manufacturing the aircraft rather first it went for manufacturing the Aircraft from SKD's. After a year the second phase began where in AMF manufactured the aircraft from CKD's and then finally in third and final phase AMF was able to manufacture the Aircraft completely from RAW material. The license agreement also allowed PAC to sell the Aircraft to certain other countries. The first indigenously manufactured MUSHAK rolled out of AMF in 1983. This aircraft was manufactured completely from raw materials.

4.3.1 The Mushak Manufacturing process and facilities

There are three sub factories or manufacturing plants with the AMF that deal with the manufacturing of the Mushak Aircraft. These facilities are known as shops. They include the Metal parts production shop (MPP), the fibre parts manufacturing shop and the assembly plant. The MPP is the focal facility where in the major part of the work takes place. The metal parts production is the most important and sophisticated job in the process. An array of machining and metal working processes are housed in the MPP shop under one roof. There is also a limited facility for aerospace grade welding. A lot of the parts of the Mushak aircraft are made of fibre glass material. For manufacturing those parts a Glass reinforced plastics (GRP) shop is operating. The GRP is also an integral part of the Mushak manufacturing process. The AMF acquired the capability of making the leg of the aircraft from pre-impregnated fibre glass and manufacturing of the Perspex canopy glass through the method of thermal stretch forming. This was state of the art technology at that time. All the products of these sub-facilities reach the assembly plant where in they are put together and then the aircraft is assembled in the assembly plant before being extensively flight tested prior to delivery to the customer. Production planning and control units look after it and the Engineering change council is responsible for the innovation and modification in the aircraft.

AMF has manufactured a total of 503 Mushak Aircraft so far. Out of those 502, 176 have been given to Pak Army which is the largest operator of Mushak. 60 have been given to PAF and about 120 have been exported to different countries.

The customer feedback on the Mushak encouraged the AMF to for some modifications in the Mushak aircraft. The Aircraft had a long take-off time and slow altitude climbing. The aircraft

along with a team of technicians and engineers was sent to the United States for the installation of 210 hp engine which was more powerful than the previous 200hp engine. This new engine had six cylinders and the aircraft was retrofitted with new air-conditioning system and new engine instrumentation. The Aircraft was finally handed over to Pakistan Army for 1000 hours flight. However due to the sanctions imposed later on by the US no more collaboration could be done with the United States regarding aerospace and defense products. However the most important gain of the AMF from the collaboration was the training of human resource. The technical team involved in the retrofitting had by then acquired sufficient skills and confidence that they could be entrusted with such a task again.

4.3.2 The Super Mushak

The sanctions imposed by United States provided incentives and opportunity for the indigenous Pakistani Industry to flourish. The trained human resource that had participated in the retrofit project was put to use. Mushak was modified with a 260hp engine, three blade propeller, and air conditioning system. Upon trial flights it was reported that the propeller produced too much vibrations so therefor it was changed with a two blades propeller thus the vibration was reduced to minimal. An advanced aviation package consisting of VHF and UHF radios, GPS and NAVCOM was installed on the aircraft. It now had far better climb, much better take speed and smooth flying. The most important thing about the super Mushak is that it was totally an indigenously produced and innovated aircraft. All the modifications and improvements in the super Mushak were indigenously done. This speaks of the level of technical expertise that AMF has achieved and also the potential of Pakistan aviation industry to grow.

4.3.3 Export of Mushak and Super Mushak

The super Mushak is a very well designed trainer aircraft.it has developed its superiority over the contemporary trainer aircrafts due to its very low cost, fast take off and high rate of climb. It is a twin seated trainer aircraft equipped with conventional controls which make the stall and spin of the aircraft very easy. Due to these attributes it has developed a good market for itself.

Iran was the first country to import Pakistani Mushak. It contracted to buy 26 aircraft from Pakistan in 1989. Iranian trainees were given training so that sufficient shop facilities could be

established in Iran. However the project did face asset back due to terrorist attack on the Iranian trainers claiming their precious lives. Royal Air force of Oman bought 8 Mushak from Pakistan. South Africa also expressed interest in buying super Mushak but the deal fell Victim to the Bureaucratic delays. Saudi Royal Air force that greatly relies on western manufacturers for defense procurements also showed interest in buying the super Mushak. A contract was signed between Pakistan and Saudi Arabia for 30 super Mushak aircrafts. RSAF inducted Mushak in Royal Air force academy as its premier trainer air craft. Later on another contract was signed with Saudi Arabia for another 20 Mushak Aircraft. Under this contract PAC has to maintain technical facilities for the SMK in Saudi Arabia. PAC deputed 125 Strength of man power for the Mushak maintenance and performance monitoring. PAF also provided qualified flight instructors to RSAF in order to ensure that flight standards are met. AMF is providing the Saudi fleet of Mushak with all sort of spare support.

4.3.4 Karakoram 8

Karakoram 8 or K-8 is Pakistan's jet fighter trainer air craft. In the early 80's CATIC of China, started working on the manufacturing of a jet fighter trainer air craft by the name of L-8. AMF was asked by PAF to get involved with CATIC for the design and development of the Jet trainer aircraft. Pakistani engineers contributed a lot to the design and development of the L-8 aircraft such as the nose wheel steering system, single piece canopy and engine access panel to facilitate quick engine exchange. Under the agreement of co-production the technology to manufacture horizontal stabilizers, Vertical stabilizers and fuselage was transferred to AMF. Capability of manufacturing of tooling was also acquired. The JIG assembly machine was also imported from China. The jigs acquired during this project also utilized in many other projects of AMF.

Other projects of the AMF include Making UAV's such as the Falco, ababeel and baaz.

4.4 Avionics production Factory

Avionics production factory was established as Radar maintenance facility at PAC in 1972. At that time it was named Radar maintenance centre. Its primary function at the time of establishment was just to provide routine maintenance to Ground radar used by the PAF. It was named Radar maintenance centre. At the time of its establishment RMC only overhauled the

MPDR-45 radar only. RMC was established with the assistance of the OEM of MPDR-45 “seimens”. Pakistani team of Engineers and technicians was sent to Germany for the training needed. RMC did first overhaul of the MPDR-45 in 1988 and since then it has come a long way. Given the sophisticated nature of the work, RMC needed skilled man power in the form of Technicians, Engineers and other trained staff. RMC was transformed into “Kamra avionics and Radar factory” and its control was given to the Civil Sector by placing it under the administrative control of MODP.

Today APF not only overhauls Radar but also manufactures it. Today APF Activities are spread over a very broad area which includes the rebuild and overhauling of Power Generators which is an integral part of ADGS, control & reporting systems overhaul, Precision measuring equipment laboratory, Co-production of the GRIFO radar and other airborne avionics products. It is also manufacturing and integration of the avionics of Pakistan’s JF-17. It has been certified as ISO 9002, ISO 9001-2000, and AS 9100-B.

It is through these activities that Kamra is playing a significant role in the economy. Regarding Karma’s contribution to the Economy. The key informants told me that Kamra has contributed to the economy in a variety of ways. First, it has given PAF MRO activities and with MRO Kamra has saved millions of foreign exchange. If Kamra has not been there, we would have depended on the OEM for this purpose. And that would have been a great burden on the national exchequer (see table 1), if PAC had not been able to provide those services. I was told that Kamra has exported Mushak and super Mushak and has acquired contracts for Boeing. This speaks of the technical expertise that Kamra has achieved so far. All the activities performed by APF has saved millions of dollars for the national Exchequer and have contributed to making Pakistan more and more self-reliant, training and development of our human resource, creating technological foundation for the avionics manufacturing industry in Pakistan, creating employment and generating revenue by serving foreign clients

Kamra has come a long way since its establishment. PAC Kamra has provided Pakistan with the strength to contribute to the Global aviation and avionics industry. The recognition of Pac by international firms and the purchase of services and products of PAC serve as testimony to the

fact that Pac has immense potential in terms of avionics and aviation products and if proper attention is given to PAC, it could have many favorable and positive results for the country.

Findings regarding determination of Defense Budget

In interviews with respondents, both the key informants' and the focused group discussion I was told that the defense expenditure is not determined by the Economy. A number of factors are considered while allocating budget for defense. The views of my respondents were unanimous on the issue that there is a hostile environment in the South Asian region. One of my respondents, who was very high ranking official, told that the hostility of India towards Pakistan had made an environment, where in we don't have an option but to keep a minimum level of deterrence. This decision of allocating funds for defense is made keeping the geostrategic environment in mind. Another respondent informed that now we are having multiple security threats, apart from hostile neighbor armed with nuclear weapons and which possesses a strong military muscle, we are facing the Taliban and Baloch insurgency. In such a situation defense cut could amount to cutting the jugular vein of Pakistan's security and sovereignty. The respondents were of the view that the Indian cold start doctrine is the testimony of the Indian hostility and the threat they pose to Pakistan.

The Cold start military doctrine

The Cold start military doctrine is, though in its experimental stage, is aimed at attacking Pakistani Military installations by quick mobilization of Indian troops within 48 to 72 hours. The quick mobilization would allow the Indian military to launch an attack quickly, to enforce the element of surprise in the attack. This doctrine is hegemonic in nature and the hostile attitude of Pakistan's nuclear armed neighbor is reflected in it. The cold start offensive operations would involve rapid armored units mobilizations which will spear head the campaign and will be coupled with air support.

The doctrine dictates that Indian armored formations accompanied by infantry battalions, will advance into Pakistani territory with limited goals in terms of territory and duration. The attack will be supported by massive use of air power. It is a plan to invade Pakistan territory, create pressure and the move back quickly. This doctrine has no doubt had an impact on the Pakistani

defense spending since the Indian defense spending increased from 20 to 20 billion US\$ from 2007 to 2009 , it was responded to by Pakistan's increase in defense spending.

Defense spending: a response to Cold Start and way to improve economy

The respondents were of the view that the Indian military strength can be responded back with increased technological capability of the armed forces. For example the test firing of Hatf-9 Al-Nasr missile had a significant impact on the Indian military strategists.

Similarly, a well-equipped Air force will be able to deter such attacks, create a more secure environment, and in the course of that there will be huge spillover effects. The spillover effects will range from, R&D development and if the defense industry is emphasized upon and projects like JF-17 are initiated at a large scale, it would significantly add to the economy as well. It is for all rational reasons imperative to respond to the so-called cold start doctrine and that response bears a cost. If the defense strategy is made inclined towards technology-oriented modes of national defense so it will reduce the negative effects that high defense spending might have on Pakistani Economy. The view was shared by all the uniform personnel that I interviewed

In the group discussion, we had multiple views. The Air force uniformed personnel were of the opinion that we are in a situation which demands a stronger military and a capable Air force. And that our strategic environment and the policies of the neighbors affect our decision of how much to be spent on defense/ the air force officials were of the view that the current allocation for the air force is below par let alone the entire military. The Civil servants were of the view that defense budget should be curtailed and that since Karma's has not been able to sell JF-17 up until now and that we are being assisted by the Chinese in this project means that we are not capable of going for these costly ventures. The uniformed officials responded by saying that the selling of JF-17 has is the job of the government and PAC or the Pakistan Air force. one of the members of the GD who also happened to be an air force official said that whether PAC has sold JF-17 or not is irrelevant . The fact that we have been able to produce a multi role fighter aircraft at such a low cost is in itself a huge feat and a step towards self-reliance. In addition, in the given security environment of Pakistan curtailing of defense budget would be a folly.

Findings regarding the issues and challenges faced by PAC

Participants of FGD as well as some individual respondents, expressed concern regarding the Pay scale followed by Kamra. Respondents said that at senior level too, this concern is worrying

the Executives. The government offers pay scale of BPS (Basic Pay Scale) to the civilian employees of Kamra. That pay scale, according to the respondents is not enough to attract talent and retain it. One of the respondents said” if we need a material engineer or a design engineer and we offer him/her a BPS salary so it would be very difficult to attract him/her since the global aerospace industry offers much higher pays, another respondent said that there have been cases where in fresh graduates have been selected and those fresh graduates have left Kamra for international firms after acquiring sufficient skill and experience here at Kamra. In the focused group discussion and a very senior key informant told that the pay and allowances budget of Kamra should be increased and we should be given sufficient freedom so that we can work as an industry proper. All the respondents were unanimous on the issue of bureaucratic Red-Tapeism and hurdles. One very senior respondent who had served as chairmen Kamra too , said that we had 7 PhD’s who wanted to join Kamra and when the case was sent to MODP, a section officer commented on the file that these PhD’s could be offered BPS 17 as assistant Managers. The respondent regretfully reported that all those candidates joined foreign firms. The respondents said that sufficient freedom in offering employment contracts, red Tapeism , lack of funds in pay and allowances were the major issues faced by PAC management and these are serious concerns because Kamra has the potential to compete in global market while such issues hinder our progress and has deteriorating effect.

Another issue reported by the respondents was the lack of knowledge on part of the civil administration regarding the importance of human resource development and training. The respondents re[ported that whenever an officer or any employee is sent for training purpose abroad , the process takes months and is often rejected on grounds that adequate funds are not available. A very senior respondent, said that the MODP and MOF, consider human resource training as something which is not of immense importance. Their non-serious attitude towards HRD is reflected by the number of cases they rejected and the objections raised by them on our training programs. One other key informant said that with exchange of people you are able to bring in Ideas. He said, “Technology doesn’t travel through internet and books, rather it travels on two feet’s and resides in the hearts and minds of the people.” He meant that to improve PAC and make it globally competitive we need to have HRD programs and for that the government needs to take serious steps.

There was a unanimity on the issue of changing the BPS to Special Pay Scale and that PAC should be allowed to offer somewhat Market based salaries so that talented human resource can be attracted from the market.

Findings regarding the savings generated by MRO activities, HRD investment by PAC and the employment provided

PAC has also provided employment opportunities in form of skilled and unskilled labor. People who directly involved with the production activities and as well as allied Jobs. PAC Kamra also has a huge supply chain thus creating induced employment. I found that Kamra is contributing to the economy in a variety of ways. Interviews revealed that ARF alone has saved a total of 10.75 million USD over the past 10 years per unit. If ARF had not been in place, the burden on national Economy would have been tremendous and the battle readiness of PAF would have depended on OEM. The MRO activities at ARF have not only saved Pakistan substantial foreign Exchange but have also contributed to training of human resource. Maintaining, repairing and overhauling an aircraft is not an easy task. It requires great deal of expertise and technical prowess to undertake such an activity. Very few countries in the world are totally self-sufficient in MRO of their air fleet. The training and learning that the Technicians and Engineers have acquired from the MRO at ARF has been passed on to the next generation and so on. The personal sent for training to abroad have been able to merge new practises with old knowledge, it is that training and its transfer to the next generation of technicians that Pakistan acquired the capability of manufacturing a Fighter jet. The studies that still claim that defense expenditure is harming the economy should have a look at it from this angle as well. The same can be said about MRF which is a factory dedicated to the MRO of Mirage fleet along with providing overhaul services for C-130 and F-100 engines.

It was found that PAC is also serving clients such as Boeing and the contract, which was a result of an offset agreement between PIA and Boeing, has now been extended by Boeing to 2016 where as it was originally set to expire in 2013. This fact is testament to the fact that PAC has achieved sufficient expertise and can venture into commercial airline manufacturing. We found that ARF and other establishments of PAC also serve Sri-Lankan Air force, UAE, Jordanian, and Saudi Air force.

Studies like Siddiqa (1999) claim that ARF is an inefficient factory. Siddiqa (1999) has not given any verifiable evidence to support her claim. It is pertinent to mention that the study mentioned above, is quoted by various policy reports and cited by many studies such as HOU (2009) Khilji (1997) Shahbaz and Talat (2013) Chawla (2001) while making a case for the harmful effects of Pakistan’s defense spending. These studies do not consider the fact that defense industry has come a long way and that by investing in defense industry, Pakistan has saved billions of foreign exchange (see Table 2), added to its self-reliance, development of domestic industry and also creating export potential.

Table 1: Cost Comparison		
Service or good at ARF	OEM Cost outside Pakistan	PAC Cost
Overhaul of F6 aircraft	0.98 million US \$ a piece	0.32 million US \$ a piece
Overhaul of Ft5,Ft6 and A5-3	1.77 million US\$ in total	0.68 million US\$
C130 engine and propeller overhaul	7 million US \$	2.5 million US \$
Wire harness and cable manufacturing	1 million US\$	0.30 million US\$
Source: Interviews with respondents		

As mentioned in the remarks, MRO activities provide a base for technical training and improvement in knowledge. Similar in its role to the ARF, MRF has also saved national economy a huge lot of precious foreign exchange by providing MRO to the Mirage fleet, keeping them battle ready at a very low cost. The wing refurbishing activity undertaken at MRF has not only saved us foreign exchange but has also led to advanced technical training and acquisition of technology that has many other purposes. Similarly CNC pipe manufacturing military and non-military role and is technology needing skilled workers. The fact that MRF has these technologies also speaks of the skill it has acquired over time

Table 1: Cost Comparison				
Aircraft	Number of air crafts	OEM cost	OEM cost of overhauling per piece	MRF cost of overhauling
Mirage 3	88	5 million US \$	1 million us \$.3 million Us \$
Mirage 5	112	34 million US \$	7.5 million US\$	2.4 million US\$

Source: Interviews with respondents

It was learnt that MRF has also managed to modify and upgrade its Mirage fleet of 1967 to mirage 2000 under the licence from the OEM. This up gradation provided an alternative to buying new aircrafts and it also made a name for Pakistan’s engineering industry in the world. If we had to buy a new aircraft it would have cost us billions of Foreign exchange along with making Pakistan dependent on the OEM for over a period of 25 to 30 years. Keeping this in mind, if the role of MRF is analysed it gives us sufficient evidence to say that MRF like other PAC factories has saved Pakistan huge amount of precious foreign exchange. This had also made PAC acquire the sufficient Technological base to undertake projects like JF-17 thunder. Siddiqua (1999) and Chawla (2001) ignore this important contribution while criticising Pakistan defense production, in my interview with a senior PAF official he said that it is the expertise and visionary management of Pakistan Air force that we are able to keep an aircraft of 1967, battle ready. And after looking at the data and studying MRF, one can find itself in total agreement of his statement.

The JF-17 thunder

The JF-17 thunder is Pakistan’s fighter jet jointly produced with CAC (Chengdu Aircraft Corporation) China. In the 1990’s sanctions were imposed on Pakistan by United States., due to which Pakistan could not get the F- 16 aircraft despite of the fact that Pakistan had paid for it.

This aircraft was envisioned by the PAC long ago but the plan was finally put to action the late 1990's. The JF-17 thunder is the 3.5 generation multi-role light combat aircraft. It flies on the Russian RD-93 KILMOV engine. It has state of the art Avionics and beautiful and well-designed airframe. Its cost is one third of any modern jet fighter. This has been one the biggest national project and along with adding to PAF's strength it has saved quite a heavy amount of foreign exchange, it has taken Pakistan aerospace industry to new heights and has made Pakistan join the elite group of few countries that manufacture aircrafts. It has also has a significant impact on Employment and employability of PAC employees.

According to the interviews, the cost of producing a JF-17 thunder is between 30-35 million US\$ while the cost of F-16 is about 80million US\$ and that of Dassault Rafael is 100 million US\$. Pakistan had to buy a multi role aircraft to modernize its fleet and to keep minimum deterrence policy towards the adversary. Since due to sanctions Pakistan could not acquire F-16 and the cost of Rafael was quite high, given our strategic environment and economic situation JF-17 was the best option available. So far almost 50 JF-17 thunder have been given to PAF by PAC Kamra. If the same number of Rafael were to be given to PAF the cost would have been 50 Hundred millions and if the same number of F-16 were to be bought the cost would have been 40 hundred million US\$. Instead JF-17 thunder saved Pakistan about 30 million apiece. and if the export deals for this fighter jet materialize it would earn foreign exchange, create more employment and Pakistan will rise in the comity of nations. Air craft deals take a long time in closing and for this the support of the foreign office is needed. The political leadership should more effectively utilize the diplomatic channels for making deals. JF 17 has employed both civilians and Uniform personnel. The ratio of civilian to uniform is 75:25 i.e. 75% civilians and 25% uniform personnel.

Dassault Rafael a French made Jet was only used by the French defense forces. Due to its high cost there were no significant Export prospects but since it employed a huge number of people and more than 500 suppliers of different components of the jet were connected to it, the French Civil machinery and its political leadership made different diplomatic manoeuvres to sell the jet. Egypt whose requirement never was the Dassault Rafael, bought it. The financing for the deal was also provided by the French government in order to keep people on Jobs, French government gave Egypt a loan so that the jet gets sold. The Prime minister of France made trips

to Qatar for closing the deal on the jet and other defense systems. And French defense minister paid visits to India for making the deal. The negotiations are still on the way. These Efforts by the French Political leadership are testimony to the fact that defense industry and aerospace industry play a vital role in developing the economy, creating employment, and earning Foreign Exchange. The Fact that the French Prime minister so successfully closed deals with Qatar and Egypt, earned him the title of Europe's number 1 salesman. And he did it because jobs in France depended on it.

Regarding the sale of JF-17 thunder, one very senior respondent told, that it is the Job of the Foreign Office and the political administration to sell the aircraft. I was told that there huge politics to the selling of Aircrafts in the Global market and for that the political administration should \make the foreign office to gear up. In Pakistan's case our foreign service and our political Leadership have not played such a vibrant role in searching out markets for the sale of JF-17 thunder. PAC cannot act independently nor can it close deals. The government and the civil bureaucracy has to play its role. The JF-17 thunder has been displayed at many international Air shows but never have the political leadership visited along with nor has it ever paid serious attention to the sales and export of the JF-17 thunder. Interviews revealed that the JF-17 is very good aircraft, it has an excellent Airframe, state of the art Avionics, can take a variety of weapon systems. PAC Kamra can integrate any weapon system depending upon the requirements of the customers. This not only adds to the self-reliance of Pakistan's aerospace and defense industry but can also serve as an incentive for the customer to maintain long run relationship with PAC. In aerospace and defense industry Export, the relationship between the buyer and the seller is never limited to the sale of the product only rather it extends to a lot of other avenues as well. For instance in case of sale of a Jet Fighter, the buyer will also have to buy in "Training" both flying and technical, Simulator, etc. She will also depend on the OEM for the repair and Maintenance, TOT, and spares. So that relationship will enhance further diplomatic ties, trade of other non-defense related products as well and it will also add to the political strength and influence of the Exporting nation.

Regarding the co-production of JF-17, the respondents told me that Aircrafts throughout the world are produced as a joint effort and there is no country in the world, which produces aircrafts all alone. They quoted the example of F-16, the Euro fighter, Rafael and even Chinese aircrafts. The key informants told that Kamra has acquired the capacity to produce 65 percent of the aircraft at its own factories. Therefore, the fact that it is not co-produced is not of concern. As far as it being a joint venture between China and Pakistan is concerned is not an issue at all. In aerospace industry” Collaboration is the name of the game”. The fact is throughout the world the aerospace industry works in collaboration with other partners, it has always been across border industry. No country in the world is totally self-sufficient especially when we talk about aerospace industry. She has to find suitable partners to work with. In Pakistan’s case this joint venture was thoroughly planned, it benefited both the Chinese and the Pakistani sides and the production was started. Today AMF has rolled out 50 JF-17 thunders so far. This has been made possible by the transfer of technology that has taken place, the investment that has been made in the JF-17 thunder programme and the vision of PAC Management at all time. It was mentioned that *‘We are trying to keep our feet on the ground and doing what we can and what is realistically possible, reported one senior respondent’*.

The Engine of JF-17 being a Russian made and Russia can break the supply chain if it sees this as a competition is more of a misconception. JF-17 is the only aircraft using the Kilmov RD-93 Engine. If Russian were to stop the production this would lead to unemployment as well as loss of a big market. The news circulated in the media is often backed by anti-state lobbies who don’t want for this jet to make a market. Moreover, there exists many alternatives that can be harnessed when needed.

In short JF-17 thunder is a very good option available to Pakistan Air force. It gives a very good performance at low cost. Its fuel efficient and has very good export potential. The political leadership and the civil bureaucracy should play its role in realizing the export potential of Jf-17 thunder

The US commission of future of aerospace industry issued a report on the economic impact of the aerospace industry on the Economy. It is worth mentioning here that the commissioner of the report ended his speech with these words *“A strong aerospace industry is essential to enable the*

United States to defend itself, compete in the global marketplace, maintain a highly skilled workforce, and provide all Americans with the ability to travel safely and securely anywhere in the world” (us commission of future aerospace industry 2001. He was not very wrong if the statistics which he revealed in the report are studied. The US aerospace sector employed 2 million workers in 2001 with an average wage of 49000 USD. The report stated, that the US aerospace sector had global, national as well as local level economic impact. What this tells us is that aviation industry has a major role to play in the development of an economy. It creates employment, enhances export potential, brings a number of allied industries into action and brings in new technology which is a requirement of the industry given its ultra-sophisticated nature and the need for perfection. The PAC in general and AMF in particular have provided sound foundations for Pakistani aerospace industry. The manufacturing of Mushak, Super Mushak, K8 and finally JF-17 thunder are the combined effect of the coordinated efforts of the four factories of PAC. The employment generated by AMF and other factories of PAC, the foreign Exchange saved through MRO and other import substitution and the Export potential of AMF, all point to the fact that it has provided sound foundations for the aerospace industry of Pakistan.

Chapter 5: RESULTS AND DISCUSSION

5.1 What determines Pakistan’s Defense spending?

Pakistan’s Defense spending is not determined by the Economic situation rather it is determined by the surrounding geo-political environment, the threat perceptions about the adversaries and by the defense spending of the adversary. Defense spending in case of Pakistan is also determined by the internal situation in the country. Given the internal terrorism situation, defense spending should not be viewed in isolation rather it should be reviewed and revisited; the notion adopted by the officials of PAF. All of the interviewed officials agreed that our defense spending is less than what is required and it should be increased in wake of external and newly emerging internal ongoing war against extremism. The fact that some countries are spending lesser percentage of their GDP than Pakistan and therefore proponents of “defense cuts” believe that we should do

Serial no	Financial year	Annual allocation	Annual Expenditure	Year wise increase	% increase	Inflation %	Rupee depreciation vs dollar	Actual increase
1	2006-07	62576		NA				
2	2007-08	63915		1339.460	2.140			
3	2008-09	73348		9432.411	14.750			
4	2009-10	90603.419	90603.419	17255.364	23.525	11.25	4.62	+7.655
5	2010-11	100518.298	101357.217	9914.879	10.943	14.26	3.00	-6.317
6	2011-12	110293.240	110405.945	9774.942	9.724	11.83	8.75	-10.856
7	2012-13	118367.027	119335.457	8073.787	7.320	7.36	4.02	-4.00
8	2013-14	133569.876	133567.945	15202.849	12.844	8.28	8.30	-3.736
9	2014-15	134634		1064.346	0.797			
10	2015-16	140675		6041.228	4.487			

the same, is not appropriate because of sheer comparison of the sizes of the economies. Pakistan has her own needs, requirements, and her own internal and external situation and we have to determine our defense spending in accordance with our defense needs.

The PAF budget on the other hand reflects a decreasing trend. The actual increase had been in negative for the past 8 years if the rupee depreciation against the dollar and inflation is taken into account. The following figure is provided for details.

Generally, the threat perception determines the defense expenditure and the first line of defense is the Foreign office. It is the foreign office's Job to reduce tensions and pave ways for peaceful, diplomatic solutions. When tensions reduces this will lead to a control of defense spending. The threat perception can be reduced only if the foreign office plays its role and the political leadership makes serious efforts for reducing tensions on the border. Thoughts of the respondents on the issue reflect that the threat a country faces on its borders as well as from internal enemies determines the spending on defense. According to the interviews, we being faced with hostile neighbours and internal conflicts should not cut our defense spending rather it should be appropriately adjusted

5.2 How is PAF and PAC Kamra contributing to Economic Growth?

Regarding our question that how is PAF and Kamra contributing to the economy the study found that in addition to fulfilling the country's defense needs, PAF and Kamra are playing an important role in generating employment, providing foundations for Industry and provides incentives for Innovation. Some of the most regarded universities like NUST, UET Lahore and Air University Islamabad have recently launched aeronautical engineering degrees to meet the requirements of PAF in general and PAC in particular. These graduates are then provided internship opportunities that are beneficial for their practical experience. A high ranking PAF Official said during the interview that now a days PAC identify problem and then the technical staff, the management and the academia sit together to find the solution to the problem.

PAC Kamra is also having a huge impact on the surrounding population and the villages of Kamra. These small villages have now transformed into a city with booming businesses and large scale economic activity taking place. Kamra Employs 14000 employees, where 8000 are civilians while 5500 are Uniform Personal, out of which 450 are having Officer Ranks. All these people are involved in productive activities and are contributing to the economy. The 12500 technical staff of PAC are working for the strengthening of national defense, National defense industry, bringing in innovations and are able to transfer their skills to the next generation. This is in itself a true example of development and progress through learning by doing. It is significant to mention here that the skills that these people have acquired in Kamra are in great demand in the private industry and thus it's a treasure that gets more valuable by getting old. This has led to the development of human resource and adaptation of technology in a resource

constraint economy that cannot allocate appropriate funds to train its human capital for such kind of sophisticated technology elsewhere.

The second channel through which PAC Kamra has had a tremendous effect on the economy is through MRO activities. PAC provides MRO facilities to entire Pakistani Fleet and all the major components and engines. A respondent said in an interview (given to me) that the PAC MRO activities on average save 2 million USD annually. Apart from the cost, it saves us time, makes us self-reliant and makes us able to transfer our training and learning from one batch to the next. PAC not only gives MRO facilities to PAF, rather it extends its MRO assistance to foreign customers like the SLAF, UAE Air force , Jordanian Air force and other countries as well; hence is a source of earning precious foreign exchange. An interview revealed that with PAC we were able to convert MIRAGE 67 into MIRAGE 2000 which speaks of the technological prowess and technical expertise that PAC has achieved over the years. If we hadn't done that, we would have had to spend millions on purchasing new aircrafts.

In fact, we were able to recondition MIRAGE-67 in such a way it can meet our requirements and the cost of this reconditioning is less than half of the cost of the jet fighter needed for those particular roles. This saved us billions of foreign Exchange. And it also strengthened our position in the international community as world class engineering industry. The fact that PAC is manufacturing 1400 parts for BOEING 777 and that all four of its factories have won ISO, CAA, Boeing and other certification. It provides sufficient evidence to conclude that it has the expertise and skills that are required by the modern day Aviation industry to get nearer to self-reliance.

The third channel where PAC is making an impact on the Economy is the Aircraft manufacturing. PAC Kamra manufactures Mushak, Super Mushak and K-8. The premiere and most precious item manufactured by PAC Kamra is the JF-17 Thunder, fighter jet aircraft. The manufacturing of an aircraft itself is a really technical and sophisticated job. There is interplay of different technologies and the performance, reliability and marketability of the aircraft are determined by the quality of those different technologies. The point to make here is that aircraft industry activates a lot of other industries and thus leads to huge indirect impact. The second important thing about Aircraft manufacturing is that it gives a country self-reliance. It is a very good example of Import substitution industrialization, specifically in defense sector. If an aircraft

is imported from outside, that country has to depend on the OEM for the next 20 years or so i.e. for as long as the aircraft is in service. But if it is manufactured domestically then the spare parts, maintenance, overhaul and all other complementary services are provided within the country. It not only keeps the aircraft in service but keeps people on job, and helps save foreign exchange. And along with that it provides incentives and opportunities for technological progress. Last, but not the least, such facilities keeps a country safe from international pressures and blackmailing.

The fourth channel through which PAC Kamra has an impact on the Economy is its Export potential. Kamra provided MRO services to Sri-Lanka, UAE Jordan and some African countries. By providing these MRO services Kamra is earning a hefty amount of foreign exchange for Pakistan. The other services exported by Kamra are the training imparted to technicians and Engineers of friendly countries. But the bulk of the revenue that Kamra earns for the country is from the export of aircrafts such as Mushak, Super-Mushak and K8. Along with exporting the aircraft, Kamra is also exporting the spares and technical assistance required by the fleets. So in that way selling an aircraft is not just a onetime sale but it is a start of long-term relationship.

PAC's JF-17 thunder is also now completely manufactured in PAC. 48 of its parts are manufactured in Pakistan and the rest are brought in from China. The aircraft is completely manufactured in Pakistan. The aircraft has added to PAF's strength and self-reliance and has also saved billions of foreign exchange. This is what the respondents revealed in the in-person interviews. All the respondents reported that JF-17 thunder has saved billions of Dollars because if we had to buy the same number of F-16's or Rafael or Mirage 2000 it would have been a very costly business. The JF-17 thunder is an another way having a positive impact on the Economy i.e. it is creating employment, providing foundations for Pakistan's aviation and avionics Industry and most importantly it is has made Pakistan rise in the comity of nations by making Pakistan join the elite group of few countries which are jet fighter manufacturers.

In my interview with the PAF Officials, I was told that the aircraft has a very good sales prospect due to the fact it's the lowest cost jet fighter available. An Air Marshal referred to it as a very beautiful aircraft with the best airframe, Avionics and best weapon systems and he said that these are the three attributes of a jet fighter and the JF 17 thunder scores high on all of them. Another respondent said that it is a very good aircraft and has the capability to take variety of missions

and it suits the requirements' of Pakistan Air force and has a very good sales prospect. The respondent said that Pakistan Air force is one of the best Air forces of the world and if it starts using a product it does attract the attention of other countries. According to him the aircraft is in its initial stage of product cycle however in future it will be a preferred Jet fighter by many Air forces around the world. Another official of the PAC revealed that aircraft deals do not materialize in days or months such deals take years. He also said that there are negotiations going on and there are very good prospects for its sale. An air marshal hinted that Foreign Office is not playing its role in the sale and promotion of JF-17 thunder and neither is the Political leadership. Similar views were expressed by another high ranking PAC official who dealt with marketability and commercial aspects of JF-17 thunder.

From these views we conclude that JF-17 thunder is a viable and feasible project and it's a very good addition to the PAF and has provided foundations for Pakistani Aerospace industry to venture into the realm of fighter jet Manufacturing. Selling of JF-17 as well as other defense products is the Job of the Political leadership and the civilian bureaucracy. PAC's Job is completed when it assembles the aircraft, test flies it and makes it Battle ready. The role of political leadership of France in closing the deals for Dassault Rafael, as we discussed in the previous section, is testament to the fact the Political leadership has a very big, important and crucial role to play in this matter.

5.3 Contribution of PAF and PAC to Education and HRD.

Regarding the impact of PAF on Education and training we have found that PAF is contributing to education in three different ways.

- 1) Sending personnel for training to other countries
- 2) Giving in service training in form of PACIT and technical schools for Airmen and the PAF academy at Risalpur.
- 3) Fazaia schools and colleges

“Technology travels from one country to another by two legs and it resides in the hearts and minds of the People” a respondent, told me in an interview in response to my question regarding TOT and why can't we replicate the already existing Technology. He meant that in order to

achieve the technology of something, we have to send our technical, Engineering, Managerial teams to those countries where by working together with the OEM, trainees are able to acquire the necessary skills and knowledge that is needed to not only adopt that technology but to utilize it to the maximum and to make modifications in it as required. Knowing how a machine works is as important (if not more) as having the machine. Those trained individuals, upon their return, are able to share the expertise and training that they have acquired with their colleagues and this is how technology is adopted. These trained human resource upon retirement join the civil industries or move abroad. This speaks of the type of training and the quality of training.

The retrofitting of the mirages, the ROSE projects were a master feat of Pakistani engineering wherein PAF reconditioned MIRAGE 67 into MIRAGE 2000. One might argue that such sort of training is only limited for Military/Air force Jobs and therefore it must not be considered as a contribution to overall human resource. Such an argument was found to be biased and inappropriate on many counts. In an interview with a senior official, he said that whether uniform or civilians we are all Pakistanis and that Pakistani citizen is employed, trained and looked after. This is the benefit to the entire nation. As the earlier section on PAC factories showed that the aviation industry is a far more sophisticated and technology intensive industry. The level of sophistication required in Aircraft manufacturing is far more than any other industry, the primary reason being that we are dealing with human lives (pilots) when we manufacture an aircraft. Therefore one can only venture into it if and only if one is capable of doing it.

Another respondent commented that such skills and technologies are not only needed by the aviation industry rather some of them have dual use and thus our trained personnel are able to provide a good form of human capital to the industry after they retire. If the industry that is able to absorb them is not there, these individuals have no other options but to go abroad. In one way that is leakage of human resource from the Economy but on the other hand it brings in remittances. So either way it does help the economy in positive way. The fact that the industry to absorb such trained human resource is not available is a problem of the Government and not a problem of defense spending. Thirdly, even if the skills are limited to Air force and PAC Kamra, still it is contributing to the Aerospace industry of Pakistan and that in our opinion is a major contribution.

The Second channel through which the air force contributes to education is in form of training given to civilians in PACIT. Where in 2000 civilians have graduated in diplomas in different technologies such as in Mechanical engineering skills, Metal and metallurgical engineering, Radio, Radar & Airframe Fitting, Engine fitting, welding skills, Electric fitting, Heat and surface treatment working. Most of these technologies also have use in other industries as well. PACIT not only inducts civilians rather it offers them a job thus this is also leading to Generation of employment.

The third channel, through which the PAF is contributing to education, is through the establishment of Fazaia schools and colleges. The Fazaia schools and colleges are located in or near PAF establishments around the country. As we have shown in table that along with PAF uniform officers and ranks, these educational institutions cater to the Civilian employees as well as the non-entitled civilians. The fee structure of these Fazaia is category wise. The lower rank officers pay less while as the rank is upgraded the fee is accordingly increased. The buildings are custom built with playgrounds and labs for all subjects. The curriculum is carefully revised and updated. The students are given an environment where in they can develop their personalities. Curricular, Extracurricular and co-curricular activities are designed for the students at national and international level. It was discussed that if the same level of education was to be given to the same students in the private sector, the fee would be at least 100% more. See the following Table-1 on next page.

Table 3: Syllabus and Fee Structure of Different School Systems				
School Name	Location	Building Custom built	Curricula	Fee
Peshawar Model degree college	Peshawar	Yes	Local textbook Board	7500 per month
Peshawar Public School	Peshawar	Yes	Local Text Book Board	6700 Per month
Beachonhouse Hayatabad Peshawar	Peshawar	NO	Cambridge schools system.	12000 per Month
Fazaia Degree School and College	Peshawar	Yes	Oxford university press	4000 per month for CNE's While for entitled it ranges from 1400 per month to 2500 per month

As far as the Cambridge school system is concerned there is no doubt that that the system is better and well equips the students with the necessary tools and grooming that are needed by the market. But if we look at the state of building then the Fazaia schools are better. Now comparing the Fazaia schools with local private schools the table indicates clearly that the Fazaia schools are affordable, well equipped, have a good environment and therefore are best if compared to the schools operating in the private sector. During the interview the Director of Fazaia Schools and Colleges pointed out that Fazaia schools and colleges should be compared with local private and government schools and it should not be compared with Roots or City or Beachonhouse. The main reason that he pointed out was that City, Roots and the like charge very high fees so they have a lot of revenue and therefore they are able to maintain teachers at very high Pays. Fazaia Schools and Colleges, on the other hand, make optimum use of its resources in order to obtain maximum benefit out of existence resource utilization.

The director also told that Fazaia schools and colleges are now going to start A-levels and O-levels so that even the people, who can't afford City or Roots, will be able to study Cambridge. This shows that defense spending has a major spill over effect on the society, the economy and the human resource. The Fazaia schools and colleges and other educational and training

institutions of PAF show that even if funds are scarce but there is good governance, efficient management and competent staff, schools and educational/training institutions could perform, leading us to the conclusion that defense budget is not the culprit and the problems of our education sector can be solved with better governance and planning.

5.4 Is the Education sector suffering due to defense?

There are serious allegations that the social and economic sectors suffer due to the defense sector. The budget allocated for defense is not snatched from the social sector rather this allocation is made keeping in view the internal and external threats faced by the country. The reason behind the dismal situation of the education and health sector is not defense spending rather it is the inherent problems of these sectors which do not let these produce the desired results. The widespread corruption in Pakistani health and education sector, the recruitment of staff on political basis, the lack of planning, the lack of trained Educationist at the primary level, the lack of planning in the health sector starting from the way the curricula is designed of Pakistani medical schools to the way the hospital function at district and Provincial level. Proper health facilities can only be afforded by the privileged class of the society and the poor cannot access these facilities because the same doctors that work in the Government hospitals also run Private clinics and there the cost is too high.

Moreover, it is a general perception that the doctors in the private sector will often prescribe tests and even medicine that are not needed at all. And the patients, on the other hand, prefer the private sector because they believe that the doctors will give them good care and more attention when they visit his/her private clinic compared to the treatment they receive from the same doctor in the Government hospital. Secondly the lack of expertise in diseases of the poor and other localized diseases is also a problem (see Appendix 1). The medical colleges in our country teach a curricula that is not suited to our needs rather to the needs of the west (Zaidi 1999).

As far as the education sector is concerned, we have deliberated on it in great detail in Appendix 2. The education sector suffers from lack of planning, competent administrative and teaching staff, the appointments based on political affiliations and the unchecked corruption. The fact that we have ghost schools and that there are ghost teachers as well is testament to the fact that there are inherent governance problems in the Education sector which needs to be addressed. Hence, it

can be argued that the basic problem of health and education sectors is not only the funds allocation rather it's their inherent problems which need to be corrected through good Governance.

5.5 Does PAC Kamra possess the required technological base to expand its base and undertake commercial ventures?

Regarding the question that whether Kamra had the potential to expand into manufacturing other aviation products like helicopters, Transport aircrafts, and extending the Jf-17 program to have whole line of jet fighters we got matching responses. A very high Ranking Official said yes there is an immense potential in Kamra to expand and venture into these categories but it is too early. According to him PAC was having its feet on the ground and doing what was realistically and economically possible but in the future PAC could expand into these categories as well. Another respondent replied that we have the potential and the technical knowhow but such a venture would require heavy funding from the government. Given such replies we believe that Kamra's base can be extended and with that the benefits to the citizens and the economy would also multiply. Given the fact that Kamra manufactures 1400 different parts for Boeing, we find it safe to conclude that Kamra can venture into commercial aviation as well, if the political and civil leadership wishes it to do so.

In brief defense spending, in case of PAF and PAC Kamra, has a positive impact on the Economy. TOT, employment, human resource development, education are some of the channels through which the positive impact shifts to the society. However, even if there is no positive externality impact on the economy or if it's not significant enough, defense still needs to be strong and the country should keep its defense forces healthy in order to remain sovereign since it's not the economy which determines the defense spending rather it is the external and internal peace situation that plays a vital role.

Chapter 6: RECOMMENDATIONS

Pakistan's is facing internal and external threats in the form of Taliban and Baloch insurgency and hostile neighbors in the form of India and Afghanistan. In such a critical phase, it would have disastrous consequences for the national security if defense budget were curtailed. The prime determinant of our defense spending is the geo strategic environment and the political leadership should play its role to reduce the tensions. The reduction in external tensions will certainly lead to cut in defense spending.

Defense spending should be revisited and special emphasis should be put on defense industry particularly aeronautical industry, aeronautical industry due its sophistication can bring with many allied benefits that other investment wont. The aeronautical industry can provide incentives for R&D in the civilian aerospace industry, motorcar, and electronics industries. This strategy will make defense spending contribute to the economy alongside making Pakistan self-reliant in aerospace and aeronautical industry and this will lead to strengthening of national defense by making it self-reliant in the most modern form of warfare. This will certainly add up for the deficiencies of the ground forces, will offset the effect of Indian pressure created through huge army and military doctrines such as cold start.

Karma's budget in pay and allowances and R&D should be increased so that PAC can attract and retain talent from the Market and become more competitive. The activates undertaken by PAC and the progress it has made so far, as reported above serves as proof that Pac can become a major player in the global aviation market,

The political leadership should utilize the diplomatic channels effectively in order to secure sales for the JF-17 thunder so that it could contribute to Economic growth and foreign exchange reserves.

The political leadership should focus on the commercial ventures that PAC can undertake so that full potential of PAC can be realised.

The inherent problems of the health and education sector should be solved through good governance and sound management practices so that these sectors can start performing as required

Future research

The study of defense expenditure is very complex and requires a multi-angled perspective ranging from the sociological factors to the domestic political factors in regional and global scenarios. All these factors can be dissected and analyzed on a case-by-case basis and then it can be recommended that which of them are controllable and which are not. The Dynamics of Pakistan Defense spending need to be thoroughly, understood so that a better policy could be informed.

The defense industry in general and aeronautical industry in particular should be analyzed in terms of comparative advantage so that we could focus on the activates that are more economically viable

What are the ways in which we can have a sufficient defense spending and at the same time our social sectors is not made to suffer.

Analyses of PAC's Supply chain and reporting the issues, challenges and solutions can also be a very promising area for future research

Limitations

Time and resource constraint were the biggest limitations of the study. While reporting the findings sensitive nature of the informations was kept in mind. Exact costs could not be ascertained due to the strategic nature of the information. Averages and approximate costs are reported. The bias of the informants and the uniformity of the sample although has advantages but at the same time couldn't give us the perception of Politicians and academics. The politicians and academics, could not be included, due time and resource limitations.

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Appendix 1

Trends in health, Education and defense expenditures

Contrary to popular belief among the academia and the research community the trends depicted by the figures of the health, education and defense budgets give us a very different picture. The trends as depicted in the graph below show that the health, education and defense budgets have no effect on each other. Infact there is no relationship between the three. Infact all three show trends that are similar.

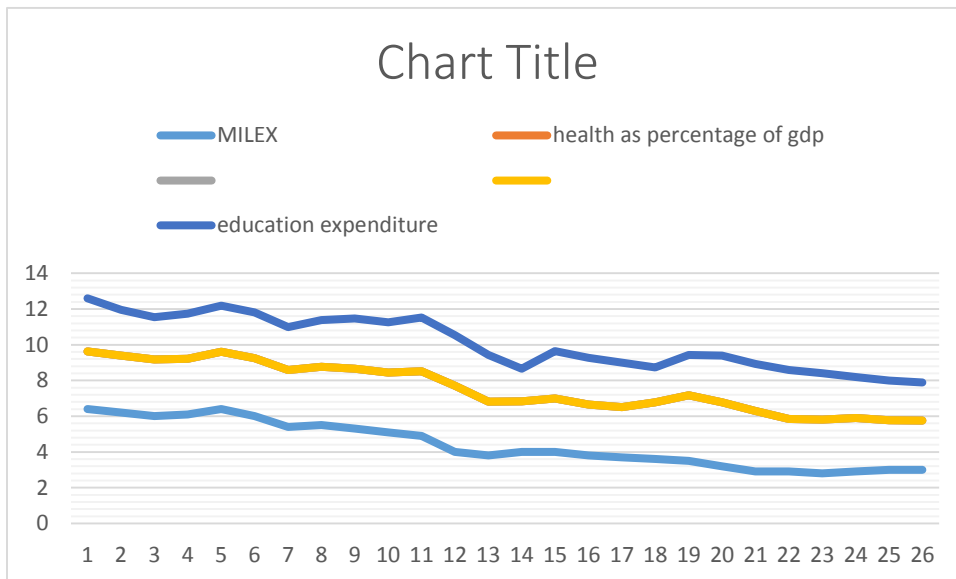


Figure 21a

The above graph is plotted for the percentage of health, education and military expenditures as a percentage of GDP. All the three have been declining as a percentage of GDP .yes one probable reason for that is the increase in the size of the GDP. So although in absolute terms, the graph will give a different trend than the one depicted above but in terms of percentage the trend has been on declining side. The notion that defense spending is responsible for the low funding of health and education sectors is not valid therefore since all the three are moving in the same direction. There is no second opinion to the fact that our health and education sector are

performing badly. But there are a lot of reasons to that bad performance. For instance the problem of corruption. Bad governance, political interventions, and lack of proper accountability procedures.

The health sector, just like the education sector is also not that much developed. The treatment here is mainly “curative” rather than “preventive”. This is how the doctors are trained i.e. to cater to needs of the rich, while the poor are neglected because the poor owing to their low income are compelled to access the public health facilities as they cannot afford private health care which is of relatively better quality (Zaidi, 1999)

Or doctors are westernized doctors which find it very difficult to work at community level, owing to their peculiar training at Medical colleges writes Akbar Zaidi in his book “issues of Pakistan Economy”. He further says that in the developed world the main causes of death are diseases like cardiovascular and cancer diseases. While here in Pakistan infectious diseases such as malaria and typhoid are main causes of the death, (Zaidi, 1999) believes that the doctors are not trained to deal with area specific diseases and he also believes that the medical curricula that is taught in Pakistan is written by the authors of the developed world keeping in mind their societies and this curricula is responsible for the making of doctors and go to serve in the west .so in a way we are providing subsidized health care to the west and Zaidi has called it “medical Brain- Drain”.

The remaining doctors who prefer to stay in the country open private clinics which cannot be afforded by the majority poor .the doctors working in the public sector also have their own private clinics which they run after duty hours (Zaidi, 1999) .

I believe and (Zaidi, 1999) support me when I say, that the health sector of Pakistan has inherent problems such as poor planning, unsuitable curricula, corruption, Political intervention in appointment of staff, while the availability of funds is not the prime cause and some people believe .neither is it because of our defense expenditure .the health sector due to its own inherent problems has not been able to utilize the already allocated funds.

Our education sectors is also suffering from corruption, bad governance and lack of visionary policy and a good accountability criterion. One very big problem of our education sector is the

heterogeneity of the education system. The four different types of education systems that are in operation in our country. They are the

- 1) English medium
- 2) Urdu Medium
- 3) Cambridge system
- 4) Madrassa system

All these four systems have their own customer base and then they give a different product to the market. This heterogeneity doesn't give equal opportunities to all the people in the society. and thus it does not only lead to inequality but also to underperformance of the education sector because the Cambridge system is often opted to by the rich and elite class of the country and then due to the fact the Cambridge system is expensive but good. The rest of the country adopts the other three systems

State of education in Pakistan: a brief analyses

The Pakistan of today was a part of the great Indus valley civilization. Various nations such as Afghan, Arabs, and Turks came here and left their imprint of the society of Indo-Pak. The influence of these invaders can still be seen in the social, economic, political and cultural life of the people of Pakistan even today. Mohenjadaro and Harappa were a great civilization and such a great civilization could not have come into existing without a good educational system (Shamsul Haq-1965).

To understand the current state of education in Pakistan, the issues, the deficiencies and the solution we need to see it in historical perspective. We can conveniently divide the analysis into four time periods

- i. The pre-Muslim India
- ii. The post Muslim India
- iii. The British Raj
- iv. The post 1947 Pakistan

a). **The pre-Muslim India**

The only references to the Pre-Muslim India and the way they educated the people can be found in their religious and mythology text only since formal history recording was not so developed in those times.

The ancient Aryans, had “Brahmic” education system. Brahmins were the priestly cast, the once considered to be the only noble cast in the Arians society and under the Brahmic education system only the Brahmins could get education. This method of education aim and preparing the Brahmin to be the breast and to lead the religious activities of the society. Because they claimed that God had created Brahmin as superior to everyone else. It would not be wrong to say that the Brahmin education system was primarily focused at protecting the Brahmin elite-hood.

The classroom were most in temple or under a big tree in the village. The students use to gather in these places and owing to the exclusivity of the system the number of system student use to be a dozen or little more. Since the ancient Arian society was in agricultural society, therefore, the teacher were paid from the harvest. The teacher’s job was to impart basic education to the people.

i). **The Emergence of Buddhism**

It is fact that whenever in existing system becomes so extracted that masses even don’t have a breathing space left, a new system has to emerge and for obvious reasons it will be radically opposing the statuesque and this new system will be nullify the existing way and practices and thus the oppressed will readily support the new system. The 1917 Communist Revolution in Russia, the Chinese Mao Ze Tung Revolution, the French Revolution, the glorious British Revolution, the recent uprising in Egypt and other parts of Arabs – Afro world all support the fact, that extraction and extractive system cannot survive for ever. The same thing happened with the Brahmic Social system.

Buddhism emerged as a new system, although it challenged all the aspects of the Brahmic life style but since we are interest in the educational aspects of Buddhism, therefore, we will not be

discussing the socio culture and economic and political changes that followed the advent of Buddhism.

Buddhism had a different educational system, it was an education for all. There was no exclusivity. Everyone could get that education unlike the Brahmic the education system which aimed at making priest in order to safeguard the elite status of the Brahman, the Buddhist educational system aimed at creating a life of solitarily meditation. This education system was more formal and had a curriculum. Buddhism left a strong impression on the life and the value of the people of the sub-continent.

b). The Muslim Period

Although as early as the 8th Century, Muslim trade relation with India had existed. Muhammad Bin Qasim captured Sindh in 712 AD, then the Sultan of Ghazni, Sultan Mehmood Ghaznavi concurred the Northern sub-continent in the 11th Century and Muslim rule was established.

Islam, being a complete system governing social, economic and political life of the people had a massive impact on all the aspect of the then India society. Islam through its teaching which emphasized values such as tolerance, justice and equality had a deep impact on the cast ridden Indian society. During the Muslims rule, the state patronized education and transformed the educational system of India. Muslims education system was a hybrid of religious and worldly arts. In fact, Muslim ruler considered education as a religious obligations due to the religious injections emphasizing education, its provision and acquisition. The classrooms were arranged in mosques and along with state pattern is and funding, donations were also a mode of financing the educational sector during the Muslim rule.

The system was more inclusive, there was no upper priestly casts, education was open to every class of the society, and even non-Muslim children were allowed acquisition of education just like the children of the Muslims even in Islamic Madrassas (the last Mughal King).

During this time works from other languages were translated into Persian and Arabic, native languages such as Bengali were revived. This liberal approach resulted in diffusion of education and re-birth of native literature.

The Muslim education system was divided into elementary, secondary and higher education. There were exclusive schools for Qur'an education known as "Madrassas". The curriculum at the elementary level consisted of basic religious instructions, reading, writing and mathematics. The curriculum at Madrassas which was higher education at that time included Algebra, History, Mathematics, logic, philosophy, Physics, Economics and Chemistry alongside Hadith and Fiq (Qureshi 1972).

c). **The British Colonial period.**

The British Colonial era changed the entire educational institutional structural of Indo-Pak sub-continent. During the British Raj, the existing education institution became weak and thus they were un-able to contribute to the society in those troubled time. The Indians, especially the Muslims since they were the ruler before the British came, were politically and economically ruined and so were there institution. The British Colonial master were not much interested in the education of sub-continent. They had their own interest and educating the Indians was not among them because they didn't need to. In 1814, the East India Company, sanctioned funds for education. The East India Company aim at educating the natives in a western way (Qureshi 1972 Page-8).

The economic and political changes that followed the British conquest and the land settlement in 1773 was a final glow to the native education system. There started a controversy between orientalist and angilicists. Then finally the British administration decided to introduce western education and this devastated the existing native system of education. The Prime architect of this education policy was Lord Macaulay and the year was 1835 (Qureshi 1972 Page-9).

Since then all schools were to teach all subjects in English and native school system was completely neglected in terms of state support, funding and consideration in policy. One might asked the question that why did the British introduce the education system in 1835 and why did they ignore it previously?

As a student of Development Studies and having studied Economics and Political Science in my bachelor, I believe that they did it for the reason that after 1835, they needed people specifically trained for running offices for them. Lord Macaulay the prime architect of this education system

said that we must produce such a class of Indians which will provide linkage between our administration and the local Indians. This class should be having similar characteristics as the British masters. This class must have British tastes, British attitude and must serve British interest.

Why did the British take interest in the educational system of India?

The British were the new ruler of the sub-continent. They constituted the “elites” and just like any other elite group they too wanted to control the masses completely. Many reasons could be cited for the British sudden emphasis on education of the Indians but I believe the two reasons which were really pushing or as I would call them the real reasons. Firstly, the British well understood the importance of education. Educational institutions are the production facilities of intellectual, work force, innovators, inventors, scientists, scholars, leaders and rulers. Educational institutions can to a very great extent shape and transform the society. I believe that education is area specific i.e. a specific system of education might work and succeed in country “A “ and give really excellent results why the same system might fail in a country “B”. Because just like other social institutions, education too does both i.e. its response and is affected by the socio culture environment it is operating in.

The British masters of India were well aware of this aspect of education or so it would seem, so therefore, I believe that they deemed necessary to intervene into the existing system and moulded it into one that would serve their interest well.

The British did not do it because they care for their Indian subjects or they considered a Government obligation rather they did it because it was best for them. The elite do not choose policies that they think are best for the people rather they select and implement the policies that they think are best for them (Acemoglu why not a political choice theorem). So the British were the elite, the ruling elites of the sub-continent, therefore they transformed the education system of India into one that suited them best. The local elite of India, the Sultans, the Rajas, the Maharajas, the Princes, and the Land-Lord etc. did not react as they were supposed to due to the reason that their interest converged here at this point with the British Colonial masters i.e. both of them wanted to control the masses. A sound education system suited to the need of the locals would have proven a great hurdle in their way, so they transformed the existing education system into one that would suit them well.

A ruler whether strong or weak, democratic or dictator, local ruler or foreign occupier always needs a bureaucracy to run the Government departments. The ruler always needs such people to implement their policies and get them the desired results. This was, what I think the second reason why the British introduced their system and created market opportunity for people trained in British designed schools. Could they have got the same sought of bureaucrat from the native education system? The answer I believe is “No” because the Indian native system would have supplied a nationalist Indian, which would prove as a hurdle for the British Colonial masters. So this system was designed to give the British masters a clerical manpower which would facilitate the British Colonial Raj.

The British Government discontinued all financial and other support to the native schools and made it mandatory for all the schools to teach “English”. A language totally foreign to the native. Furthermore it also made it mandatory that all subjects should be taught in English too.

The British Government later made this British style primary education as compulsory for all and this action was also supported by Quid-e-Azam Muhammad Ali Jinnah (Education for all 1968 Page-54).

After initial opposition finally in 1918, the Government made British style primary education mandatory for all. But still the primary education did not expand at that space. According to Afridi, the number of schools goes was 2.6% of the total population while the planner expected the figure to be around 15%. The figure for literacy increased by only 01%. The reason at that time why the primary education could not expand were the structural difficulties and problems, the ignoring of the social structure of the Indian society. Some of the main reasons, why the education could not expand can be listed as follows:-

- a). Indigenous letter system and social structure being completely ignored.
- b). Focused on quantity rather than quality.
- c). Drop out of students.

a). Indigenous cultural system and social structure being completely ignore.

India as we have briefly discussed in the preceding paragraphs had an age old, century old system of its own. Now if that system which had a Brahmin aspect, a Buddhist aspect and then an Islamic transform shape to which the Indian native had adopted an hundreds of years of Muslims rules couldn't be changed overnight, neither could the people and society adopt to it on the spot because they were human being and not machine. Since the native cultural, social, economic, religious and political aspects were ignored, therefore, the new education system which was a completely alien system to the native did not work / succeed.

b). Focused on quantity rather than quality.

Secondly education is a quality based service a single school, which is of standard is a thousand times more productive than a thousand other schools where quality of education is compromised. Take the example of MIT in Massachuset and compare it with the numerous technical schools and technological institutions in Pakistan and India. In terms of impact and technological research and academic contribution, MIT surpasses all technical institute of Indo-Pak combined because if quality is ignored the system would have desired effect. This is what the Britishers did with the indigenous educational system of India. They ignored the quality and emphasized on quantity and therefore, the system did not work.

c). Drop out of students

Drop out from school at that time was also high (Afridi). The students drop out due to two main reasons either the student is unable to comprehend what is thought in his class, therefore, is unable to become of part of the system. He or she feels as if he or she doesn't belong to the system or that whatever is start in the classroom is of little importance. Something that is not connected in any way to the real world around them where they left. Second reason why students might drop out is the economic reason i.e. the student is unable to pay for the education or he /she may be able to earn if he / she doesn't go to school and go to work instead. So looking at the society of India during the British Raj, it's not a hidden secret that masses were poor (still are) and were unable to participate in the engineered British System due to economic social and political reasons.

Other reasons why the education system of British was not productive for the masses including the following:-

- a). Westernized Curriculum
- b). This education system aimed at creating students that could join public service under the British Raj in lower ranks. It somewhat supplied the British Colonial administration with Clerical staff while a good education system is supposed to breed leaders not clerks and such a good education system capable the supplying of society with leaders has to be an indigenous educational system.
- c). The curriculum was never improved revised or updated because the British Raj did not have an incentive to do so, they needed clerks and the system was supplying them with it so there was no need felt by them to bring any positive change or updating the existing curriculum.
- d). the teachers were poorly trained again for the same reason. The teachers were just trained enough to prepare the sought of product that the British elite , the Colonial masters needed, so it didn't matter whether the system was indeed doing any benefit in intellectual and thought growth of the masses or not.
- e). the supervision of the system was not sufficient for adequate.
- f). the children who went to these schools were not feeling any connection of what they were thought in the classroom and they environment that they live int. And perhaps this is also one of the reason why the education system was unable to play a positive role in the society because just like classroom, the society also teaches the person, and if there exists a gross contradiction between the two learning, then the results are not beneficial.

Then when the British Raj held elections and Congress won the election, some serious steps were taken by the Congress Government to improve the state of education but still it wasn't of a crucial impact. The British had already damaged out indigenous education system to quite an extent then.

It would not be wrong to say that the British period was a particularly dark period for the indigenous educational structure and system of India. Pakistan inherited such a crippled education system from the British Raj.

THE STATE OF EDUCATION IN PAKISTAN AFTER INDEPENDENCE

Independence in Political Science is actually a condition or a state of being wherein an individual, group, community, nation, or a country can exercise self-Government. Independence does not necessarily mean freedom. The dictionary definition of independence is to be free from the influence, control, support, aid, or the like, of others.

When Pakistan got independence from “British Rule” did we achieve “freedom” too? The answer to this question cannot be given by a fancy fiery romantic speech or poem; the answer to this question can be given after we have studied the institutional transformation (if there was any) that took place after the British left. The way policies were made and the way decisions were taken. While formulating policies, what priorities were set, for whom were the priorities set, and who set those priorities. What was the aim of our education system? What sort of products we wanted it to produce and the most important question did it follow the legacy of the previous time and if so, then in what ways.

Today we hear the cry from so-called circles of intellectual and so-called development experts that Pakistan’s education system is not productive and is unable to perform and produce a good product only because of the reason that the Defense sector takes all the funds. This is an absolutely wrong acquisition. Institutions have a tendency to persist. Our education system has not reformed after our independence and neither have we given this a serious thought. Today our education system is underproductive due to the same reason which contributed to its failure during the British Raj.

Let’s have a brief inspection of the Pakistan Educational sector 1947 to present

After independence, Pakistan had to face a number of problems. We were engulfed in a crisis situation from all fronts. The “Cripps mission” did not demarcate India justly, there was a massive influx of refugees, and the military assets were justly divided. The new Government had to solve and take control of this crisis situation so education, for obvious reasons, could not have

been the number one priority of the Government, because, there were other pressing matters of grave nature demanding the Governments attention.

To address the educational problems and how to deal with it, a conference was called, it was the first conference on education. It was five days conference lasting from 27th of November, 1947 to the 1st of December, 1947. Among many things, said and agreed upon in conference one was the free provision and acquisition of education to (What the conference called) “largely illiterate masses”. The conference maintain that Pakistan National Policy on education will have the provision “Free Primary Education” as its basic principle (proceeding of education conference 1947 Page-13).

National Education Commission 1959

The 1959 report of National Education Commission explicitly stated that compulsory education at the elementary level was indispensable for a skilled and creative citizenship. The National Education Commission laid-down some objectives of the primary education system.

- To make the children able to function as literate citizen
- To develop their personalities in moral, physical and mental aspects.
- To prepare the students to acquire higher education after completing schools.
- To inculcate a spirit of patriotism towards the country.

The commission also stated that the development of curiosity as one of the objectives of the Pakistani education system. The commission in its report also stated that the curriculum should be such to match the abilities of the students. Regarding school furniture and buildings the commission report stated that the furniture should not be costly and the buildings should be simple. The commission in its report recommended locally available materials to be used in the building of schools. Regarding teachers training it recommended that teachers should be trained and training facilities for teachers should be made adequate.

Regarding girls education, the commission in its report laid emphasis on the recruitment of women teachers and that acceptable working condition should be made for them. It also recommended that there should be attached houses / residential complexes for women schools

teachers attached to the school's campus. Regarding pay of the school teachers, the commission recommended that the pay should be enough to afford a decent standard of living.

For financing education and to deal with all the financial aspects of the education sector, the commission forwarded recommendations that senior level committees must be set to deal with the issue, so that the stated goals could be achieved.

The two main problems that this commission had to face were that a large of students was supposed to be educated and this must be ensured that they complete their five years of primary education (Afridi).

The five compulsory education as recommended at the conference was supposed to have a curriculum which was to develop all aspects of the child personalities, develop and attitude toward scientific thinking and some vague terms such as “desirable attitude”, “international understanding” and “universal brotherhood”.

The commission emphasized the activity based learning and an up to date cumulative record of the students to be kept and also a good evaluation system of the educational institutions.

In brief, the commission and curriculum committee give guideline and try to develop Pakistani education system by focusing on the primary education.

The National Education Policy 1970 to 77

In 1970, the government announced an educational program expending the primary education to Class-8. The policy also aimed that decentralization of the department of education. Due to short period of the regime, this policy could not be completed, however, future education policies were framed on these lines.

This new policy was in direct contrast to the recommendations of the educational commission which emphasized on the centralize educational system. During this time, the educational planners faced problems such as huge infrastructural requirement of the schools, lack of the basic facilities in the schools and the high dropout rate of the students. The system could not retain the students and if a system is unable to retain the students, it means that there is something wrong somewhere inside the system.

Afridi writes that wastage has been a concern for all our planners in the education sector since independence. By “wastage” we mean that drop out of students from schools all the stagnation of children at the lowest – initial level of education such as the primary level.

This drop out has far-reaching economic, social and political implications but those are beyond the scope of this thesis.

Why “Wastage” takes place at the primary level?

Poverty, incompetent teacher at the initial level, a carelessly design curricula, a non-interesting environment at the schools, parents attitude for not caring much, absence of trained, councilors at schools are some of the reasons identify by the literature reported by (Afridi) (Jamila).

There are no coordinated programs aimed at improving the education system of Pakistan, no carefully designed pre service training or in-service training , no research based policies taking into consideration the physiological and behavioral aspects of the students. Remedies could be, improved teacher training program, improved school environment, appointment of counsellors, making parents teachers association at the primary level and making research based policies.

These things don’t require bulk of funds rather a change in attitudes and a concern by policy makers, but unfortunately, the needed things are not done the planners and policy maker have not done their job as they should have done it while all the culprits find it very easy to take refuge in criticizing military expenditure for all the problems and the troubles of the educational sector.

National Education Policy 1978.

The guideline of this policy were laid by the National Educational Conference of 1977. The aims sets for this policy were quite different. In this policy the Islamic or Muslim aspects of Pakistani society was very much emphasized. The stated aims of the policy included statement and expression such as to infuse a loyal attitude and spirit in students towards religion and the country, to make every students aware of him as being a part of Muslim Ummah and that he / she has to contribute to the welfare and progress of the Muslim Ummah, to inculcate a character in the students which is in accordance with the Holy Qur’an and Sunna, to develop an educational

system of quality, to create interest and love for learning and discipline in the students, to promote and strengthen scientific and technological educational institutions.

As apparent from the statement of objectives of this policy, it was a radically difference policy then the previous one. It wouldn't wrong to say that this policy was a 180 degree turn. It was an experiment conducted on our educational system and all the previous journey and the negligible progress that we had made so far was almost nullified. Once again poor planning and lack of vision inflicted wounds on our educational system and the so called unavailability of funds and a high military expenditure had nothing to do with it. Therefore, criticizing Pakistan's high defense spending for the under productive, poorly administer and week education system is illogical and irrational.

National Education Policy – 1992.

This policy was a result of a directive from the Prime Minister. This was an educational policy which for the first time took input from academician, administrator and as usual (as always had been in the past) from Members of National Assembly (MNAs).

This policy was again a “U” turn from the policies of its pre-decease. However, it did have one similarity with the previous policy i.e. it also consisted of vague statements which might appear very good, noble and romantic in a novel then on a policy documents such as (to create a system capable with demand perspective economic activity and keeping in view the socio cultural environment as such to create an egalitarian Muslims society.

Targets set by this education policy.

The policy however, did lay-down some guidelines for example regarding primary education it set a goal of training 26,500 primary schools teachers, opening of 1, 07,000 primary and mosque schools, to add a room each to the 20,000 one room schools, 24,750 shelter less schools would be converted to two rooms schools, service condition in the schools would be improved, “wastage” phenomena would be studied, so that a solution could be given. This policy could not be implemented due to the change of regime. The new government forwarded its own policy but that government too could not complete its tenure.

National Education Policy 1998 – 2010.

The major issues of Pakistan Education System when studied reveal that funds provision is not a big reason for an under productive educational system rather it is the inherent deficiencies of the education sector itself, for example

- A third of the students are left out at 5 – 9 years.
- Teacher's absenteeism and goes schools are a common phenomenon.
- Instructional supervision is weak.
- Under develop curricula.
- Inappropriate teaching methods.
- Aspect of character building is neglected.

The prevalent financial corruption is perhaps the major reason along with nepotism and undue political intervention in the appointment of staff but unfortunately this has not even received half of the criticism that the military and defense funding has received. This issue, however, has a political economy of its own.

Strategy set by the Government to improve the educational structure.

This new regime did however, take some serious steps towards improving the educational structure, many reasons could be cited for the relative success or relative improvement in the educational policy of this government such as its freedom to implement its policy due to its doctoral nature, the lack of political opposition etc. However, that beyond the scope of this thesis. Let's discuss the few salient future of the new educational policy of this regime.

As discussed above, the educational department suffers from undue political involvement. There are a lot of appointment and recruitment of staff at lower level as well as at the officer's level based on political affiliation, favoritism and nepotism. This has destroyed our entire educational system and this is unfortunately a characteristic of an under developed country. The new policy of this government set out to change this and it maintained and explicitly stated that the hiring of staff in the Educational Department should be purely based on merit and a formal transparent procedure should be followed while recruiting staff in the educational departments.

It also made a new strategy for providing incentives for primary school teachers by making it a policy to recruit local teachers, so that they could performed their duties well because of the benefits associated with working locally in once area.

As discussed earlier that teacher's absenteeism is also a major reason for our weak and under productive educational system. This new policy aimed at developing a strict system to check the teacher absenteeism issue and to penalize the violators.

In any job or profession, training place a crucial role in determining the quality of the service whether it's military service or the services of a doctor or the job of a bureaucrat training is a crucial importance. This new policy aimed at making in-service training available to the teachers, so that they could contribute to the system as required.

Previously, the minimum qualification for PTC teachers was Middle i.e. Class 8th but under this new policy the qualification for PTC teacher was raised to higher secondary school certificate i.e. Intermediate.

No matter what the profession, the career development is a concern for the people who have adopted the particular profession and in the course of pursuing a career and developing it the people contribute to improving the quality of the service. In the previous policy, this aspect i.e. the career development of the teachers was neglected. This new policy, however, aimed at defining a clear cut path for teacher's career.

This policy also aimed that linking performance of the teachers to promotion possibilities. Once again providing incentive for the teachers and the staff of education department to deliver a good service.

The primary school teacher

There is no difference of opinion regarding the statement / fact that primary education is in fact the back bone or the foundation stone of the entire education system of a country. The stronger the foundation, the stronger will be the building that rests on it. Similarly, the stronger our primary education and the more developed it is the stronger will be our higher education.

As discussed earlier, the biggest problem with Pakistani Primary education is that of "wastage", and one reason of "wastage" is poor quality of education and no education reform so far have addressed the low quality problem effectively.(Afridi). One reason why education reform has so far being able to bring desired improvement is because that the "Primary School Teacher" who is the nucleus around which this whole system revolves has been neglected. No educational policy, therefore, can achieve its target or desired result unless the teacher is not involved in its formulation and execution.

This is one of the main reason while we are still struggling with our educational system. This is one of the major reason while our educational system is under productive and is not contributing to the society what it should contribute. This issue is another prove that lack of vision not the lack of funds is responsible for the plight of our education system. This is something that the critic of military expenditure of Pakistan who say that the defense spending is the major reason for our troubles of the educational sector should consider.

Higher education in Pakistan “a brief analysis”

Now let's briefly discuss the “University” or “Higher Education” segment of the educational sector.

Prior to 1980's, the funding of universities was a provincial burden. The provincial government had to grant funds to the universities. After 1980, this was changed and now the Federal Government was supposed to provide for funds. This proved underproductive for the universities. Secondly the universities were also not able to fully utilize the already allocated funds (243).

The university demand for funds has remained unmatched by the Federal Government ever since. To address the problem of scarcity of funds the universities have responded by launching self-finance program. The ratio of government funding to universities is now reduced to 50% (243).

Bulk of university budget is spent on Pay & Allowances, then comes the spending on academic activities, then miscellaneous and almost no funds are allocated for research. The figure below shows the development expenditure and that how much of the development expenditure has been spend on education.

Discussion

Education is one of the main drivers of growth and there can't be any two opinions about it. A well-educated society is a peaceful and prosperous society. Education is the decider of the fate of nations and perhaps the answer to the question “why nations fail “lay in this one word.

The provision of education to the populace is the responsibility of the state. although the private sector has jumped in and has a taken affair share in the sector but still education being a basic right of the individual is supposed to be safeguarded by the state and the state has to take all possible measures to ensure that the people can get basic education if they will.

Pakistan has various types of education systems and all these are creating different so t of products and the product of each of this system is treated differently in the market.

The different types of education systems that we have in Pakistan are

Level /A level (Cambridge system)

English Medium (matriculation)

Urdu Medium (matriculation)

Madrasa System

All these systems are quite different from each other in terms of content, method of teaching, environment and market value of the product. It would not be wrong to say that this heterogeneity of education systems is responsible, to some extent for the inequalities that characterize the Pakistani society. It can be debated whether this is the cause of the result of inequalities but none the less it does have a huge economic, social and political impact,

I believe and I find huge research work supporting me when I say that the heterogeneity of the education system, appointment based on political affiliations, nepotism, corruption, and poor planning are the reason for the underproductive education system of Pakistan while the scarcity of funds is not the prime reason for the deteriorating educational sector.

So it is not the defense expenditure that is responsible for the plight of the educational sector rather the inherent problem of the sector itself.

Appendix 2

Sample of the thematic interviews conducted

Structure / Questioner for Respondents

PROLOGUE

Thank you Sir for giving me time to interview you for my research. The topic of my research at PIDE is “addressing misconceptions regarding welfare impact of defense spending: a case study of Pakistan AIRFORCE /Kamra, we provide guidance to the government of Pakistan particularly planning division, Economic Affairs Division and Finance Division. In short, the purpose of my research is misconception on part of Economic Experts, Intellectuals that Defense sector’s spending in our country is burden on the Economy. And Nation is left with little resource allocation for Health, Education, Employment and other public investment. As an Economist, I used to discuss this issue with my father who is Financial Adviser (PAF/JF-17 Thunder) and he thought otherwise. Then the pilot survey of the literature convinced me that his point of view was verifiable with statistical data and then after lengthy discussion with my supervisor, my topic was approved.

This a Defense thesis to support Defense spending in Pakistan. Not only for security reasons, which is sacred and deserves top priority due to the Geo political situation of our country but also for the solid statistical reasons that Defense sector in Pakistan is contributing towards employment generation, health and Education and last but not least towards research and Development in different fields of engineering and physical sciences like physics, thermodynamic, particle physics etc.

Sir, if you give me time, I want to clarify one point in the beginning that Defense spending rather exact Defense spending is a topic that cannot be made public for different strategic reasons and I fully agree and I am not going to explore secrecy or something sensitive like that. I simply want the information and figures which are more or less public in scattered form. because I am a

Pakistani national and all those things which lead to Pakistani security are as dearer to me as they are dear to any Pakistani so after this , allow me to have your expert opinion on some aspects.

(Q-1). Defense Expenditure to GDP ratio of India is 2.4%, Turkey 2.2 %, USA is 3.3%, France 2.2% UK 2.1% where as in Pakistan, and it is 2.6% which is on lower side. It indicates our Defense Expenditure is not burden on our economy in comparative prospective. What are your comments, Should we increase our Defense Expenditure or keep it on the same pattern of GDP Expenditure ratio or reduce it?

(Q-2). In allocation of Defense Budget, normally 20% increase in allowed on previous expenditure increase in FEX Allocation is also given on the same rate in overall budget. This 20% increase caters for Annual increment, inflation and even depreciation of Pakistani rupee vs US Dollar. If we take in to account that three factors that in annual increment of pay, inflation, roughly at the rate of 11% and rupee depreciation vs dollar from 7 to 10% than the overall increase in Defense spending is round about 7%. This again speaks that allocation to Defense Sector by Government of Pakistan is on lesser side. Our Defense Expenditure is still less than what is required. Sir, what are your comments? Shall we reasonably increase Defense Expenditure or is the current expenditure by the Government meeting our requirement or should we decrease it.

(Q-3). JF-17 PMO and your set up in Kamra will be having budget in Pay and Allowances. How much allocation is made in Pay & Allowance? An idea in-terms of percentage may please be given if possible.

(Q-6). How many MS / M.Phil. And PhDs are working in your organizations such as JF17 PMO, Kamra and other wings and branches of the Air Force?

(Q-6a).What are your estimates of Annual Budget of Pay and allowance?

(Q-6b).How much of the pay and allowance goes to Civilian employees of your organization?
Rough idea would suffice

(Q-7). Do you give health facilities to civilian employees indoor / outdoor including dental. This with reference to PAF Islamabad Hospital and Kamra Hospital.

(Q-8). JF-17 Thunder is perhaps the largest project in Public Sector under supervision of Government of Pakistan? Can you give me an idea of the total estimated cost of the project as approved by the Government of Pakistan?

(Q-9). What is impact of this largest project of the public sector on employment of civilian of Pakistan?

(Q-10).How many JF-17 aircraft have been given to Pakistan Air Force by PMO JF-17?

(Q-11).If the same number of F-16 aircraft were to be given to PAF, than the cost comparison for National exchequer? I believe PMO has saved billion of foreign exchange for the country when cost of a JF-17 aircraft is compared with cost of f-16 (aircraft). I do not mean the up-graded, modified F-16 available with countries like Turkey and Jordan. I mean cost of new f-16.

(Q-12).As per the information given in the press etc., PAF is planning 250 Aircraft of JF-17 Thunder as per their requirement. If JF-17 PMO and its allied setup in Kamra succeed in giving 250 aircraft, than what will be its impact mirage and F-16 aircraft available in PAF.

Sir, is JF 17 a good replacement for f 16 and French mirage. if the answer is in the affirmative , then having JF 17 which costs 20 to 25 million US\$ a piece is a far better option compared to the US f16 which costs 80 million US\$ a piece. Sir what are your comments.

(Q-13).This is a joint venture between Pakistan and China and its sales and marketing was jointly planned. What sort of set up is available with JF-17 PMO and its allied set up in Kamra to promote export / sale of JF-17 Thunder?

(Q-13B). What sort of arrangement has been done by CATIC for sales and promotion of JF-17 aircraft to other countries?

(Q-14). So far there have been 13 countries to have shown interest in purchasing JF-17 Thunder. The Geo-political and economic situation of these countries is different and their requirement will be also different, did we devise a specific strategy for each country in consultation with Ministry of Foreign Affairs, Prime Minister Secretariat and President Secretariat. How can we more effectively utilize our diplomatic channels to promote JF-17 Thunder?

Q 14b (a) if we succeed in selling JF-17 to the interested buyers it will have a huge positive impact on the whole nation. Would you agree?

(Q-17). There have been media reports regarding JF-17 Thunder sale and promotion saying “it is not a bad aircraft but there is not a big demand for its export”

If this aircraft is upgraded to a level such as Block-52 F-16 then there can be a reasonable substantial sales prospect. What are your comments as far as the capability of JF-17 is concerned with special reference to Block-52 F-16.

(Q-18). The engine used in JF-17 is Russian made, China has J-10 aircraft which is using Chinese Engine, if in the future, China starts competing with Russia for arms sale and in retaliation, Russia stops or cut all support, then what would be its impact on the adaptation of JF-17 with PAF is this sort of fear being created in target market/potential buyers and is this fear a hurdle in the promotion and sales of JF-17?

(Q-19). What are the main hurdles that JF-17 engine cannot be indigenously produced?

(Q-20). If it is produced indigenously will it lower the burden on National exchequer?

Q21 Does PAC Kamra has any Export potential? Can we export any aviation products? If not what are the main hurdles in it?

Q22) Can PAC Kamra and PAF play any role in boosting private investment in the aviation industry.

(Sir for my research I would also be needing the following statistical & qualitative information. it would be a great help if I could be guided as how to get the following information)

(Q-23).What are your estimates of Annual Budget of Pay and allowance?

(Q-24).How much of the pay and allowance goes to Civilian employees of your organization? Rough idea would suffice?

(Q-25).The civilian employed by your organization have some carrier progression or not? Do their grades differ from BPS? If so then in what effects is it different?

(Q-26).Do you have financial and administrative power to engage professional engineers on certain terms and conditions that you can negotiate with them or you have to follow the formal rules set by the Government of Pakistan?

(Q-27).Are the civilians employed by our organization given better facilities and fringe benefits compared to other civil organizations? Facilities in terms of official accommodation, Medical facilities and education facilities.

(Q-2B). Are the civilians in your organization entitled for House Building Advance, Motor Car Advance, Motor Cycle Advance, Cycle advance etc.?

PAY & ALLOWANCES

Financial Years	Army		Navy		PAF		Kamra		POF		HIT		Total
	U ni	Civ s	Uni	Civ s	Uni	Civ s	Uni	Civs	Uni	Civs	Uni	Civs	
1970-71													
.													
.													
.													
2014-2015													

(Q-27C). Is there any mental or cultural barrier between uniform personnel and civilian employees of your organization?

(Q-28).How many MS and Ph.Ds. are working in your esteemed organization who have research background with special reference to civilian skilled employees such as Engineers, Researchers etc?

(Q-29).How may full-fledged hospitals do you have in your organization?

(Q-30). How many medical Sqns do you have?

(Q-31).

Hospitals (Name & Location)	Total Nos. of Beds	No. of Doctors	No. of spelist	No. of nurses	Average OPD case Dealt per weeks(Un- entitled)	No. of OPD cases dealt per week(Total)	No. of unentitled patient admitted on monthly basis	No. of entitled patient admitted on monthly basis.	State of cleanliness.

Hospitals (Name & Location)	Teaching Hospital	State of equipment	No. of Ambulances	No. of Death cases reported on average (Indoor admission)	Emergency Facility (Entitled – Unentitled)	Exp: per Patient	Pay & Allows of Doctors	Pay & Allows of Para Medic Staff	Doctor Patient Ratio.

Hospital (Name & location)	Budget of Medicines (Amount of stock received from Central Stores)	Amount of medicine purchased locally							

Q 32) What is the condition of Building of Your hospital?

Q33) what is the level of the schools and colleges that you have here in Kamra?

Q34) how many children of the civilian employees are admitted in the schools?

Q35) how many unentitled civilians are admitted in the school?

Co-curricular

Participation	Army	PAF	Navy	Provincial	Federal	Private
National level						
Provincial Level						
Inter Service						
Intra Service						

(Q-36). Is the standard of your Schools/colleges at Par with local private schools and Beachonhouse and City schools?

(Q-37).Is the standard of your Schools higher than Provincial Government schools?

(Q-38). What is Fee Structure Primary Secondary, higher Secondary, Degree?

(Q-39). Educational qualification for teachers Inter Level, Master Level, M. Phill and Ph. D or any special training of the teachers?

(Q-40). Source of funding of schools?

(Q-41). Curriculum up-gradation of curriculum?

(Q-42). ‘A’ Level, ‘O’ Level exists – not exist, if exist then in how many institutions?

(Q-43). State of discipline

Q-44). If civil education system is handed over to Defense can it contribute to the betterment of civil education system?

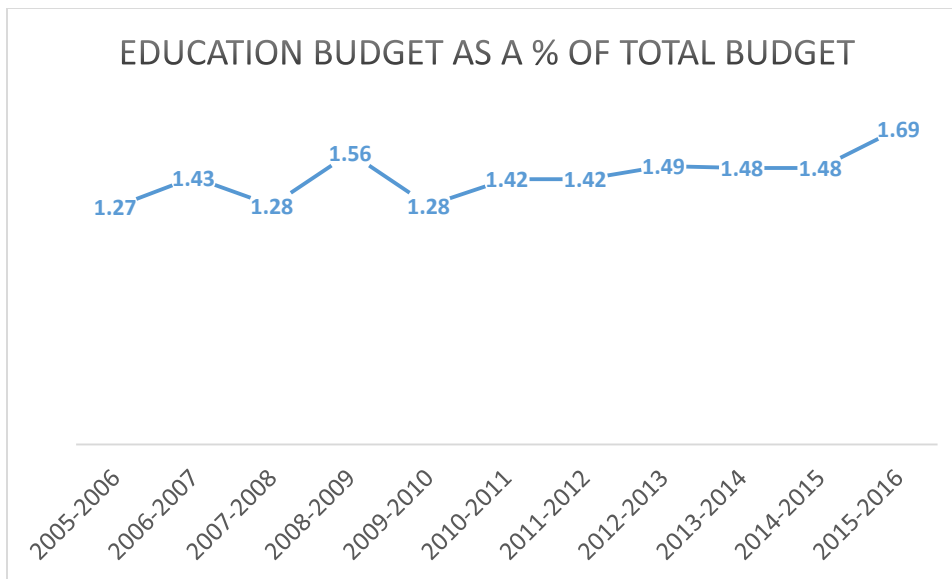
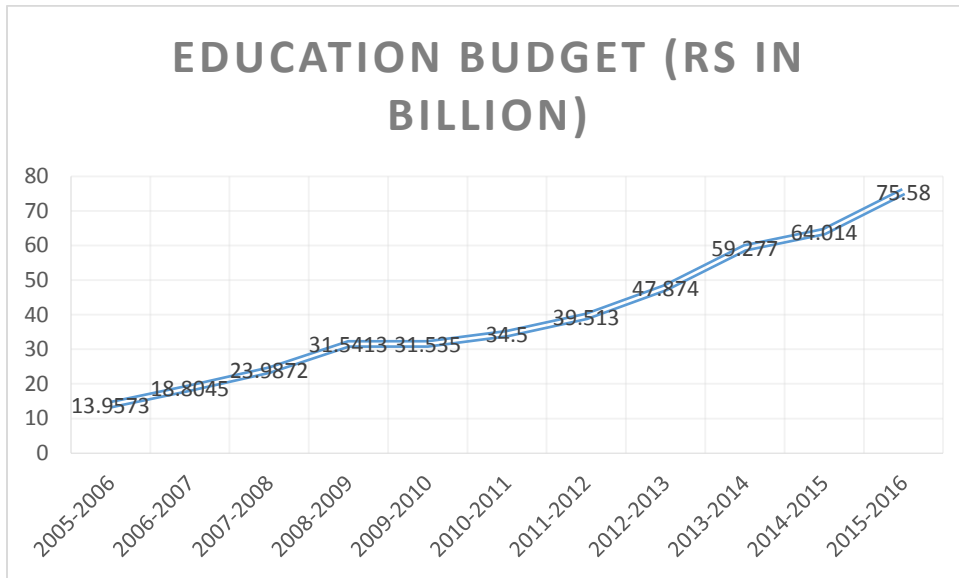
Q 45) affiliations with which board/university?

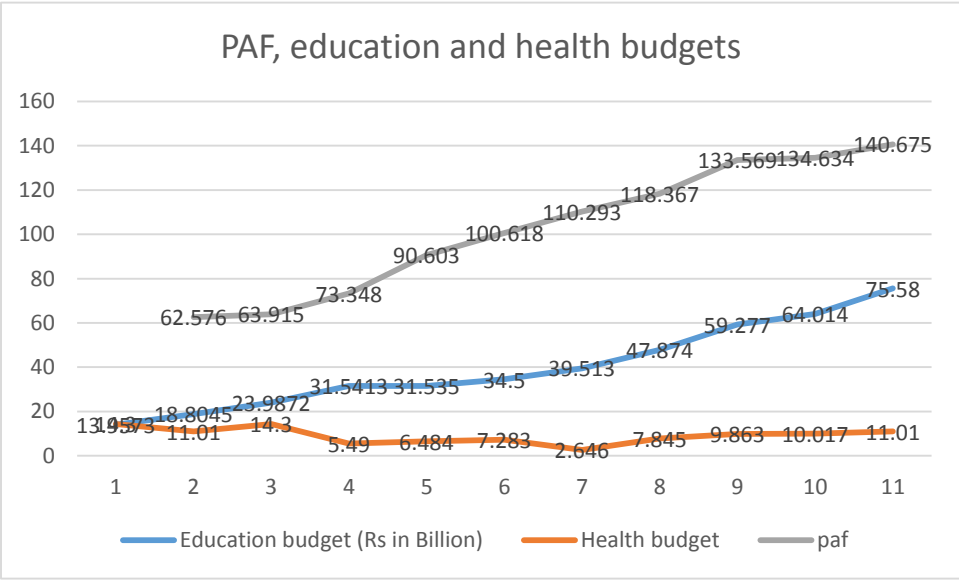
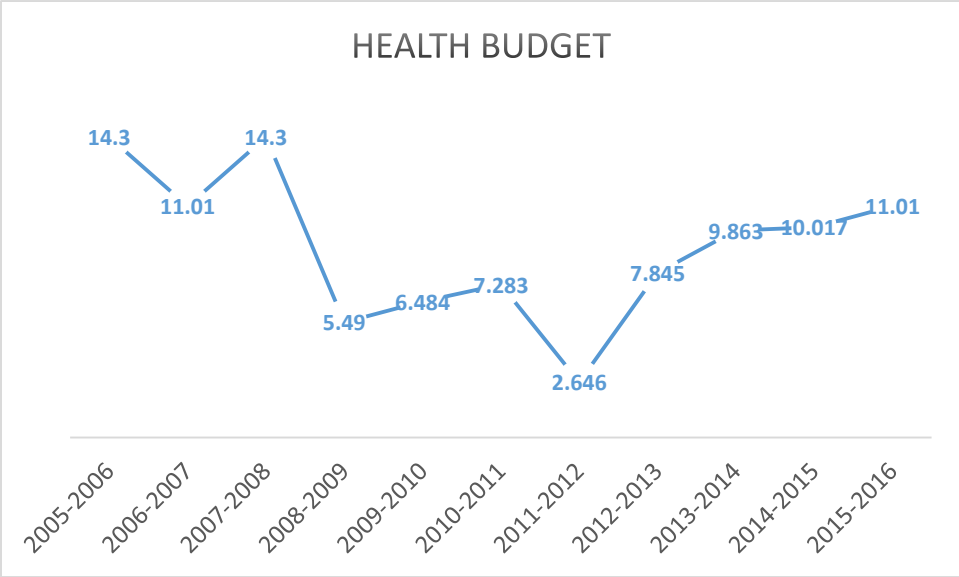
(Q-46). Research publications on part of teachers? Research publication on part of other employees like Engineers, PhD’s uniform or civilians.

Q 47 What sort of training courses do your employees avail within country or outside uniform /civilians?

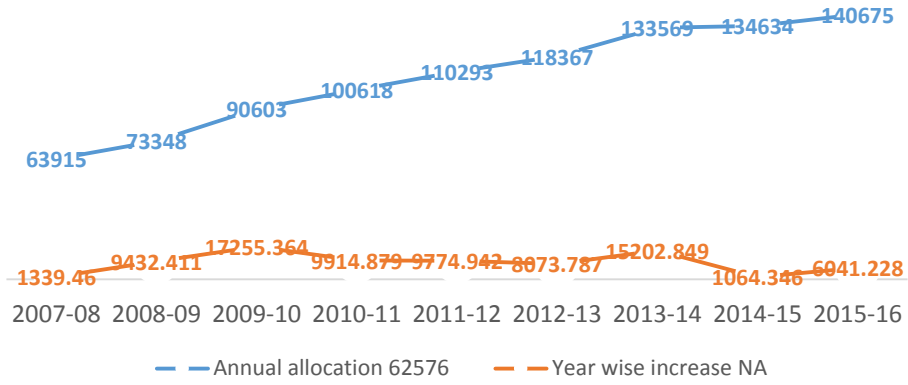
Appendix 3

Figures





ANNUAL PAF ALLOCATION AND YEAR WISE INCREASE



% INCREASE IN PAF BUDGET

