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Developing startup business plan for renewable power for Pakistan market

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DEVELOPING STARTUP BUSINESS PLAN FOR RENEWABLE POWER FOR PAKISTAN'S MARKET

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The power supply situation to homes in Pakistan is in very poor state right now and population in majority of cities and villages is facing a challenging situation. Pakistan is facing an exponential growth in population and power consumption in parallel. Due to the nature of development the carbon footprint Pakistan is massive and currently a study ranked Pakistan seventh badly effected country due to climate change in the world. Electricity shortages, bad for years, have reached crisis proportions. Lights went out for at least 10 hours a day in major cities and up to 22 hours a day in rural areas.

The aim of this study is to verify that the Pakistan is suitable market for solar power production. The objective of this thesis is to develop a business plan for startup firm that will invest in renewable system especially focused on solar power systems to bridge for power deprived market.

This thesis study involves comprehensive study of Pakistan solar market and its potential in technical terms as well as points out the philosophy behind establishing company with lean principles. The theoretical background and research methodology for this thesis is based on knowledge from developing success business planning and counter checking of survey results for the market.

The core of this thesis is formed by conducting resource analysis, comprehensive opportunity analysis by using PEST and Porter five force tools, customer needs and demands via comprehensive survey questionnaire from the potential customers, and market situation analysis based on analysis from online resources and interview with housing building firm.

The analysis conducted during this thesis enables this research to develop a lean business plan that includes internal SWOT analysis, marketing analysis 4P to evaluate the market positioning, operation plan and financial plan. The results from this thesis show that Pakistan has very good potential to be future market for solar power production business.

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1 INTRODUCTION

This research aims at the analysis of solar powered housing industry business opportunity in Pakistani market. It will study the solar powered housing sector in Pakistan and this research will examine the author's resources and opportunity in the market in order to create a viable business plan.

1.1 Background

Pakistan is a federal parliamentary republic. It has four provinces (Khyber Pakhtunkhwa, Baluchistan, Punjab, and Sindh), one capital territory (Islamabad Capital Territory), two autonomous and disputed territories (Azad Jammu & Kashmir and Gilgit-Baltistan) and the Federally Administered Tribal Areas (FATA). It is the sixth most populous country in the world with a rapidly growing population of over 190 million (Worldometers, 2017) (see Figure 1).

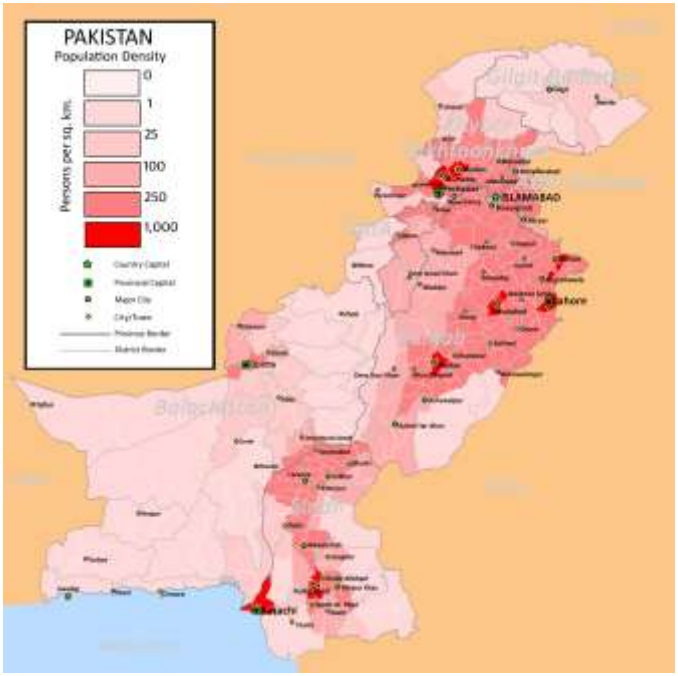


Figure 1: Pakistan population density

Recent economic developments in Pakistan have largely been positive. In 2015, inflation declined to 4.5% and GDP growth was 4.2%, up from 4% in 2014. Growth is expected to continue on an upward trajectory to reach 4.5% in 2016 and 5.2% from 2018 onwards according to Asian Development Bank (ADB) (ADB, 2016). Pakistan

has been classified as one of the key emerging markets in the world by International Monetary Fund (IMF) (Christine, 2016). Despite the positive outlook Pakistan has key factors that are hurdles in economic development. The IMF and ADB have pointed out the following key areas require improvement in-order to achieve economic excellence (Christine, 2016) (ADB, 2016):

- Boosting growth is by improving the business climate by strengthening governance and enabling the private sector to thrive.
- Promoting sustainable and inclusive growth. Increasing transparency and accountability and removing red tape.
- Simplifying procedures to open new businesses enforce contracts, and pay taxes can go a long way in promoting growth.
- Energy sector reform needs to be completed.
- Reducing public enterprise losses can enable a scaling up of growth-enhancing investment in physical and human capital.
- Education is crucial for Pakistan economic development. Education outcomes in Pakistan remain weak. Investing 2.5% of GDP on education will be essential to prepare the workforce with the necessary skills and make Pakistan more competitive on the global market.

1.1.1 Pakistan housing sector and energy crisis

Energy and the production of electricity has become a key hurdle for economic success and prosperity of Pakistan ((ADB, 2016) (Christine, 2016)). Pakistan is currently looking for alternative means of energy. Solar Energy is by far the easiest and highly recommended alternative source of energy in this region. It provides a massive influx of heat to a larger population. However, the countries such as Pakistan, China and India are facing an exponential growth in population as well as power consumption. Due, the nature of development the carbon footprint from these countries is very large. Especially, Pakistan is my home country and is facing a challenging situation regarding electricity shortages. Electricity shortages, bad for years, have reached crisis proportions. Lights went out for at least 10 hours a day in major cities and up to 22 hours a day in rural areas (WALSH & Masood, 2013). Pakistan's energy sector has also undergone a number of structural reforms in the last two decades.

Pakistan Electric Power Company was formed to unbundle the Water and Power Development Authority (WAPDA). In 2007, WAPDA‘s power function was unbundled into 10 public sector distribution companies, 4 generation companies and the National Transmission & Distribution Company (NTDC). For the last decade or so, Pakistan has been facing a severe energy crisis. With installed generation capacity of about 23,600 MW, the country is facing a power shortage of approximately 3,000 MW to 6,000 MW during peak hours (KHAN, 2016) (NEPRA, 1997) (see Figure 2).

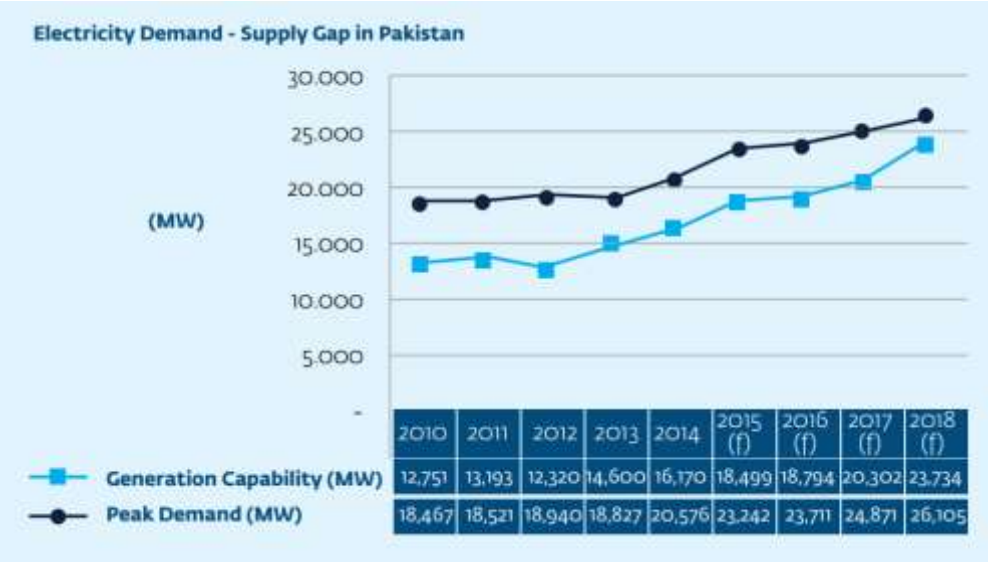


Figure 2 : Pakistan electricity demand - supply gap (NEPRA, 1997)

The power shortfall is due to two factors:

- Firstly, Pakistan has lower capacity and could not generate enough electric power to meet demand due to poor power generating infrastructure.
- Secondly, the Pakistan has very hot and humid summer where temperature index can reach up to 52 degrees Celsius in majority populated region. Hence, a spike in power consumption can be observed during the summer time and short fall can increase drastically.

This means clearly that Pakistan currently needs electric power and quickly. Pakistan is heavily investing in power sector to diversify the power production. However, Pakistan urban regions are termed as most polluted areas on average (WAQ, 2015) (Smith, 2017). Pakistan has emitted maximum of 163060.48 kt Carbon dioxide in 2012 according to World Bank (WB, 2017). Pakistan is now looking for renewable resources to reduce carbon foot print in accordance to the UN Paris agreement on global warming (EU, 2016). Solar power is now key entity within the Pakistan state policy to fulfill the electricity demand.

1.1.2 Solar power potential in Pakistan

The energy crises in Pakistan have become crucial Pakistan has a sole dependence on hydel power generation within renewable energy section. Currently, three major hydel power plants (Terbela, Mangla, and Ghazi Brotha) are generating electricity but their capacity is much lower than the growing needs for electricity in the country and has a varying sessional output. However the solar power sector is whole different story for Pakistan.

Pakistan has a potential to generate over 2.324 million megawatts electricity per annum through solar thermal and photovoltaic systems (PPI, 2012). The solar systems can be used all across Pakistan because the country is located in the Sun Belt. The study carried published by Journal of Renewable and Sustainable Energy in 2012 shows that (Adnan, Khan, Haider, & Mahm, 2012):

- In Pakistan solar radiation intensity remains favorable from March to October throughout the country.
- That solar radiation intensity greater than 200 W/m2 was observed, from February to October in Sindh, from March to October in Baluchistan region, from April to September in NWFP, Northern Areas and Kashmir region while from March to October in the Punjab.
- Southern Punjab, Sindh, and Baluchistan, has the highest potential for solar power generation throughout the year and are favorable for industrial solar power stations.
- In an area of 100 m2, 45 MW to 83 MW power per month may be generated in the above mentioned regions.

A comprehensive resource assessment and mapping project covering biomass, solar and wind is currently ongoing, with a final Solar Atlas expected in early 2017. The project is being implemented by The World Bank in cooperation with the Alternative Energy Development Board (AEDB), with funding from the Energy Sector Management Assistance Program (ESMAP) and the Asia Sustainable and Alternative Energy Program (ASTAE). Solar irradiance levels in parts of Pakistan, particularly in the southwest, are on par with the best in the world with global horizontal irradiance (GHI) values over 1500 kWh/m² in over 90% of the country's land area. The annual

mean value of GHI for whole Pakistan, based on preliminary analysis by The World Bank, is 2071 kWh/m² (The World Bank, 2015).

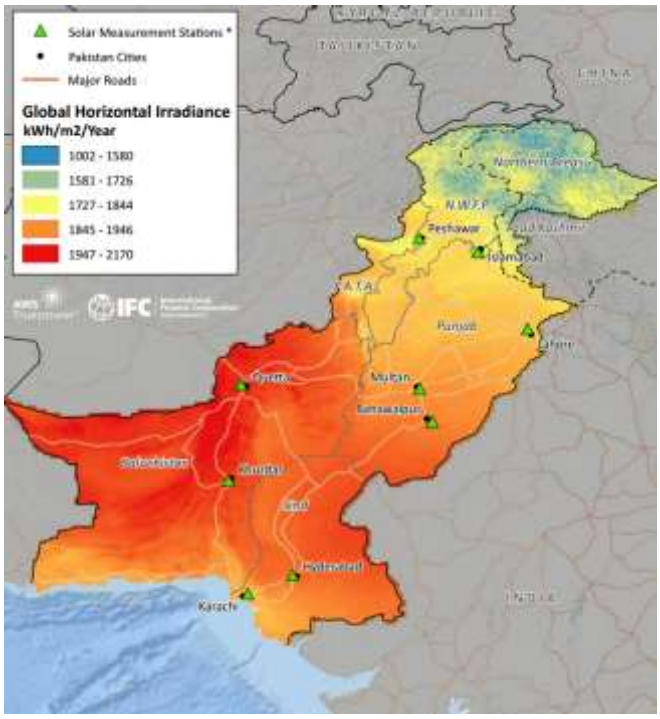


Figure 3: ESMAP solar measurement statistics (The World Bank, 2015)

In summary, High levels of solar radiation are received throughout the year as sun shines for 250-300 days per year and in Pakistan. Average Sunshine is 8-12 hours per but there are a few cloudy days in the wettest regions. Annual solar radiation intensity greater than 200 W/m^2 was observed in almost every part of the country except some of the coastal and northern regions.

1.1.3 Solar power for home and passive house technologies

1.1.3.1 Solar power technologies for home

Solar power systems for houses are not very complex systems. A complete home solar electric system requires various components to produce electricity, convert power into alternating current that can be used by home appliances, store excess electricity and maintain safety. The solar power systems for houses can be divided into two types:

- Grid-tied solar system for homes
- Off-grid solar system for homes

The solar power system shown in Figure 4 is a basic solar system that can be used to power house. The solar power system can be equipped with following components (Pickerel, 2015):

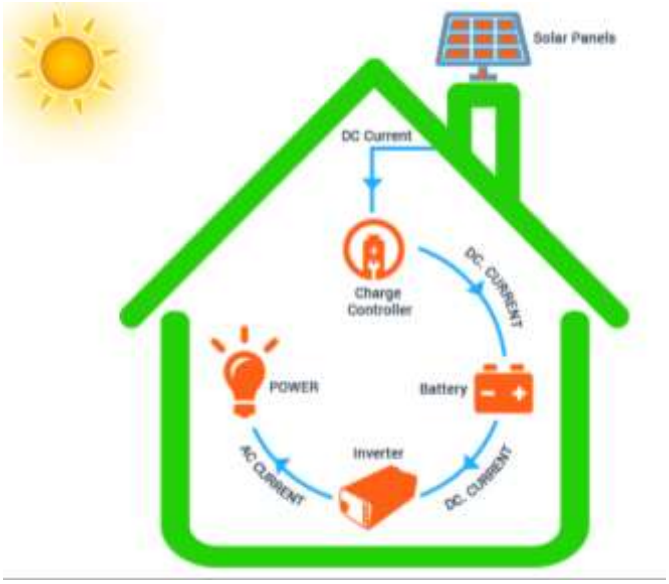


Figure 4: House solar power system schematic diagram (Solarnation, 2015)

- PV (photovoltaic) panels are the most common type of panel, especially for residential installations. Photovoltaic (PV) modules make electricity from sunlight, and are impressively simple, effective, and durable. They sit in the sun and, with no moving parts, can run home appliances, charge solar system batteries, or make energy for the utility grid. The PV panels are mainly of two types:
    - Monocrystalline Silicon Solar PV
    - Polycrystalline Silicon Solar PV
- Inverter: To use the energy from the array, one also needs inverters. An inverter is used to convert the DC PV array power to AC for use with AC household appliances, and all the required disconnects, monitoring, and associated electrical safety gear
- Charge controller: A charge controller to protect the battery bank from overcharge. The controller directly reads the battery level, and once the battery is full, it knows to slow down the rate of solar charge to a stop; keeping is from charging the batteries past 100%. There are two main types of charge controllers:
    - Pulse Width Modulation (PWM) controller
    - Maximum Power Point Tracking (MPPT) controller

- Battery pack: battery pack to store the solar electricity for use during nighttime or cloudy weather. The battery back is directly related to power needed to operate the house.

1.1.3.2 Passive house technologies

Passive House is voluntary standard for energy efficiency in a building, reducing the ecological footprint. The "Passive Haus Institute" (PHI) is an independent research institute lead by Dr Wolfgang Feist based in Darmstadt, Germany (PHI, 2015). PHI has played an especially crucial role in the development Passive House standard. I am based in the Darmstadt, Germany and now is suggesting passive house to reduce the carbon emissions. Passive houses (shown in Figure 5)allow for heating and cooling related energy savings of up to 90% compared with typical building stock and over 75% compared with average new buildings (PassiveHouse, 2016). In search of reducing my energy cost here in Germany, I came across the passive house standard that offers a set of solutions that can reduce the energy bill in very effective manner utilizing solar energy.

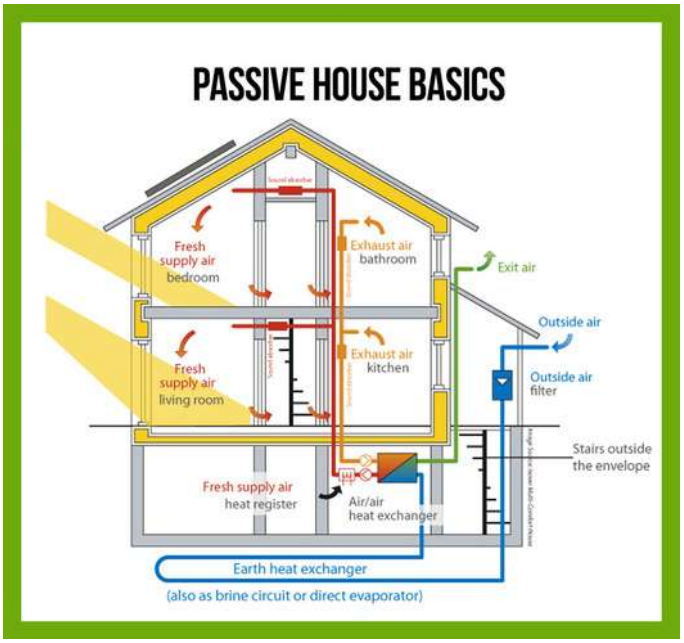


Figure 5: Passive house schematic diagram (PassiveHouse, 2016)

1.1.4 Renewable power adoption revolution across the globe

Across the globe thousands of solar powered homes have been built that includes throughout Europe, with an increasing number worldwide in places ranging from North America to the Far East (SEIA, 2017). The current extensive development of solar power including other form of renewable resources, goal to reduce carbon emissions and rise in demand of power in Asia has brought the solar power to forefront. Currently, Asia is producing 38.1% of global renewable energy that amount up to 811,591 MW in total (IRENA, 2016). However, Europe is leading the way from the front by producing and integrating renewable energy systems for homes and business. As of 2016 Europe is producing 22.6% of world total renewable energy that amounts up to 486,693 MW annually (IRENA, 2016). For example, solar powered energy efficient homes are now a key feature of German power sector as Germany part ways with traditional fossil fuel power generation and switching to renewable resources for power production (Henning & Palzer, 2015). Germany is switching to renewable energy resources to develop maximum energy for the country using renewable resources by 2050 (Henning & Palzer, 2015).

The solar power within the renewable resources is becoming more and more evident since last decade. As of 2016 statistics solar power is 13% (Figure 6) if global renewable energy market compared to 0.4% in 2006 (IRENA, 2016) .

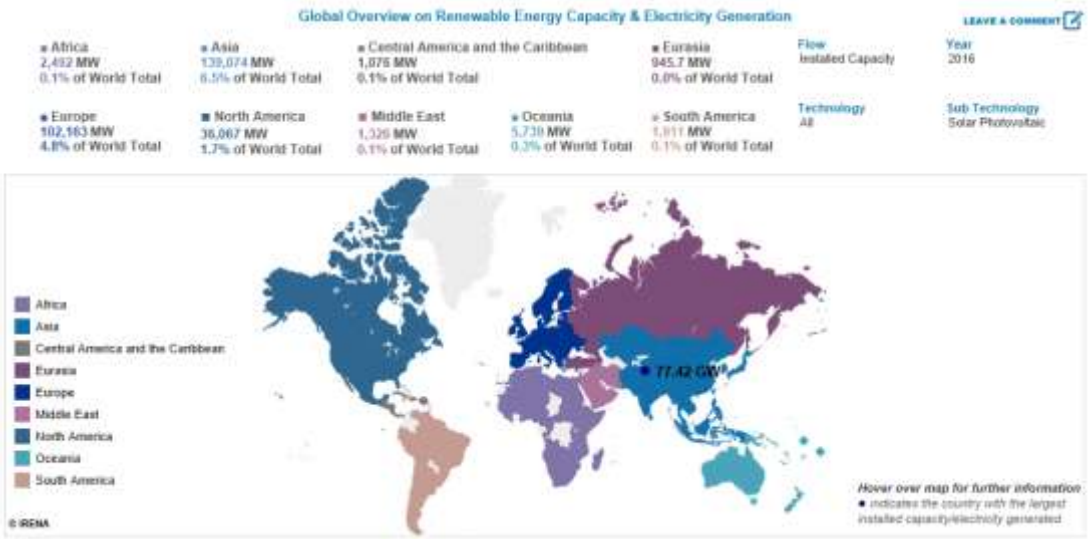


Figure 6: Global solar power Generation (IRENA, 2016).

This trend is clearly showing very growing trend in using solar energy for generating electricity. With reduction in prices, improved solar power production equipment

availability and smart grid integration a solar power adoption revolution is underway. Since 2007 till 2016 specifically Pakistan in going through solar adoption trend at very fast pace. From 2007 to 0 MW Pakistan is producing 410 MW (see Figure 7) of solar power (IRENA, 2016).

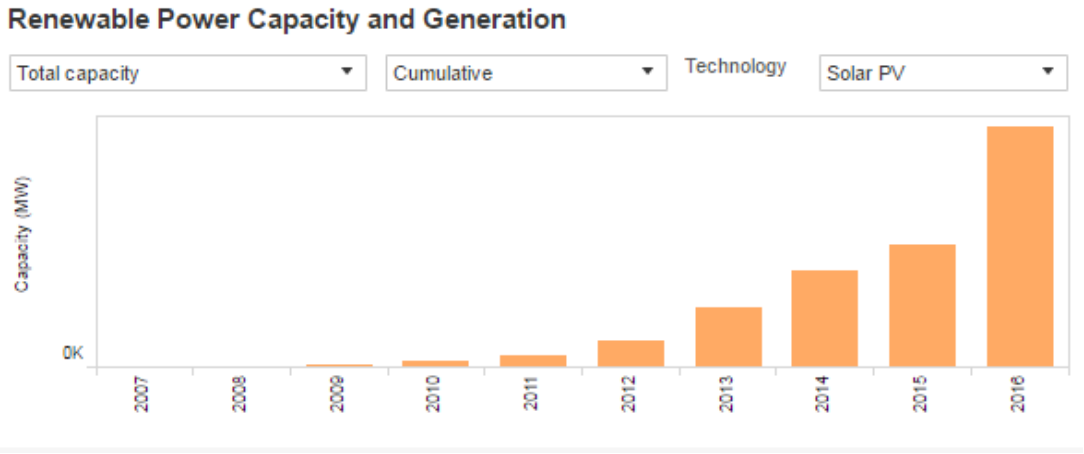


Figure 7: Pakistan solar power generation capacity 2007-2016 (IRENA, 2016).

1.1.5 The evolution of business idea

First Iteration

The initial target was to develop a business plan for passive house product sold to Pakistani market with help of PHI. PHI has shown very low interest in exploring Pakistan housing market. The PHI was not interested due two reasons:

- PHI is primarily a research institute and provides licensing to other companies to provide the equipment that is passive house certified.
- Pakistan is unfamiliar business territory for PHI and their business focus is currently Europe and USA.

Second Iteration

After PHI reluctance to participated I was planning to use this thesis opportunity, to develop a business plan for new venture plan named as "Alive Home", That will provide passive house equipment coupled with renewable resources to address housing market in Pakistan.

However, during introductory seminar following comments were made by the reviewing team:

- Scope of thesis is too large at current state with passive house.

- Pakistani consumer may not be able to accept the technology itself as well cost associated with it.
- Passive house may still need some time in Europe and USA before it can be implemented to new developing countries markets.

Third Iteration (final)

Based on the introductory seminar reviews, now this thesis will be focused solely on the providing solar energy products for domestic use in Pakistan and gradually work on integrating solar powered homes technologies after establishing one aspect of the business. However at current state passive house technologies will not be part of this thesis.

The company will retain its name "Alive Home". The initial plan for the company is to provide solar energy power products for Pakistan domestic market. They key target customers would be private existing and new home owners and house building companies. This proposal currently doesn't include the government sector housing. The public housing can be an attractive customer segment; however, the state housing schemes are normally bureaucratic nightmares. Hence, for a start company it can be challenging financial situation.

During the process of writing this thesis, I have assumed the joint role of researcher and entrepreneur. However, due my current technology study background and being Pakistani citizen, I have drafted a team that is willing to contribute to this new venture effort once the business plan is ready. The team includes business analyst, passive house expert, renewable energy system expert and housing developer.

1.2 Problem statement, Objectives and purpose of this research

The problem statement of this thesis is:

- That in due to current energy crisis in the region is causing extensive energy interruption to domestic consumer and there is enormous market for investing in renewable off the grid power generating solutions.
- That the housing structures in Pakistan are not energy efficient and the housing owners along with developers are unaware of modern renewable power

technologies. The solar powered home solutions can offer lucrative business prospect in growing housing market in Pakistan.

- That to develop business plan for new venture that provides products and services in the Pakistan housing market that integrate solar powered homes.

The purpose of thesis study is:

- To provide people with renewable power production resources that can reduce carbon emission foot print.
- To show how it's possible to utilize and integrate the state of the art renewable power production technology used in Europe into the Pakistan.
- To explore new emerging markets for business opportunities.
- To provide solutions on how to integrate solar power technologies with in existing housing sector to address the issue of power outage in Pakistan housing sector.

The objectives of this study:

- To develop new venture business plan based house powered with solar panel technologies.
- To investigate and understand the investment feasibility within Pakistani solar power market.
- To understand the Pakistan solar energy market and people readiness to accept innovative solutions.
- To provide solutions, how to deliver reliable solar power energy products to customer that can be used for off gird and grid-tied solar systems for homes.

Nature and target of the new venture business

The solar power systems for house entrepreneurial venture into the Pakistan housing market can be divided into multiple categories:

- New solar power producing kits for new home owners
- New services to house building market and existing home owners
- New solar power systems kits for state funded solar power projects for rural areas
- Collaboration with house building firms to integrate solar power products with housing building packages.
- Training and events for house building professionals

1.3 Literature review and theoretical background

1.3.1 Definitions

Entrepreneurship

Entrepreneurship is very new academic field in business management and no single definition exist however according (Donald & Kuratko, 2007) it is "*the capacity and willingness to develop, organize and manage a business venture along with any of its risks in order to make a profit*". The most obvious example of entrepreneurship is the starting of new businesses. However, according to Ohyama (Ohyama, Braguinsky, & Klepper, 2009) argues that entrepreneur causes "*creative destruction*" and argues "*Entrepreneur is a person who destroys exiting economic order by introducing new products and services, by introducing new methods of production, by creating new forms of organization, or by exploiting new raw materials*". However, (Bygrave & Zacharakis, 2011) argues that "*creative destruction*" is not the only way to entrepreneurship but more often an opportunity focused researchers define entrepreneurship.

Strategic management

Strategic management is the comprehensive collection of "*ongoing activities and processes*" that organizations use to systematically coordinate and align resources and actions with mission, vision and strategy throughout an organization (David & David, 2016). According to modern experts such as Ambrosini et. Al. (Ambrosini, Jenkins, & Mowbray, 2015) the modern strategic management had developed into two main streams: "*problem- oriented which concentrates on competitive advantage" discovery and feasibility*"; and "*process-oriented where central part of the focus is strategy formulation and strategic decision-making*". Hence, in a competitive market the companies must discover and explore competitive edge to stay feasible in competitive environment (Economou & Chatzikonstantinou, 2009). Since, a company competitive edge can potentially materialize when company capitalize and utilize a rare organization resource effectively (Jurevicius, 2013). However, startups normally have limited resources unlike larger enterprises. But they have the flexibility, speed for change, and niche, and therefore can utilize opportunities faster and more effective than larger companies (Alton, 2015).

What is Strategic Entrepreneurship?

According to experts (Ireland, Hitt, & Sirmon, 2003) "*Strategic entrepreneurship (SE) involves simultaneous opportunity-seeking and advantage-seeking behaviors and results in superior firm performance*". Here based on the fore-mentioned discussion, we can state that "the *entrepreneurship* and *strategic management* academic fields both seek opportunity identification and exploitation and through that a creation of competitive advantage and value". Literature review of the strategic management and entrepreneurship has common ground i.e. innovation, networks, growth, resource optimization and opportunity seeking are same in startups and large enterprises (Ireland, Hitt, & Sirmon, 2003).

The next question is how startups can use the knowledge of strategic entrepreneurship to succeed in competitive market and what is the difference between startup strategy and larger enterprise approach?

According to the EU (European Union) Eurostat (eurostat, 2016):

- "the one-year survival rate for enterprises created in 2013 was about 80 % the five-year survival rate of enterprises born in 2009 and still active in 2014 was nearly 44 %"
- The proportion of newly-born enterprises in 2014 compared to 2013 increased by 1.8 %. Birth and death rates of enterprises tend to be around 9 % of the total number, however in 2013, there were more enterprise births than deaths, both at EU level and in the majority of Member States.

This points out that more 56% of startups fails within 5 years into the market and the death of startups is key issue in EU and across the globe. Due to the startups deaths the entrepreneurs, therefore are constantly in search for techniques to increase the feasibility of the new enterprise. The relationship between business planning and performance is a major subject of interest in the entrepreneurship research. This addresses the key issue of whether the entrepreneur must conduct a precise planning regime or conduct business since the opportunity will not last very long. The experts of the field are divided into two schools i.e. "planning school" and "learning school".

- Planning School: The planning school of thought term that systematic planning and prediction-oriented strategies will improve human actions to

achieve clearly defined goals of a startup and propel the company to success in a competitive market (Hussey, 1998) (Sadler, 2003). The planning experts states that, the planning consists of "definition of clear strategic goals, generation of alternatives to reach these goals, evaluation and decision among alternatives as well as implementation control" (Brinkmann, Grichnik, & Kapsa, 2010).

- Learning School: the learning school of thought teaches that formal plans and strategies cannot always be a guaranty of success, if the startup follow predefined pattern because of the dynamic and uncertain environments (Mintzberg, 1994). Mintzberg, argues that following formal plans and strategies are causing narrowing the company vision and that in turn can reduce the company ability to exploit rising and unnoticed opportunities in the volatile atmosphere. The failures in business are inevitable but always provide an opportunity to learn. Rather than concentrating on a goals-resources fit strategy, the organization can benefit from creating a strategy with stretch goals, as well as leveraging the controlled resources and acquiring more resources (Hamer & Prahalad, 1994).

Since there are two schools of thoughts and none of them fully rejects ideas of opposing fraction in totality and there are studies (Falshaw, Llaister, & Tatoglu, 2006) (Greenley, 1994) suggesting that strategic planning is linked with business performance. However, at the same time other research (Boyd, 1991) (Bachmanna, EngelenaAndreas, & Schwens, 2016) (Gruber, 2007) (Shane & Delmar, 2004) suggest conventional strategic planning practices has to evolve and must be more rigorous in measuring formal "planning, control for industry effects and separately analyses the different business performance" to stay objective and fruitful in competitive environment.

Modern entrepreneurship theory

Based on the modern entrepreneurship studies we can conclude that entrepreneurship is "opportunity driven" phenomena. Entrepreneurship consists of planning and learning essential periodical entities. However, attainment of competitive advantage and value creation via planning and learning may be different within startups and

major enterprises. In established organization than new startups the correlation planning-performance is stronger. However, product/process innovation (Teece, 2010) (Utterback, 1996) (Ketchen, Ireland, & Snow, 2007) (Moenaert, Souder, Meyer, & Deschoolmeester, 1994) and lean startup approach (Blank, 2013) during planning stage can be key factor for business success and boast to performance. The Lean principles and practices originate from the Toyota Production JIT System that enables a company to utilize the use of resources (technology, capital, labor, etc.) in the most effective and efficient manner while maintaining zero waste. Today the Lean principles are widely used in every field across the globe not only in manufacturing – but also in management, software development, architecture, supply chain management, entrepreneurship, etc.

1.3.2 The adopted entrepreneurial philosophy for this thesis

The new venture business plan for the Pakistan solar energies market is based on principles of "Strategic Entrepreneurship" based on opportunity focused entrepreneurship approach by using "collaborative innovation" (Ketchen, Ireland, & Snow, 2007) and "Lean Start-up" approach (Blank, 2013). This thesis research will be based on the aforementioned entrepreneurship theories due the reason:

- These approaches are based on opportunity seeking activities.
- These approaches are targeted towards small new ventures.
- These also don't require substantial capital investment.
- Both approaches offer innovative techniques to address the entrepreneurship challenges.

1.4 Research methodology

The research data and knowledge in this thesis will be collected using three main sources:

– Survey or direct interview with CEO from house building company/ies. The target information required regarding integration of renewable powered house

technologies in Pakistan housing sector. This information source will focus on the house powered by renewable energies trends in Pakistan sector.

- Online Survey:
    - Online survey questioner targeted toward current private home owners in Pakistan. The survey aims to collect the knowledge regarding current home owner in Pakistan views about house power supply system and energy optimization diversification of existing homes.
    - Online survey questioner targeted toward the potential future prospective first home buyers/owners in Pakistan. The survey aims to collect the knowledge regarding current prospective first home buyers/owners in Pakistan views about need for installing renewable house power supply system and energy optimization.
- Literature review concerning the use of renewable resource adaptation in Pakistan housing sector. Due the nature of this industry reliable online information regarding Pakistan housing sector is available. However caution will be taken to validate and verify the sources of information. Every internet source in this thesis will be from reliable website and with adequate referencing for future evaluation.

The interviews and online survey will use both "Quantitative and Qualitative" questions to collect the data. In developing this business plan, this research will use combination of quantitative and qualitative data that can improve our evaluation by ensuring the limitation of one data are balanced by the strength of another (Greene, Caracelli, & Graham, 1989) (Carvalho & White, 2002).

However, this research focuses on utilizing the knowledge provided by USAID on how to conduct "Mixed-Method Evaluations" (USAID, 2013), for the research interviews and online survey in this thesis. The main aim to use "Mixed-Method Evaluations" is due the fact (Caracelli & Greene, 1997):

- **Enriching:** using qualitative work to identify issues or obtain information on variables not obtained by quantitative surveys.
- **Examining:** generating hypotheses from qualitative work to be tested through the quantitative approach.

- **Explaining:** using qualitative data to understand unanticipated results from quantitative data.
- **Triangulation (Confirming/reinforcing; Rejecting)**: verifying or rejecting results from quantitative data using qualitative data (or vice versa)

This research will use parallel data analysis technique (Figure 8) for the data collection and analyzing during this research work. In this method, two or more data sets will be collected from the three sources and analyzed separately and the findings will be combined and integrated and will be reported in the business plan section (USAID, 2013). The data for this thesis will be integrated from different fore mentioned resources.

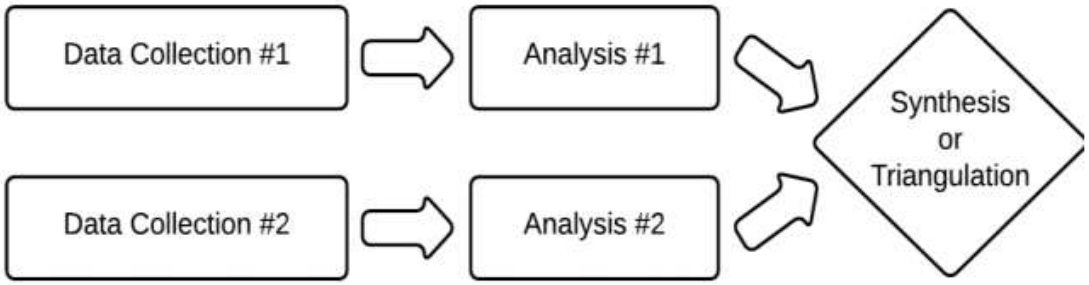


Figure 8: Parallel combination technique for analyzing mixed method data.

The products and services that will be provided and offered during this thesis are real and available in the current market for installation based on passive house technologies along with renewable energy sector. However, due the ever evolving economic policy situation (taxation system) in Pakistan for investors the product hypothesis can be tested as the business is established.

1.5 Thesis theoretical framework

The theoretical framework (Figure 9) of this research work is focused to find and utilize the key factors and elements that can contribute to the development of effective business plan. Thousands of businesses plans are written every year, however to develop an effective business plan it is key to understand the key internal and external factors that can affect a business plan and clear analysis is conducted beforehand.

Figure 9. Theoretical framework: Key factors for developing effective business plan

After studying various state of the business plans, literature on how to develop business plans and successful business venture statement the business plan has to fulfill following entities:

- Executive summary
- Mission statement
- Company background
- Product description
- Marketing plan
- Competitor analysis.
- SWOT analysis
- Operations
- Financial planning
- Timeline

This research work will discuss and cover the fore mentioned factors in detailed using structure of this thesis.

1.6 Thesis outline

This thesis is divided into four chapters. The content of each chapter is summarized below:

Chapter1: Chapter 1 provides a brief overview of the research objectives, contributions and goals. It elaborates on the research context, the power crisis in Pakistan, the need for power supply to plug the power shortfall, the solar power for home and passive house technologies global prospective, the literature review and the research methodology along with theoretical background used to achieve the target goals.

Chapter 2: This chapter examines key factors associated with developing an effective business plan this chapter is divided into five main sections. The first section of chapter conduct detailed resource analysis to understand the market dynamics and resource availability. The second includes market opportunity analysis by analyzing the market using PEST and Porter five forces. The two studies provide a comprehensive opportunity analysis and provide a holistic picture regarding the market driving forces. The third focuses on customer needed, requirements, readiness, and timelines to install solar power units by conducting a detailed customer market survey.
The fourth section of thesis analyses Pakistan housing market along with key competitive renewable resources that can challenge solar power production. The final section of this thesis develop business plan using canvas business model to outline the business parameters. This section also provide a detail description of revenue channels for the "Alive Home" and growth and value proposition strategy in context to Pakistan and global market status.

Chapter3: This chapter presents the business plan factor for “Alive home” project in detail. The chapter is divided into four main sections. The first section presents the SWOT analysis. The SWOT analysis will be used to identify the internal and external factors that will affect the company’s future performance. SWOT analysis is critical for competitive positioning, discovering opportunities, improving operations and utilization of resources effectively. The second section of this chapter focuses on 4P marketing mix for “Alive home” to align the important factors of marketing to have a cohesive marketing plan in a competitive market. The third section discusses the course of action and operation plan for “Alive home” project. It provides a detailed overview of startup phase and future operation plan to lead manage the entry to the market and diversify the business portfolio in future. The final section of the chapter provides a detailed overview of “Alive home “financial plan. In this section the thesis discuss the “Initial capital investment” and “Projected income and cash flow statement”.

Chapter4: This chapter presents the conclusions

2 OVERVIEW, ANALYSIS OF THE TARGET MARKET

2.1 Resource analysis

2.1.1 Financial resources procurement

Apart from the investment from partners and founder, which is rather limited in case of “Alive Homes”, it has been much quicker and to obtain financial backing from both governmental and general public in this era. In Pakistan, government support for SME business has been a key driver. SMEDA (Small and Medium Enterprises Development Authority) since 1998 has been working on developing Small & Medium Enterprises (SMEs) in Pakistan (SMEDA, Small and Medium Enterprises Development Authority - SMEDA, 1998). SMEDA Premier Institution of the Government of Pakistan under Ministry of Industries & Production and will be the key funding agency.

2.1.1.1 Governmental financial support

SMEDA is public organization that provides services to SME’s under the supervision of Ministry of Industries & Production in Pakistan. SMEDA has very extensive and detailed services to support SME’s. SMEDA has offers financial assistance to young business men under programed named as “Prime Minister's Youth Business Loan” (SMEDA, Prime Minister's Youth Business Loan - Introduction, 2013). The loan is program has special features:

- The person can loan from 10,000 PKR.- 7 million PKR.
- It is specially designed for young entrepreneurs between the age group of 21 - 45 years.
- The program provides subsidized financing at 8.0% mark-up per annum for one hundred thousand (100,000) beneficiaries, through designated financial institutions, initially through National Bank of Pakistan (NBP) and First Women Bank Ltd. (FWBL).

- Small business loan with tenure up to 8 years, with first year grace period.
- The guarantor can be any person including blood relatives / family member having net worth of 1.5 times the loan.

Apart from the loan the SMEDA also provide following services to SME's:

- Facilitate in the starting up a SME in term of financial services.
- Assistance in tax calculation and exemption on duties
- Exemption from corporate tax for 8 years
- IT Services for e-Enabling SMEs
- Legal and contracting services
- Training services

Requirements for securing SMEDA loan for SME:

- Business Idea
- Business Plan
    - Product design
    - Marketing and distribution plan
    - Financial risk assessment

SMEDA project "Cluster development" (SMEDA, SME Cluster Development, 2006) is also providing funding for enterprises which produce and sell a range of related or complementary products. Cluster development is basically supporting and strengthening the clusters of industries. The SMEDA "Light Engineering" cluster initiative in Faisalabad, Pakistan is very focused on power industry and hence can provide a loan for "Alive home" business initiative. The SMEDA loan for cluster must be carried out in conjunction with another partner firm to secure a loan. The loan can range from 5 million to 500 million PKR for cluster partners. The requirements and services are identical as mentioned before in SMEDA youth loan program.

The SMEDA loan initiatives are suitable for the "Alive home" project and according to the requirements the project is eligible for both programs once registered as a company.

2.1.1.2 Banking sector loan

According to the state bank of Pakistan (SBP, 2008) all commercial banking sector banks are offering comprehensive packages for financing business with features:

- very quick business assessment business plan (9 days)
- with amount Min: 0.5 Million-Max: 75 Million PKR
- duration of 3 year minimum-7 years (Renewable) maximum
- Collateral Based
- Variable interest rates based on business plan min (5, 75%)

However, Pakistan banks are also offering interest free loan to business based on profit and loss sharing according to Shariah-compliant borrowing (Alfalah, 2017). The financing of business via Islamic banking is growing now at a faster pace however, SME loans remain only small fraction of their portfolio-mix (Aazim, 2016). However, for the young business such as "Alive home" a loan based on Islamic banking rules is very favorable compared to interest based banking loan.

2.1.2 Internal development capabilities

The key reasons to start the solar powered house business in Pakistan are due to:

- Market that has high need for solar power systems
- Availability of human resources with right skills
- Effective supply chain linkup

2.1.2.1 Management and development team (Human Resources)

<u>Internal human resources</u>

Our current team consists of family members at this stage

Management / Business development Germany (CEO)

- Author of business plan
- Mechanical Engineer (doctoral degree) with business studies
- Studying MBA in Finland at SAMK

- 10 years of hi-tech engineering experience in Europe
- Responsible for tackling new technologies
- Technological / product supply link form Germany

Finance management / Business development Pakistan (partner)

- MBA from IMS University of Peshawar
- Business finance management
- Logistic management for products
- 5 years of managing property business and finance issues

Technical development (Partner)

- Doctoral degree in Electrical engineering
- 10 years of experience in electrical systems
- Firm product and services in-charge
- Ability to quickly adapt into new tool and technologies
- Service and maintenance of the product on offer
- Technological / product supply link form China

External human resource availability

Apart from core team members, many services are needed to establish this business and sell products such as product installation, product delivery services, product testing services and financing of product etc. These services for the project will be acquired by outsourcing and collaboration. The external human resource links and connections are established by the author during engineering industry experience. On the other hand business side services are gathered from associates in study program as well. Examples of outsourcing are accounting, product logistics and marketing.

Since the "Alive home" company is going to be based in Pakistan, an accounting firm in Pakistan is required. Zahid Jamil & Company (Figure 10) is a Pakistan-based accounting firm that provides valuable services in establishing a company in Pakistan. Similarity, the "Alive home" products logistics across Pakistan and in-between Germany and Pakistan will require logistic services outsourced. Agility (Figure 11) is a Pakistani end-to-end supply chain provider in Pakistan. They have a strong presence with offices strategically located in all airports and ports, supported by reliable connections with major carriers from Europe. Agility logistics can provide reliable services for "Alive home" products.

Figure 10: Zahid Jami & Co. Charterer Accountants

Figure 11: Agility logistic firm Pakistan

Pakistan is also very competitive market and to market the product in the region, the company needs and experience marketing firm that understand the market. The marketing company will be a Pakistani firm. Adcom (Figure 12) is one of the famous firms working since 1965 and has 47 years of experience in the Pakistani market and is one of a key competitor to carry out advertisement campaign for “Alive home”. The company if selected will be responsible for company product description, press releases to announce the product publically, advertisement campaign in media and online. "Alive home" will provide products based on customer needs and most of the products will be imported from China and Germany. The questions remain why China and Germany will be the key destination to get the solar power equipment?

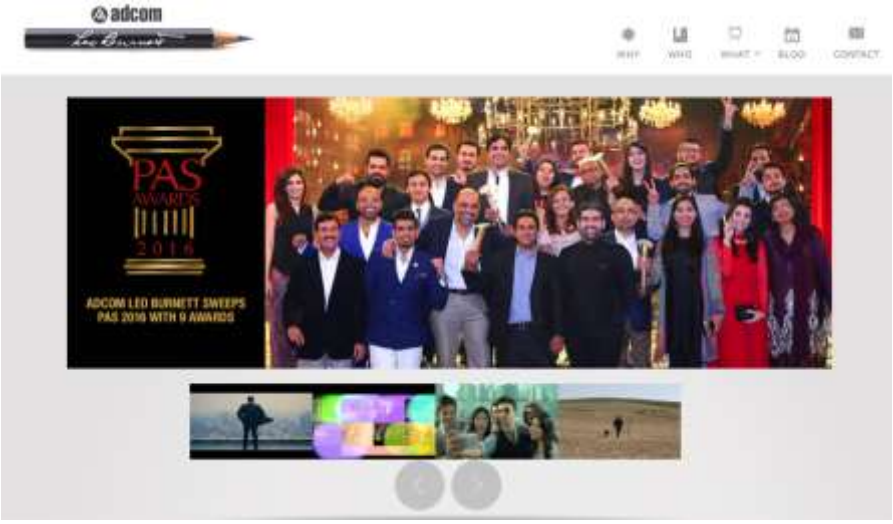


Figure 12: Adcom marketing firm

2.1.3 Product supplier analysis

Why Germany?

- Germany is leading the world in renewable energy conversion. The German solar power utilization started in 1980 and in 2000 it materialized faster due to government effort and technological advances. We can see in Figure 13 (Ball, 2017)that the Germany is increasing its power production from renewable and solar power system.

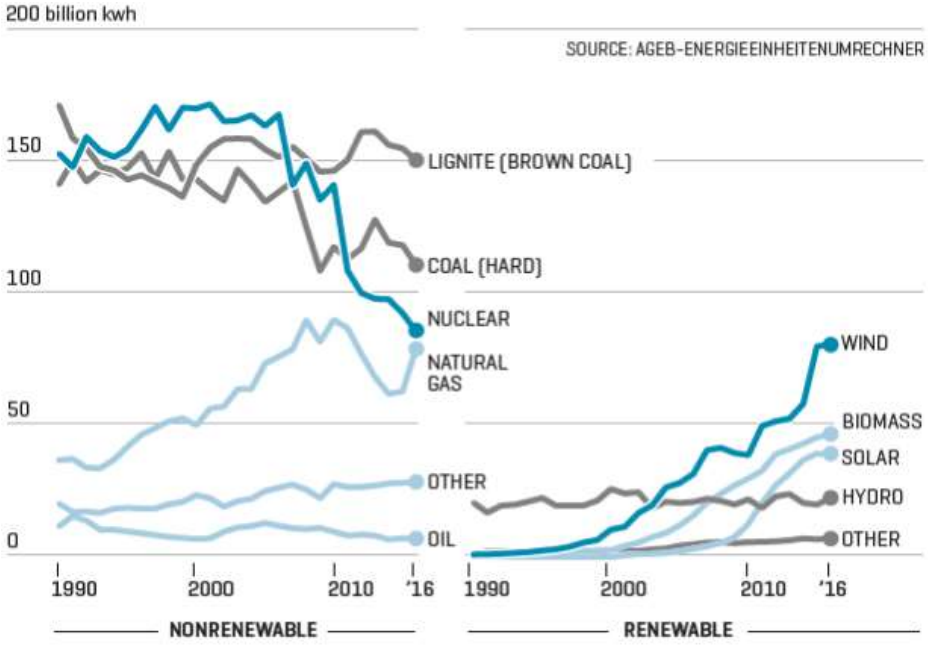
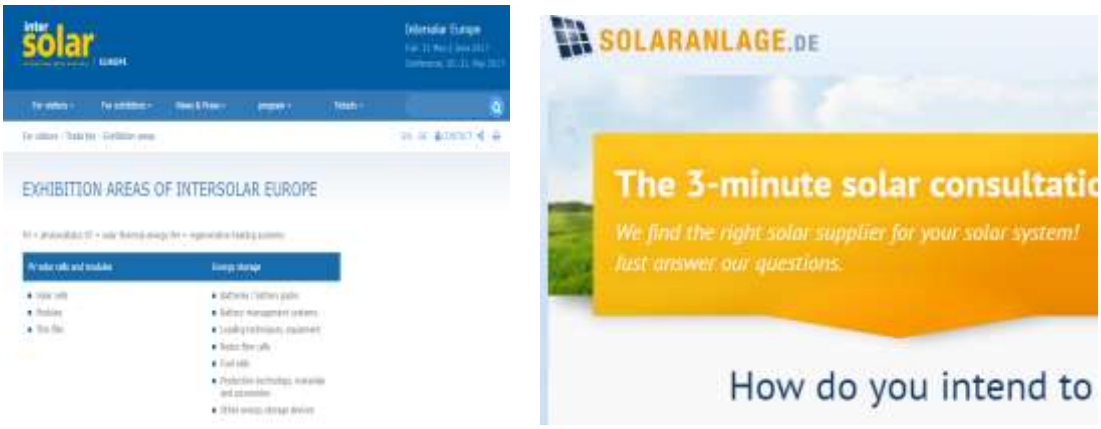


Figure 13: German power production spectrum (Ball, 2017)

- To observe and understand the solar power systems integration / evolution with national grid and off-grid system utilization / installation of optimized technologies, Germany is the precise place to develop business ties.
- Within Germany, solar power systems providers can find the state of art testing companies and firms that can provide the best products that can be used to produce solar power.
- In Germany, we can find the biggest collection of solar power systems manufacturers and suppliers that will be the key to securing reliable equipment and forge long-term business partnerships.
- Smart Grid is the future for modern home and industrial use. Germany is one of place that is performing state of the art research in the field to optimize the power utilization and distribution. The link to German market will be critical in the business evaluation and expansion ambitions.

“Alive home" has also close links with "http://www.solaranlage.de" a solar systems sales portal for consumers and business. The key aim is to establish close ties with solar companies to acquire solar production. In May 2017 "Alive home" will participate in "Intersolar -Europe" exhibition in Munich to establish close business partnership and contacts.



(a) (b)

Figure 14: (a) Intersolar-Europe exhibition in Munich to create business partnerships. (b) Solaranlage.de portal for solar Panel sales.

The author of this proposal is well placed in Germany and has knowledge regarding German business environment.

Why China?

China has made strategic choices favoring renewables over fossil fuels as it faces very key issues regarding: environmental benefits, sustainable development, overwhelming economic and energy security. China is becoming a major promoter of international infrastructure development, across the world through the One Belt-One Road strategy – and this too carries strong implications for other countries' energy choices (Mathews, 2016).

- China is advancing very fast in the renewable energy section and as of 2015 has invested 110 billion USD in renewable power production. Compared to EU, China has increased (Figure 15) its investment in the renewable energy section (Mathews, 2016).

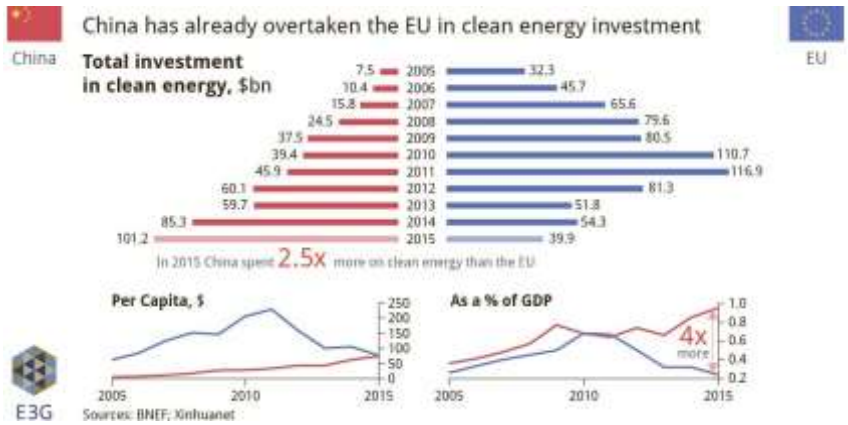


Figure 15: Clean energy investment, China vs EU, 2005 – 2015 (Mathews, 2016).

- According to reports, China is the leading manufacturer in the world currently in producing PV panels for solar power (Mints, 2016).
- Favorable trade links between China and Pakistan provides shortest lead time. The Chinese manufacturers provide shortest lead time, lower transportation and logistics costs, and customization capabilities at a lower price.
- The China-Pakistan Economic Corridor (CPEC) project also enables Pakistani companies to forge long-term relationship with Chinese companies with tax rebate and investment opportunities from Chinese investors.
- During 2015 market trends shows that the best panels are also manufactured by Chinese companies (energysage, 2016).

2015 RANK	COMPANY	CHANGE FROM 2014*	ENERGYSAGE QUALITY RANKING	HEADQUARTERS
1	Trina Solar	–	Standard	China
2	JA Solar	↑3	Standard	China
3	Hanwha Q Cells	↑6	Standard	South Korea
4	Canadian Solar	↓1	N/A	Canada
5	First Solar	↑3	Standard	USA
6	Jinko Solar	-↑	Standard	China
7	Yingli Solar	-↑	Standard	China
8	Motech Solar	-↑	N/A	Taiwan
9	NeoSolar	-↑	Standard	Taiwan
10	SunPower	–	Premium	USA

Figure 16: Best Solar Panel Manufacturers 2015 – Global ranking by volume, US market share & Energy quality ranking (energysage, 2016)

- China is the best market to acquire competitive price for solar panels and find lowest prices.
- The technical director of "Alive home" has spent 4 years studying and working in China as Electrical engineer and has links to Chinese manufacturers and logistic networks to organize orders delivery.
- Chinese solar panels and system producers are also obtaining TÜV and ISO standard certification in-order to compete in global markets.

2.1.4 Resource analysis summary

This section included the resource analysis for “Alive home” startup. This section focused on three main resources of finance, human capital and product suppliers. Based on the analysis with abundant financial support from the public sector, experienced / well-placed team, industrial connection and a network of the suppliers ;

"Alive home" should have enough resources, in term of both financial and human capital, to start and expand solar powered system for homes in Pakistan.

2.2 Opportunity Analysis

2.2.1 Market feasibility PEST analysis

2.2.1.1 Political

- Politics always has the potential to have dramatic effect on the future of renewable energy presenting with opportunities alongside many risks to existing and future renewable resources. Pakistan government has complete control on forging suitable policies however it is critical to take into world agreements into account regarding global warming and waste management. The policies are also dictated by funding agencies / countries and investor at times.
- One key issue in current politics is security due to the geographical conflicts with India and ongoing war in Afghanistan. The renewable resources such as hydropower plants are a key flash point with India as water coming to Pakistan originates from India and the countries are often arguing about resource handling. However solar power infrastructure is well perceived in the country and political support exists to implement solar power is one of key power generating sources. Similarly, due to terrorist activities, various power plants and electric infrastructure has been targeted and requires extensive security arrangements. Investor sometime is reluctant to venture into power plant project in Pakistan. However on individual home level solar power off-grid products are legal and allowed, but the integration of house solar power with national grid has not been achieved yet.
- The government approved renewable energy technologies act in 2006 by introducing its first renewable energy policy (Siddiqui, 2006). However, due to continuous political government stability the effects of this policy have not yet reached to the population. In order to achieve objectives of 100% energy

coverage in Pakistan a strong policy for off-grid electrification projects for renewable energy is needed. Even as of 2013 policy review ambitions goals (Bhatti, 2013) were set and till today the Government of Pakistan has failed to achieve it targets (Yazdanie, 2010). This can cause because of concern for investor.

- The most significant political risks come at national level, mostly due to the fact that each political party is in power for a relatively short fixed term focusing on their own separate agendas. This coupled with the fact that world economic crisis since 2007 has led to government cut backs in spending, may see reduction renewables vital funding.

In general the state of Pakistan is motivated to solve the problem of power shortage to its population and governmental policy is friendly toward renewable power production resources.

2.2.1.2 Economical

- Currently the economic forecast of for future is very positive that is predicting a robust growth in services and industry sector. The major infrastructure spending, foreign investment and business friendly economic policies Pakistan is predicted to achieve a 5.2% GDP growth in 2017 and 5.5 in 2018 (ADB, 2016).
- The information regarding solar power system equipment is now more available to people and renewable energy business can bring positive and substantial economic benefits into Pakistan business and energy sector. The effects will be two folds: first, it will create a new market related towards energy centered business and second, it will provide uninterrupted power supply to energy-hungry business.
- The Karachi stock market has put in a good performance by rising 46 % (Figure 17) over the last year (Cowen, 2017).

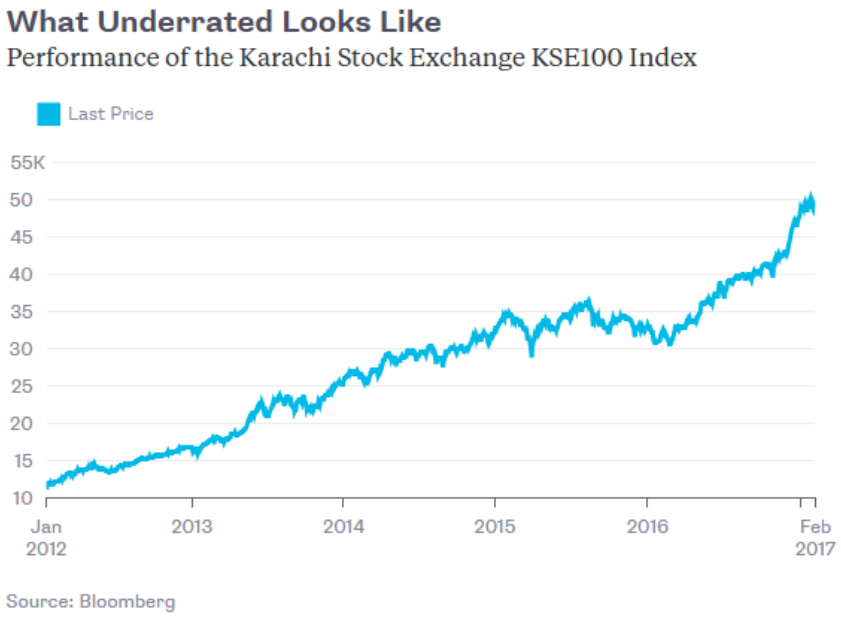


Figure 17: Karachi Stock Exchange Performance 2012-2017 (Cowen, 2017)

- The Pakistan currency is notoriously subjected to fluctuation due to economic in the past, but PKR (Pakistani Rupee) is stable since 2013 due increased economic activity and continuous foreign investment. However, IMF issued a statement in 2015 that PKR is overvalued between 5 - 20 % (Haider, 2015). The State bank of Pakistan data also shows a 5-15% fluctuation historically throughout fiscal year (Pakistan - Money Data, 2014). This can be key element for a business that imports products from outside from the Pakistan.
- Pakistan has shown steady increase in inflation over the past and the inflation rate is relatively stable at 5.3% compare to historic data (Pakistan Core Inflation Rate, 2017). Since, the interest rates are high but relatively stable, it can be assed is still too high may for borrowing and for startup. Hence, Islamic banking based (profit-loss) loan will be much more suitable than borrowing at high rate.

All in all the economic activity is on the rise and it is very good time to invest in Pakistan for doing business in Pakistan that is offering very large customer base.

2.2.1.3 Social

- Pakistan estimated to a population of 194.9 million and currently population recount is carried out that will be completed in May 2009. Pakistan is world's sixth-most-populous country, behind Brazil and ahead of Nigeria.
- Due to rapid urbanization 1990-2010 Pakistan have led to emergence of mega-acities and with city dwellers making up 36% of its population (CIA).
- The Pakistan middle class is on the rise and has increased spending and business are seen increasing profits across the board. Pakistani market research firm Aftab Associates, found that 38% of the country is middle class, while a further 4% is upper class. That's a combined 84 million people roughly equivalent to the entire populations of Germany or Turkey and represents a very big market (Shah, 2017).
- Pakistan population density is at maximum in Punjab, KPK, Sindh and Baluchistan respectively. With all regions experiencing up-to 300days of direct sunshine. The population density orientation clearly divides the solar power market into off-grid and with grid systems. With very young population demographic (Figure 18) and rise in literacy rates the adoption of new technologies is expected to be faster.

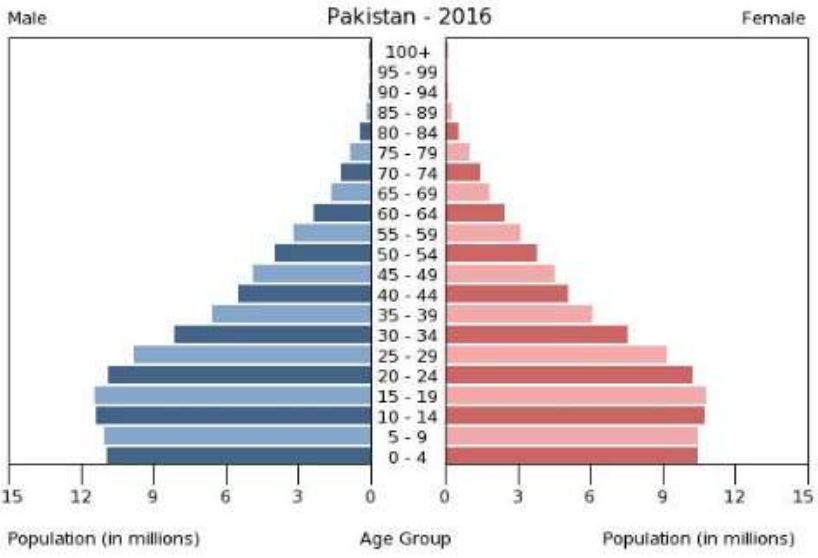


Figure 18: Population Pyramid (CIA)

- More Pakistani population is facing shortage of power on daily basis and face warmer weather. The climate change effects are visible in Pakistan and Pakistan has taken hit to the economies with critical power cuts (Johnston, 2016).

The renewable and solar power system adoption will have three fold effect in Pakistan i.e. it will provide much needed power to the deprived pollution and business, secondly it will provide much need help in climate by reducing the country carbon footprint, and last but not least will have positive effect on the economic growth.

2.2.1.4 Technological

- Since 2002 Pakistan invested heavily in developing technical human capital by collaborating with international institution. In 2002 Pakistan start a program to train professionals from renowned universities and at the time Dr. Atta-ur-Rehman minster for education send a workforce to be trained in all different fields. Sine 2002 Educational sector reforms Pakistan has abundance of engineering universities and colleges that are producing quality technical graduates is vital for work force (Rahman, 2002).
- However, on the negative side the state of Pakistan investment in research and development since 2013 has shifted and the focus is on economic growth mainly (Shahid). Pakistan is only spending 0.293% of the GDP (Figure 19) on research and development according to UNESCO statistics (UNESCO, 2017)

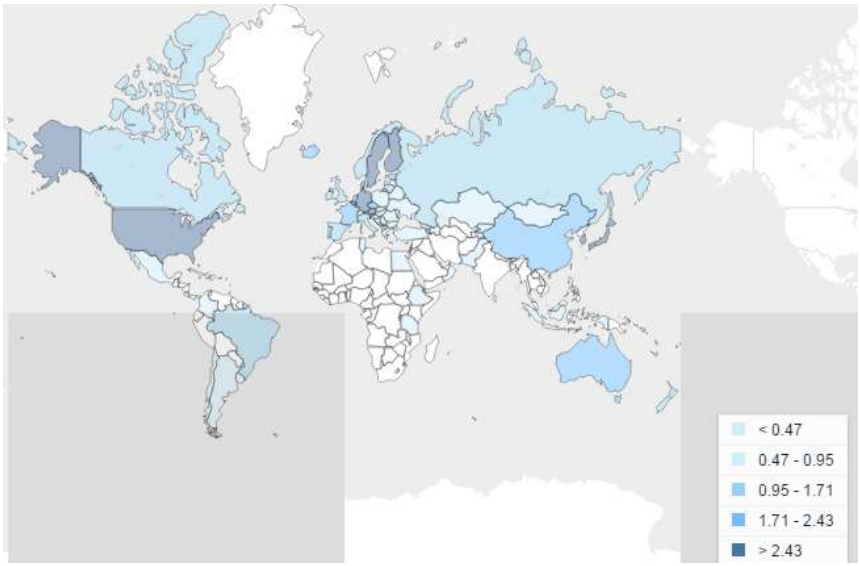


Figure 19: UNESCO Research and development expenditure (% of GDP) (UNESCO, 2017)

- The majority of population living in Pakistan is very young and the access to internet and information is increasing at a very fast pace. The population is also now adopting new technologies and focusing on startups adopt technologies and kick start the economy to faster pace.

In short the technological outlook for Pakistan is very positive and due to information dissemination and literacy rate along with technical workforce available investing in renewable market is feasible.

2.2.1.5 Summary

The PEST analysis of the Pakistan market shows positive outlook due to the fact:

- The government is encouraging the small scale investor to invest in the solar power systems for the market by providing necessary legislation, funding and subsidies.
- The economic situation in Pakistan is improving as the country is finding solid grounds and has continuous stream of investment with stable growth projections.
- The country demographics are encouraging as the investment for off-grid and with-gird solar power systems can be adopted by masses of the population.
- The country literacy rate is on the rise that means required technical workforce along to install and maintain state of the art technologies for the solar power investors.

The recent studies of renewable energy status shows (Khan & Mirza, 2016) (Raheem, et al., 2016) that Pakistan has great potential to become full fledge renewable energy giant. After facing criticism of government policymakers in terms of short-term political gains to use coal power plant investment the country is pushing back toward solar and wind power generation. With the costs of renewable energy falling fast, Pakistan is planning to spike wind power generation from less than 300 megawatts today to more than 3,500 megawatts by end of 2018. Pakistan has also set a target of electrifying 40,000 villages via solar photovoltaics by 2018, although the progress of this project is unclear (Wylie, 2013).

2.2.2 Porter five forces market analysis

The porter five forces will analyze the market for solar power systems sales firm perspective. The "Alive home" is not a solar power manufacturing firm but a downstream firm that is involved in sales, installation and maintenance of the equipment. The porter five force analyses will overview the market status and concluded the entry into the market based on the analysis. The “Alive home” is focusing solar power supply to individual home and gradually focusing on building business to other domains.

2.2.2.1 Entry barriers are low

The entry barrier in the past to the renewable or solar power sector was very hard and difficult due to difficult licensing, high research and development costs, and lack of good quality solar power system equipment. However, now the situation is changing very fast and the barrier to new entrants is very low in Pakistan for investing in solar power systems due to:

- Pakistan government has made it very easy to setup as SME unit with help of SMEDA.
- Pakistan is encouraging use of renewable resources to bridge the power supply and demand gap.
- Pakistan has now very low taxation and duty policies for renewable power systems.
- In the past decade, the solar power production technologies have progressed very fast and have achieved a good level of efficiency with optimized per KWh cost.

In short, the barrier to new entrants in solar power system sales is low to medium and it is very favorable to start a solar power system sales business.

Threat level from new entrants: High

2.2.2.2 Threat of rivals

The competitive landscape in the solar energy industry differs drastically by country and region. The growth rate of industries can be a significant factor in competition, and the solar energy industry is growing at very fast pace in Pakistan and in turn driving price competition. Competition is growing fierce among residential solar as new companies immerge due to the increase in rooftop solar from consumers. However, in Pakistan the market is flooded from high to low quality products in the solar power market and establishing a brand with quality product and reliable services will enable company to standout from competition. The key lies in differentiating from rest of the pack with emphasis on quality and reliability of the product while offering lowest per KWh on longer scale.

Threat level from rivals: Medium

2.2.2.3 Threat of bargaining power of buyers

The bargaining power of buyers is fairly low in the solar power since the switching cost for customer is heavily subsidized by government. In Pakistan there are two type of buyers of solar power product i.e. First type (majority) of customer will be small scale (in conjunction with grid) that will buy the system and will not opt for long term maintenance agreement and second type that wants to go off-grid and will opt long term contract. The first group will buy a fixed price product form the market, for such item they will have various options are available but in such case they will not have warranty of the components and prices can be low. The first type of buyer is one off buyer and has an options to select from various companies to buy reliable product the variation is very small.

The long term contracts that are typically available with home solar systems can be for 20-30 years long contract. Long term leasing and loan (20 years) contract agreement with solar energy companies are essentially tied to their rates and their provider company.

However, solar power market has now established players in this industry, as the industry is maturing the buyers have plenty of options to choose a solar solution pro-

vider. The solar products are mainly differentiated based on cost/KW of efficiency, and thus, low product differentiation in this industry makes buyer more discriminant.

Threat of bargaining power of buyer: Low

2.2.2.4 Threat of bargaining power of suppliers

The leading solar energy companies and renewable energy companies invest huge sums of money on expensive specific equipment used in providing their products and services. At the same time these suppliers/manufactures invest heavily in research and development in-order to provide and optimized product and standout in the competitive manufacturing market. These investments make the switching costs to new suppliers extremely high. In addition also the specialized technologies and components have large lead time and it quite hard to change suppliers. Due, these factors the bargain power of the suppliers is very high in solar power sector but with increase in demand and production capacity is driving the supplier bargaining power down.

Threat of bargaining power of suppliers: High

2.2.2.5 Threat of Substitutes

The obvious substitution for solar/renewable energy would be electricity generated from fossil-fuel or nuclear power stations. Renewable energy is becoming more and more affordable for consumers and is finally at the point where it can actually achieve grid parity and save consumers money. However, in Pakistan the national grid still not capable advance enough to provide benefits to solar power system owners. It can only be used as substitute or make shift source when grid power is off.

Historically solar energy has been far more expensive than alternative substitutes that are why majority of people still uses natural gas generators to generate power. . Hydrogen fuel cells capable of producing high level of electricity (Cruz) are becoming an economically attractive option due to low upfront cost. Also, the cost of electricity generated using fossil fuel is still far lower than that of solar energy. The economic benefits of renewable energy substitutes make this the most severe threat level in the industry.

Threat level from substitutes High

In conclusion the overall indicators to enter the Pakistan solar power business market are favorable and it is good time to venture in the market. However, the diversification of business will be critical as technologies will evolve with time.

Figure 20: Porter five force analysis of Pakistan solar power market.

2.3 Customer market survey (online)

Market research is a systematic process that includes collecting, analyzing, and reporting information to enhance decision making throughout the marketing planning process (Shank, 2004). Market research is used to answer any number of questions about products and customers. In "Alive home" project case it was key to understand the market dynamics and also customer requirements. "Alive home" research targets the following core issue using the customer survey:

- Identify if there is a demand for the product?
- What are the customer requirements and demands?
- How to improve reachability to customer?
- How to plan an effective marketing campaign?

- How to enter the market and attract customer to increase market share?
- How to tackle product and service evolution in the market?

The primary data analyze the market was based conduction customer market survey. Primary data come directly from consumers. In "Alive home" case the primary data was collected using online surveys and was target toward prospective solar power consumers. The customer survey (Appendix I) when designed was based on fore mentioned questions to make well informed decision to accommodate factor such as "market segments, target markets, purchasing behavioral characteristics, benefits, and future market assessment".

The "Alive home" market survey was online from 10-04-2017 until 09-05-2017 and total of 52 online responses were collected. The data collected shows (Figure 21) that 77% of respondents were living in rented apartments and 23% were the owners of the property with household income ranging from 20K € to 50K € and plus. The survey also shows that the respondents from all social status contributed the survey and provided their input into the survey.

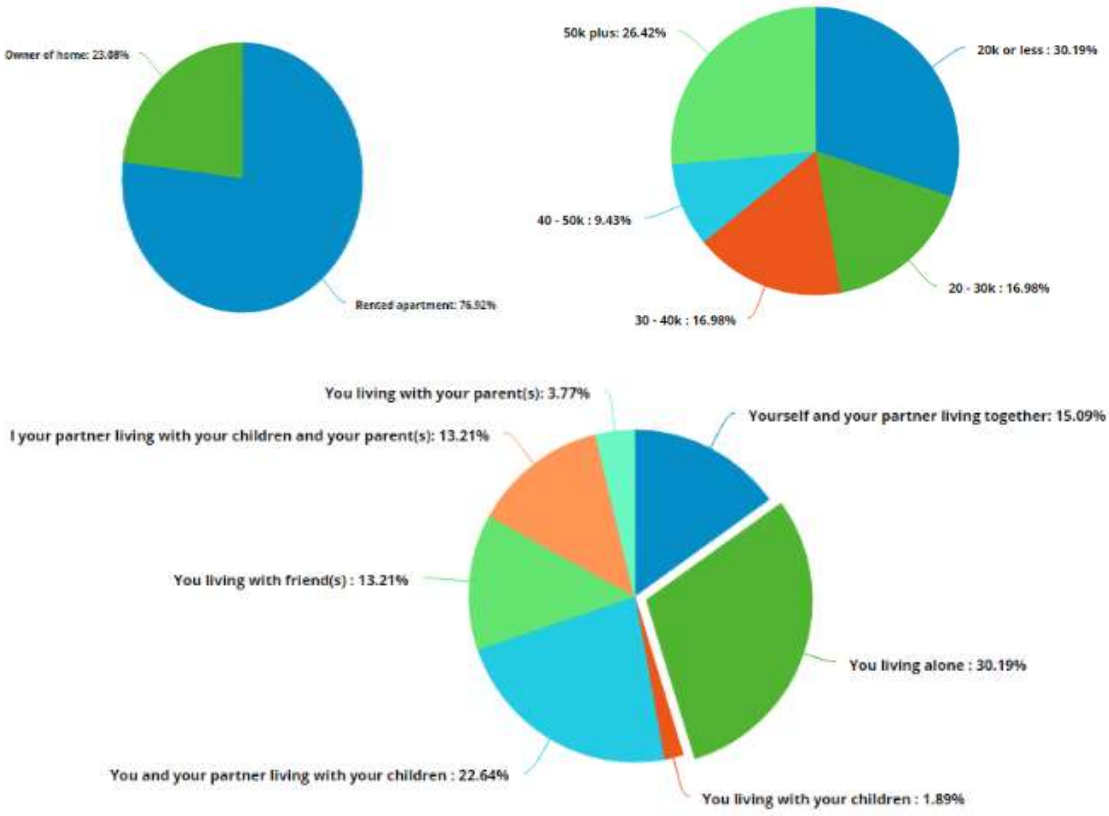


Figure 21: Online customer survey respondent demographics

The survey also showed that 90.57% (Figure 22) were aware regarding the climate change however only 88.68% shows concern regarding climate change issue. Based on the survey results, a fraction of people 1.89% rejected to do anything to change and 1.89% deemed it is not an important topic to be widely discussed. However, major of the survey respondents clearly indicated that climate change was important for them and they are aware of solar power generation technologies (Figure 22).

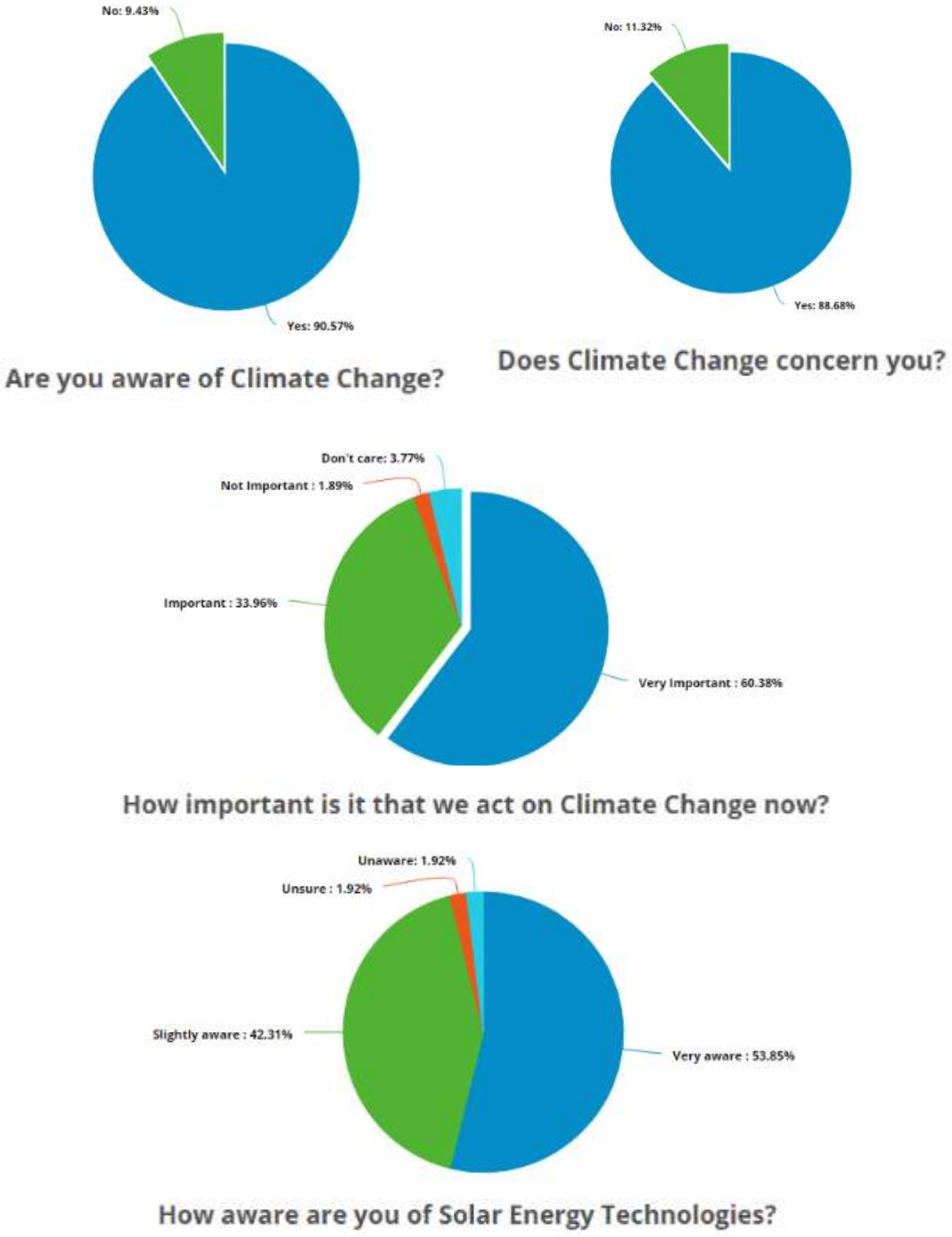


Figure 22: Survey response regarding customer mind-set.

To the question focused toward customer requirements, needs and demands majority of respondent 80.4% (Figure 23) showed that they were interested in using the solar power system at the home either as primary source (off-grid) or secondary source (grid-tied). However, the 19.6 % showed they either don't want it or argued that it was very expensive technology to generate gap. From the positive responses the survey can also comprehend that both off-grid and grid-tied systems are required in the market. The answer also shows that majority of responds thinks that investing in solar power will save them money overtime.

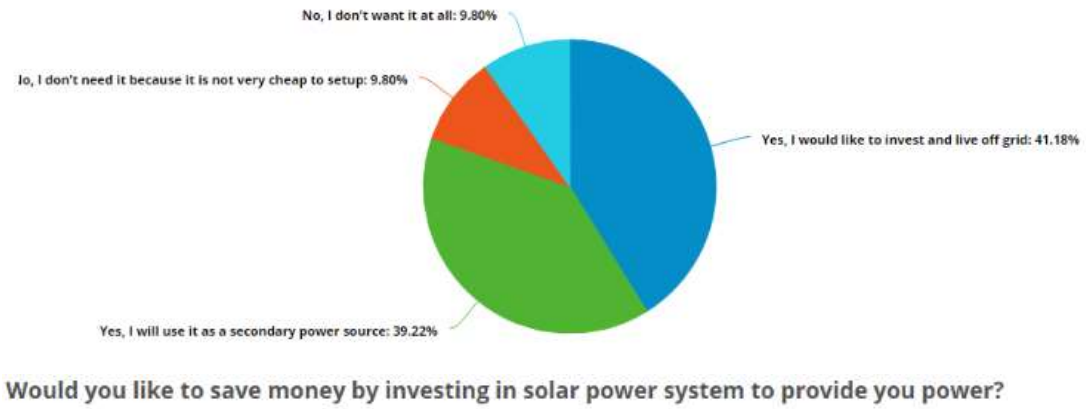


Figure 23: Survey respondent interest in acquiring solar power system for homes.

However, to complement the needs it was also critical to understand what customer is thinking concerning solar power system cost, technology and after sale services. The survey indicated that customer top three concerns were regarding obtaining a cost effective long-term contract, choosing the right technology and finding a trustworthy contractor (Figure 24).

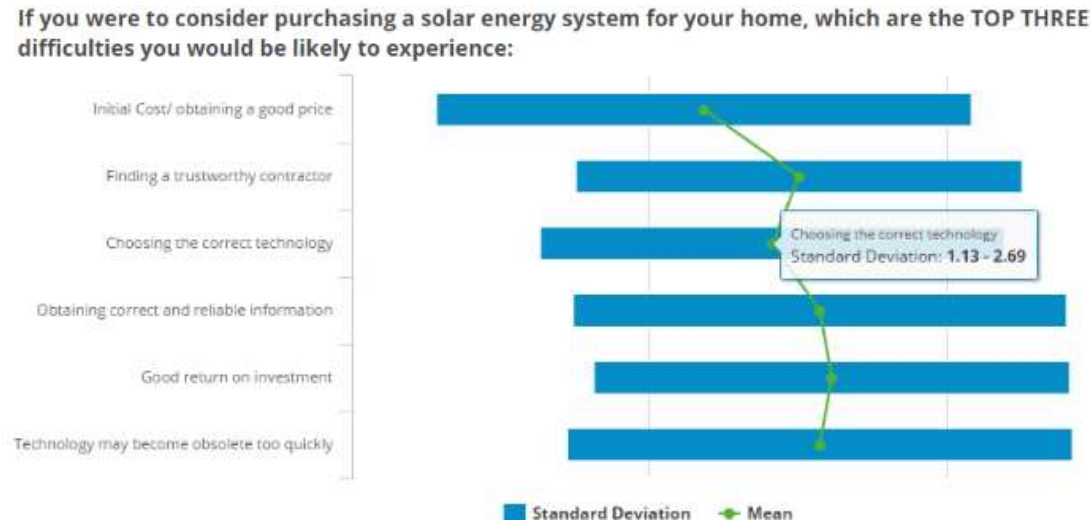


Figure 24: Survey Responses regarding the difficulties the customer expects to face.

To understand, what are the key disadvantages in the mind of the customer regarding solar power generating units? The survey asks a key question by comparing "solar and utility power unit" regarding disadvantages for the potential customer. The respondents indicate that "Initial cost, efficiency, lack of information, service, and availability, reliability, no disadvantage, and solar power systems is not yet ready" are primary reasons disadvantages in chronological order (Figure 25).

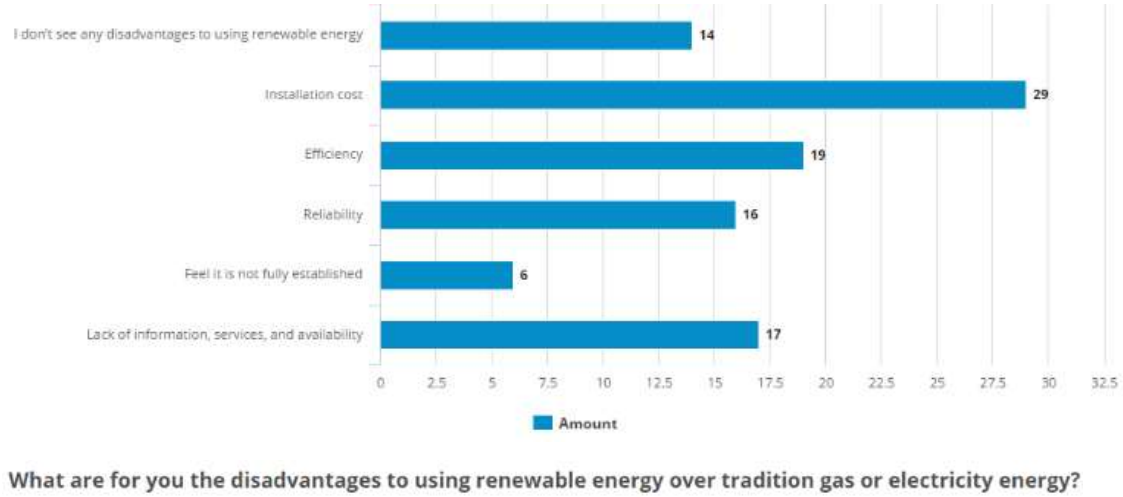


Figure 25: Survey responsed to chart out disadvantages of solar power system compared to conventioal fossile fuel power genreation.

The survey also targeted question to understand the customer spending and purchase patterns.64% the respondents indicated that they were interested in buying units using their own funds and saving, while the 36% showed an interest in acquiring the solar power units for their homes by acquiring loans. This means the majority of people are even willing to invest their savings to ensure sustainable secure power supply for their homes (Figure 26). This response is key factor for designing the business model for the "Alive home project.

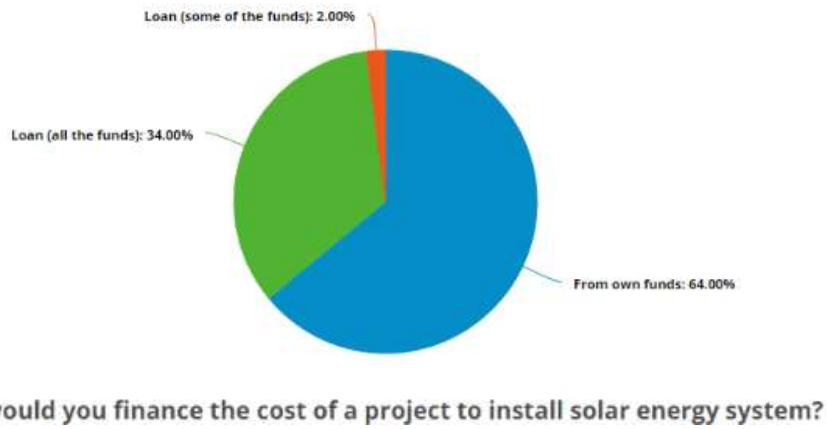


Figure 26: Response to intended means for financing

The survey focused on establishes a startup also wanted to know the customer perceived time frame for purchasing power system. This was also critical in terms of understanding the sales pattern and strategy. In the survey, 38% of the respondents wanted to install the system within the one-month time frame, while 28% responded to 6-month time span and 34% responded that 12months to 24 months are good time frame for them.

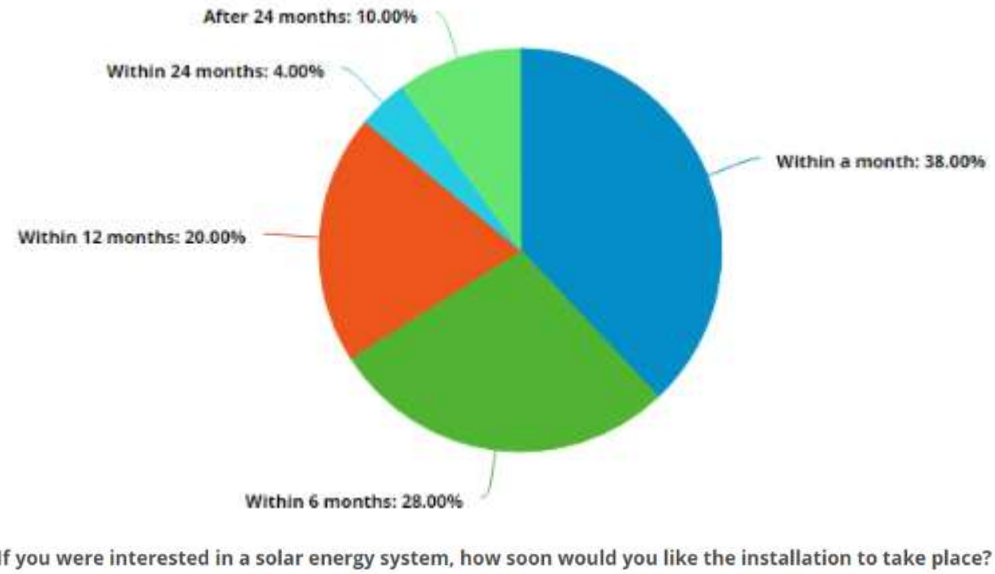


Figure 27: Timeframe set by customer to obtain solar power system for homes.

From sales and marketing point of view, the importance of perceived benefits of solar system and expectation of customer in assisting them in sales, maintenance and services are critical. The survey shows the customer perceived that reducing electricity and gas bills were the key advantages of solar power system (Figure 28). The environmental effect, energy security and seeing solar power as the source of income were in relative chronological importance. The second question was concerning that what will motivate the consumer base to invest in the solar power system. The 29.41% showed interest in a promotion, that product is installed as the package deal when customer purchases solar power system (Figure 28). Similarly, free maintenance for a certain time period was also an attractive incentive for the survey respondents. Another incentive such as overtime payment for system and loan without or low interest got a 17.65% approval from the survey respondents. Discounted products was the least popular approach with obtain 15.69% of popularity (Figure 28).

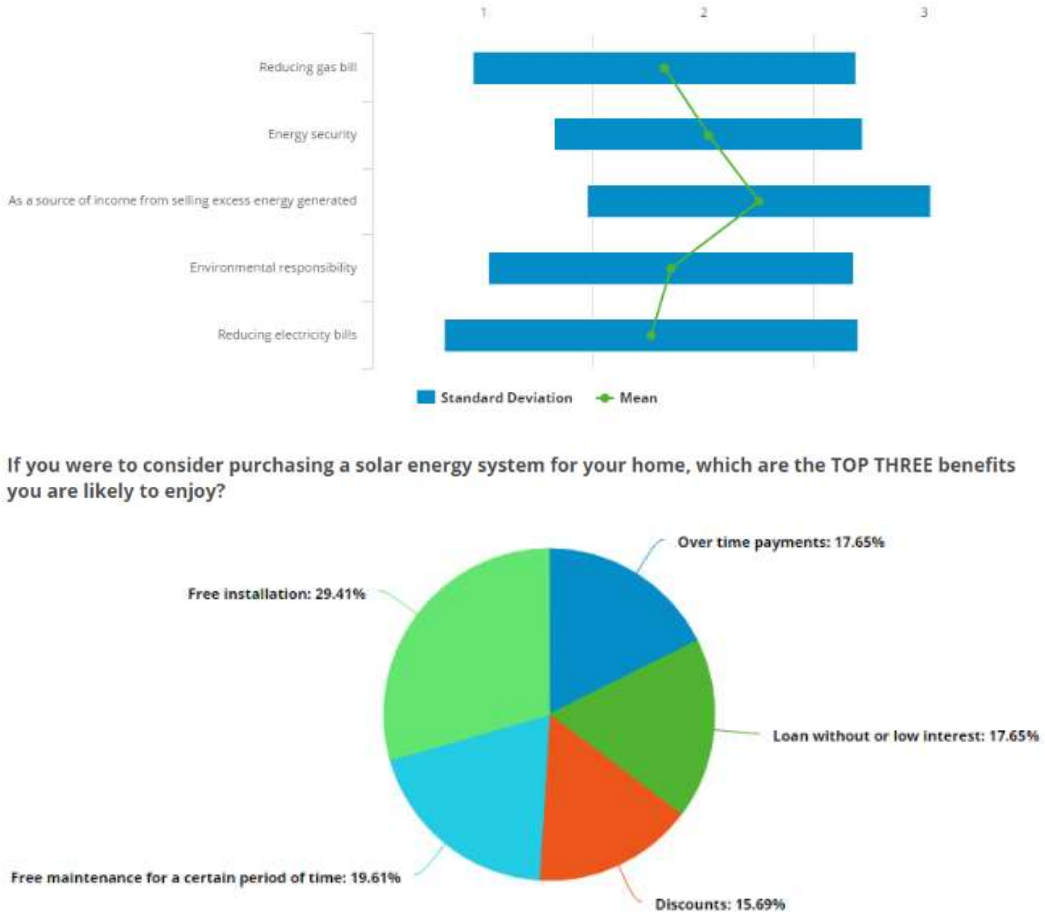


Figure 28: Benifits of solar system and attractive offer question survey responses.

In the end of the survey, a direct question was asked of respondents, to see who will invest right away into solar power system for their home? In response to question 58% were willing to invest their money on installing solar technology right away, 26% said maintenance was key priority for them and 16% were focused on home improvements (Figure 29).

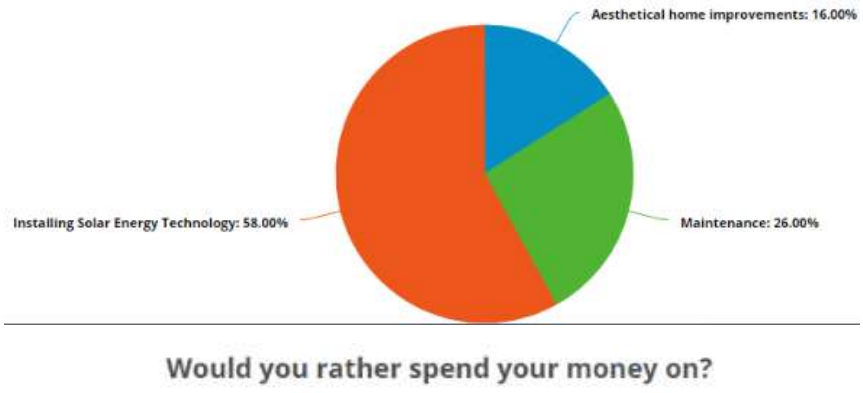


Figure 29: The readiness of survey respondent to spend money on solar power unit.

2.3.1 Customer Survey Summary

The market survey carried out during this research is critical to understand customer requirements, needs, demands, wishes, and aspirations. This survey was comprehensive shows that customers within Pakistan are well aware of the solar power system development and the benefits it carries. The customer has pointed outed that they are interested in having a sustainable power supply system that can provide secure power supply, reduce power and gas bill and also later onwards that can contribute to improving the environment. Though a majority of customer also expressed concerned regarding having a lack of information, reliability, and efficiency of solar power systems, most of the customers have shown their interest to invest in solar power systems for their homes. The customers that want to install solar power system are divided equally into having either grid-tied system or off-grid system. The prospects of establishing solar power system are bright as 38% of respondents want to invest imminently into solar power systems, while 86% of total respondents are planning to invest with 12 month time period. The investment pattern indicates that solar power system for houses will rise and the solar power systems market for the home will be expanding. As the PPA policies by the state are updated along with smart grids investments the solar power production business will expand exponentially.

The majority of customers are not aware of passive house technologies, however, it is one of future investment projects that can be integrated into the solar power systems to diversify the future of "Alive home" business portfolio.

This survey provides important data to "Alive home" business planning team that will assist in charting out an effective business plan with a targeted product catalog and an efficient marketing plan.

2.3.2 Notes on survey data

For this thesis, 52 survey responses are collected until this point, but "Alive home" will keep the survey open until end of June 2017 to collect further data. This survey will be conducted and diversified as the business is established.

2.4 Situation analysis

2.4.1 Pakistan housing market analysis

Real estate is one of the most lucrative areas of investment, offering Return on Investments (ROIs) of over 100% within a span of a few years. Pakistan is one of most populous countries on the world and due to rapid urbanization the real estate industry has seen rapid from since 2000. Even at uncertain economic situation the property and real estate business has been very stable (Shaikh, 2017). Current reports regarding studies and surveys a positive growth in the real estate sector (Editorial, 2017).Recent increase in taxation on the real estate has caused a drop in the property prices (Javaid, 2016) due the investor taking money out of the sector. However at the same time a first home owner is buying properties in-order to secure house for their families.

Figure 30: Effect of law on real estate market.

However, the recent survey indicates the property market has seen very positive growth due to increase access to mobile phones and IT technologies (Lamudi, 2017). The people are buying at a faster pace removing the middle man. The study also shows due to looming power shortage sustainable power resource is the key issues on people's mind. The study respondent pointed out that a house with a renewable re-

source is a key selection point purchasing a property (Lamudi, 2017). Solar power for homes now considers plus point and termed as a positive deal making aspect in real estate property.

Real estate experts (Lamudi, 2017) (Zameen, 2015) (Nadeem, 2016)are clearly predicting that the real estate business is going pick up even more pace in the coming years, as CPEC and other foreign investment in the infrastructure is causing massive urbanization. Security situation is also improving and as side effect people are investing more into business and economic situation is improving very fast.

“Alive home” initial target is home customers at this movement and strategic partnership with real estate firm is logical fit for the company from the start. The “Alive home” will offer solar power packages along with real estate firm developing homes to provide a sustainable power supply. This will be one of the key strategies ahead in offering services to masses of population.

2.4.2 Summary of Interview with property developers

In order to understand Pakistani housing market, it was the key that we conduct and interview with property development representative and understand the current mode and attitude of house owner in Pakistan. In this section, we will present a summary of interview (for details see Appendix II).

During the comprehensive interview the research learned following key points:

- The Pakistan housing sector is going through a continuous sustainable growth since 2000 and people are investing heavily in the property sector.
- The middle class is rising and this is also leading homeownership rising at a faster rate among new families.
- The power outage is a critical issue and house developers are tackling it with backup power generated using fossil fuel generator that causes even more pollution.
- The property developers are considering solar power system as the backup source to power home.
- In the property developer opinion, the future power supply will be done using solar power systems.

- The solar power system growth is weak due to initial cost, lack of information, reliable products, availability of the products and after sales services.

2.4.3 Types of renewable energy resource providers

Pakistan has approximately shortfall of 5000–8000 MW with a constant increase of 8–10 % per annum, and the heavy dependence on limited fossil fuel resources, renewable alternatives which are able to commercially support conventional energy options can be used to reduce the shortfall drastically. According to research studies (Raheem, et al., 2016) (The World Bank, 2015) Pakistan has abundant renewable energy resources in form of Wind, solar, hydro, and biomass. The composite research study (Raheem, et al., 2016) confirmation of extensive generation capacities of these resources, it stands at 120,000 MW for wind, 2,900,000 MW for solar, 5500 MW for biomass, and 42,000 MW for hydropower (see Figure 31). The study also shows that the power potential in renewable resources will easily plug the power supply and demand gap. The study also points out that the power generation potential is distributed across country "*This potential capacity is fairly distributed among the different provinces. Sindh is endowed with wind potential in the South, Baluchistan is rich with solar potential in the West, and Khyber Pakhtunkhwa is rich with hydro in the northeast area*." This means that all the power potential can be developed simultaneously and the gird connection cost will be smaller and local.

The study also clearly conclude that the solar power is the only mean that has the highest potential, it can be exploited across the country, and the systems deployed can be from mega power plants to need based solar power systems for homes. The other renewable resource harvesting (Wind, hydro, and biomass) can be more costly and the unit's development will require considerable effort and direct participation from funding agencies.

However the biomass stands out as competitor to the solar power sources in a rural environment due to the fact:

- Pakistan rural area is majority agricultural based
- Raw product for biomass gas production is readily available.
- Land is abundant across the rural areas and biomass gas installation for a community can be built very easily and close proximity.

- To use the biomass gas existing natural gas generator can be used.
- The biomass gas is available 24 hours per day unlike solar power.
- Provides constant supply for organic farming.

Biomass gas has also drawback such as:

- Gas distribution network will be required.
- Maintenance intensive and requires regular monitoring.
- The gas supply is not constant from small biomass setup.

All in all currently investing into solar power systems for homes is viable option compared and also required for firm capacity, capital and resource building.

Status	Completion date	Capacity (MW)
Wind		
Technically exploitable potential		120,000
Installed projects	2013	500
5 commissioned projects	2014	255.4
9 projects under construction	2016	479
Projects under feasibility study	Not known	964
Solar		
Technically exploitable potential		2,900,000
Quaid-e-Azam solar park (commissioned)	2015	2000
6 projects under development	2016	46
3 projects under development	2017	150
22 projects under development	2018	513.6
Biomass		
Technically exploitable potential in 2010		5500
Sugar Mills Ltd (Unit-II) at Rahim Yar Khan (Operational)	2013	26.35
Sugar Mills Ltd (Unit-III) at Ghotiki (Operational)	2013	26.35
13 projects under development (at different locations in country)	Not known	301
Hydropower		
Technically exploitable potential		42,000
Current production	2013	128
7 projects under development	2017	877
9 projects under feasibility study	Not known	1500

Figure 31: Renewable power resources summary in Pakistan (Raheem, et al., 2016).

2.5 Business Model

The business model idea is relatively new domain in the business strategy research studies. Academically the dot-com era was the key in developing the business model approach. In the dot-com era and now the technological progress and decreasing computing and communication costs had enhanced the transformation of how companies are creating and delivering value. These processes lead to substantial change in the business approach, processes and infrastructure. Acceding to Investopedia the business model is defined as "*A business model is the way in which a company generates revenue and makes a profit from company operations*". In 2010 Osterwalder gave very comprehensive definition of business model ""*A business model describes the rationale of how an organization creates, delivers, and captures value. (…) We believe a business model can be best described through nine basic building blocks that show the logic of how a company intends to make money. The nine blocks cover the four main area of a business: customer, offer, infrastructure, and financial viability. The business model is like a blueprint for a strategy to be implemented through organizational structures, processes, and systems*" (Osterwalder & Pigneur, 210). In his book he describes his model with template that became known as Canvas business Model (Figure 32).

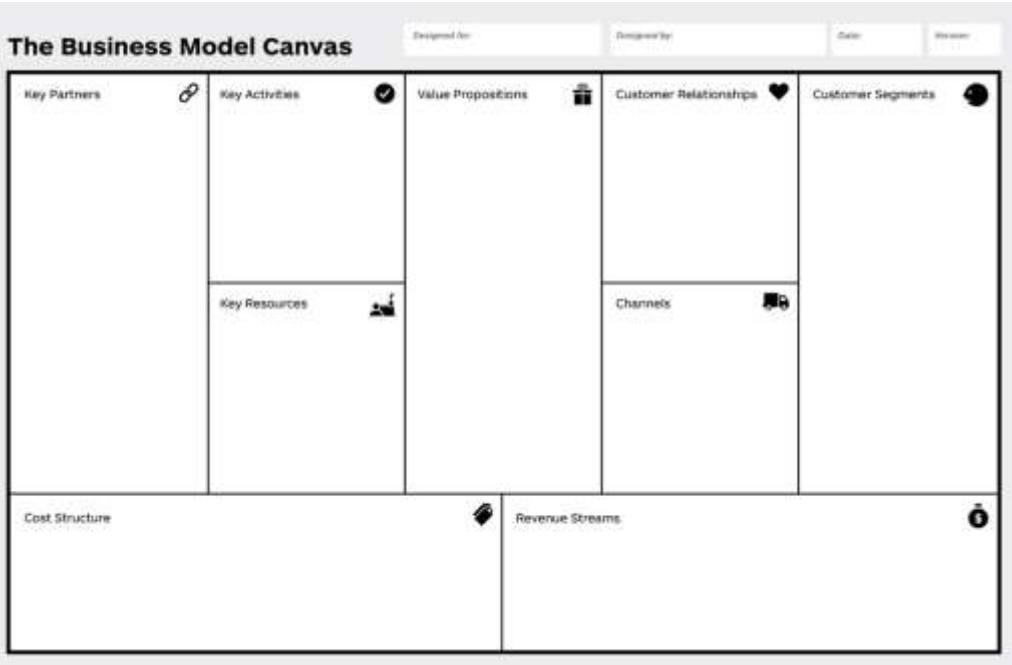


Figure 32: Canvas business model (Osterwalder & Pigneur, 210)

The Canvas business model describes all the key entities that are of interest to managers, entrepreneurs and stakeholders. This model is very visual and provides a detailed overview of who are key actors, processes and actions to establish a business within a competitive market. Due to it lean structure the Canvas business model is very popular among modern day entrepreneurship and can be used to demonstrate, study, and plan business strategies with detail. In this research for "Alive Home" project is based and planned using the Business model canvas. The Alive home Business model canvas can be seen in Figure 33.

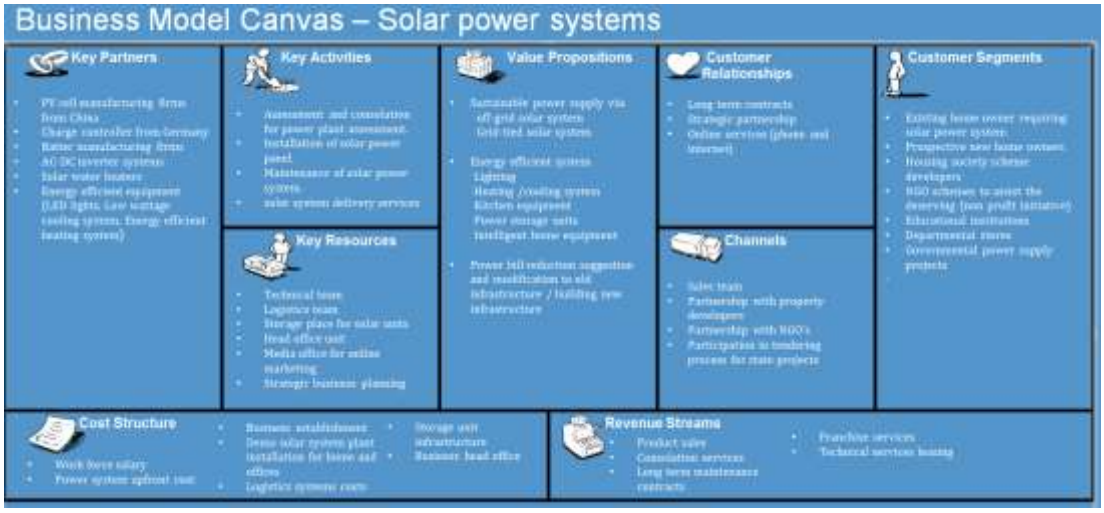


Figure 33: The Alive Home project Canvas business model (source: author)

The Canvas business model for Alive Home project was prepared during group meeting with team members to point out the key entities and factors that will affect the business. This Canvas business model at this movement only represents the starting phase and also points out the key challenges and resources that will be cost drivers. At the same time the value proposition and key activities will give the product the value that can be used for generating much needed revenue streams. In the discussions, it was clear that establishing the business is not an easy task, but the all goals are achievable with right plan. The Canvas business model for "Alive home" was filled using technique proposed by (Maurya, 2012) for lean canvas model. This approach provides very logical sequence i.e. Key Partners > Customer segments> Value propositions > Key activities > Customer relationship > Revenue streams > Cost structure > Key resources > Channels. The lean canvas also provides an insight into how to fill the Canvas business model in "customer centric" and "problem-focus" approach.

2.5.1 Revenue channels

Revenue channels for the "Alive Home" project can be divided into two main types product sale and services. The product sales will be one of key the source and the “Alive home” will facilitate a customer to either lease of purchase a solar power system. The customer with "Alive home" will need is a building or free ground area to host a solar photovoltaic (PV) energy system.

Products Sale

The product (link) sold to types of customer:

- To one-off customers, who will buy specific (low power generating) product for limited and specific use. The product will sold will be without maintenance or warranty services, once the product is installed and operational at the site.
- To the loyal customer who will make long-term contract to lease or finance a high powered solar power with 20-25 years contract. In this banks and financing firms will be involved (Figure 34, Figure 35).

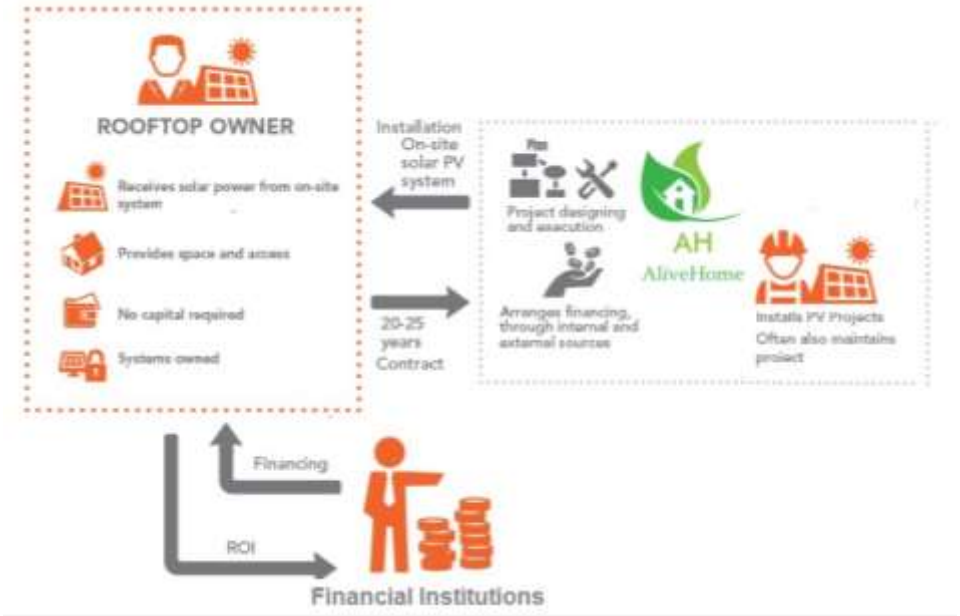


Figure 34: Revenue channel model for leasing the solar power unit (Adopted from (Solatricity, 2017))

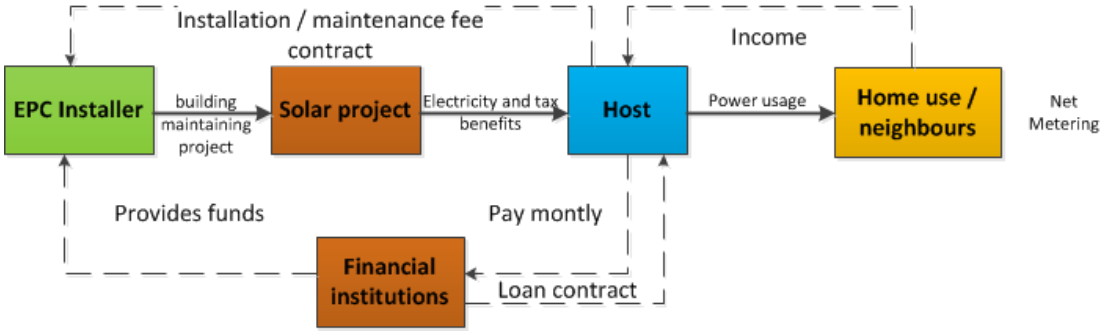


Figure 35: Host owned solar model for Pakistan in current situation (visualize by author)

- Future Revenue channel: The power purchase agreements (PPA)/leasing model in the developed markets and has become one of the most popular methods enabling power consumers realize the benefits of solar energy (Figure 36). This PPA leasing model will allow Alive home to build a solar generation system on a consumer's property in return for a long-term PPA at a fixed-rate. Pakistan is now integrating solar power system into its national grid and future will be to use PPA agreements that have been successfully implemented all across the globe.

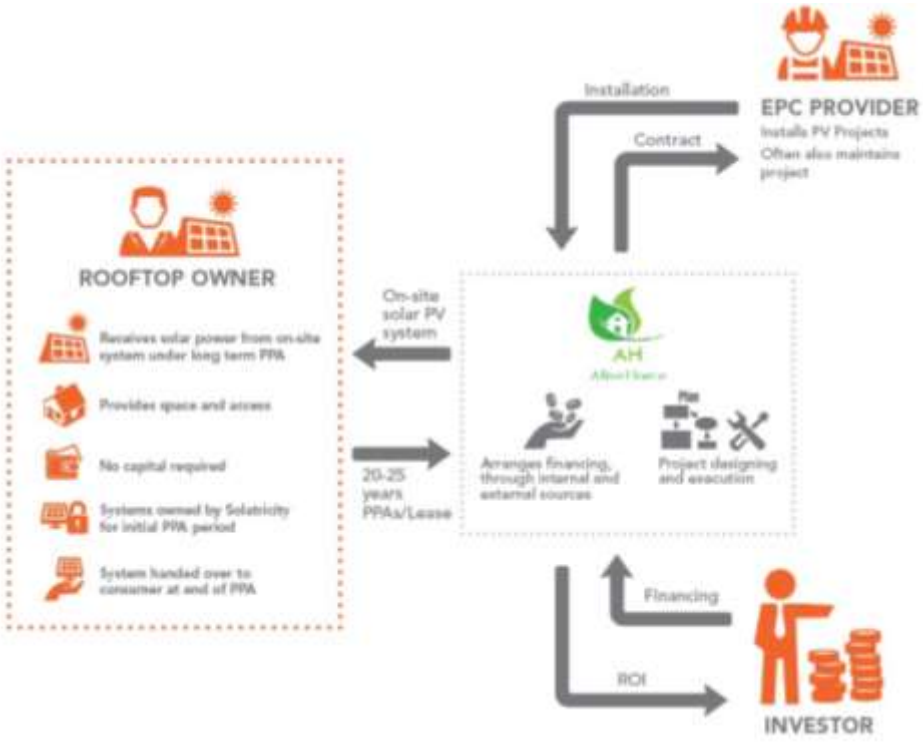


Figure 36: Alive Home solar PPA model for the future (Adopted from (Solatricity, 2017)).

In the leasing model "Alive home" will also include following clauses:

Term length: Residential solar leases are usually for 20 to 25 years. Commercial solar leases can be customized, and generally range from 7 to 20 years.

Performance & maintenance: The leasing company will monitor the system's performance to ensure that it is operating correctly for the duration of the lease. They are also responsible for maintaining and repairing it, although solar panels require little to no maintenance over their lifetime.

Monitoring: Most solar leasing companies offer free online, smartphone, or tablet programs to track your solar panel system's performance.

Buying the system: You can buy the solar panel system at any time during the lease term at the price defined in your contract or its fair market value, whichever is higher.

Selling your home: If you sell your property, you can transfer the remainder of your lease to the homebuyer or buy the system from your leasing company yourself and include it in the sale of your property (this one will be included later onwards)

At the end of the term: When your agreement ends, you can either buy the system outright, have the leasing company remove it, or leave the system in place and renew the agreement with the owner.

Services

The services will be the second key link to generate the much needed revenue for "Alive home" project. The "Alive home", through it solutions and consulting division will provides unique, state-of-the-art solutions to suit customer requirements.

- Its services will span across the entire lifecycle – conceptual designing, prototyping, testing, installation and commissioning of the equipment.
- Long-term maintenance contract with current projects (Figure 37).
- Training services to train solar power installation professionals. "Alive home" leverages its domain knowledge and strong technical expertise in tailoring off-grid solar power solutions for clients.
- Franchising the brand once the business is established.
- Partnering with other firms as engineering, procurement, and construction (EPC) firm in the solar power sector.

- Consolation services to other firms that will use another EPC firm.
- Establish strategic partnership with property developing firms to build solar power system into the houses.

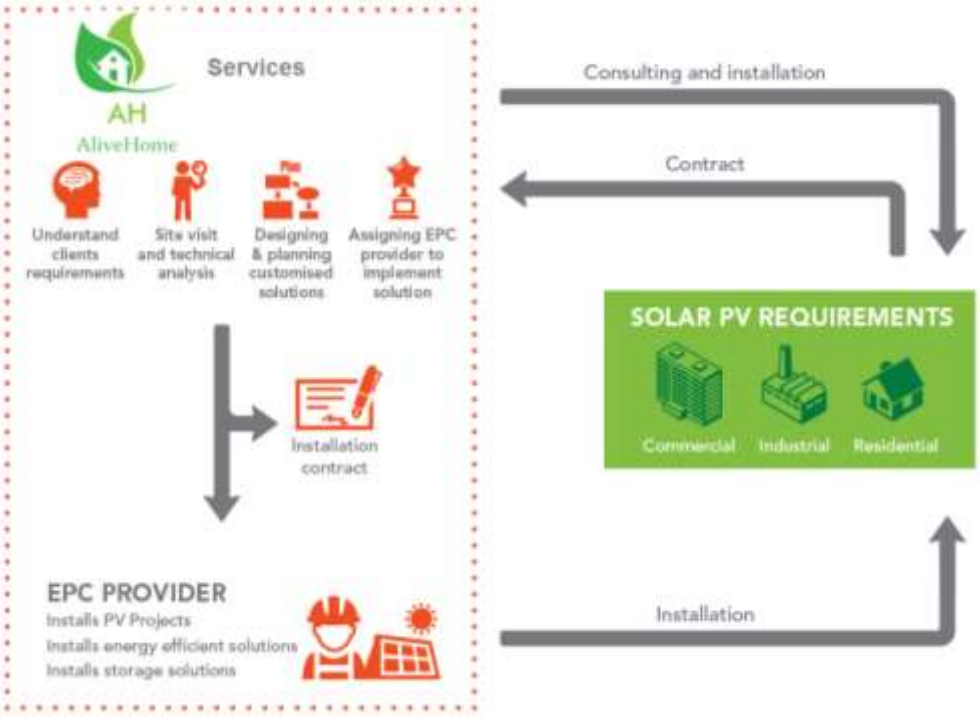


Figure 37: "Alive home" services (Adopted from (Solatricity, 2017)).

2.5.2 Growth and Value proposition strategy

The "Alive home" business model is based around the value proposition of providing customers 24 hours clean electricity at a cost lower than they are currently paying their utility and with limited upfront cost. The contract will be 20-25 years in order to assist the customer in payments and maintenance (Figure 34).

Currently, in Pakistan smart grid is not implemented. However, in future "Alive home" able to do this by having its customer enter into 20-25 year contracts to purchase the electricity generated by its solar energy systems, which creates a 20 year stream of cash flows (Figure 36).

The National Renewable Energy Laboratory (NREL) has provided a very in-depth analysis of the "Solar Business Models" (Graham, Katofsky, & Frantzis, 2008) (Figure 38). The study shows the evaluation of the business models across the time. Currently, zero generation model has evolved into first generation of business model has taken over market. However, in the future second generation business model

tends to be the dominant business model (Graham, Katofsky, & Frantzis, 2008). Currently, in the global leading solar markets are U.S., Germany and Japan the third-party ownership secures adequate financing support and is expected as dominant business strategy in recent years and future (Graham, Katofsky, & Frantzis, 2008).

In Pakistan the situation is little bit different and it is currently in transition between zero generation and first generation business model. Hence, "Alive home" has to adopt its strategy according to the market situation and gradually implement first generation business model as the technological advancement are up to par with modern world.

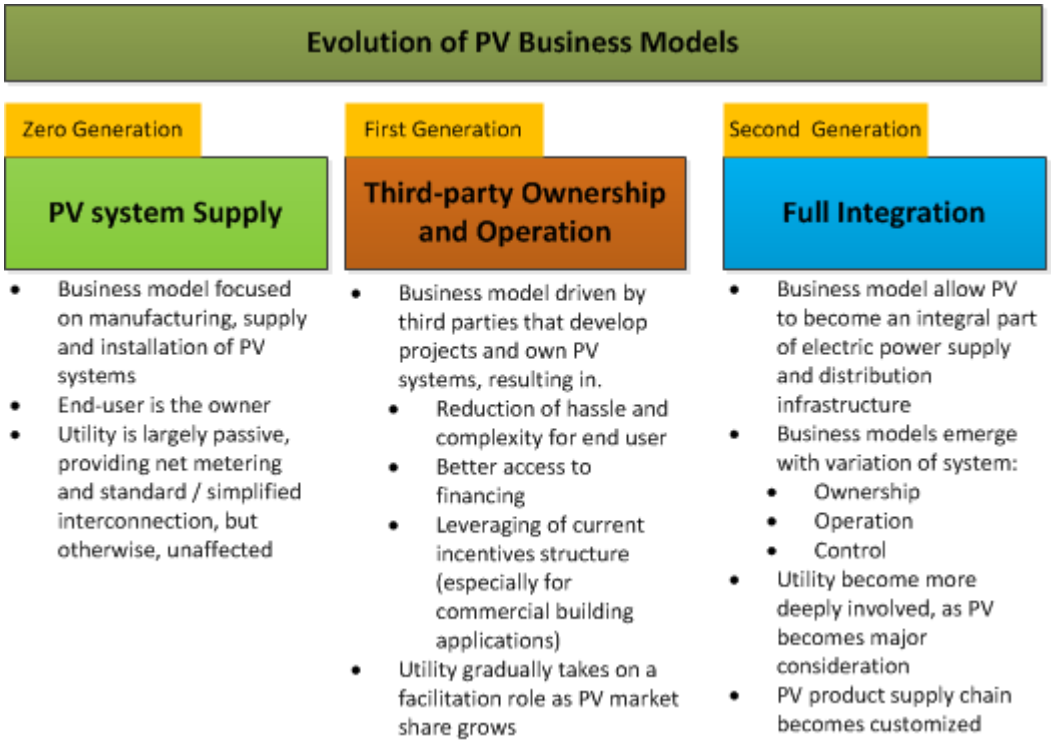


Figure 38. Evolution of PV business models (Graham, Katofsky, & Frantzis, 2008).

As shown in the Figure 38 the solar power market is evolving and Third-party owner ship is providing the end-user a good value. However, Pakistan market is different compared to develop world and based on that "Alive home" divides the strategy in to two main phases of startup phase and future phase strategy.

2.5.2.1 Startup phase strategy

The key focus for "Alive home" is to target Pakistani power consumer, who are facing extreme shortages and power cuts at the movement. The initial prospect of offer-

ing 24 hours of off-grid solar power unit can provide key value proportions for the adopters with features such as (shown in Figure 39):

- Annual variance in overall supply: Continuous power supply to operate basic equipment. The sun provides a stable traffic from year to year with variance ±4%.
- No noise, no waste products and no pollution.
- No fuel consumption (Gas bill reduces drastically).
- Operating costs are very low and no fast moving parts that will require lubrication or maintenance at any point.
- Generally, output follows the short-term fluctuations of the sunlight. However, that's still less volatile than wind fluctuations.
- Healthier environment.

The advantages listed above and shown in Figure 39 will provide the customer to adopt this technology and providing off-grid solution combined with efficient system will increase the product sold by Alive home.
For a larger off-grid solar power production unit the customer will have to enter into a contract with "Alive home" for maintenance and installation while also for financing the financial institution will be the key drivers. The other option will be to pay lump sum payment for the product installed and maintenance contract with "Alive home".Smaller off-grid units and grid-tied units will be sold as one off payment with possibility of maintenance contract with "Alive home".

At the same time "Alive home" will focus providing an ecosystem of products ranging from solar power production units to LED lights, solar heaters, and home power management system to make home power system sustainable and reliable.

To add and attract new customer "Alive home" will demonstrate the innovative technologies that can be used by the customer using solar power units. In Crossing the Chasm (Moore, 2006) (Figure 40), Moore introduces us to the theory of innovations and argues there is a chasm between the early adopters of the product and pragmatists. Since, the pragmatists are need focused and "Alive home" will target the cus-

tomers with demonstration units to attract customers with open days. The demonstration units will include.

Figure 39: Solar power advantage compared to fossil fuel power generation (Global, 2017)

- Home / office setup operated using solar power unit
- Home / office power management system
- Mobile solar power production units

- Power units to operated high powered equipment i.e. tube well, cooling units, irrigation system.

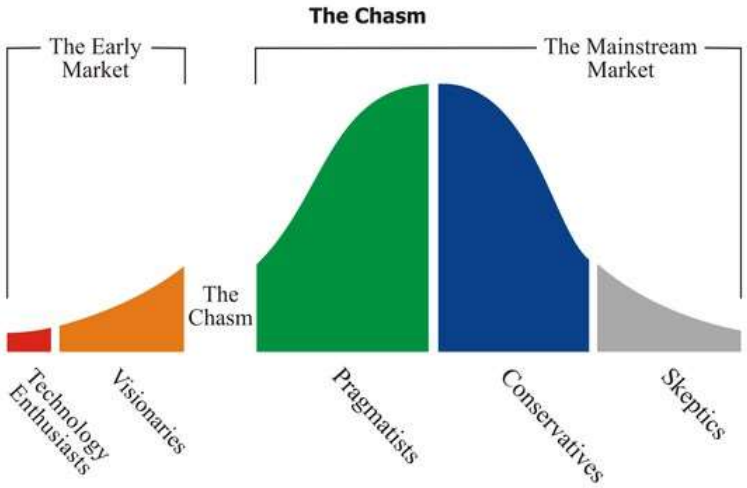


Figure 40: Crossing the Chasm (Moore, 2006)

In our opinion now the pragmatists that make 34% of the technology user are now the key market as the technology is advancing very fast. To target the pragmatists we will focus on developing effective product concept, positioning the product, building a marketing strategy, and choosing the most appropriate distribution channel and pricing.

2.5.2.2 Future phase strategy

In future the distributed energy systems will be reality as smart grid technology is progressing at very fast pace. The smart gird intelligent equipment is will enable consumer to utilize, store and distribute the power with optimum efficiency. The new energy industry, where distributed solar, energy storage, energy efficiency, electric vehicles, smart home analytics, energy literacy, and comfort/lifestyle are coming together and transforming the lives of everyday people. In-order to survive in this highly competitive market the "Alive home" next move will be to capitalize on solar power integration of passive home, smart home equipment and smart grid technologies. The business diversification, as the technologies rapidly evolve, can only ensure "Alive home" survival in the fast changing market. The expansion of business into

connecting technologies and services will be pivot to ensure growth in the future. “Alive home” will focus not just only on home but it will focus on expanding its business to the public sector projects and lead the way from the front in the technology market.

The future phase strategy will be divided into two phases. First, once market is able to offer PPA agreements to end-users (home owners / small business owners), the “Alive home” will offer third party ownership. This will enable “Alive home” will provide consumers with affordable solar price while avoiding extensive energy system upfront costs, maintenance costs and monitoring costs. This will enable the customer to be energy independence and reduction in electricity bills. The second phase will be transition between first generation and second generation business model and it will depend on:

- Customer demands require and purchase patterns
- Additional solar services
- Products in future solar systems, such as energy storage systems
- Technological advancement
- The challenges to system design and cost

3 BUSINESS PLAN

3.1 SWOT analysis

Strengths

- Capable, trained and well positioned team members to carry establish the “Alive home” operations in fast changing market.
- The company will sell product to the customers that will ensure that prices for energy is below utility rates, so the customer will save money.
- Ensure continuity of power supply per customer needs and requirement.

- The company will offer product based on customer needs and will provide customer support. The product offering from "Alive home" is flexible and will offer wide range of product according to customer needs
- The company purchases major components from multiple manufacturers belonging to China and Germany. At least four companies provide the solar panels and four companies that will provide controller and battery packs.
- "Alive home" will run a customer referral program to find new customers. The company offers cash awards to customers who convince their friends, family, and colleagues to become new customers.
- "Alive home" will offer full spectrum of solar power product from solar panels to LED lights and smart management system.
- "Alive home" is focused on developing strategic partnership with property developers to offer products as package for new home owner or during home renovations.
- Solar power units can give uninterrupted supply of power to households and commercial places. Elminaitng, dependancing on utility power supplier and fossil fuels resources.

Weaknesses

- New to Pakistan power market. Aims to disrupt the market with reliable solar power products.
- A Chinese company can install cheaper solar panels in Pakistan.
- High-level of investment needed bank and SMEDA assistance will be required to expand the business.
- Not yet profitable, need to achieve economies of scale.
- "Alive home" will borrow money to pay for an installed large scale solar system. If the value of these systems is lowered for some reason, the company has to pay back the difference. The firm is neither guaranteed that they can borrow money.
- Customers may fail to pay for their installed solar systems and refinancing for "Alive home" units will be need.
- "Alive home" is not manufacturing firm it is sales firm and supply chain can be subjected to fluctuations with higher bargaining threat from suppliers.

- "Alive home" is starting business from small scale due to available capital. The established firm can put it out of business by waging price wars against the "Alive home".
- The cost of installation is expensive for a common man. So only rich people chooses solar energy.
- Logistics will be outsourced due to lack of human resources

Opportunities

- Solar power developers may also negotiate directly with landowners for private lands.
- State is supporting the solar power initiative with lowering tax rates:
    - There is no tax on income derived from generation of electricity since renewable energy and all power projects are exempted from income tax in Pakistan.
    - The withholding tax rate on dividends for wind and solar power projects is 7.5%.
    - No income tax or provincial withholding tax would apply in respect to dividends.
    - Equipment for renewable energy projects is exempted from import duties effective 01-07-2015.
    - Sales tax is charged in Pakistan at the rate of17%.
- Power related problems, for Pakistani power consumer is chronic with massive shortfall.
- People are concerned about the environment, including nuclear and coal power plants.
- Can acquire products, technologies, and enter into joint ventures
- As of 2011, the cost of solar power has fallen well below that of nuclear power and is set to fall further and is continuing to fall further as technology is improving.

Threats

- The traditional utilities that supply energy to potential customers are a threat. Reduction in utility electricity prices or a cheaper renewable energy source will make it unprofitable to install solar panels.

- The solar power units are mostly imported from China and Germany that can be subjected to fluctuation within the supply.
- Only large investors can get higher operating profit from solar energy distribution since it requires huge investment to install, maintain and distribution.
- Pakistan and china business is growing at very fast pace and that may cause the market flooded with Chinese solar power products.
- Some of the consumer is still reluctant to invest in solar power due to (Figure 41): little or no information about solar power units cost of the solar power units and availability of product, Product quality and low level of after sale services.

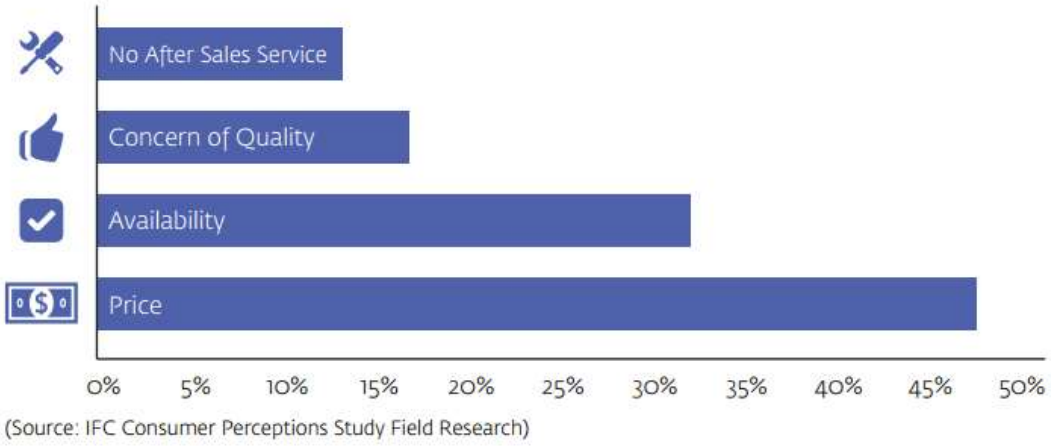


Figure 41: Why People are not Buying Solar Products (Global, 2017).

- Currency risks include those in relation to macroeconomic shocks, such as currency devaluation, inflation, and indexation of various tariff cost components.
- There is no grid connection agreement in Pakistan. The distribution network is very old and will require an update

In summary from SWOT analysis we can summarize that:

- "Alive home" has the resource capacity, technological knowledge and state of the art technology suppliers that can provide reliable product for wide range of customers according to customer needs.
- The "Alive home" success is dependent on market situation, effective marketing strategy, standout branding based on reliability, effectively reaching the customer, ensuring capital for business expansion and exploitation of market using state incentives.

- Customer is willing to spend the money to obtain sustainable energy supply but customer needs persuasion and surety that customer needs will be fulfilled.
- "Alive home" must diversify its business portfolio in order to compete with larger players in the market especially Chinese companies.
- Strategic partnership with property developers will also provide a key contact and sales point with customer.

3.2 Marketing Plan (4P analysis)

The SWOT analysis highlighted the key challenges for "Alive home" project that are directly related to an effective marketing plan. The solar market of Pakistan is still developing and well organized effort is needed to find a strong foothold in the market. To gain market share effective marketing strategy is required. In order to develop a dynamic marketing plan to penetrate Pakistan solar power market this research will use 4P marketing technique. The marketing plan is based on four surveys that include one market survey conducted in this thesis, second interview with CEO of property development firm, third survey obtained from IFC (International Finance Corporation) initiative funded by UK aid and Australian aid (Global, 2017) and fourth survey of Pakistan market conducted by Lamundi firm (Lamudi, 2017). Also the 4P marketing is based on data available online regarding Pakistan solar power demand and supply gap.

3.2.1 Products

The products are (solar power production) systems that generate electricity from solar radiation. The choice of technology will almost certainly depend on the size of the installation and the annual solar irradiance at the site. "Alive home" is startup firm that is focused to provide solar power systems to home owners and small business owners. Solar power production units offered by "Alive home" are ranged below 10KW (Figure 42).

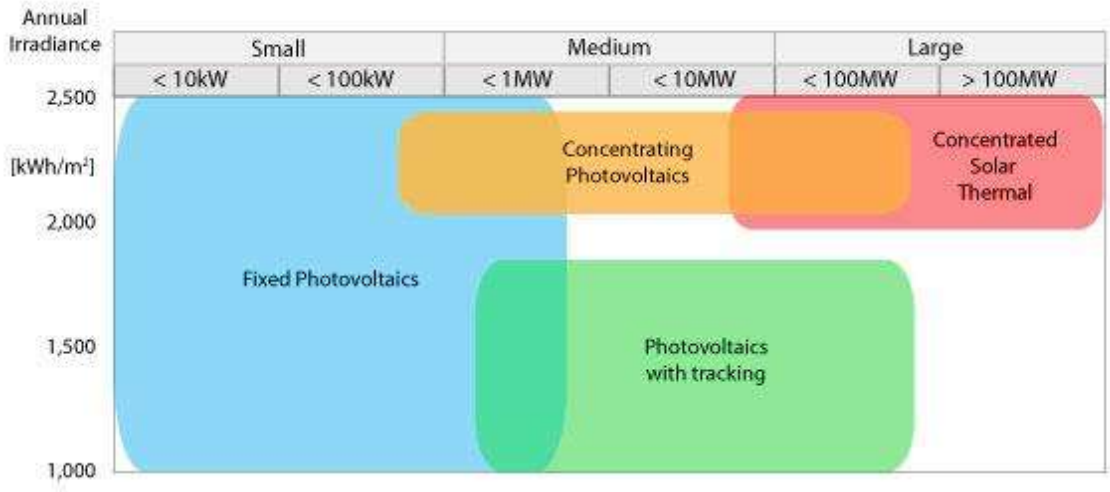


Figure 42: Universal solar power product range description

To bring state of the art solar power systems to Pakistan "Alive home" will be aiming to establish strategic partnership with following firms:

- German firm "Solar world"
- Austrian firm "Smartflower"
- USA Firm "Renogy"
- Chinese firm "SunTech"

The "Alive home" will import products from these fore mentioned companies according to customer demands. The products will be installed on customer premises with required services once the agreements are in place with target companies. The product selections shown in this catalog are from the fore mentioned companies and owned totally by the firms. In this thesis they are used for only educational and information purpose. For commercial purpose these items will be used in catalog once companies agrees with "Alive home" to establish business ties.

Product Range One: Off-grid products

The products described in this section, will enable the customer to power the home (or a small office) independently from utility services. These solutions are off-grid solutions for home and for small business offices.

- Product 1: Smartflower 4.6 kWh fully off-grid solution with integrated battery, controller, inverter, and batter charging unit (Link). This system can cost up to 25000 USD.

- Product 2: 3.36-6.72 kWh roof top Solar-World kits that will include high quality PV modules, the mounting system, cables, batteries, charge controller, inverter, data logging system and accessories (Link see pages 14-15). These are off grid solutions and will power be used to power a household. This unit will cost in between 8000-20000 USD.
- Product 3: Sunfix aero 2.0 mounting units for roof to optimize the solar system power output. The cost will depend on the number of products needed (Link see pages 20-21).

Product Range two: Grid-tied products

These products are focused toward home owner and small offices that are suffering due to power outages. These systems will offer continuity of power supply during power outage. However these systems will power basic function of a home or small office.

- Product 4: Smartflower 2.3 kWh fully grid-tied solution with integrated battery, controller, inverter, and batter charging unit (Link). This system can cost up to 17000 USD. This system will enable the customer full functionality of all appliances during power outages for a maximum of one day.
- Product 5: 100-400 Watt 12 volt secondary solar kits for supplementary power system during power outage. This system can only be used as backup ((UPS) Uninterrupted Power Supply) system with battery packs to supply power for 2-4 hours of power outage. This system can cost between 450 USD up to 1200 USD. This product offering will be equipped with solar panel, charge controller, inverter and batteries (Link). These systems can be mobile and mounted on camper vans and will provide power during vacation trips. This unit will not power fridge, washing machine, cooking unit, AC unit, and heating units. This system only power fans, lights, computer, and communication networks.
- Product 6: 500-800 Watt 12 volt premium solar kits that can power a house for hold during power outage. This system can only be used as backup ((UPS) Uninterrupted Power Supply) system with battery packs to supply power for 4-8 hours of power outage. This system can cost between 2500 USD up to 4500 USD. This product offering will be equipped with solar panel, charge

controller, inverter and batteries (Link). This unit will not power fridge, washing machine, cooking unit, AC unit, and heating units. This system only power fans, lights, computer, and communication networks.

Product Range three: Portable solar chargers

The product in this section will target people who needs to power devices where the power outage is longer or if charging is not available such as during camping or travelling. This will target people from all walks of life.

- Product 7: Sun-charger that can be used as 3 in 1 as a power supply, additional battery and solar charger. This can be used to power devices such as mobile phones, tablets and computers independently of grid (Link see page 36-37). It will cost up-to 30 USD.
- Product 8: Renogy E.FLEX10 Portable Solar Panel to power devices such as mobile phones, tablets and computers (Link). The cost of this device will be 30USD.
- Product 9: The Phoenix Generator 20W All-in-one Solar Kit will be targeting a small house hold communication devices during power outage or during normal use. This device is portable solar power system specifically designed for mobile, off-grid applications, and is ideal for emergencies (Link). This item will cost up to 700USD.

To differentiate from the market competitors the “Alive home” products will be branded as:

- Reliable German imported products.
- Compact in dimensions with optimum efficiency.
- Product range customizable to customer needs and requirements.
- Extensive after sale services and maintenance guide.
- Online system to track product status and efficiency.
- Extensive peripheral to optimize energy storage, utilization and management.

3.2.2 Place

“Alive home” business is focused on selling solar power system and will attract customer by demonstrating the technology. The “Alive home” team members own property that will be used an office for the “Alive home” project. The head office of the business will be the 40-minute drive away from Pakistan capital city Islamabad and 50 minutes away from Peshawar the provincial capital of KPK province. Establishment of two offices in Lahore and Karachi will be launched by the start of quarter nine. The head office will also house inventory store that will be used to house solar power system and logistics of the components will be coordinated from head office location. The head office will serve as demonstration unit since the plan is to power the office using solar power system. The head office will also have display center, at where all portable devices will be demonstrated to customers.

The “Alive home” intends to register www.alive-home.net domain name and will provide the services using online portals. The firm will provide product and service information via website. The website, will also serve as contact and informative portal for the potential customers.

3.2.3 Price

The "Alive Home" project is offering a variety of products to its customers. The products are divided into three different types of ranges and each product houses at least three different types of products.

The first product range is the most expensive product range and the price will range from 8000 USD to 25000 USD depending on the technology and power generation capacity. Each product will be offered with free installation package once it is purchased via “Alive home". The product range one has 2000 USD will carry profit margin per unit. The first product range will serve as an off-grid system to power a complete household. The average unit sales are foreseen to be limited as the technology is expensive and will require a long-term commitment from the customer.

The second product range is the medium priced that will cost in between 2500-17000 USD. The cost again will depend on the system technology and power production capacity. Depending on the system purchased it can be used as an off-grid to power a small household or serve as secondary power supply for a larger household and complement the utility services when power is out. The average profit is limited to 500 USD. However, the product offered to the customer will be price competitive but will charge an installation fee, maintenance surcharge if required, and transportation cost. The key selling point of this product will be that customer does not require signing a long-term contract with the firm.

The third product range falls in portable category range that can be used be used to power personal electronic equipment. The product will have a price range from 30-700 USD. The products will be offered at a competitive price and sold a bundle to the customer. The average profit for this product range is 45USD. However, due to the nature of the product, the firm will rely on high volume of the product sale. The product range will basically target the homes and people that have limited energy needs and require portable systems even when no utility services are available.

3.2.4 Promotion

Promotion is a key entity for "Alive home" project to propagate key organization message to the potential customer. The promotion will enable the firm to reach customers and provide a product to the customer according to their needs and requirements. The "Alive home" target is to forge a long-term relationship with its customer and provide reliable products with dependable services. The promotion will not only focus on acquiring customers but it will also focus on retaining customers by offering promotional upgrades to newer products and free of charge services.

The promotion strategy of the firm is divided into two sections. The first "Alive home" will hire local advertisement firm and outsource the promotion campaign that will focus on TV, on radio, on press/ journalist or on billboards. The firm will also manage the online advertising by effectively using "Google AdSense" and "Facebook advertisement". The second section will be jointly run by "Alive home" man-

agement member and advertisement firm on social media such as Facebook, twitter, Instagram, and YouTube. The promotion message will focus on five key points:

- Utility bills reduction
- Rising costs of fuel
- Sustainable uninterrupted power
- Guilt about emissions and global warming (especially focus on local environmental desaturation)
- Affordability and Competition

The third complementary promotional section will be PR (Public Relation) campaign that will involve only the "Alive home" team members visiting local communities, universities /colleges campuses, trade exhibitions and community exhibitions. In this targeted operation the along with five key points of promotion, the "Alive home" will target potential future customer and educate them about the importance of the renewable system and cost saving advantage. This will not only attract customer these events will be used to serve the communities that are in need of solar power systems due to deprivation and provide technical training to students by offering internship and train them as potential employees.

The local advertisement firm and Alive home will enter into the contract on the quarterly basis. The promotional campaign will be aggressive to market the product in Q1 and Q4 that will focus on selling off-grid power systems mainly since the power outages are more evident and customers are expected to shop during the spring-summer peak season. Q2 and Q3 Autumn the power shortfall is smaller hence the focus will be on grid-tied and portable solar power units with discounted price tag offers.

The promotional firm will also be responsible for:

- Writing and releasing professional press releases regarding "Alive home"
- Produce and release TV and press advertisement campaign
- Design and install billboards advertisement
- Arrange and ensure slots for firm on technology event

The key mindset of our advertisement campaign will be "stop selling and start educating" the customer about benefits of current and future technologies.

3.3 Operation Plan

“Alive home” values its customer and intent to is intending to establish long-term relationship to ensure sustainable power supply with effective management system. The fast pace evolution of technology is transforming the business market and company that can evolve exploited the need of customer with technological innovation will survive the competitive market. The “Alive home” operating plan is based on the organization strategic goals of using future innovation and effective integration with existing infrastructure to drive firm growth

3.3.1 Startup Phase (2018-2020)

During the startup phase, the organization will focus on delivering solar power production system to customers and establish credentials within the competitive market. The initial customers are important to the business as they will serve as sales reference and statistics for the organization (Figure 43). The firm will import products from a reliable strategic supplier and will add value for a customer by managing sales, installing the systems, operating the system, optimizing the power production from the system, maintaining the system and upgrading the customer power management system to maximize the power utilization.

The first phase for “Alive home” will last from 2018-2020 and the focus of the project will be to provide solar power production units and establish business on solid financial grounds. At the end of this startup phase the project must be able to diversify business portfolio based on its own funds and attracting new investors.

Year	2017-2018				2018-2019				2019-2020			
Period	Q1 Jun-Aug	Q2 Sep-Nov	Q3 Dec-Feb	Q4 Mar-May	Q5 Jun-Aug	Q6 Sep-Nov	Q7 Dec-Feb	Q8 Mar-May	Q9 June-Aug	Q10 Sep-Nov	Q11 Dec-Feb	Q12 Mar-May
Project Phase												
Develop business plan												
Strategic partnership establishment (supply)												
Strategic partnership with property developers (Pakistan)												
Sign contract for product supply (MOUs)												
Sign contract for logistics												
Sign contract for Advertisement												
Renovate the office space												
Capital investment resource conformation (SMEDA) (Investors) (Banks)												
Training of technical team and sales members												
Order placement to supplies to demonstration units and initial inventory												
Installation of demonstration units												
Quality control of inventory received												
Launching ceremony of the project												
Marketing and sales campaign launched												
Road show across the region to attract potential customer. Demonstration of technology												
Organization focus on solar technology Sales, installation and maintenance of the solar power systems												

Figure 43: Startup phase opertional plan for "Alive home" project.

3.3.2 Near future (2021-2025)

"Alive home" project is focused on providing uninterrupted power supply solutions that are sustainable, renewable, and reliable. To ensure future business growth the "Alive home" project will provide state of art technologies to the customer with an option to complement the usability of the purchased product and compatibility of the product with future technological advancements. . In the second phase from 2021-2025 The Alive home will target:

- Investing into public projects to ensure market presence to supply renewable power national grid. The first plan is to develop 50 MW solar power production plant at "Quaid-e-Azam solar power park" in Punjab by end of 2023.
- Implementation of the PPA model for homeowners as the national grid will be updated and distribution networks will be modernized. This will boost the established product sales from the first phase.
- Investing into "Passive house" technologies by end of 2021 and building 3-4 units of the passive house. This will demonstrate the effectiveness of energy conservation and optimized use of energy.
- Secure passive house licensing for units that will be sold by "Alive home".
- Secure public (national/international) and private funding for the developing manufacturing base for passive house units (e.bg. doors, windows, insulation, passive house approved designs etc.).

3.3.3 Long term future operation plan (2025-2035)

The "Alive home" project will also diversify its business portfolio in the distant future. The future operation plan will focus on three main regions:

- Extend the existing solar infrastructure base across Pakistan power supply spectrum. Investment into public sector power production units.
- Licensing technology and experience gained during the first two phases. That will include passive house and solar power production technologies.
- Investing into the smart homes and smart electric car technology industry. Smart home technology will complement the sustainable power source and passive house technologies. At the same time investment into TESLA supercharging ports powered by renewable resource will be next step. Diversifying, the solar panel business into solar roof tiles technologies.
- Development of biogas and biomass power production infrastructure for farming communities.

3.4 Financial Plan

3.4.1 Initial capital investment

The initial capital requirements for “Alive home” are presented in Table 1 below. The cost of establishment 81700 USD will be needed as an initial investment. The “Alive home” partner owns property that is located very close to capital city Islamabad. Hence the investment into office space will be restricted to the renovation of the property. The business is technology intensive; hence, demonstration units will be built on office site. The demonstration unit will serve two main purposes:

- Demonstration of technologies provide by “Alive home”.
- Attract customer.
- Powering “Alive home” business with sustainable technologies to reduce carbon emissions.

Table 1. Alive Home project cost of establishement

Serial No.	Description	Amount (USD)
1	Property renovation	10000
2	Business establishment fees and legal costs	3000
3	Office furniture	10000
4	IT computer and communication equipment	5000
5	Launch advertising	5000
6	Promotion contract	5000
7	Display unit rooftop (3.36 kWh) Off-grid system	8000
8	Display unit rooftop (500-800 Wh) Grid-tied System	2500
9	Display unit portable (100-400 Wh) Grid-tied System	1200
10	Display units portable devices (<10Wh) System	1000
11	Initial logistic contract	1000
12	Initial inventory of solar system	30000
	Total cost	81700

3.4.2 Projected income and cash flow statement

The Table 2 shown below represents the projected income statement and cash flow with expected revenue and operating cost for the first eight quarters. The solar power system sales are susceptible to seasonal demand. The highest demand is expected in the Q1 (June-August) and Q4 (Mar-May) as the supply to demand ratio drastically increases. At the same time, a marketing and promotion push will be launched to attract potential customer using data from the survey conducted earlier. The Q2 (Sep-Nov) and Q3 (Dec-Feb) are calculated as pessimistic because “Alive home” is not offering solar water heaters during initial phase. The Q2 and Q3 reduction in sales can also be off-settled by offering discounted prices on off season inventory. However, the key idea of business is to implement JIT (Just in Time) and reduce the inventory cost to a minimum. The first eight quarters are critical for “Alive home” project as it will target pay off initial investment and will have 436059.6 USD to diversify the business portfolio.

Table 2. Projected income statement for the first eight quarters

Revenues	Q1(June-Aug)	Q2 (Sep-Nov)	Q3(Dec-Feb)	Q4(Mar-May)	Q5 (June-Aug)	Q6(Sep-Nov)	Q7(Dec-Feb)	Q8(Mar-May)
Product Range One (Average units/month) sales	10	6	6	15	20	10	10	20
Product Range One (Average profit / unit) USD	2000	2000	2000	2000	2000	2000	2000	2000
Product Range One (Average profit / Quarter) USD	60000	36000	36000	90000	120000	60000	60000	120000
Product Range Two (Average units/month) sales	30	25	25	35	40	30	30	35
Product Range Two (Average profit / unit) USD	500	500	500	500	500	500	500	500
Product Range Two (Average profit / Quarter) USD	45000	37500	37500	52500	60000	45000	45000	52500
Product Range Three (Average units/month) sales	150	150	150	160	200	180	160	200
Product Range Three (Average profit / unit) USD	45	45	45	45	45	45	45	45
Product Range Three (Average profit / Quarter) USD	20250	20250	20250	21600	27000	24300	21600	27000
Total Revenue	**125250**	**93750**	**93750**	**164100**	**207000**	**129300**	**126600**	**199500**
Operating Expenses								
Technical-management Average salary / person USD	4500	4500	4500	4500	4500	4500	4500	4500

Staff Salaries (5 members) USD	22500	22500	22500	22500	22500	22500	22500	22500
Logistic base contract fee USD	1000	1000	1000	1000	1000	1000	1000	1000
Logistic fee range one average /unit USD	800	800	800	800	800	800	800	800
Logistic fee range one average /unit USD	400	400	400	400	400	400	400	400
Logistic cost USD	20000	14800	14800	26000	32000	20000	20000	30000
Advertisement Contract USD	10000	5000	7000	10000	10000	5000	7000	10000
Office expenditure USD	4000	4000	4000	4000	4000	4000	4000	4000
Insurance and legal fees USD	5000	5000	5000	5000	5000	5000	5000	5000
Communication contracts USD	2000	2000	2000	2000	2000	2000	2000	2000
Total Operating Expenses	**64500**	**54300**	**56300**	**70500**	**76500**	**59500**	**61500**	**74500**
EBIT (Earnings before interest and taxes)	**60750**	**39450**	**37450**	**93600**	**130500**	**69800**	**65100**	**125000**
Initial investment loan (10% interest)	89870	78636.25	67402.5	56168.75	44935	33701.25	22467.5	11233.75
Loan quarterly installment	11233.75	11233.75	11233.75	11233.75	11233.75	11233.75	11233.75	11233.75

EBT (Earnings before interest)	49516.25	28216.25	26216.25	82366.25	119266.25	58566.25	53866.25	113766.25
Sales taxation (18% VAT)	8912.925	5078.925	4718.925	14825.925	21467.925	10541.925	9695.925	20477.925
Earning	40603.325	23137.325	21497.325	67540.325	97798.325	48024.325	44170.325	93288.325
Accumulated earning at end of period	40603.325	63740.65	85237.975	152778.3	250576.625	298600.95	342771.275	436059.6

4 CONCLUSION

This thesis has presented a detailed business plan for the development of business and evaluation of Pakistani market for solar power businesses. Specifically, it has focused on the development of business plan of renewable power system for Pakistan market. Due to the Pakistan solar power potential the solar power system has been focal point for this thesis business plan.

This work has made key contributions to the knowledge for developing lean business plan for solar power business in Pakistan. This contribution has been divided into chapter 1, chapter 2 and chapter 3 of this thesis. The first set of contribution included a detailed study of Pakistani market consists of solar power production potential analysis. The study also includes resources references to studies that shows that Pakistan power supply and demand has huge gap and can be only be bridge if and only all available resources are exploited. Solar power production units are one of the key resources that can be used all over Pakistan, which can be used to take advantage of 300 days of sunshine per year. The second set of contribution included a detailed resource analysis, opportunity analysis using PEST and porter five force analyses, Customer market survey, and situation analysis. The knowledge gained from first and second set of contribution was used to develop business model for "Alive home" project. The third set of contribution in chapter three is basically a detailed roadmap on how to implement and execute the business model for this research work. The third chapter contribution includes a detailed SWOT analysis, 4P marketing plan, operational plan and financial plan in order to execute the project.

The research study showed that there is high possibility for "Alive home" project in starting up a successful business in solar power systems. The reason for going into the Pakistan solar market are, low entry barrier, very attractive and large market, right environment for solar power production and growing middle class with buying power. The study presented in this thesis has shown the readiness of firm to acquire the required human resources for conducting solar power business. The "Alive

home" also has financial means to startup the business with help of Pakistan government SMEDA loan and banking sector for the initial phase.

In the current stage the Pakistan solar power industry is in establishment and growth phase. The public power outage has caused the customer to provide back power using fossil fuel generator. The fossil fuel power generation is susceptible to fluctuation due its price variation and also contributing to degradation of the environment. The data collected using market survey indicates that customer is willing to invest in solar power according to their needs. The same conclusion was reached, after the situation analysis of Pakistani market. Based on these critical analysis business plan was developed and that showed with right planning the solar power system can be a value-added item for the customer. The critical SWOT analysis shows that "Alive home" possess the right advantages that can enable the project to capitalize on the opportunities that are available right now in Pakistan. The marketing plan will focus on the customer needs and demands with clear message to enable the customer to reduce the utility bill, sustainable and constant power that will not be effected with rising fuel prices, reliable product, and with affordability to attract customer. The "Alive home" will also target customer from all walks of life that includes off-grid system seekers, grid-tied system wisher and portable specific charging device to cater for customer needs.

"Alive home" aims to survive in a market that will be constantly growing and changing in terms of demands and technologies. With low entry barrier, more and more competitors are going to enter the market. However, the "Alive home" will tackle this situation with plan to diversify its portfolio down the line. The project will start as solar power system producing company but it will evolve its tactics and also invest in public projects; venture into passive house technologies in near future and for long term future the company will target investment into smart homes technology along with electric car charging technology.

It is very difficult to determine any situation before hand. This thesis provides most of the information that can be prepared before entering the market. But other information regarding the market must be tested along the way as the company launches its products into the market. "Alive home" project will be adaptive and adjust its product range to adjust along the market demands and needs.

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APPENDICES:

Appendix I: Online market customer survey (Pakistan)

Do you rent or own your home?

- Rent
- Own

What is your approximate annual household income?

- 20k or less
- 20 - 30k
- 30 - 40k
- 40 - 50k
- 50k plus

Where is your home located?

- City Centre
- Urban
- Suburban
- Rural

Which description best describes your household:

- Yourself and your partner living together
- You living alone
- You living with your children
- You and your partner living with your children
- You living with friend(s)
- You living with your parent(s)

How would you describe your property?

- Flat/Apartment
- Detached House
- Semi-detached House
- Bungalow
- Maisonette

- Other

Are you aware of Climate Change?

- Yes
- No
- It does not exist

Does Climate Change concern you?

- Yes
- No

How important is it that we act on Climate Change now?

- Very Important
- Important
- Not Important
- Climate Change is not happening
- Don't care

How concerned are you on the effect that Climate Change is having on our planet?

- (•) Very concerned
- Slightly concerned
- Not concerned
- Very unconcerned

How aware are you of Solar Energy Technologies?

- Very aware
- Slightly aware
- Unsure
- Unaware

Do you have any Solar Energy technology installed in your home?

- Yes
- No

If 'Yes', what type?

- Solar Thermal (hot water)
- photo voltaic (electricity)
- Both types

Would you like your home to use less electricity?

- Yes
- No

14.If you were to consider purchasing a solar energy system for your home, which are the TOP THREE difficulties you would be likely to experience?

Please rank the top three: 1 being the most likely

3	Initial Cost/ obtaining a good price
	Finding a trustworthy contractor
	Choosing the correct technology
	Obtaining correct and reliable information
	Good return on investment
	Technology may become obsolete too quickly

15.Have you any knowledge about passive house technologies?

- ☐ Yes, I know about it
- ☐ No, I have no idea about it
- ☐ I have limited knowledge about it

16.Would you like to save money by investing in solar power system to provide you power?

- ☐ Yes, I would like to invest and live off grid
- ☐ Yes, I will use it as a secondary power source
- ☐ No, I don't need it because it is not very cheap to setup
- ☐ No, I don't want it at all

17.What are for you the disadvantages to using renewable energy over tradition gas or electricity energy?

- ☐ I don't see any disadvantages to using renewable energy
- ☐ Installation cost
- ☐ Efficiency
- ☐ Reliability
- ☐ Feel it is not fully established
- ☐ Lack of information, services, and availability

☐ Other, please specify:

18. If you were interested in a solar energy system, how soon would you like the installation to take place?

- ○ Within a month
- ○ Within 6 months
- ○ Within 12 months
- ○ Within 24 months
- ○ After 24 months

19.How would you finance the cost of a project to install solar energy system?

- ○ From own funds
- ○ Loan (all the funds)
- ○ Loan (some of the funds)
- ○ Credit card

20.If you were to consider purchasing a solar energy system for your home, which are the TOP THREE benefits you are likely to enjoy?

- Reducing gas bill
- Energy security
- As a source of income from selling excess energy generated
- Environmental responsibility
- Reducing electricity bills

21.If you wished to receive information about the benefits of solar energy, which method would you prefer?

- ○ Door to door sales person
- ○ Advertisement on television or radio
- ○ Information leaflet/letter through the post
- ○ Direct email
- ○ Online information website
- ○ Telephone

- Friend referral
- Other, please specify:

22.What type of promotions would encourage you to purchase a solar energy system?

- Over time payments
- Loan without interest
- Discounts
- Free maintenance for a certain period of time
- Free installation
- Other, please specify:

23. What factors would prevent you from installing Solar Energy Technology?

- Affordability
- Inconvenience
- Lack of awareness
- Lack of interest
- Lack of trust in the technology
- Other (please specify)

24. Would you rather spend your money on...

- Aesthetical home improvements
- Maintenance
- Installing Solar Energy Technology

Appendix II: Property development chief operating officer interview

Contact Person: Zaka Ullah Fahim (founding member, chief operating officer Zaida, KPK)

Organization: Saiban property marketing

Interview Questions:

1. How do you view the current state of Pakistan's real estate market?

The market is expanding very fast since 2000 and now the market has been even more demanding as people are investing heavily in the real estate. The people normally consider real estate as good investment. At same time number people are investing also build their own homes as the middle class is growing at faster pace now.

2. What are the challenges the property sector faces?

Since 2013, Pakistan state has put very heavy taxation on the property business and it is proving to be one very big hurdle towards the market growth. The next issue is with public services such as electricity supply, gas and water supply infrastructure it is very slow bureaucratic process from the state.

3. Is it true that the power shortages are a key problem for house new owners and developers?

Yes public power supply is in shortage and all of the property developers are offering backup power generation. It is very big cost as the power cuts are very frequent, the operation of back power is connected with fossil fuel prices and it is very uncertain bill to manage. When developing a property we focus on providing backup power for our customer.

4. Is it true that the renewable energy such as solar, wind power, biogas etc. is considered by home owners?

Most of the customer are concerned about a secure power supply they always ask us question regarding continuous power supply. Some of the customers that are well informed also ask us if we can provide power supply that is based on solar power. In short yes customers do demand solar power quotation from us. However, we have no experience with managing solar power supply systems.

5. Will real estate developers offer renewable energy such as solar power as a package as a property development?

I think the future is taking us in that direction for sure. Solar power seems to be the future of power generation and in our case we would also like to obtain solar power systems for housing project to ensure sustainable and reliable power source.

6. What are offers made to the customer by real estate developer to ensure (electric) power security?

For now normally if the customers as for backup power supply, we can equip the home with fossil fuel power generator. However, I have seen some of our customer has equipped their homes with solar power panels on their own.

7. Do you think solar power can add value to a property when sold in Pakistan real estate market?

Yes, for sure it is very attractive offer to customer. The solar power has various advantages to the customer especially there is no running cost.

8. Is Pakistani homeowner ready to purchase solar power to replace conventional power systems with renewable resources?

Yes, the home owners are fed-up with continuous and long disruptions in public power network. An independent off-grid will be very attractive prospect for the customer. The only drawback is that it can carry huge initial investment if one wants to live off-grid. In my opinion an attractive offer from a solar power provider can exponentially increase the customer base. Lack of availability of product and services regarding reliable products are also key hurdle solar power providers needs to overcome.

9. Do you think providing solar power to Pakistani homeowner is a lucrative business market?

The power supply issues are not going away anytime soon so answer is yes. The solar power as I mentioned can be possible future business for both public and private sector.

10. Does Pakistani customer has funds to buy solar power products in order to secure power security using renewable resources?

Yes, with correct product range that can fulfill customer needs the consumer is ready to invest. However, not all customers will go off-grids so the product range offered

must cover off-grid, grid-tied and mobile solar units. Already solar power sector in Pakistan is picking pace and next 5-10year the market will be key entity that can replace fossil fuel generators.