

Notre Dame University - Louaize
Faculty of Business Administration & Economics
Graduate Division

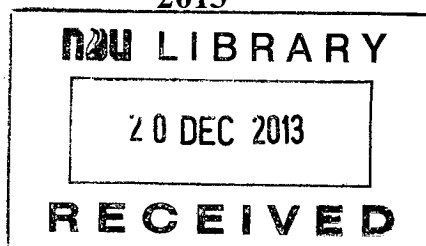
Assessing the Implementation of Green Mobile Telecommunication
Systems in Lebanon: A Consumer Perspective

A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree
of the Master of Business Administration
(M.B.A.)

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NDU-Lebanon

2013



Approval Certificate

Assessing the Implementation of Green Mobile Telecommunication
Systems in Lebanon: A Consumer Perspective

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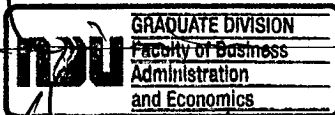
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DECLARATION

I hereby declare that this thesis is entirely my own work and that it has not been submitted as an exercise for a degree at any other University.

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ABSTRACT

Mobile telecommunications are one of the fastest developing sectors in the world. Both high usage and demand gather to show how this sector is increasing especially with the energy resources it requires to operate. Mobile telecommunications have a direct effect on the environment related to the usage (users' behavior, network's interaction, power and energy saving, etc.). Therefore, there is a serious need of going green in mobile telecommunications. The telecommunications sector in Lebanon is complex as different inter-related parties such as the government, the private sector, and the consumers are involved in this sector. The main objective of this research is to assess the consumers' awareness and willingness to pay to go green in mobile telecommunication. The theory of planned behavior is used as the conceptual framework to assess the consumers' behavior towards green telecommunication. Questionnaires were conducted in four areas in Lebanon (Jdeideh, Haret Hreik, Roueis, and Maameltein) that were selected based on the traffic profile (voice and data), number of distinct users, locations, population, and workplaces. Three hypotheses were verified: 1) the Lebanese consumers (around 70% of the respondents) are aware of the negative environmental and health impacts of telecommunications; 2) the Lebanese consumers (about 75% of the sample) are ready to pay higher mobile fees if green telecom systems are to be applied in Lebanon; 3) variables such as attitudes, perceived behavioral control, and subjective norms affect the consumers' intention to go green in mobile telecommunications. The main findings suggest that about 83 % of the respondents are likely to adopt green mobile telecommunications if implemented; around 70 % of the respondents are certain to have future plans for going green in mobile telecom. Statistical analyses performed showed high significance of the model used (99%). Results showed that the Lebanese consumers' intention to go green in mobile telecom was affected by attitudes towards 'green', subjective norms, perceived behavioral control, and different socio-demographic factors.

Keywords: *Green mobile telecommunications, theory of planned behavior, willingness to pay, environmental awareness.*

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AKNOWLEDGMENTS

The first and last thanks are to God, that only due to the blessings I got, I was able to finish my thesis. "I can do everything through him who give me strength" (Philippians 4: 13).

I would like to start my gratitude to Father Walid Moussa and Father Bechara Khoury for their support, push, attention, and help in building my academic life at NDU.

I would like to express my gratitude to Dr. Nancy Kanbar for her guidance, contribution, support, and expertise that led to the completion of this research. Dr. Kanbar supervised all the steps of this research and provided support in all the aspects of the study. In addition, special thanks to Dr. Atef Harb for his review and comments throughout the development of this research and to Dr. Wessam Chibani who revised and edited my thesis.

Also, I would like to recognize the Faculty of Business Administration and Economics, which welcomed me into the graduate program, and offered me continuous support throughout my studies.

Special thanks to "mon autre" and my family who contributed in my achievement by supporting, caring, and believing in my work.

Finally, I would like to thank all those who trusted in me and my work, prayed for me, and helped me directly and indirectly in the research.

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Chapter 1: Introduction

1.1 Background: Mobile telecommunications

Mobile telecommunication is a fast developing field. The result of several years of work includes mathematical, scientific new solutions, and theorems funneled in order to optimize the output (Von Alven, 1998). The mobile telecommunications system (GSM or Global System for Mobile Communications, originally Groupe Spécial Mobile) is divided into several main parts: starting from the Mobile Station (MS), till all the stations found to operate any mobile telecommunications network (Kabir, 2009). Each station's components are issued from different technologies, and in order to turn green, those components must be changed into environmentally friendly ones. In addition to the stations, the back offices in the telecommunications domain require information technology (IT) solutions and implementations. The usage of computers accounts on most of the power consumption in the offices: half of computer offices are left powered-on over the whole week days and even over the non-working hours which account for 75% of the energy consumed (Bray, 2006). Changing hardware is not enough, but software, features, and operations techniques as well must be changed. In order that the equipment function for optimal operations (less power usage), the hardware is to be guided by well-designed software and features. As an example, the concept of stations' cells rest (sleeping mode of the transmitters and receivers 'Idle time is minimized') is applied in several networks: the reduction of the mobile station's transmission reduces the transmission power by that the energy consumption (Sachs, Amann, Tuazon, Mendelsohn, & Rainer, 2004; Blume, 2011; Onorati, Malizia, Díaz, & Aedo, 2011). Green mobile telecommunications aim to reduce the electromagnetic pollution to people

and environment. The reductions of the radiation limit, the implementation of creative call routing algorithms to reduce the electromagnetic pollution and radiations that will be minimized, are found to ensure safer mobile telecommunications (Avadhanulu, 2011). Going green also saves money since fuel price is increasing; maintenance cost is lower for green solutions (Chandrashekhar, 2002). All subparts of the mobile telecommunications business can be turned into environmental friendly solutions in the appropriate management investments; for that cost analysis was conducted and normalized to cover all the stations in the network to be considered as a total green mobile telecommunications system where the contribution from local emissions dominated the total costs contributing in around 4% of the GDP (El-Fadel & Massoud, 2000). Energy saving and emissions decrease are the main concern: green action plans were established with standardization, green-packing, equipment energy saving, e-business, and environmental protection in order to go green in mobile telecommunications in china as this is being applied in the world (Li, 2008).

1.2 Rationale of the study

With more environmental degradation, going green became a necessity. New statistics in the world show that around 87% of the world's population use mobile phones (Gercke, 2011). In Lebanon, the increase of mobile telephone users was observed in mobile telecommunications. The need of going green in a sector covering a large number of people is crucial. The influence on the numerous usages of mobile services is affected by the strong support for the effects of motivation, attitude effect, pressure, and follow up, control users (Nysveen, Pedersen, & Thorbjornsen, 2005). Mobile

telecommunications help in the reduction of the environmental degradation and enhance systems (Akyildiz, Gutierrez-Estevez, & Reyes, 2010). Enhancing mobile telecommunications, especially going green, decreases emissions and helps in solving the environmental degradation due to pollution affected by power consumption caused by transportation, heating, air conditioning, and equipment recycling (Bauer, 2008). For the purpose of going green in the mobile telecommunications arise different research focuses such as (a) environmental degradation due to mobile telecommunications, (b) consumers' awareness of environmental degradation (affecting users, non-users, operators, vendors, etc...), (c) the cost of going green in mobile telecommunications (while optimizing the cost of changing into green and using as much as possible the already implemented system), and (d) the willingness of the consumers to pay extra costs while saving different environmental degradations expenditures. Zero emissions (through energy consumption, recycling, and lead-free soldering) are important goals for different technologies; especially in telecommunications where solar systems, grid and infrastructure, green construction, transportation, water, and waste contribute in the environmental degradation (Barnes, 2006; Kanellos, 2010). Going green requires a lot of resources, equipment, investment, management, and dedication. Green material manufacturing, green awareness, health degradation, noise pollution, and energy consumption are considered the major contributors in turning into environmental friendly mobile telecommunications (Stoner, 2011). In this study, customers are assumed to pay the cost of going green in mobile telecommunications. In order to push customers to go green, behavior, awareness, and many other factors are being studied using the theory of planned behavior.

1.3 Objectives of the study

Mobile telecommunications is a field where different technologies combine for providing mobile services. Mobile telecommunication is one of the fastest growing sectors in Lebanon where a lot of consumers use it extensively. Going green is not an easy task especially in mobile telecommunications. The objectives of this study are: 1) to assess the Lebanese consumers' awareness of the environment and health effect of mobile telecommunication, 2) to examine consumers' willingness to pay to go green in mobile telecommunication systems, and 3) to study the influence of attitudes, perceived behavioral control, and subjective norms on the Lebanese consumers' intentions to go green in mobile telecommunications.

1.4 Research questions

This thesis will include an assessment of the Lebanese consumers' awareness of the environmental and health effect of mobile telecommunication as well as their willingness to pay higher monthly mobile fees to apply green systems in Lebanon. Therefore, the thesis will answer the following research questions:

- A. Are the Lebanese customers aware of the negative environmental and health effects of mobile telecommunications?
- B. Are the Lebanese consumers willing to pay higher mobile fees where green telecom systems will be applied in Lebanon?

C. What is the influence of attitudes, perceived behavioral control, and subjective norms in explaining the Lebanese consumers' intentions to go green in mobile telecommunications?

1.5 Structure of the study

In this thesis, the following chapters are included in the following order:

Chapter one gives a general introduction about mobile telecommunications highlighting the importance of green transformation and followed by the objectives and research questions. Chapter two highlights the studies related to green mobile telecommunications, the development of mobile telecommunications, and the need for green transformations along with different systems costs. Also, it includes other studies related to the chosen models and different applications. Chapter three explains the theoretical model (Ajzen's theory of planned behavior) with the methodology for building the questionnaire as well as descriptive and regression analysis. Chapter four discusses the findings and the different regression models. Finally, chapter five presents the conclusions, research limitations, and recommendations.

Chapter 2: Review of the Literature

After examining the background of mobile telecommunications, setting the objectives and research questions and defining the structure of this study, chapter two describes the evolution of mobile telecommunications including green systems. In addition, this chapter presents the degradation and effects of the application of environmentally friendly solutions and shows the differences among these systems. The theory of planned behavior and its application in the environmental field is presented in this chapter.

2.1 Green telecommunications

2.1.1 The development of mobile telecommunication

The development of mobile telecommunications was fast. Its necessity has increased and this is obvious as the large number of mobile users and stations is increasing day after day.

Mobile telecommunications have a direct effect on the environment related to the usage (users' behavior, network's interaction, power and energy saving, etc.). As much as the second Generation -2G (mainly the normal usage of voice calls, simple data via GPRS 'General Packet Radio Service' and EDGE 'Enhanced Data rates for GSM Evolution' technologies) has been developing rapidly, and the newly implementations of the 3G (3rd Generation Mobile Technology) has been implemented in around 73% of the world's countries. "In 2010, 143 countries were offering 3G services commercially, compared to 95 in 2007" (Telecommunication Standardization Sector ITU-T, 2010, p19). In 2012, the U.S. Department of State states that 196 countries are found around the world. Statistics indicate the growth of the mobile usage comparison 2G & 3G performed

by the ITU-T as from 2 to 5 billion of mobile cellular subscriptions (2G and 3G) respectively since 2005 till 2010 (5,981 million subscriptions all over the world, as for 349 million subscription in the Arab states); retrieved and proven in the global telecom indicators for the world telecommunication sector (ITU-T, 2011). The increase in the number of users is directly proportional to the equipment usage (more pollution results from more usage of the equipment). The work has been extensive to ensure mobile telecommunications services all over any country: the implementation of “Alternative Energy Program” in Qatar by Alcatel-Lucent in 2008 has shown a turnover in providing telecommunication mobile services to far users and future possible ones in rural areas (Narlikar, Govindaraj, Naidu, & Nandi, 2010). Mobile telecommunications represents 28% of the total world energy consumption (Somavat & Namboodiri, 2009). In Lebanon, the same pace is perceived: data usage (browsing the internet, downloading, chatting, voice over IP calls, etc....) and voice usage is increasing beyond the forecasts and has exceeded five times since only one year (Alfa, 2012). In the Lebanese market, the usage of the mobile telephones has been increasing at a fast pace (over three million mobile users in Lebanon). In order to go green in telecom business, it is important to check if customers are ready to increase their payment. More mobile telecommunication usage means more subscribers. In order to serve more subscribers, we need more stations, more hardware, and more energy consumption; thus, more environmental pollution.

2.1.2 Environmental and health degradation and effects

After what the world has faced of deteriorations in environment through noise, electric energy, pollution, and others, the idea of making a waste-free world started to

take place (Annual Energy Review, 2010). Abido (2010) showed that environmental protection has become a major concern. People are likely to associate environmental problems with health quality in their surrounding (Wind, Van Sickle, & Wright, 2004). The high cost of environmental degradation in Lebanon is the major contributor in going green in different sectors (Sarraf, Larsen, & Owaygen, 2004). In order to go green in mobile telecommunications, changing hardware, software, features, behaviors, and awareness started to take place in order to have a green system. Sustainability of systems during emergencies must be present (Gaynor, Brander, Pearce, & Post, 2009). On the professional level, if the employee is more socially responsible, he/she will be presenting more adaptation and more flexibility; this is elaborated in “The Nokia Siemens Networks' environmentally sustainable business (ESB) program that allows working closely with operator customers to evaluate the performance of installed equipment and to implement the most environmentally sustainable solutions in the future” (Baburajan, 2008; Goel, Tiwary, & Schmidt, 2011). For any new technology adoption, customers must change their behavior and must have more knowledge and awareness prior to overcome new technology adoptions (Simonsen & Dick, 1997). Awareness is a necessity: the reduction of time spent over the phone, the replacement of phone calls with SMS, and the internet applications will reduce and limit the exposure to radio waves (Stoner, 2011). Going green is not an easy task; it must include more than just consumers' awareness or willingness, but also mobile telecom companies' management and government's approvals since the sector is under the Ministry of Telecommunications' authority and governance (Shah, 2008). The effects of mobile telecommunications on the environment can be highlighted in the following: “Energy transfer to water molecules, leading to a

temperature increase of the tissue” is the only mechanism of how the Electro-Magnetic Field (EMF) impacts health at small non-harmful measures, as per the International standards (Marino & Galloni, 2011, p 765). As for microwave links, it can cause a lot of transmitted frequencies on a very high output power that might cause diseases (Osepchuk, 1996). Wind Turbine or solar panels replacing ordinary generators are green solutions related to mobile telecommunications. Capital cost of implementing wind turbine is higher than the usual diesel generators, yet the operating costs, logistics, and maintenance requirements are lower for wind turbines: saving costs, reducing energy usage, and minimizing impact on health (Bergey, 2010). The implementation of green systems decreases both the emissions and the energy usage. All the different parts of the mobile telecommunications system contribute in the usage of energy affecting the environment through the emission of mobile power that is considered a major pollutant. Thus, reducing the usage of transmitted power of the mobile is a necessity in spite of reducing the battery usage and electrical recharging time and energy (Alfa, 2010). Smart phones applications connected to the network lead to high battery usage. All over the world, there are 106 million smart phone users in 2012 (Verna, 2012). As it is expected, the number of smart phone users will be increasing. Energy usage in mobiles and stations must be accompanied by a behavioral adaptation for both people and equipment. As for people, they have to be aware of the equipment they are using as the equipment can be operated in different modes as inactive, active, standby. Also, many software designs for optimal energy saving with maximum utilization should be considered. As for equipment, the noise coming from the generators and maintenance actions is considered a major pollutant (Mungwitikul & Mohanty, 1997). The development of automated systems

focuses on lowering the budgets, lowering the costs, and optimizing the energy utilization. Green Telecom Equipment is going to signify 46% of network capital expenditures by 2013 in China and this is expected to increase (Business Wire, 2009). The fourth generation BTS reduces resources like equipment room and energy: lower power consumption, less noise, less electromagnetic radiation, lower environmental impact, less auxiliary equipment, less network deployment, and lower environmental protection and resources utilization. This makes the construction process simpler, expansion smoother, and civil work costs lower (Wujun, 2008). Changing material and behavior into environmental friendly ones are costly and time consuming but necessary to ensure the continuity of the business since it is a live network that will be turned into green. As for the long term investment, the clean green energy is more efficient due to the new competitive prices and lower future total cost (Aird, 2010). Telecommunication companies have taken a lot of corrective actions in order to be more environmental friendly. Bell Canada has reduced the amount of GHG emissions by 15% (Maloney, 2010). By 2020, the British telecommunication is going to reduce the worldwide CO₂ emissions per unit of British Telecom's contribution to GDP by 80% from 1996 levels (Tuppen, 2008). The Deutsch Telecom will reduce CO₂ emissions for "Deutsche Telekom Group" by 20% below 2006 levels at the end of 2020 (Hellmonds, 2009). According to Hellmonds (2009), France Telecom will reduce CO₂ emissions for France Telecom Group by 20% below 2006 levels by 2020 and Telecom Italia aims at 30% increase (with respect to 2007) of the eco-efficiency indicator for 2008: the objective for 2008 is 1,130 Bit/Joule (the value for 2007 is 873 B/J). As for Vodafone, it will reduce absolute CO₂ emissions by 50% against the 2006/07 footprint baseline, by 2020

(Hellmonds, 2009). Thus, hybrid stations could be the most suitable solutions. The new “Green BTS” offered by Huawei incorporates environmental protection into product design “lower the total cost of ownership (TCO) while saving energy” (Wu Wujun, 2008). Energy consumption, water usage, wastewater generation, use of raw material, generation of solid wastes, and emissions contribute to environmental degradation and lead to negative effects on economy (National Environmental Audit Manual, 2000; Kraemer, 1982; Energy Policy, 2011). Environmental requirements are necessary for green implementations especially in stations and installations: low visual impact, less power, and less cooling systems in addition to miscellaneous standardized equipment. New solutions show that some remote radio head solutions lead to: lower site acquisition cost, smaller areas due to minimized site construction, and shorter cabling leading to faster site deployment (Heikkila & Ojwaka, 2008).

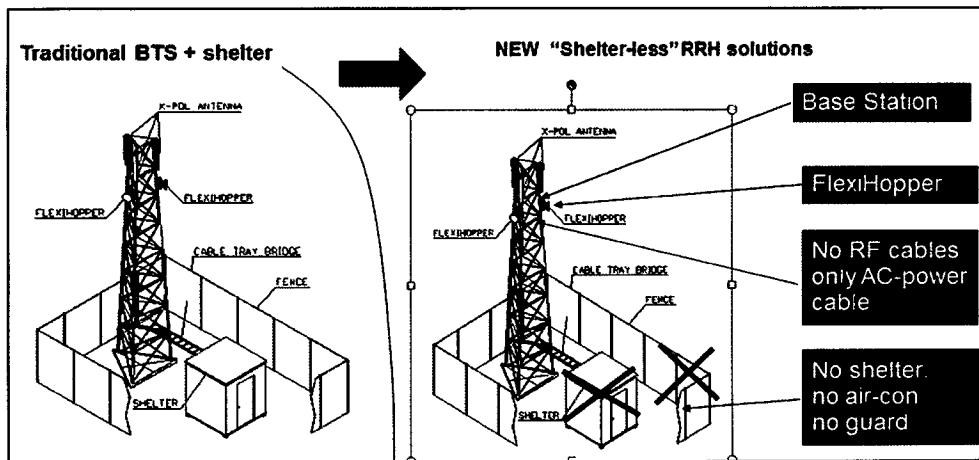


Figure 1: Comparison between Traditional and New Green Stations

Source: Nokia Siemens Networks Studies environmental friendly solutions (Heikkila & Ojwaka, 2008).

As in the above figure 1, in the new green systems, there will be no shelters, no air conditioning, no guard fences, and no Radio Frequency cables that directly reflect in

the new green systems: less equipment usage, lower power consumption, less maintenance, less installation time, and less cost. The direct impact of the new green stations' implementation is concentrated in simplified site construction with standardized site requirements, layouts equipment configurations, and assembly of the site. There is no need for separate shelter building, which means faster installation and lower power consumption since no air conditioner (free cooling instead) and less maintenance are required. It is to be highlighted that those tubular towers (less weight, less space, lower paint areas) are easily transported, need shorter cables, have less feeders' loss, and contribute in less space, and cost savings. Lower rental costs and more freedom to select the site and the location where to install the station with fewer negotiations reduce the total cost of ownership (Heikkila *et al.*, 2008). Special features for smart usage of energy and automation help in the decrease of the BTS energy consumption by 20% (remote site access, minimizing elements usage, and enabling features during low traffic) (JuhaErkki, 2006). For the purpose of improving mobile efficiency, more than 70% energy saving solutions is found under Nokia Siemens Networks, low energy in function of temperature, no air conditioning, improved efficiency, no indoor unit, and significantly reduction of power consumption (Kalle, 2009). The cost resulting from the pollution is very high; it leads to many cases of mortality. The cost of 80 death cases due to air pollution in Beirut is estimated at \$4.7 million (Djoundourian, Chaaban, & Nuwayhid, 2001, 2007). Investments in the renewable energy domain have reached a record of \$211 billion in 2010 compared to \$160 billion in 2009 (Appleyard, Runyon, & Bayar, 2011). In mobile telecommunications, the reduction in the generator runtime is not the only saving (fuel saving down to 2K liters/year), but reducing the CO₂ emissions per site to 5

tons/year (Majumdar, 2011). Improving the infrastructure elements, life time of the equipment, and creating usage control systems (smart equipment) gather to enhance the maintenance and optimize all the activities related to Telecom (Majumdar, 2011). The cost of environmental degradation from air pollution related problems in Lebanon is estimated at \$170 million/year (1.02% of the GDP) (World Bank, 2004). Lebanon urban areas contain 90% of its population along with a population density of about 430 people per square kilometer. Around 25% of the population lives in Great Beirut Area and more than 50% in the coastal areas (World Bank, WDI 2001). This is to explain that the stations are mainly for two purposes: capacity and coverage.

All the above examples show the necessity of going green in mobile telecommunications. In Lebanon, the shift to green is a necessity due to the large amount of environmental degradation the country is facing. Customers' behaviors, attitudes, awareness, environmental citizenship, and subjective norms should be studied since customers will be the investors in going green in mobile telecommunications. Cost analysis is performed in order to compare different telecommunication systems and to assess customers' willingness to pay to go green.

2.1.3 Current and green mobile telecommunications

Going green is costly and requires many resources. In mobile telecommunications, several parts can't be substituted since there is no green replacement. In Table 1, the difference between the current and green systems is presented. In order to satisfy power needs, hybrid solutions are presented (solar & generators, or wind turbines & generators, etc.) (Dur, Yigitcanlar, & Bunker, 2011).

Indirect revenues of implementing the green telecommunications are included in the cost analysis where the creation of green industry needs more labor. Economic studies related to the environment have focused on the new world trends into going green (El Sayed, 2011). This case is similar especially in mobile telecommunications.

In order to optimize the cost, the calculations take into consideration the parts that can be reused. The total cost for 1600 stations found under both operators in Lebanon presents itself by around \$331,200,000.00 (final amount after the utilization of the existing equipment that remains the same in current and green systems). This amount over 3,000,000 subscribers found in the Lebanese territory will result around 111\$ per subscriber (with slight additional cost of unexpected margin that might be included in implementations, change of prices, etc....). Indirect costs that are not taken into consideration include the time spent to implement green mobile telecommunications, the saving in fuel usage that will result in using the new systems, the time spent for awareness campaigns, the estimated time for customers to being convinced, etc.

Table 1: Current versus Green System Approximate Pricing *

Different systems costs			
Part	Current System Approximate Price	Green System Approximate Pricing	Reason for price difference between systems
Civil Works	\$20,000.00	\$10,000.00	less civil work for smaller area, less concrete, and less architectural designs in green systems
Energy	\$26,000.00	\$60,000.00	Higher prices in order to have hybrid system with same stability in power (Solar system, Wind Turbine...)
Protection	\$5,000.00	\$8,000.00	The hybrid systems cost more money for protection against lightning
Antennas	\$3,000.00	\$3,000.00	Same antennas on both systems
Shelter	\$1,500.00	\$0.00	No shelter in green systems (indicated in figure 1)
EDL ¹ Counter	\$2,000.00	\$2,000.00	Same EDL ¹ counters on all systems
Design Margin (7%)	\$4,500.00	\$6,000.00	Some design changes causing the change in the design margin
Adaptations at Site of Origin	\$3,000.00	\$3,000.00	
Equipment	\$55,000.00	\$90,000.00	In green systems the cables are shorter, indicating less loss, but the compact equipment cost more special installation equipment related to new technology with remote access in order to save further interventions on the site
Microwave Equipment and services	\$18,500.00	\$30,000.00	Installations on the top of the tower need special equipment and specialized employees for installations and maintenance in green systems
Total Budget:	\$138,500.00	\$212,000.00	
Number of Stations:	1600 (for both operators, the same number of stations in both systems current and green)		
Price for different systems	\$221,600,000.00	\$339,200,000.00	
Savings	Antennas and EDL ¹ Counters	\$8,000,000.00	(1600 x 3000) + (1600 x 2000)
Amount to be paid	\$331,200,000.00		amount to being paid by the customers to turn systems into green after the deductions for the equipment that can be reused

¹ EDL: Electricité Du Liban

*Prices can change according to the market prices

*Calculations performed by the author based on information provided by Alfa (approximate calculations were done by multiple one-to-one meetings held with different departments: Civil, Electrical and Telecommunications budgeting departments).

2.2 Application of the theory of planned behavior

The theory of planned behavior has been used in many studies: to check weight loss behavior (Schifter & Ajzen, 1985), to check “college students' intentions to attend class and earn a good grade” (Ajzen & Madden, 1986, p22), to predict computer resource center usage by students (Taylor & Todd, 1995). Harrison and many others have demonstrated since 1997 that the behavior is directly proportional to intentions, attitudes, subjective norms, and perceived behavioral control (Harrison, Mykytyn, & Riemenschneider, 1997). “A consumer with a genuine interest in being ‘green’, for the sake of society and the wider environment, may also have a strong self-interest in being seen to be green” (Freestone & McGoldrick, 2008, p.447). In what relates to the application of Ajzen’s model (theory of planned behavior), the study of the behavior takes into consideration the consumers’ intentions to turn into environment friendly solutions (Von Anedel & Voogd, 2011). Consumers having environmental awareness and experiences are more likely to use their environmental attitudes into behavioral decisions, including consumption and expenditure decisions to higher environmental concern: past behavior over the studied topic leads to more accurate data (Berger & Kanetkar, 1995). Decisions about investing mainly in new technological investments were a major center of discussions in addition to the effects of socio-demographic variables (East, 1993; Baker, 2007). Various topics have been studied based on the theory of planned behavior. This theory was designed based on helping people (consumers) to adapt the healthy behavior and show reliable and accountable results. Other examples include the studies performed by Conner and Armitage (2001). Using the theory of planned behavior in the environmental friendly domain has been a major success as in the green consumerism. It

is based on the relationship between self-identity and behavioral intentions (Sparks & Shepherd, 1992). Sparks and Shepherd (1992) showed that the customers' behaviors are the main contributors in turning green and this was proven by identifying going green and by defining the behavioral intentions of going green. Environmental related issues are highly related to subjective value judgment and attitudes (Shen, Lee, & Chen, 2004). As per different studies, the relationship of green telecom with other networks is largely dependent on proper consumers' behavior (Whitten, 2009). Companies in the world are moving forward to environmentally friendly and especially in green telecommunications. IBM's Global Business Services has set strategies for its organizations to go green (Olsen, 2008). Those organizations are starting to go green by basing the studies on users' behaviors, such as green maturity and behavioral methodology (Olsen, 2008). Some mobile services studies were done based on the data service continuity and the usage of the theory of planned behavior confirmed the results (new investments in the telecom domain based on the users' answers) (Byoungsoo, 2011). Godin and Kok (1996) have verified the application of the theory of planned behavior to health and environmental related behaviors; the intention was explained by the theory with an averaged R^2 of 0.41 (Godin *et al.*, 1996). Bamberg (2002) showed the effects of the implementation intentions on the performance of environmentally friendly behaviors through the theory of planned behavior usage. Studies were conducted as well in the UK and Greek markets where the theory of planned behavior is used to examine the determinants affecting consumers' intention to buy environmentally friendly products (Kalafatis, Pollard, East, & Tsogas, 1999). Environmental managers' pollution prevention attitudes, perceptions of norms for environmental rules, and their perceived behavioral

control were analyzed using the theory of planned behavior and this analysis showed good explanatory results (Cordano & Frieze, 2000). The relation between beliefs about relevant consequences and willingness to pay for renewable energy was established (Bang, Ellinger, Hadjimarcou, & Traichal, 2000) using the theory of reasoned action (precursor of the theory of planned behavior) (Ajzen, 1991). The theory of planned behavior was also used to explain the customers' intentions to visit a green hotel (Han, Hsu, and Sheu, 2010). For people's ecological behavior, Kaiser and Guter (2003) showed that the theory of planned behavior's variables: attitudes, subjective norms, and perceived behavioral control explained 81% of intention's variance (Kaiser *et al.*, 2003). While it is hard to show a clear socio-demographic profile for the green mobile telecommunications, many factors contribute in affecting the intention of the consumers to go green (Clark, Kotchen, & Moore, 2003; Hansla, Gamble, Juliusson, & Gärling, 2007; Kotchen & Moore, 2007). The study of consumers' behavior towards going green has been a major issue in the Swiss electricity market, and results showed the importance of providing information affecting the intention to go green in electricity, sustainable agricultural practices, willingness to pay for green systems, going green in recycling, in particular attitudes towards the green purchase, social norms, and perceived behavioral control (Litvine & Wüstenhagen, 2010; Roe, Teisl, Levy, & Russell, 2001; Tonglet, Philips, & Read, 2004; Borchers, Duke, Parsons, 2007; Harland, Staats, & Wilke, 1999; Fielding, Terry, Masser, & Hogg, 2008; Chao, 2012). Ecological behavior is predicted mainly by the environmental attitude and the tendency to behave ecologically (Kaiser, Wolfing, & Fuhrer, 1999). Jackson (2005) stated that the theory of planned behavior is one of the mostly used theories to study pro-environmental behaviors. The pro-

environmental behavior is a major issue and was tested nationally over a 27 country sample and verified through the theory of planned behavior and value belief norm theory (Oreg & Katz-Gerro, 2006). In addition, the theory of planned behavior is used in order to explain the consumers' green washing (green marketing) and the results were significant for the model and variables (Schielke & Altobelli, 2012). In order to participate in saving the environment, the theory of planned behavior was used for predicting the use of public transportation and significant results were found (Heath & Gifford, 2002). Environmental concerns, especially problems coming from cars in Netherland, were a major concern and the theory of planned behavior contributed to explaining the results (Steg & Vlek, 1997). The relationship between environmental characteristics and walking behaviors was verified through the theory of planned behavior (Rhodes, Brown, & McIntyre, 2006). The theory of planned behavior is widely applied to help the problems the environment is facing. This theory was used in order to predict the participation in recycling programs helping the environment (Nigbur, Lyons, & Uzzell, 2010).

The usage of new environmentally friendly solutions in different sectors showed high efficiency in applying them with an increasing trend worldwide. International organizations are recommending green systems as the basis for new projects. Mobile telecommunications need many systems to operate; therefore, the necessity of green manufacturing became the concern of all factories leading the market. The government, public sector, telecom companies and individuals should all present individuals to set a list of rules, regulations, and life style guidance for all concerned parties in order to get the research work being adopted by the concerned parties in the most optimized way. In

particular, this study focuses on the part related to the necessity of going green in mobile telecom and on the consumers' behaviors to go green in mobile telecom. As for the theory of planned behavior used in similar topics, it has proven its efficiency; especially when it comes to the intentions and behaviors of adopting new green systems. This model was adopted to be the framework of this research in order to test the study hypotheses.

Chapter 3: Methods and Procedures

Nowadays, going green is more than just a trend. It is a necessity: its various usages and implications led to going green in mobile telecommunications. Based on numerous reviews and data collections, the framework will be designed using the theory of planned behavior in order to verify the research hypotheses and to assess the significance of the model.

3.1 Conceptual framework and research questions

Among many models that relate to the application of green mobile telecommunications, the choice was to adopt the Ajzen's theory of planned behavior as the model for this research in Lebanon. This theory is the development of the reasoned action theory (Ajzen & Fishbein, 2004). This study aims to apply the theory of planned behavior onto the subject studied (green telecommunications) to examine the consumers awareness and behavior. Going green is a trend that will take time to being implemented; this research is done to study the consumers' perspective while having the attitudes, perceived behavioral control, and subjective norms as the major determinants (independent variables) affecting the choice of the consumers to going green in mobile telecom (Von Anandel *et al.*, 2011). The different components of the theory of planned behavior are major constituents of the green telecom research, and the application of the theory of planned behavior was performed in different newly implemented technologies and in particular going green. Below is the theory of planned behavior in a structured diagram format.

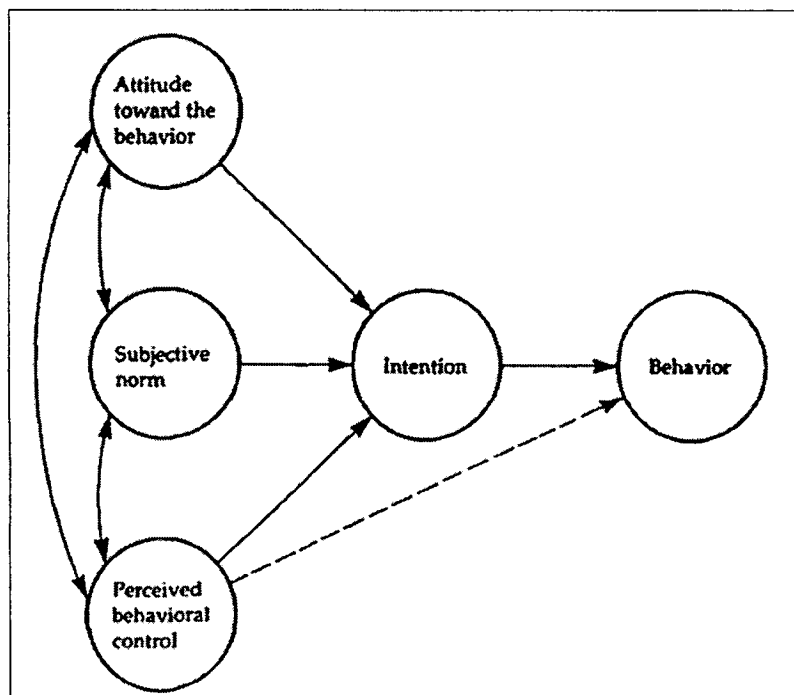


Figure 2: Theory of Planned Behavior

Source: (Ajzen, 1975)

Many variables contribute directly and indirectly in the theory of planned behavior. Our focus in this study is on three independent variables that measure attitudes, subjective norms, and perceived behavioral control, in addition to the dependent variable: intention. Additional variables were taken into consideration including socio-demographic, awareness, environmental citizenship, etc. Starting with the attitude, it is explained in each individual's evaluation and self-application of the behavior: the level to which the behavior is positively or negatively valued (attitude towards the consequences of going green in mobile telecom). Second, the subjective norms are described by the individual's awareness of normative pressure or beliefs to performing a behavior. As for the perceived behavioral control, it is apparent as the ability of the individual to perform the behavior (Ajzen, 1991). All three combined together determine the behavioral intentions to adapt and adopt any new idea such as environmentally friendly mobile

telecommunications (Ajzen, 1991). In order to explain more the theory of planned behavior, several questions can be used to describe the variables: Is the consumer in favor of doing it (in going green in mobile telecommunications) ('this describes the attitude')? How much does the individual feel the social pressure to go green in mobile telecommunications) ('subjective norm')? Does the individual feel in control of the action in question (of going green in mobile telecommunications) ('perceived behavioral control')? (Francis, Eccles, Johnston, Walker, Grimshaw, Foy, Kaner, Smith, & Bonetti, 2004). People's behavior is affected by how much they trust their ability to perform it (Bandura, 1982, 1991). In addition to what was mentioned in the theory of planned behavior manual, the divergence and focus on strategies to help people adopting healthy behaviors is a necessity (Francis *et al.*, 2004).

Behavioral beliefs are contributing in the production of a given outcome: the selective behavioral beliefs since few numbers are accessible at a time. Each outcome subsidizes and contributes in the attitude and directly relates to what the behavior produces at first related to the same person's subjective probability (Ajzen & Fishbein, 2004). The attitudes of each person about any topic impact the behavioral intentions towards that issue (Stern, Dietz, & Kalof, 1993). In this case, the attitude of each mobile user impacts the behavioral intention towards turning mobile telecommunications into environmentally friendly solutions. As in the subjective norm, social pressure plays a very important role in behavioral changes. "The strength of each normative belief (n) is weighted by motivation to comply (m) with the referent in question" (Ajzen *et al.*, 2004, p 32). Normative belief is the perception of the person about the behavior under study influenced by others' decision (Ajzen *et al.*, 2004). Control beliefs are affected and related to the factors that facilitate the performance of a behavior (Ajzen *et al.*, 2004).

How much a person is ready to perform a given behavior is considered an intention and directly descends from behavior (Ajzen *et al.*, 2004; Van Empelen & Kok, 2008; Wang 2009). How much a person has skills and all what it takes to perform a given behavior is under the actual behavior control part (Ajzen, 1991). Intention is best explained as the “strength of conscious plans to perform the target behavior” (Harrison *et al.*, 1997, p.176). This intention is the main focus behind predicting the behavior *ceteris paribus*. This study is based on the theory of planned behavior to assess the implementation of green mobile telecommunication systems in Lebanon from a consumer perspective. In order to go green in mobile telecommunications, choosing the customer’s behavior, awareness, attitudes, and previous experience about technology are major contributors in the study of variables. The theory of planned behavior contains several variables that can be developed into more specific ones for giving the different attitudes, behaviors, subjective norms, perceived behavioral control, and intention towards the behavior. The theory of planned behavior variables such as: intentions are considered as what explains the factors related to motivations and affect the behavior (intention is how much trials and efforts people are willing to perform) (Ajzen, 1991). The stronger the intention is, the better the performance (Ajzen, 1991). On the other hand, the second variable is the perceived behavioral control that congregates in the people’s awareness of their own capability to performing a specific behavior (Ajzen, 1991). The intention and the perceived behavioral control combined result in the third variable: the behavior (Ajzen & Fishbein, 2004; Ajzen, 1991).

This thesis attempts to assess the intention of Lebanese consumers to go green once the green mobile telecommunications is implemented. Intentions and perceived behavioral control should always remain unchangeable from the assessment till the

observation (Ajzen, 1991). Actual control is reflected by the perceptions of the behavioral control. Different behaviors result from the behavioral predictions variations (directly related to the intentions and perceived behavioral control). When the complete control over behavioral performance is found, intention and perception of behavioral control are enough to predict the behavior (Ajzen, 1991). The mentioned variables influence both intentions and behavior biased towards attitude and normative influences where the perceived behavioral control is less accurate in the prediction of intentions (Armitage & Conner, 2001). The relation between the variables, especially behavior and control, is to be optimal while keeping the effect of perceived behavioral control as moderate in order to keep the result as fair, realistic and applicable (Armitage *et al*, 2001). In order to explain the variables, important and relevant beliefs are notable as follows: the behavioral beliefs affect the attitudes towards the behavior in question, the normative beliefs affect the subjective norms (social pressure to engage into a belief), and control beliefs affect the perception of behavioral control (Ajzen, 1991). The adopted theoretical model (theory of planned behavior) will attempt to answer the main research questions: Are the Lebanese consumers aware of the negative, environmental, and health effects of mobile telecommunications? Are the Lebanese consumers ready to pay higher mobile fees where green telecom systems will be applied in Lebanon? What is the influence of attitudes, perceived behavioral control, and subjective norms on explaining the Lebanese consumers' intentions to go green in mobile telecommunications?

3.2 Research hypotheses

The research hypotheses are consistent with the literature related to the adoption of environmental friendly technologies using the theory of planned behavior. Three hypotheses will be tested in this study:

- 1) The Lebanese consumers are aware of the negative environmental and health impacts of mobile telecommunications.
- 2) The Lebanese consumers are ready to pay higher mobile fees if green telecom systems are to be applied in Lebanon.
- 3) The attitudes, perceived behavioral control and subjective norms influence the Lebanese consumers' intention to go green in mobile telecommunications.

According to the theory of planned behavior, different aspects contribute in building the decision for any new implementation adoption. Various studies, in particular Stern (1999), have described that environmental behaviors are directly affected by personal norms. This is why people who have strong personal norms ought to adopt green mobile telecommunications and to pay extra amounts for going green. In addition, people that are more environmentally aware are more likely to adopt green telecommunications. Environmental citizenship is considered a major contributor in pushing consumers to go green in telecommunications (Stern, 1999).

The focus of the study is on the consumers' behavior, willingness, awareness, attitude, motivation to comply, and intention of going green in mobile telecommunications. When more people who are important in mobile telecommunications would approve going green, it is more likely that more survey respondents will choose to adopt environmental behaviors (Harrison *et al.*, 1997).

Environmental behaviors are affected by many aspects including personal norms (Mhanna, 2010), awareness, intentions etc. (Ajzen, 1991). It is important to highlight that the decision of any individual to go green depends on his/her previous experience in practicing environmentally friendly daily activities. In addition, different factors such as social, behavioral, demographic, gender, age, perceived power, control contribute in going green in mobile telecommunications (Harrison *et al.*, 1997). The “actual” behavior cannot be assessed in this study since there is no implementation of the green telecommunication system at this point. Only “stated” behavior is assessed in this study.

3.3 Data collection

In order to answer the research questions, primary data collection is a major important task since there is lack of secondary data related to environmental attitudes and behavioral intentions in Lebanon (related to technology in particular mobile telecom). A questionnaire is developed based on the theory of planned behavior. It includes questions related to attitudes, awareness, behavioral beliefs, behavioral intentions, control beliefs, demographic, environmental citizenship, evaluations, influences, motivation to comply, normative beliefs, perceived control, perceived power, subjective norms, and demographic variables of the respondents. Many of the questionnaire items are adopted by Harrison and others (1997) and modified to serve the present research.

To select the study sample, a cross sectional method was used and the targeted respondents were questioned at one specific point of time. Respondents were selected from four areas in Lebanon: Haret Hreik, Jdaide, Maameltein and Roueiss. The four selected locations are highly populated and this is reflected in the high number of distinct mobile users as well as the high mobile phone usage (Table 2). The questionnaires were

conducted in both weekends and weekdays, since the selected areas contain business companies, households, mini markets, and shops etc. (Alfa, 2012). The choice of buildings (where respondents were selected) was random: two collated buildings and two consecutive floors were not chosen unless different categories of people are in those locations (ex: first floor is a company's office and the second floor is a household, if not the case, the third floor is then selected).

The sample comprises different respondents' characteristics, including educational status, income level, age, demographic, etc.). A specific time was chosen during one peak hour and distinct simultaneous users were chosen (Alfa, 2012). The choice was done based on the most mobile phone usage areas (voice calls, data sessions and usage including 2G and 3G technologies). In addition to the number of users calculation based on the whole area surrounding the chosen location, the choice of the number of users was taken as the maximum combination of distinct users calling simultaneously in the same area (including voice calls, sms, data usage, etc.). The approximate values below are rounded ones reflecting the actual behavior of the consumers in the corresponding areas.

The calculation was performed for weekdays and weekends, but in order to relate the number of respondents to the values below, the choice of one hour where peak traffic occurs was done. Relative percentages were given to each area and then a 15% weight was chosen from the number of 1 hour users, and the respondents sample size is indicated in Table 2 below. Additional 10 % were added as extra respondents to have a safe margin and guarantee unbiased results.

Table 2: Number of users per location area studied

Location	Approximate Number of users during 1 hour of peak traffic	Percentage of total users in this study (calculated weight)	Around 15% of the total number of users	Number of respondents to being questioned (calculated weight * 15% of the total number of users)
Haret Hreik	2,600	35.86	390	140
Jdaideh	1,150	15.86	173	28
Roueiss	1,600	22.07	240	53
Maameltein	1,900	26.21	285	75
Total	7,250	100.00	1,088	296

Source: Alfa 2012

The data collection performed through questionnaires is used for the purpose of getting specific details about the consumers' attitude, behavior, or awareness. The survey uses face-to-face self-administered questionnaires, while the person questioning is always present to clarify the needed information for the respondents. The distinct number of users is first retrieved; then the weighted percentage for each location is done and number of users based on the weight percentage is calculated. At the end, the number of respondents questioned is calculated as 15% of the weighted number of users during one hour of peak traffic in each region.

The questionnaire, composed of 20 questions, was adopted by Harrison *et al.* (1997). The questionnaire comprises a cover page describing briefly the purpose of the survey and the major points that will be addressed to respondents; such as the description of the environmental degradation especially due to technology, and details on how to answer the questionnaire. To ensure honest responses, anonymity and confidentiality were maintained. While questioning respondents, several factors were considered especially related to the mobile networks in Lebanon newly changed to 3G and LTE

network. Several questions are based on seven – point balanced Likert scales to have more detailed results.

The theory of planned behavior has been used in similar topics and it is found to be useful in generating specific results. The use of the theory of planned behavior in the questionnaire presents different aspects' descriptions that were gathered between technical adoption of environmental friendly solutions and consumers' behavior of adopting green telecommunications. The questionnaire was designed in order to be specific while including all the studied variables. The questions ranking as well as the proposed answers' were designed in order to keep the respondent attention to details as high as possible. The questionnaire was translated into Arabic language and both versions (English and Arabic) were pilot tested. A pilot test was conducted in the selected locations for the study (Haret Hreik, Roueiss, Maameltein and Jdaideh). Slight changes in the questionnaire were modified after the pilot test in order to reduce ambiguity. The pilot test was conducted between 10 and 16 of November 2012 (including weekdays and weekends) with respondents of different ages, educational levels, and various demographic characteristics. As for the survey, the respondents were questioned during different periods of the day on a face – to – face basis (from November 16th 2012 till December 10th 2012). The questionnaire contains different parts representing the studied variables. The variables (attitudes, awareness, behaviors (behavioral beliefs), environmental citizenship, intentions (behavioral intention), perceived control, and subjective norms) are all designed in seven – point balanced Likert scales (extremely unlikely, quite unlikely, slightly unlikely, neither, slightly likely, quite likely, and extremely likely). Since the questionnaire was to be performed in different areas, where not all respondents are knowledgeable of the English language, the questionnaire

was translated into the Arabic language (see Appendix A and B). The survey was administered in both English and Arabic languages depending on the respondent's preference. The last question is an open-ended question leaving the respondents free for any suggestion or comment.

3.4 Dependent and independent variables

In this study, the variables stemming from the theory of planned behavior are the independent variables contributing to the prediction of the behavior. Those variables are attitudes, subjective norms, perceived behavioral control, demographic, structural, social, environmental citizenship, and awareness. As for the dependent variables, they can be summarized in the intention to going green in mobile telecommunications (Ajzen, 1991). In the model chosen, each variable has been evaluated through corresponding items in the questionnaire that were answered by the respondents. Table 3 below states each variable and the corresponding item used in the questionnaire. Extra variables such as income, gender, and some socio-demographic questions were added in order to gather more information about the respondents.

Table 3: Variables in the Questionnaire

Variable	Question	Item #	Reference
Environmental Citizenship	• Have you ever participated in an environmental activity?	1	Author
	• How much do you think you can adapt to changes in your daily mobile usage (calling methods: (Viber, skype,...) call duration, etc.?)	2	Author
	• How much do you consider yourself environmental friendly in your daily activities (other than in telecom, ex: waste, behavior, etc.)?	3	Author
Awareness	• Have you ever considered that mobile telecommunications can have effects on health	4	Author
	• How likely do you consider that going green in Mobile Telecommunications (telecom companies use eco-friendly products and green energy to power their equipment) will	5	Author
Intention (Behavioral Intention)	• How likely is it that you intend adopting green Mobile Telecommunications if it is	6	Harrison <i>etal</i> 1997
	• Are you ready to pay an extra amount on your monthly mobile bill to move to environmentally friendly mobile telecom? (If no skip question 8)	7	Author
	• What is the maximum additional amount on your mobile bill (in \$US Dollars) per month that you are willing to pay in order to have environment friendly mobile telecommunications :	8	Harrison <i>etal</i> 1997
	• How certain is your plan to adopt green mobile telecommunications when implemented?	9	Harrison <i>etal</i> 1997
Subjective norms	• Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications	10	Author
	• In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is Weak or high	11	Author
Perceived Control	• To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be easy/difficult	12	Harrison <i>etal</i> 1997
Attitude	• Turning into environment friendly Mobile Telecom would be (harmful, positive, effective, foolish, having negative impacts on quality during installation) (5 questions)	13	Harrison <i>etal</i> 1997
	• Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used,	14	Harrison <i>etal</i> 1997
	1.. it will have high costs for me as a consumer to being implemented		
	2.. it will reduce my health bill		
	3.. it will improve communication		
4.. it will cause calling problems during the installation of the green telecom			
5.. it will help better serve mobile customers			

Tables 5 till 11 summarize the methodology of the analysis used in order to test the study model. They describe the dependent and independent variables that will be used in the regression analysis. In regression 2 and regression 6, logistic regression was done while the rest of the regressions are linear regressions. Logistic regressions are used for the cases where the variables are binomial (in this case: are you ready to pay extra amount on your bills in order to get green mobile telecom? the answer for this question is yes/no). The different forms of the independent variable items are presented: mean score values for independent variables used (mean score subjective norm and mean score attitude) as well as independent variables used separately.

Questions were customized and the survey questions were closed-ended in order to facilitate the results analysis. Data entry of the questionnaire was performed in SPSS statistical package in order to being analyzed. . Different tests were performed in order to analyze the data.

The framework has been set based on the theory of planned behavior, as well as the methodology for data collection. The strategy for data analysis in addition to the measurement of the dependent and independent variables will be studied in the next chapter. Research hypotheses, model reliability, and different variables that were identified in chapter 3 will be verified through the findings analysis in chapter 4.

Chapter 4: Findings

After explaining the theoretical framework and the methods and procedures used in this study, descriptive and regression analyses, in addition to verifying the reliability of the model as well as the findings are discussed in chapter 4. The questionnaire was conducted in November 2012 in order to collect quantitative data through a sample of 349 respondents. Twenty one questionnaires were canceled due to missing information or inconsistency (more than 5 missing answers per questionnaire showing ambiguous responses). Therefore, 328 questionnaires were analyzed. Prior to the analysis, reliability tests were performed (Chronback Alpha) and the results ($\alpha = 0.698$ and 0.658 both > 0.6) indicate the reliability of the data for the intention and attitude variables. Chronback Alpha tests were performed on the variables that comprehend more than four questions for each variable.

4.1 Descriptive analysis

The descriptive statistics are identified for each questionnaire item and the Appendix C's table identifies each item and its corresponding descriptive statistics. For each question, the following section explains answers to each questionnaire item that were submitted. Each variable has been explained in a different questionnaire item and each section below explains the main findings of every studied variable.

4.1.1 Environmental citizenship

Starting with environmental citizenship, 53.4 % of the respondents have already participated in environmentally friendly solution. The sample is approximately evenly divided between people who have participated in environmentally friendly activities and those who have not. On the other hand, 76.6 % of the respondents can adapt to changes in

daily mobile usage (with different levels of adaptation) which will contribute much in going green in mobile telecommunications (Appendix C). Sixty eight percent (68 %) of the respondents are environmentally friendly in their daily activities.

4.1.2 Awareness

The results show that around 60% of the respondents consider that mobile telecommunications can have effects on health degradation. About 12.2 % of the respondents consider that mobile telecommunications slightly don't have negative effects on health. Going to question number 5 of the questionnaire, 73.8 % of the respondents consider that going green in mobile telecom will contribute in saving the environment: 10.1 % of the respondents are neutral about this question.

4.1.3 Intention

About eighty three percent (82.6 %) of the respondents are likely to adopt green mobile telecommunications, if implemented. Also, 74.1 % of the respondents are ready to pay an extra amount on their monthly mobile bill to move to environmentally friendly mobile telecommunications with 54 % of the respondents who are ready to pay from 1\$ to 10 \$ per month. Additionally, 72.9 % of the respondents are ready to pay from 1\$ to 50\$ per month and 2.1 % of the respondents are ready to pay an amount greater than 51\$ per month attaining a maximum of 180\$ for going green in mobile telecommunications. Around seventy percent (70.1 %) of the respondents are certain to have future plans for going green in mobile telecom (slightly certain 20.1%, quite certain 32.3%, extremely certain 17.7%).

4.1.4 Subjective norms

Most people who are important to the respondents approve of the respondents' switching to environmentally friendly telecommunications: around 55.5 % of the total

number of the respondents approve that important people to them are willing to switch to green, 18 % of the respondents are neutral regarding this question, while 16.5 % slightly disapprove of the question. The effort other citizens are ready to make in order to switch to environmentally friendly telecommunications in the coming months is as follows: extremely weak effort (10.4%), quite weak effort (16.5%), slightly weak effort (22.3%), neither weak nor high effort (23.8%), slightly high effort (16.5%), quite high effort (8.2%), and extremely high effort (2.4%).

4.1.5 Perceived behavioral control

Perceived behavioral control is measured in item 12 of the questionnaire. Results show that 58.2 % of the respondents indicate that going green in mobile telecommunications is difficult (the ability of the respondents). While 15.9 % are neutral towards this question.

4.1.6 Attitude

Turning into green mobile telecommunication would be helpful (87.2 %), positive (85.6 %) positive, effective (79.3 %), and wise (85 %). As for studying if the green mobile telecommunications have negative impacts on the quality of mobile calls during installation, the following figures illustrate the results: extremely having negative impacts on quality during installation (6.4%), quite having negative impacts on quality during installation (14.9%), slightly having negative impacts on quality during installation (19.8%), neither having negative impacts on quality during installation nor having positive impacts on quality during installation (24.4%), slightly not having negative impacts on quality during installation (13.1%), quite not having negative impacts on quality during installation (11.3%), extremely not having negative impacts on quality during installation (10.1%). As far as costs are considered, 64.9 % of the respondents

answered that going green has a high cost. On another question, if environmentally friendly telecommunications system is to be used, it will reduce respondents' health bill, respondents' answers were: extremely unlikely (6.1%), quite unlikely (6.4%), slightly unlikely (10.4%), neither unlikely nor likely (15.5%), slightly likely (33.2%), quite likely (19.8%), and extremely likely (8.5%). From the respondents' points of view, green mobile systems will improve communications: extremely unlikely (3.4%), quite unlikely (4.9%), slightly unlikely (9.8%), neither unlikely nor likely (27.4%), slightly likely (24.1%), quite likely (21.3%), and extremely likely (9.1%). Moreover, 60.4 % of the respondents view that if environmentally friendly telecommunications system is to be used, it will cause calling problems during the installation of the green telecom, and this is mainly due to the experience that the respondents or mobile users have faced during the installation of the 3G project (Alfa, 2011). Also, 64.3 % of the respondents say that if environmentally friendly telecommunications system is to be used, it will help better serve mobile customers. A large percentage (21 %) of the respondents neither say that green telecom will help better serving mobile customers nor will serve worse mobile users.

4.1.7 Socio-Demographic information

The sample included 40.24% of females and 59.76 % of males. As for education, 78.6 % of the respondents are undergraduates and above, with 19.8 % of those are of graduate education level. As for the respondents' range of age, the ranges from the oldest respondent born in 1933 till the youngest in 1999. The mean of the age is 33 years old with a standard deviation of 12.13, while most of the respondents were born in 1985 (7% of the total number of respondents). The distribution of the average monthly household income in US Dollars \$ shows that 67.4 % of the respondents have their salaries greater

than 1,500\$. As for the marital status, it is described as follows: married (32.9%), separated (1.5%), single (63.4%), widow/er (2.1%). Also, 68.9 % of the respondents answered that the number of family members living in the respondent's house is less than 4 family members.

4.1.8 Household income and willingness to pay

Table 4 shows the cross tabulation results performed between the average monthly household income and the willingness to pay of the mobile telecom consumers. The higher the income is, the higher the percentage of respondents that are ready to pay extra amounts on their monthly mobile bill in order to move to environmentally friendly mobile telecom. The results show that 84.75 % of the respondents that are willing to pay extra money have a monthly household income of the range (1001-1500 US \$). Most of the answers of cross tabulation show values of higher than 70% as in the Table 4 (70% is the average of the percentages of respondents who answered positively in their readiness for going green).

Table 4: Respondents average monthly household income v/s their willingness to pay

Average monthly household income (US \$):	Are you ready to pay an extra amount on your monthly mobile bill to move to environmentally friendly mobile telecom?		Total Number	Percentages (%)	
	yes	no		yes (%)	no (%)
0-500	6	7	13	46.15	53.85
501-1,000	19	16	35	54.29	45.71
1,001 - 1,500	50	9	59	84.75	15.25
1,501 - 2,000	64	15	79	81.01	18.99
2,001 - 3,000	43	18	61	70.49	29.51
3,001 - 4,000	26	8	34	76.47	23.53
above 4,001	35	12	47	74.47	25.53
Total	243	85	328	74.09	25.91

4.3 Regression analysis

In order to cover all kinds of data implications based on the theory of planned behavior, different linear regressions were run (details are shown in the tables below and in Appendix C). The regressions are described in details next:

The first regression was done by setting up the dependent variable (intention) as item 6 in the questionnaire and using the independent variables as the mean score for subjective norms, perceived behavioral control, and the mean score for attitudes taking into considering the reverse scores for items number 12, 13b, 13c, 14a, and 14d. The details of this regression are found in the table 5 below. The significance level for the mentioned regression showed 0.000 (less than 0.01) as the significance for the F stats, and then, the model chosen is significant at more than 99%. In addition, the R^2 value for this regression is 0.438 meaning that 43.8 % of the data collected fits the regression line. This implies that 43.8 % of the future customers' intentions to going green in mobile telecommunications if it is implemented are likely to be predicted by the chosen model. The remaining 56.2 % of the variation in the intention of going green is presumed to be due to random variability of the respondents selected (small sample size, four locations in Lebanon, etc.), missing data related to the respondents, unfamiliarity of the topic under study, and many other unknown variables that might be identified if additional variables were introduced.

Table 5: Regression 1

Dependent Variable	Independent Variables	Significance (Fstats)	Significance (T stats)
Intention (<i>item 6</i>): How likely is it that you intend adopting green Mobile Telecommunications if it is implemented	<u>Mean Score Subjective norm for the following items:</u> <ul style="list-style-type: none"> ●Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications (item 10) ●In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is Weak or high (item 11 #) 	0.000	0.000
	<u>Perceived Control:</u> <ul style="list-style-type: none"> ●To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be easy/difficult (item 12)* 		0.478
	<u>Mean Score Attitude norm for the following items:</u> <ul style="list-style-type: none"> ●Turning into environment friendly Mobile Telecom would be (a- harmful, b-positive*, c-effective*, d-foolish, having negative impacts on quality during installation) (item13) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will have high costs for me as a consumer to being implemented (item 14a)* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will reduce my health bill (item 14b) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will improve communication (item 14c) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will cause calling problems during the installation of the green telecom (item 14d)* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will help better serve mobile customers (item 14e) 		0.000

* Reverse order

As for the T-stats describing the independent variables, both the subjective norms and the attitudes are 99% significant (T-stats value 0.000 as in table 5). The perceived control was found to be not significant (0.478), this could be due to the fact that green mobile telecommunications is not yet implemented. This regression showed that the mean scores of the independent variables (subjective norms and attitudes) explain the dependent variable the 'intention' as in the theory of planned behavior.

The second regression was done by setting up the dependent variable (intention) as item 7, and using the independent variables as the mean scores for subjective norms, perceived behavioral control, and mean score for attitudes. The method used in this regression is the logistic regression, since the dependent variable is a binomial question,

and the covariate is formed based on the mean score of the independent variables. The significance level for the mentioned regression showed 0.000 as the significance. Then, it is significant at 99% and a valid result is present. 'Omnibus tests' were used in order to test the model significance in this case; Omnibus tests (or Omnibus F tests meaning overall tests) are used in logistic regressions to verify the significance of the model, testing the variance's significance of the data under study (Doornik & Hansen, 2008). Nagelkerke R^2 is a pseudo R squared and is used in logistic regression to check how much the model predicts the outcome, describing the goodness of fit of the data (Barclay, 1991). It describes more the power of explanation of the model. In addition, the R^2 value for this regression is 0.36 meaning that 36 % of the data collected fits the regression line. This implies that 36 % of the future results: customers' willingness to pay to go green in mobile telecom is likely to be predicted by the chosen model. Missing data and random variability of the respondents, contributed in the value of the R^2 . This regression shows that the mean independent variables - subjective norms, perceived behavioral control, and attitudes- have a significant impact on the dependent variable 'the intention (item 7)' as in the theory of planned behavior. The second regression is summarized in the table 6 below.

Table 6: Regression 2

Dependent Variable	Independent Variables	Significance
Intention (item 7): Are you ready to pay an extra amount on your monthly mobile bill to move to environmentally friendly mobile telecom?	<u>Mean Score Subjective norm for the following items:</u> <ul style="list-style-type: none"> ●Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications (item 10) ●In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is Weak or high (item 11) 	0.000
	<u>Perceived Control:</u> <ul style="list-style-type: none"> ●To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be easy/difficult (item 12)* 	
	<u>Mean Score Attitude norm for the following items:</u> <ul style="list-style-type: none"> ●Turning into environment friendly Mobile Telecom would be (a- harmful, b-positive*, c-effective*, d-foolish, having negative impacts on quality during installation) (item13) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will have high costs for me as a consumer to being implemented (item 14a)* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will reduce my health bill (item 14b) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will improve communication (item 14c) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will cause calling problems during the installation of the green telecom (item 14d)* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will help better serve mobile customers (item 14e) 	

* Reverse order

The third regression was done by setting up the dependent variable (intention) as item 8 in the variables table and using the independent variables as the mean scores for subjective norms, perceived behavioral control and mean scores for attitudes. The significance level for the mentioned regression show 0.019 as the significance for the F stats, and then the model is significant at 99%. In addition, the R^2 value for this regression is 0.292 meaning that 29.2 % of the data collected fits the regression line. This implies that 29.2 % of the future results (maximum amount to being paid to go green) are likely to be predicted by the chosen model. Missing data and random variability of the respondents, contributed in the value of the R^2 . A valid result for T-stats is around 90% for the independent variable subjective norm (significance is 0.117) as well as around 99% for the independent variable attitude (significance 0.006). T-stats significance for the perceived behavioral control is 0.362: this is due to the fact of chance and missing

knowledge related to green telecommunications. Furthermore, going green in mobile telecommunications is not yet implemented, and the respondents' knowledge of the turning into green process is still vague and just built on different previous experiences in the sector. This regression shows that the mean scores of the independent variables (subjective norms and attitudes) have a significant impact and explain well the dependent variable 'the intention (item 8)' as in the theory of planned behavior. The third regression is summarized in the table 7 below.

Table 7: Regression 3

Dependent Variable	Independent Variables	Significance (Fstats)	Significance (T stats)
Intention (item 8): What is the maximum additional amount on your mobile bill (in \$US Dollars) per month that you are willing to pay in order to have environment friendly mobile telecommunications	<u>Mean Score Subjective norm for the following items:</u> <ul style="list-style-type: none"> ● Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications (item 10) ● In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is Weak or high (item 11 #) 	0.019	0.117
	<u>Perceived Control:</u> <ul style="list-style-type: none"> ● To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be easy/difficult (item 12)* 		0.362
	<u>Mean Score Attitude norm for the following items:</u> <ul style="list-style-type: none"> ● Turning into environment friendly Mobile Telecom would be (a- harmful, b-positive*, c-effective*, d-foolish, having negative impacts on quality during installation) (item 13) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will have high costs for me as a consumer to being implemented (item 14a)* ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will reduce my health bill (item 14b) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will improve communication (item 14c) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will cause calling problems during the installation of the green telecom (item 14d)* ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will help better serve mobile customers (item 14e) 		0.006

* Reverse order

The fourth regression was done by setting up the dependent variable (intention) as item 9 and using the independent variables as the mean scores for subjective norms, perceived behavioral control, and mean scores for attitudes. The significance level for this regression shows 0.000 as the significance for the F stats, and then, the model is

significant at 99%. In addition, the R^2 value for this regression is 0.459 meaning that 45.9% of the data collected fits the regression line. This implies that 45.9 % of the future results (certainty of the respondents' plans to going green if mobile telecom is implemented) are likely to be predicted by the chosen model. Considering the T-stats for each independent variable, the mean scores of attitude and subjective norms are significance to 99% (T-stats significance of 0.000). As for the perceived behavioral control, t-stats value of 0.174 express that there is low significance (around 83%) in describing the dependent variable item 9. Perceived behavioral control depends on telecom companies' usage of environmentally friendly solutions. The low significance of the perceived control was impacted by the low certainty of the respondents' plans to adopt green mobile telecom when implemented. This regression shows that the mean scores of the independent variables (subjective norms and attitude) are significant and explain well the dependent variable: the intention (item 9) as in the theory of planned behavior. The fourth regression is summarized in the table 8 below.

Table 8: Regression 4

Dependent Variable	Independent Variables	Significance (Fstats)	Significance (T stats)
Intention (<i>item 9</i>): How certain is your plan to adopt green mobile telecommunications when implemented?	<u>Mean Score Subjective norm for the following items:</u> <ul style="list-style-type: none"> ●Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications (item 10) ●In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is Weak or high (item 11) 	0.000	0.000
	<u>Perceived Control:</u> <ul style="list-style-type: none"> ●To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be easy/difficult (item 12)* 		0.174
	<u>Mean Score Attitude norm for the following items:</u> <ul style="list-style-type: none"> ●Turning into environment friendly Mobile Telecom would be (a- harmful, b-positive*, c-effective*, d-foolish, having negative impacts on quality during installation) (item 13) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will have high costs for me as a consumer to being implemented (item 14a)* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will reduce my health bill (item 14b) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will improve communication (item 14c) ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will cause calling problems during the installation of the green telecom (item 14d)* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will help better serve mobile customers (item 14e) 		0.000

* Reverse order

The fifth regression is done by setting up the dependent variable (intention) as item 6 and using the independent variables as the separate questions for each variable. Independent variables are: subjective norms, perceived behavioral control, and attitudes. The reverse scores are taken into consideration as well. The significance level for the mentioned regression shows 0.000 as the significance for the F stats; by that the model is significant at 99% confidence level. In addition, the R^2 value for this regression is 0.226 meaning that 22.6 % of the data collected fits the regression line. Missing data and random variability of the respondents, contributed in the value of the R^2 . As for the t-statistics, perceived control has low significance (0.989), where it depends on telecom companies to adopt environmental friendly solutions. Out of ten items for attitude, four

were found with low significance, which didn't affect the significance of the model. Significance values are shown in table 9 below. On the other hand, the effects of mobile telecom by having higher costs on consumers and reducing health bill showed low significance 0.838, 0.553 respectively; and this is mainly due to the bad experience that the consumers have already faced during the deployment of the 3G network. The Lebanese consumers' trust towards the public sector is missing as expressed frankly by the respondents during the survey. This regression shows that the independent variables (subjective norms and attitudes) are significant and explain the intention as in the theory of planned behavior. The fifth regression is summarized in the table 9 below.

Table 9: Regression 5

Dependent Variable	Independent Variables	Significance (F stats)	Significance (T stats)
Intention (<i>item 6</i>) How likely is it that you intend adopting green Mobile Telecommunications if it is implemented	<u>Subjective Norm: item 10</u> ●Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications	0.000	0.010
	<u>Subjective Norm: item 11</u> ●In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is Weak or high		0.117
	<u>Perceived Control:</u> ●To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be easy/difficult*		0.989
	<u>Attitude: item 13</u> ●Turning into environment friendly Mobile Telecom would be: Harmful Positive* Effective* Foolish Having negative impacts on quality during installation).		0.465 0.176 0.015 0.677 0.004
	<u>Attitude: item 14</u> ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will have high costs for me as a consumer to being implemented* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will reduce my health bill ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will improve communication ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will cause calling problems during the installation of the green telecom* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will help better serve mobile customers		0.838 0.553 0.015 0.029 0.003

* Reverse order

The sixth regression was done by setting up the dependent variable (intention, item 7) and the independent variables as the separate questions for each variable: independent variables are subjective norms, perceived behavioral control, and attitude. The reverse scores were taken into consideration as well. The significance level for this regression shows 0.004 as the significance; therefore, the model is significant at 99% confidence level. 'Omnibus tests' were used in order to test the model significance in this case. In addition, the R^2 (Nagelkerke R^2) value for this regression is 0.484 meaning that 48.4% of the data collected fits the regression line. This implies that 48.4 % of the future customers' intentions to going green in mobile telecommunications if it is implemented are likely to be predicted by the chosen model. The dependent variable question 7 is binomial. Therefore, this regression is logistic regression which indicates the covariates as individual questions. This regression shows that the separately used independent variables (subjective norms, perceived behavioral control and attitudes) are significant and explain well the dependent variable the intention (item 7) as in the theory of planned behavior. The sixth regression is summarized in the table 10 below.

Table 10: Regression 6

Dependent Variable	Independent Variables	Significance
Intention (<i>item 7</i>): Are you ready to pay an extra amount on your monthly mobile bill to move to environmentally friendly mobile telecom?	<u>Subjective Norm: item 10</u> ●Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications	0.004
	<u>Subjective Norm: item 11</u> ●In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is Weak or high	
	<u>Perceived Control: item 12</u> ●To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be easy/difficult*	
	<u>Attitude: item 13</u> ●Turning into environment friendly Mobile Telecom would be Harmful Positive* Effective* Foolish Having negative impacts on quality during installation).	
	<u>Attitude: item 14</u> ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will have high costs for me as a consumer to being implemented* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will reduce my health bill ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will improve communication ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will cause calling problems during the installation of the green telecom * ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will help better serve mobile customers	

* Reverse order

The seventh regression was done by setting up the dependent variable as item 9 and the independent variables as the separate questions for each variable. Independent variables: are subjective norms, perceived behavioral control, and attitudes. The significance level for the mentioned regression shows 0.000 as the significance for the F-stats. By that, the model is significant at 99%. In addition, the R^2 value for this regression is 0.302 meaning that 30.2 % of the data collected fits the regression line. This shows that 30.2 % of the future customers' intentions to going green in mobile telecommunications if it is implemented are likely to be predicted by the chosen model. Missing data and random variability of the respondents, contributed in the value of the R^2 . As for the t-stats, the perceived behavioral control was found with low significance (significance of

0.926); it depends on telecom companies to adopt environmentally friendly solutions. Out of ten items for attitude, some were found with low significance, which didn't affect the significance of the model. For turning into environment friendly mobile telecom would be positive, foolish, or having negative impacts on quality during installation, the significances were found 0.884, 0.346, and 0.232 respectively. Those values are indicated in details in the table 11. This was mainly due to factor of chance and missing knowledge in the environmentally friendly domain, since a lack of technical knowledge is missing in the implementation of green mobile telecom. On the other hand, the effects of mobile telecom by having higher costs on consumers, reducing health bill, and causing calling problems during the installation have low significance 0.907, 0.236, 0.864 respectively; and this is mainly due to the bad experience that the consumers have already faced during the deployment of the 3G network (ex: the large amount of complaints of unexpected over limits usage of the consumers (Alfa, 2012) as well as in MTC Touch) and the lack of trust towards the public sectors responsible expressed frankly during the survey with the respondents. The sample size, previous experience in similar domains, and the factor of chance affected the results. This regression shows that the independent variables (subjective norms, perceived behavioral control and attitudes) are significant and explain the dependent variable (the intention) as predicted in the theory of planned behavior. The seventh regression is summarized in the table 11 below.

Table 11: Regression 7

Dependent Variable	Independent Variables	Significance (Fstats)	Significance (T stats)
Intention (<i>item 9</i>) How certain is your plan to adopt green mobile telecommunications when implemented?	<u>Subjective Norm: item 10</u> ●Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications	0.000	0.001
	<u>Subjective Norm: item 11</u> ●In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is Weak or high		0.018
	<u>Perceived Control: item 12*</u> ●To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be easy/difficult*		0.926
	<u>Attitude: item 13</u> ●Turning into environment friendly Mobile Telecom would be Harmful Positive* Effective* Foolish Having negative impacts on quality during installation).		0.000 0.884 0.028 0.346 0.232
	<u>Attitude: item 14</u> ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will have high costs for me as a consumer to being implemented* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will reduce my health bill ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will improve communication ● Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will cause calling problems during the installation of the green telecom* ●Choose the one that best express your opinion to complete the statement If environmentally friendly telecommunications system is to be used it will help better serve mobile customers		0.907 0.236 0.163 0.864 0.033

In conclusion, different regressions verified the significance of the model. As for the t-statistics, the most significant variable that explained the model is the attitude whereas the least significant one is the perceived behavioral control. The perceived behavioral control is the least significant variable due to the number of questions related to it in the questionnaire (one in this case), previous experience in the sector, and others unknown variables. This classification of variables in the order of their significance would have differed if more variables were included, a bigger sample size was selected, more models were chosen and more diversified respondents were questioned. All the variables included in the questionnaire contributed in the justification of the hypotheses. As for the main concern of this research, Lebanese consumers are encouraged to go green

in mobile telecommunication once it is implemented, knowing that some respondents showed their concerns of the probable degradation of mobile services during the installation of green systems. The consumers' awareness of going green is a major predictor of consumers' intentions and behaviors.

This study is aligned with all the studies performed worldwide as described in details in the literature review. The theory of planned behavior showed its significance as in different similar related studies. The environmental behavior and the explanations of going green in different topics (transportation, green consumerism, green marketing, different customized behaviors supporting going green, etc.) were verified through the theory of planned behavior in particular going green in mobile telecommunications.

This study supports the decision makers in the telecom business to assess the Lebanese consumers' intentions of being environmentally friendly in mobile telecom. The Lebanese consumers' intention to go green in mobile telecommunications is considered a new topic in Lebanon; my work at Alfa, my daily contacts with employees in MTC Touch, as well as my research helped me know that such studies are not yet performed in Lebanon. The sector is under the responsibility of the government who is responsible of the investments and the capital expenditures. Convincing the government in investing to go green in mobile telecommunications is very hard. Hence, this study is based on consumers' awareness, intentions towards going green, and their willingness to pay to go green in mobile telecom. Also, this study was performed to increase the consumers' knowledge of the effect of mobile telecommunications. Numerous studies have been performed globally relating green technologies and implementation, in particular green mobile telecom. The operations of the telecom sector around the world are different from the operations in Lebanon, and the studies are performed within private

companies. Those companies are taking the go green process on their behalf in order to meet international standards. If it is implemented, the impact in Lebanon would be of high importance, targeting one of the most used and developing sectors to be environmentally friendly. This research supports decision makers, the government, and the telecom sector in order to drive mobile telecommunications into green. The awareness of the Lebanese consumers, their willingness to pay, and their intention (based on attitude, subjective norms, and perceived behavioral control) to adopt green mobile telecom are the main focus of the study.

Chapter 5: Conclusions and Recommendations

After detailing the main findings and results in chapter 4, chapter 5 includes the study conclusions, research limitations, and recommendations.

5.1 Conclusions

This research examines different factors that assess the intention of mobile telecommunications users of adopting green mobile telecom. Mobile telecom users were questioned in order to assess their awareness about the topic of going green in mobile telecommunications. Results show that about 60.1 % of the respondents consider that mobile telecommunications can have effects on health degradation, while 73.8 % of the respondents are likely to consider that going green in mobile telecommunications will contribute in saving the environment. Respondents were asked if they were ready to pay an extra amount on their monthly mobile bill to move to environmentally friendly mobile telecom and the majority of the respondents (around 75%) are ready to do it.

In order to verify the reliability of the tests, Chronback Alpha (coefficient for internal consistency) was performed. This test's results are significant and reliable (values 0.698 and 0.658) for the intention and attitude. The descriptive analyses and the significance levels of variables' verify the hypotheses. The theory of planned behavior applied to going green in mobile telecom showed good explanatory results gathering the various data (socio demographic variables, locations, mobile usage, etc.). About eighty three percent (82.6 %) of the respondents are likely to adopt green mobile telecommunications if implemented. Therefore, the Lebanese consumers are aware of the negative environmental and health effects of mobile telecommunications and they are ready to pay higher mobile fees where green telecom systems will be applied in Lebanon. Also,

consumers' intention to go green in mobile telecommunications is affected by the attitude, perceived behavioral control, and subjective norms.

As presented in the literature review, the application of the theory of planned behavior shows significant results in what relates to going green in mobile telecom similarly to the cases used worldwide with consumers' behaviors towards going green. Environmentally friendly solutions have been implemented in several countries and good results were shown worldwide especially in North America, Europe, and the Middle East.

5.2 Research Limitations

Several limitations were confronted throughout the study and are summarized below: there is no sufficient data about going green in mobile telecommunication in what relates to consumers' behavior in Lebanon; by that, the respondents found this topic as new and this might have affected the results.

The sample of respondents chosen was randomly selected from a population located in Haret Hreik, Jdaide, Maameltein, and Roueiss. The questions were conducted by passing through the areas' population through weekends and weekdays, in order to cover distinct users with the variety of respondents and their locations that changes between weekends and weekdays. Different variables revealed in the questionnaire are studied; those variables are attitudes, awareness, environmental citizenship, perceived control, subjective norms, and socio-demographic factors. Furthermore, different additional factors can affect the intention of going green in mobile telecommunications. It is important to highlight that the study measures the intention of going green and not the behavior of the respondents; the behavior can't be measured until the green mobile telecom will be implemented.

The telecommunications sector is directly related to the government where the decision to invest in any new technology is taken by the ministry of telecommunications. The government deals with the two mobile telecom companies who are just offering management of the sector. By that, the decision of going environmentally friendly requires the political will of the Lebanese council of ministers.

5.3 Recommendations

Analyses performed in this study are to assess the influence of different variables on green telecom. International standards and norms were abided and the new systems utilized were approved by the International Telecommunications Union. Even the application of green telecom has been applied in different countries, yet this new study in Lebanon requires several pre-requisites and needs more experience prior to being implemented. This research gives an example of the many factors that might influence mobile telecom users to going green. Major findings show that different factors affect the intention of going green in mobile telecommunication, respondents are aware of the negative environmental and health effects of mobile telecommunications, and respondents are willing to pay for going green in mobile telecommunications. One of the hardest aspects of going green is to generate decisions based on the customers' opinions where different variables determine the respondents' opinions.

In some questions, the respondents were found neutral in what relates to knowledge, awareness, and environmental citizenship. Awareness campaigns such as workshops, discussion groups, mass media, and others can encourage better adoption of green systems.

Mobile telecommunications have become a major contributor in our daily lives and a necessity for every person (for work, entertainment, etc.). The number of mobile phone users is increasing tremendously and this is a significant trend in Lebanon and in the world; even the networks are being adapted to handle smart phones (Alfa, 2012). This study applied in Lebanon can be adapted in any other country; this is technically feasible since the Lebanese mobile network is one of the most complex networks with Lebanon's hard geography and diversified equipment, diversified users, and different behaviors, etc. Hence, going green in mobile telecommunications depends on many factors (availability of the equipment, deployment, world environmental solutions, international standard organizations, etc.) and more specifically on the consumers (decision and policy makers). Their adaptation and lifestyles contribute in saving the environment through green solutions; hence the association between the business needs meeting international standards, consumers' behaviors, and technical requirements is attained. The role of the government, decision makers, mobile telecom companies, and employees in mobile telecom sector is important by having clear strategic plans to adopting green technologies in particular mobile telecom. In future studies, it is proposed to add other variables, such as previous experience in related sectors, outcome expectancy, and practical adaptation of going green.

In order to get more accurate results, data collection should cover more respondents, with more questions for each variable.

Awareness campaigns are a necessity for decision makers in order to know the direct and indirect impact of not implementing such systems while showing that the consumers are ready to go green in mobile telecom.

Attitudes, subjective norms, perceived behavioral control, willingness to pay to go green, awareness, and all socio-demographic variables affect the respondents' intention to go green in mobile telecom. The consumers' intentions to go green have an effect on the mobile telecom sector. The study supports the national and international standards of mobile telecom, provides feedback to the decision makers for going green, and affects directly and indirectly different sectors (energy, power, etc.) helping in an environmentally friendly sector and country.

As from previous experience in the sector, clear project implementation plans and optimal solutions of the material chosen are a must. Implementing green mobile telecom requires time, while many advantages and disadvantages accompany the implementation. Advantages are found such as less pollution, less emissions, lower maintenance cost, etc. As for disadvantages, they are described as problems occurring in the installations, hybrid systems with higher cost, government decision for budgets, manipulation of the new systems and ability to adapt.

Green communities and companies' contributions and collaborations with the government are a must in order to come up with a global solution in mobile telecommunications.

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APPENDICES

APPENDIX A (Questionnaire in English)

Green Mobile Telecommunications in Lebanon

This questionnaire is designed to complete a study for a Master degree in Business Administration.

Health and environmental conditions have been degrading, affecting directly the well-being of humans. Mobile Telecommunications is one of the fastest developing sectors in the world and in Lebanon. It is a sector where different technological parts are utilized and in large amounts in order to operate mobile telecommunications while ensuring the quality of the services.

Going green in mobile telecommunications means:

- Environment friendly systems
- Consumers reduce mobile usage
- Consumers are more attentive in charger usages, substituting calls by texting
- Some costs that might be reflected on customers for the implementation of green mobile telecommunications

Going Green in mobile telecommunications has advantages:

- Decrease Environmental degradations
- Reduce Health deterioration
- Reduce Pollution
- Increase life expectancy
- Lower costs in future systems' operations (maintenance, installation, etc.)

In this survey, we are trying to know more about your views depending on how others may react to going green in mobile telecommunications and how it might affect your choice.

You should be able to answer the questions in 7 minutes. Without the help of people like you, research on customers could not be conducted. Your participation is voluntary and there is no penalty if you do not participate. Please remember that there is no right or wrong answer.

Please be assured that your responses will be kept strictly confidential. Please do not write your name on the questionnaire, we are only interested in your opinions.

Please indicate your opinion by choosing the most appropriate answer for each question over a scale from 1 to 7.

1. Have you ever participated in an environmental activity?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

2. How much do you think you can adapt to changes in your daily mobile usage (calling methods: (Viber, Skype ...) call duration), etc.?

CAN'T ADAPT -----1-----2-----3-----4-----5-----6-----7----- CAN ADAPT

3. How much do you consider yourself environmental friendly in your daily activities (other than in telecom; ex: waste, behavior, etc.)?

NOT ENVIRONMENTALLY FRIENDLY -----1-----2-----3-----4-----5-----6-----7-----
ENVIRONMENTALLY FRIENDLY

4. Have you ever considered that mobile telecommunications can have effects on health degradation?

HAVE NEGATIVE EFFECTS ON HEALTH -----1-----2-----3-----4-----5-----6-----7----- DON'T HAVE NEGATIVE EFFECTS ON HEALTH

5. How likely do you consider that going green in Mobile Telecommunications (telecom companies use eco-friendly products and green energy to power their equipment) will contribute in saving the environment?

UNLIKELY -----1-----2-----3-----4-----5-----6-----7----- LIKELY

6. How likely is it that you intend adopting green Mobile Telecommunications if it is implemented?

UNLIKELY TO ADOPT -----1-----2-----3-----4-----5-----6-----7----- LIKELY TO ADOPT

7. Are you ready to pay an extra amount on your monthly mobile bill to move to environmentally friendly mobile telecom? (If no skip question 8)

Yes		No	
-----	--	----	--

8. What is the maximum additional amount on your mobile bill (in \$US Dollars) per month that you are willing to pay in order to have environment friendly mobile telecommunications :

Amount in US \$	
-----------------	--

9. How certain is your plan to adopt green mobile telecommunications when implemented?

UNCERTAIN -----1-----2-----3-----4-----5-----6-----7----- CERTAIN

10. Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications

DISAPPROVE -----1-----2-----3-----4-----5-----6-----7----- APPROVE

11. In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is

WEAK EFFORT -----1-----2-----3-----4-----5-----6-----7----- HIGH EFFORT

12. To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be

EASY -----1-----2-----3-----4-----5-----6-----7----- DIFFICULT

13. Turning into environment friendly Mobile Telecom would be ...

HARMFUL -----1-----2-----3-----4-----5-----6-----7----- HELPFUL

POSITIVE -----1-----2-----3-----4-----5-----6-----7----- NEGATIVE

EFFECTIVE -----1-----2-----3-----4-----5-----6-----7----- INEFFECTIVE

FOOLISH -----1-----2-----3-----4-----5-----6-----7----- WISE

HAVING NEGATIVE IMPACTS

NOT HAVING NEGATIVE IMPACTS

ON QUALITY DURING INSTALLATION -----1-----2-----3-----4-----5-----6-----7-----ON QUALITY DURING
INSTALLATION

14. The items in the list below all have to do with possible consequences of going green in mobile Telecom.
For each item, circle what completes the statement in a way that best expresses YOUR OPINION.

If environmentally friendly telecommunications system is to be used, ...

Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely	
1	2	3	4	5	6	7	.. it will have high costs for me as a consumer
1	2	3	4	5	6	7	.. it will reduce my health bill
1	2	3	4	5	6	7	.. it will improve communication
1	2	3	4	5	6	7	.. it will cause calling problems during the installation of the green telecom
1	2	3	4	5	6	7	.. it will help better serve mobile customers

15. Gender: Male Female

16. Year of Birth: _____

17. Educational Level:

No School	<input type="checkbox"/>
Elementary	<input type="checkbox"/>
Intermediate	<input type="checkbox"/>
Secondary	<input type="checkbox"/>
Undergraduate	<input type="checkbox"/>
Graduate	<input type="checkbox"/>

18. Average Monthly household Income (US Dollars \$):

0-500	<input type="checkbox"/>
501-1000	<input type="checkbox"/>
1001-1500	<input type="checkbox"/>
1501-2000	<input type="checkbox"/>
2001-3000	<input type="checkbox"/>
3001-4000	<input type="checkbox"/>
Above 4001	<input type="checkbox"/>

19. Marital Status:

Married	<input type="checkbox"/>
Separated	<input type="checkbox"/>
Single	<input type="checkbox"/>
Widow/er	<input type="checkbox"/>

20. The number of family members living in your house including yourself is:

Please feel free to write your comment below _____

APPENDIX B (Questionnaire in Arabic)

قطاع اتصالات خليوية صديقة للبيئة في لبنان

يهدف هذا الاستبيان الى استكمال دراسة للحصول على شهادة الماجستير في إدارة الأعمال.

شهدت الظروف الصحية والبيئية تدهوراً كبيراً أثر بشكل جسيم على رفاهية الإنسان.

يُعدّ قطاع الاتصالات الخليوية من أسرع القطاعات نمواً في العالم ولبنان. والجدير بالذكر أنه يتم في هذا القطاع استخدام المحافظة على البيئة في قطاع. تكنولوجيايات مختلفة وبكميات وافرة بغية تشغيل الاتصالات الخليوية مع ضمان جودة الخدمات الاتصالات الخليوية معناه:

- أنظمة صديقة للبيئة.
- حد استعمال الهواتف الخليوية من قبل المستهلكين.
- ايلاء عناية أكبر لاستعمال الشاحن واستبدال الاتصالات بالرسائل القصيرة من قبل المستهلكين.
- التكاليف التي قد تنعكس على العملاء إثر تنفيذ قطاع اتصالات خليوية صديقة للبيئة

المحافظة على البيئة في قطاع الاتصالات الخليوية لها مزاياها:

- خفض الأثار التي تسبب تدهورات بيئية
- الحدّ من تدهور الصحة
- الحدّ من التلوث
- زيادة متوسط العمر المتوقع
- خفض التكاليف في نظم العمليات المستقبلية (صيانة، وتركيب، إلخ...)

نحاول من خلال هذه الدراسة أن نستشف المزيد حول وجهات نظركم بالاستناد إلى ردّ فعل الآخرين إزاء المحافظة على البيئة في قطاع الاتصالات الخليوية وكيف عساها تؤثر على اختياركم.

ينبغي أن تكون قادراً / قادرة على الإجابة على الأسئلة الواردة أدناه خلال ٧ دقائق فقط. واعلم أنه من دون مساعدة أشخاص على غرارك، لاستحال إجراء أبحاث تُعنى بالعملاء. إن مشاركتك طوعية، ولا تترتب أيّ عقوبة عن تمّنعك عن المشاركة. ويُرجى منك تذكر أنه لا يوجد جواب صحيح وآخر خاطئ. واطمئن أن أجوبتك ستبقى سرية. وأخيراً، يرجى عدم كتابة اسمك على الاستبيان، فنحن مهتمون وحسب بأرائك.

يرجى بيان رأيكم من خلال اختيار الجواب المناسب حول الرقم الصحيح (من ١ الى ٧)

1- هل سبق لك أن شاركت في نشاط أجل كلا يبني؟

2- إلى أي مدى تظن أن بوسعك التكيف مع التغيرات في استعمالك اليومي لهاتفك النقال (أساليب الاتصال): ("فاير"، "سكايب"، إلخ...)، ومدة المكالمات، وما إلى ذلك؟

لا يسعني التكيف ١-----٢-----٣-----٤-----٥-----٦-----٧-----بوسعي التكيف

3- إلى أي مدى تعتبر نفسك صديقاً للبيئة في أنشطتك اليومية (غير الإتصالات: تصرفات، تشجير، إلخ.)؟

غير صديق للبيئة ١-----٢-----٣-----٤-----٥-----٦-----٧-----صديق للبيئة

4- هل سبق لك أن فكرت في أن الاتصالات الخليوية يمكن أن تؤثر على تدهور الصحة؟

تؤثر على تدهور الصحة ١-----٢-----٣-----٤-----٥-----٦-----٧-----لا تؤثر على تدهور

الصحة

5- إلى أي درجة تظن أنه من المحتمل أن يساهم قطاع اتصالات خليوية صديق للبيئة في الحفاظ على البيئة

غير محتمل ١-----٢-----٣-----٤-----٥-----٦-----٧-----محتمل

6- إلى أي مقدار يُحتمل أن تتبنى اتصالات خليوية صديقة للبيئة إن تمّ تنفيذها؟

لا أتبنى ١-----٢-----٣-----٤-----٥-----٦-----٧-----أتبنى

7- هل أنت مستعد لدفع مبلغ إضافي على فاتورة هاتفك الخليوي بهدف الانتقال إلى إتصالات صديقة للبيئة ؟ (إذا

الجواب كلا الرجاء الانتقال إلى أجل كلا السؤال رقم 9)

8- ما هو الرسم الإضافي الأقصى الذي أنت مستعد لدفعه شهرياً للحصول على إتصالات صديقة للبيئة:

المبلغ بالدولار الأميركي	\$
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9- إلى أي درجة أنت واثق من أنك ستبنى اتصالات خليوية صديقة للبيئة عند تنفيذها؟

غير واثق ١-----٢-----٣-----٤-----٥-----٦-----٧-----واثق

10- أغلبية الناس المقربين منك (يوافقون أم لا) على أنك ستحول إلى استخدام اتصالات صديقة للبيئة

لا يوافقون ١-----٢-----٣-----٤-----٥-----٦-----٧-----يوافقون

11- بالنسبة إليك، أن الجهد الذي يبذله المواطنون الآخريين للحصول على قطاع اتصالات خليوية صديقة للبيئة:

ضعيف ١-----٢-----٣-----٤-----٥-----٦-----٧-----قوي

12- بالنسبة إليك، التحول إلى اتصالات خليوية صديقة للبيئة سيكون:

سهلاً ١-----٢-----٣-----٤-----٥-----٦-----٧-----صعباً

13- التحول إلى اتصالات خلوبية صديقة للبيئة سيكون:

ضاراً ١-----٢-----٣-----٤-----٥-----٦-----٧----- مفيداً
 إيجابياً ١-----٢-----٣-----٤-----٥-----٦-----٧----- سلبياً
 فعالاً ١-----٢-----٣-----٤-----٥-----٦-----٧----- غير فعال
 غيباً ١-----٢-----٣-----٤-----٥-----٦-----٧----- حكيماً

لن يكون له عواقب سلبية

له عواقب سلبية

على نوعية الاتصالات ١-----٢-----٣-----٤-----٥-----٦-----٧----- على نوعية الاتصالات

خلال التركيب

خلال التركيب

14- إن البنود المنوه عنها في القائمة أدناه تعنى جميعها بالتبعات المحتملة التي قد ترتبط بالمحافظة على البيئة في الاتصالات الخليوية. بالنسبة لكل بند من البنود، ضع دائرة حول التفسير الذي يكمل البيان بأفضل طريقة ممكنة
 تعرب عن رأيك.

إن كانت الاتصالات الخليوية الصديقة للبيئة سعتمد، ...

مرجح للغاية	مرجح جداً	مرجح قليلاً	مطلقاً	غير مرجح قليلاً	غير مرجح جداً	غير مرجح للغاية	
٧	٦	٥	٤	٣	٢	١	..سيترتب عليّ تكاليف عالية بصفتي مستهلك إن نفذت
٧	٦	٥	٤	٣	٢	١	... ستحد من فاتورتي الطبية
٧	٦	٥	٤	٣	٢	١	... ستتحسن الاتصالات
٧	٦	٥	٤	٣	٢	١	... ستسبب مشاكل في الاتصالات خلال عملية تركيب الاتصالات الصديقة للبيئة
٧	٦	٥	٤	٣	٢	١	ستساهم في خدمة المستهلكين على نحو أفضل.

15- الجنس ذكر أنثى

16- سنة الولادة: _____

17- المستوى التعليمي:

<input type="checkbox"/>	غير متعلم
<input type="checkbox"/>	ابتدائي
<input type="checkbox"/>	متوسط
<input type="checkbox"/>	ثانوي
<input type="checkbox"/>	جامعي
<input type="checkbox"/>	دراسات عليا

18- متوسط دخل الأسرة الشهري (بالدولار الأميركي):

	0-500
	501-1000
	1001-1500
	1501-2000
	2001-3000
	3001-4000
	أكثر من 4001

19- الوضع العائلي:

	متزوج/ة
	منفصل/ة
	أعزب/عزباء
	أرمل/ة

20- الرجاء تحديد عدد أفراد الأسرة بما في ذلك نفسك

الرجاء تدوين ملاحظتك أدناه

APPENDIX C (Variable Items with Descriptive Statistical Results)

The below table describes the variable items with their descriptive statistical results:

Question number	Item	Descriptive statistics	Valid Percentage
Q1	Have you ever participated in an environmentally friendly solution	Yes	53.4
		No	46.6
Q2	How much do you think you can adapt to changes in your daily mobile usage (calling methods: (Viber, Skype ...) call duration??	extremely can't adapt	2.4
		quite can't adapt	4.6
		slightly can't adapt	7
		neither can't adapt nor can adapt	9.5
		slightly can adapt	22.6
		quite can adapt	28.7
		extremely can adapt	25.3
Q3	How much do you consider yourself environmental friendly in your daily activities (other than in telecom; ex: waste, behavior, etc	extremely not environmentally friendly	1.5
		quite not environmentally friendly	5.2
		slightly not environmentally friendly	9.5
		neither not environmentally friendly nor environmentally friendly	15.9
		Slightly environmentally friendly	21
		quite environmentally friendly	24.4
		extremely environmentally friendly	22.6
Q4	Have you ever considered that mobile telecommunications can have effects on health degradation	extremely have negative effects on health	16.8
		quite have negative effects on health	22.6
		slightly have negative effects on health	20.7
		neither have negative effects on health nor don't have negative effects on health	13.4
		slightly don't have negative effects on health	12.2
		quite don't have negative effects on health	8.2
		extremely don't have negative effects on health	6.1
Q5	How likely do you consider that going green in Mobile Telecommunications (telecom companies use eco-friendly products and green energy to power their equipment) will contribute in saving the environment?	extremely Unlikely	2.4
		quite Unlikely	7.6
		slightly Unlikely	6.1
		neither Unlikely nor Likely	10.1
		slightly likely	23.2
		quite likely	29.6
		extremely likely	21
Q6	How likely is it that you intend adopting green Mobile Telecommunications if it is implemented	extremely Unlikely to adopt to adopt	1.5
		quite Unlikely to adopt	3.4
		slightly Unlikely to adopt	4.9
		neither Unlikely to adopt nor Likely to adopt	7.6
		slightly likely to adopt	21.6
		quite likely to adopt	30.2
		extremely likely to adopt	30.8
Q8	Are you ready to pay an extra amount on your monthly mobile bill to move to environmentally friendly mobile telecom?	Yes	74.1
		No	25.9
Q9	How certain is your plan to adopt green mobile telecommunications	extremely Uncertain	2.7
		quite Uncertain	4.9

	when implemented?	slightly Uncertain	7.6
		neither Uncertain nor certain	14.6
		slightly certain	20.1
		quite certain	32.3
		extremely certain	17.7
Q10	Most people who are important to you (disapprove/approve) of your switching to environmentally friendly telecommunications	extremely disapprove	4
		quite disapprove	5.8
		slightly disapprove	16.5
		neither disapprove nor approve	18
		slightly approve	26.8
		quite approve	16.8
		extremely approve	11.9
Q11	In my opinion, the effort other citizens are ready to make to switch to environmentally friendly telecommunications in the coming months is	extremely weak effort	10.4
		quite weak effort	16.5
		slightly weak effort	22.3
		neither weak effort nor high effort	23.8
		slightly high effort	16.5
		quite high effort	8.2
		extremely high effort	2.4
Q12	To you, going green in Mobile Telecom (telecom companies use eco-friendly products and green energy to power their equipment) would be	extremely easy	6.1
		quite easy	7.3
		slightly easy	12.5
		neither easy nor difficult	15.9
		slightly difficult	23.5
		quite difficult	21.6
		extremely difficult	13.1
Q13a	Turning into environment friendly Mobile Telecom would be ...	extremely harmful	1.8
		quite harmful	1.5
		slightly harmful	2.4
		neither harmful nor helpful	7
		slightly helpful	14.3
		quite helpful	35.1
		extremely helpful	37.8
Q13b	Turning into environment friendly Mobile Telecom would be ...	extremely positive	38.7
		quite positive	33.5
		slightly positive	13.4
		neither positive nor negative	6.7
		slightly negative	4.6
		quite negative	2.1
		extremely negative	0.9
Q13c	Turning into environment friendly Mobile Telecom would be ...	extremely effective	29.6
		quite effective	30.8
		slightly effective	18.9
		neither effective nor ineffective	11
		slightly ineffective	4.6
		quite ineffective	3.4
		extremely ineffective	1.8
Q13d	Turning into environment friendly Mobile Telecom would be ...	extremely foolish	2.7
		quite foolish	1.8
		slightly foolish	2.1
		neither foolish nor wise	8.2
		slightly wise	15.2

		quite wise	30.2
		extremely wise	39.6
Q13e	Turning into environment friendly Mobile Telecom would be ...	extremely having negative impacts on quality during installation	6.4
		quite having negative impacts on quality during installation	14.9
		slightly having negative impacts on quality during installation	19.8
		neither having negative impacts on quality during installation nor not having negative impacts on quality during installation	24.4
		slightly not having negative impacts on quality during installation	13.1
		quite not having negative impacts on quality during installation	11.3
		extremely not having negative impacts on quality during installation	10.1
Q14a	If environmentally friendly telecommunications system is to be used, it will have high costs for me as a consumer	extremely Unlikely	3
		quite Unlikely	7.9
		slightly Unlikely	10.7
		neither Unlikely nor Likely	13.4
		slightly likely	32.3
		quite likely	25.9
		extremely likely	6.7
Q14b	If environmentally friendly telecommunications system is to be used, it will reduce my health bill	extremely Unlikely	6.1
		quite Unlikely	6.4
		slightly Unlikely	10.4
		neither Unlikely nor Likely	15.5
		slightly likely	33.2
		quite likely	19.8
		extremely likely	8.5
Q14c	If environmentally friendly telecommunications system is to be used, it will improve communication	extremely Unlikely	3.4
		quite Unlikely	4.9
		slightly Unlikely	9.8
		neither Unlikely nor Likely	27.4
		slightly likely	24.1
		quite likely	21.3
		extremely likely	9.1
Q14d	If environmentally friendly telecommunications system is to be used, it will cause calling problems during the installation of the green telecom	extremely Unlikely	3
		quite Unlikely	6.4
		slightly Unlikely	9.8
		neither Unlikely nor Likely	20.4
		slightly likely	31.1
		quite likely	19.5
		extremely likely	9.8
Q14e	if environmentally friendly telecommunications system is to be used, it will help better serve mobile customers	extremely Unlikely	2.4
		quite Unlikely	5.2
		slightly Unlikely	7
		neither Unlikely nor Likely	21
		slightly likely	27.4
		quite likely	25.6
		extremely likely	11.3
Q15	Gender	Female	40.24

		Male	59.76
Q16	Age Ranges	54 – 80	9.76
		33 – 53	28.96
		23 – 32	48.78
		14 – 22	12.50
Q17	Educational Level	No School	0.9
		Elementary	4
		Intermediate	5.5
		Secondary	11
		Undergraduate	58.8
		Graduate	19.8
Q18	Average Monthly household Income (US Dollars \$):	0-500	4
		501-1000	10.7
		1001-1500	18
		1501-2000	24.1
		2001-3000	18.6
		3001-4000	10.4
		Above 4001	14.3
Q19	Marital Status	Married	32.9
		Separated	1.5
		Single	63.4
		Widow/er	2.1
Q20	The Number of Family Members living in your house is	0	1.5
		1	10.1
		2	10.4
		3	20.1
		4	26.8
		5	20.7
		6	6.7
		7	2.7
		8	0.3
		9	0.6