

GE 401 – INNOVATIVE PRODUCT DESIGN AND DEVELOPMENT I

FINAL REPORT

TEAM 6



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1. Introduction

In this report, a brief summary of our studies in this semester is presented. This report includes, managerial and technical conclusions as well as samples of the work done thougout semester by innoWi engineers. In addition to all conclusions given in report, some support documents can be found in appendix.

2. Executive Summary

innoWi Wireless Technologies Corporation is a new company established in November 2011 in Ankara. innoWi has research and development efforts in wireless technologies going on, as well as maintaining operations for establishing production facilities which will provide innovative products for mobile phone market. innoWi was established by five idealist engineers from different areas of engineering, in search of developing and producing qualified, distinguished and innovative products.

innoWi has continious research and development programmes about wireless technologies especially about transmitting power without wires. Main phenomena that is worked on is magnetism and near-field magnetic fiels. innoWi mainly develops, wireless charger devices for mobile phones. Depending upon the research and development facilities, innoWi will start to produce high-profile and distinguished wireless mobile phone charger by the summer 2012. Production facilities will also be run by innoWi in the future and innoWi will become not only a developer but also a supplier of wireless-technology based products.

As being a company working on technology, innoWi decided its mission as to become the market leader in wireless charging technology through breaking new grounds and vision as to provide a pleasant and effortless multimedia environment and make technology accessible to people. Moreover, innoWi has certain values to maintain on the way to reach its goals which are being; innovative, flexible, environmental/human friendly, customer focused and ethical.

innoWi is a corporation in terms of its legal structure. After completion of legalisation process and completion of production facilities, it is planned to go public and have new shareholders.

innoWi has headquarters in Bilkent/Ankara in need of advanced research facilities and manufacturing plant in Beylikduzu/Istanbul due to closeness to logistics facilities and customers.

innoWi is developing flagship product Wicharger. As its name suggests, Wichager will be a wireless mobile phone charger, which will be fixed under your table and charge the devices on the table. It is expected that, prototype of Wicharger will be ready in the first months of 2012. Afterwards, production and diffusion stages will be continued. It is forecasted that, by summer 2012, customers may have chance to find Wicharger available in technology stores and our web page. What is more, mobile phones will need suitable socket/cover to be charged and these will also be provided be innoWi. Along with Wicharger, there would be new products for commercial use, which will be considered by innoWi in the near future.

Due to the being a new-born company, innoWi has a spreading strategy for at least few years. InnoWi will concantrate to become a recognized and well-liked company in its first years. It is determined that target customer group of Wicharger is young/early-mid aged and educated people, who have a fair income level. innoWi will follow a marketing strategy according to this target group. It is decided that, technology store chains will be used for distribution of product. Moreover, e-advertising and e-commerce methods will be used to reach to the customer, since target customers are highly interested in technology.

3. Company Organization

innoWi considers its human resources as most important resources of it. In consistent with this perception, innoWi tries to put forth an organization, that maximizes productivity of members and alleviates coordination problems.

Organization Chart is given below:

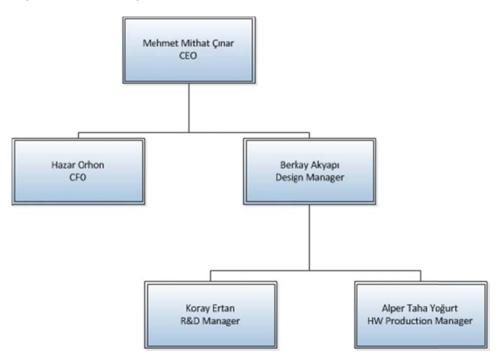


Figure 1-Organization Chart

Despite, there is a certain responsibility distribution and job descriptions, innoWi does not accepts a sharp hierarchy. According to corporate culture of innoWi, every member of innoWi company is responsible for assisting others in need.

Job descriptions and according performance evaluation criteria given below:

Mehmet Mithat Çınar (CEO – Chief Executive Officer)

He acts as a leader for the company. He advises new paths to follow and strategies for the company. He is the face of the company and makes the connection between the community and innoWi. He also plays the role of motivator among the company and he is responsible for the work level, organization of the funds, operational decision processes and budget limitations. At the same time, he is the head of the board of the company.

His performance is measured by the improvement of the company by every mean. Basically, it can be said that profitability of the company and the growth in the revenue of the company is a performance measure for him. His performance is evaluated by the board itself.

Hazar Orhon (CFO – Chief Financial Officer)

Financial planning, keeping the record of the financial documentation, cost and revenue analyses are the main responsibilities of him. Especially after the entrance to the stock market, he will be actively working on the shareholders relations and financial aspect of going to public. He is reporting to board and CEO at the same time.

Performance of CFO is measured by the financial improvement and stability of the company. By following the financial reports he can be evaluated by the board and the CEO.

Berkay Akyapı (Design Manager)

As being a design manager he has two main responsibilities.

First of all is that, with Hazar Orhon who is originally CFO of the company, he is the one responsible for the coordination in between the company. He is the connecting bridge internally, between the design, production and financial components of the company.

In another aspect, he acts as the leader of the design and hardware team of the company. He is not very into the creation or production processes, but he is responsible of the quality services and order of production.

His performance is measured by the level of content inside the company and the customer happiness. He directly reports to board.

Koray Ertan (R&D Manager)

He is the one who is responsible for the research and developments made by the company. He follows the breaking news on the industry and keeps the track of the competitors.

However especially, he is responsible of the production and design of the products, and works with HW Production Manager.

He is evaluated by the innovation aspect of the designs and the seen strength of the company compared to competitors from the point of view of hardware. He reports to board.

Alper Taha Yoğurt (HW Production Manager)

He works together with R&D Manager and his first and most important responsibility is developing new products and technologies for the company. He is the head of engineers in the company and he acts as a chief engineer.

As a total, hardware is his area.

His performance is measured according to improvement and development on technological situation of the company. Following the last trends and being ahead of the competitor by mean of technology is his evaluators. He reports to board.

4. Corporate Identity

As indicated in executive summary, innoWi has certain characteristics and targets to reach. In parallel with it, it has a perceived identity from eye of customers.

In order to reach desired target in corporate identity, innoWi defined keywords that defines itself.

Technology

We believe, technology is one the words defining innoWi®. We use high-end technologies as well asmost basic Technologies in our existing and prospective products.

Innovation

As name offers, innovation is key motivation for innoWi®.

Elegancy

innoWi® reflects elegancy and tries to produce most qualified products with rather reasonable prices.

Mobility

As wireless technology offers, products of innoWi® provides mobility for customers. So we believe mobility is one of the key title defines innoWi®.

In the light of these, innoWi designed its corporate identity materials. Corporate identity materials are given starting from next page.



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Return Address Line 1 1 Return Address Line 2

Date (Month Day, Year) 2

Mr./Mrs./Ms./Dr. Full name of recipient. 3 Title/Position of Recipient. Company Name Address Line 1 Address Line 2

Dear Ms./Mrs./Mr. Last Name: 4

Subject: Title of Subject 5

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Closing (Sincerely...), 7

Signature 8

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Bilkent/Ankara





5. Development and Changes in Project

As being a company with values of innovation and reflexibility, innoWi always has a continuous search for reaching better. Due to this thought, innoWi changed configuration of its product designs with running configuration management procedures many times. Moreover, innoWi realized many developments step by step about the product and also work environement.

First of all, certain developments about working environment was realized. When the design stage of Wicharger project started, as innoWi, we needed an established working environment to realize our product. For this reason, permission obtanied from the head of UMRAM who is Ergin Atalar. Through this permission, we get chance to work in an an established facility. Moreover, first experiments done by hand, and lack of standardization. We developed our own experiment setup, in order to do our experiments under same condition every time.

When we come to our product, there is also some very significant changes and developments realized. At the beginning of the project, we decided that Wicharger should be a box, in order to take the adventage of density of magnetic field, with covering all sides of box with magnetic inductors. However, after experiments and simulations with different pre-designs, we decided that we can also achieve charging only with a plate. As a result, Wicharger was switched from a box to plate which can chager your mobile phone on your desk efficiently. Due to the new plate-type design we had to cancel the disinfecting ultraviolet lamp which would decided to clean the mobile phone.

In parallel with this design, some other changes done about project. Due to the initial design was decided to be box, for sake of conveniency, it was designed with a built in battery. However, since we switched it from a box to a plate, we cancelled the built-in battery design. New design with using mains electricity directly, prevent the problems about the battery problems as well as efficiency problems.

6. Ethical Issues

a. Ethical Issues in Hardware Development

During our implementation of the circuit we used some different papers that were written and published and we give in the references all the papers used. In addition to using papers, as we have very skilledprofessors in our department we used their knowledge to prepare our design. The magnetically coupled HW design was advised by Ergin Atalar and most of the design was prepared by the theoretical help that he gave to us. The other parts of the circuit like amplifier and rectifier was advised by Tarik Reyhan and again we used mostly the theoretical knowledge that he gave to us. Therefore, we do not think that there is a possibility of cheating from us both aware or not aware of it because we used mostlytheoretical knowledge that normally are thought in class.

b. Policies to ensure the Non Disclosure Agreement

In the design, sales or after- sales process of the products, innoWi may need to use know-how or expertise of other companies as well as establishing strategical partnerships. As indicated in values section of the report, ethical issues are very important for innoWi and it respects commercial and trade ethics. As a result, innoWi uses a certain policy in its partnerships and collaborations. Items of policy is given below.

- Information is only shared with related members of innoWi in order to avoid possible consequences about NDA.
- Members of innoWi sign NDA with innoWi in order to ensure not to share information coming from partner company.
- At every stage of design, design manager controls the design documents in order to avoid any kind of information leakage.
- If any document is needed to be published or shared with a third party, after control of
 Design Manager, at least 2 board members signs the document that ensures the
 accuracy of control of design manager and there will not be consequences about NDA.

c. Dedication to Development of Employees

Since innoWi considers human resources as most valuable asset of it, it invests in its members. One of the main aims of innoWi is contributing personal developments of members of innoWi

- Firstly, innoWi arranges 3 days training sessions in every quarter in order to improve the
 corporate culture and insight of its members about their expertise issues. In trainings,
 there are many skills improved which are mainly about team-working and specific
 departmental abilities.
- Moreover, innoWi intoduces a challenge in every quarter. innoWi members can work in a group of 3 and try to develop a solution about the problem which is mostly a real problem about company. Winners of this challenge is introduced in training session and gain some rewards.
- innoWi arranges personal development seminars about productivity, team-working and
 working under stress issues in the company. These seminars are not on a regular basis
 and mainly arranged when density of work is lower. It is also possible to attend a
 seminar which is arranged by a third-party instead self-arranged seminar.
- Moreover, innoWi highly supports continuing education while working in company.
 innoWi tries to encourage its members to have masters or doctoral degrees especially
 about their expertise area in company. In future, there may be some financial aids
 introduced about these degrees on condition of some commitments. However, for now
 until company is established and settled down, it is not possible.

7. Impacts of Projects

a. Global Scale Impacts

As it can be seen from many different many different products operation without wires, any kind of wireless technology is trending globally. However, even if data transfer is possible and started to be used frequently, wireless power transfer is not very common. At this point innoWi comes to stage with its products. innoWi will help to provide a complete wireless environment for mobile phone users. When we consider this, we can say that Wicharger may change the way of interaction of people with technology. After Wicharger is fully developed, a person who can already transfer data from his mobile phone, can also charge his mobile phone without wires. This may bring the idea that, all devices may be charged or used with out power cables which may have a boost on mobility of technological devices. Using same idea with certain changes in different products may lead a true wireless environment with your laptop, media-player, mobile phone etc. Wicharger it self may not achieve all these indicated impacts, however we believe it will be a pioneer in wireless charging and at least will give idea to others, how wireless charging can be achieved or used.

b. Economic Impact to Society

As it is well known, Turkey as a country is a technology importer. In Turkey, there are only few companies designing and producing their high technology products and export them to other countries. innoWi is a Turkish company, established by Turkish Engineers. Due to this reason, the products and designs of innoWi can be considered as hundred percent Turkish. So, innoWi will be the one of those, who develop technology in Turkey and sell the price added products to other companies. As it can be seen a new company with rather low economic values cannot affect economy directly, however it will have an symbolic importance. We believe, if innoWi will be successful to export Wicharger to many countries of world, it will courage other Turkish companies to develop technology and market it to world. As a result, we can say that in case that innoWi's success in world market, it will have a pioneering impact in Turkish economy.

c. Environmental Impact

Wicharger is expected not to have effects on environmental issues. It is not a device that can cause pollution. As it is indicated in value statement of innoWi, innoWi will consider environmental issues in manufacturing processes

d. Social Impact

We believe, Wicharger may have effects on people's lives also. One of the main target customer group of innoWi is public places, such as restaurants, cafes, airports etc. If innoWi achieve its goal and spread in such places, it will dispose the need of carrying mobile phone chargers. Only putting your mobile phone to table while sitting in a café or lounge of an airport will be enough to charge your mobile phone. This will increase mobility of people, and prevent the lack of communication in case of a dead battery. Without carrying any cables or adapters, people may charge their mobile phone with a simple cover or socket which can be carried in a wallet.

8. Conclusions

Througout the semester, we have derived plenty of important results as whole company. We had prepared marketing plan, organizational plan and financial plan as well as, many technical reports including subassemblies report, specification report and progress report. As a result that we divided, our activities as managerial and technical, we can divide our conclusions in parellel.

First of all, when we started to the project, according to our research we reached to the conclusion that, wireless technology industry and especially intersection of this industry with mobile phone industry is a perfect industry to enter due to some reasons. That are, lack of competitors, inqury about wireless technology and trending side of wireless technologies and almost no barriers of entry by legal or supplier sides. We saw that, there is an important opportunity to take, and we have a chance to establish a new national-wise market.

Moreover, we concluded that, we will have a high consumer profile as our target customers. According to our research and surveys, our target customers will be highly educated, interested in technology, fairly young and holding a fair income level. As a result, we came with the idea that our products should be perceived as cool and innovative. (Surveys can be found in appendix)

Quality Function Deployment(QFD) activities were also contributed to our marketing and development activities with showing us our unique sides and powerful sides of our competitors. Moreover, QFD activities helped our design team due to showing the possible requirements that should be realised. Surveys and research used for QFD purposes to get more accurate data.(QFD House of quality tables and survey can be found in appendix)

From the last result we concluded, we designed our corporate identity materials. While prepairing them, we considered our needed perception, our mission and our vision while this corporate identity design progress. We used, shapes and fonts that would invoke the perception of technology and innovation. We supported them with soft colours to solidify our identity.

When we consider our organizational issues, we also derived many important conclusions. First of all, we understood the importantce of quality activities. At first, we had not started to use an effective quality management system. However, when we started to apply our unique system after working for technical issues, we saw how these activities improve productivity and avoid the breakdown of communication. As innoWi we used our own unique quality management and configuration system which are mainly based

on ISO standards and actually more basic versions of it.(Printscreen from our document archive can be found in appendix.)

When we come to technical side, we again came with many different and important conclusions. These conclusions include insight of induction principles and the formal way of designing a system.

During this project we had the chance to improve our technical knowledge of electrical engineering. We improved our skills to research and analyze different papers and find from that papers the useful parts and our knowledge about implementing the theoretical knowledge to experiments. Realizing the limits of the things that an engineer can do is an important issue for the engineers. At the beginning of our project we were thinking about a wireless charger that could charge without any direct connection and from far field. However as we begin the project we saw that using far field in nearly impossible and we turned our attention to near field because the electromagnetic waves are decaying very fast as the distance between the coupled inductors increase. We also considered the chance to use other phenomena for transmitting power without any direct connection. However the importance that we give to safeness of people prevented us to use other kinds of transmission. During this project we also learned that while innovative idea is concerned on one thing other parts of the project are also important. For example although our first concern was to prepare magnetically coupled transmitter and receiver circuits we also had to work on amplifier, power supply and rectifiers. We had to give special attention to the amplifier as it is very important the voltage that we use in the transmitter part.

We used a D-type amplifier and learned that although some circuits have not too many devices and they look simple it can be difficult to implement them. Througout project, innoWi design team wrote many different reports and documents. These documents showed how a real design is developed as a process and gave an insight to us in our way to designing our project Wicharger. To sum up, as an engineer working on an innovative project improved our engineering skills on different fields like researching; experimenting and even dreaming.

9. Appendices

- a. QFD Survey
- **b.** House of Quality Table
- c. Product Design
- d. innoWi Document Archive

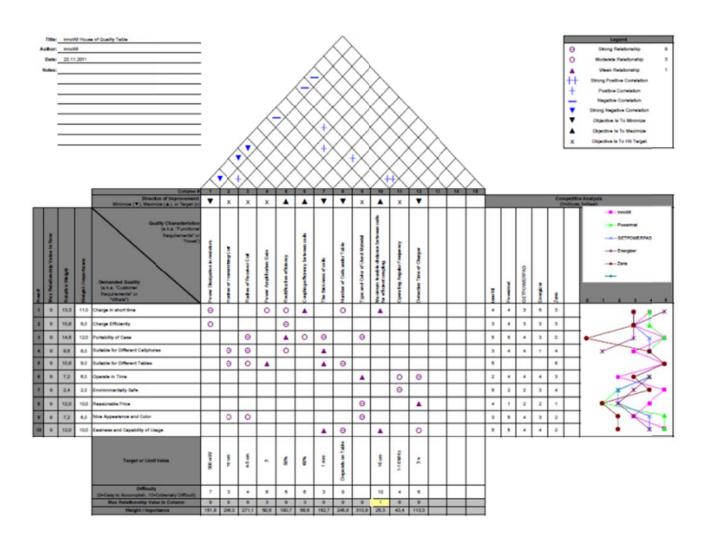
QFD Survey

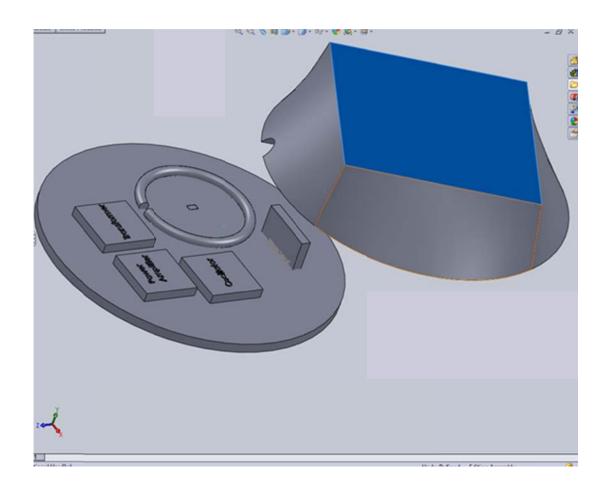
1. If a classic charging device charges cell phone "X" in 2 hours fully, how long would be the acceptable charging time of a wireless charger for you? 1 hour between 1 and 2 hours between 2 and 3 hours between 3 and 4 hours
2. Would you accept a slight increase in your electricity usage amount because of using a wireless charging device for cellphones? yes no
3. How important is the mobility of a wireless charging device? • very important • important • average • slightly important • not important
4. Would you mind using different sockets for different cell phones to use a wireless charging device? yes maybe no

5. Is it important that your wireless charger fits different kinds of tables?
o yes
o no
6. How much do you care about the operation start time of a wireless charging
device?
overy much
o much
o average
o not much
not at all
7. If you know that your wireless charging device is slightly more harmful to the
environment than the classic charging devices, would you stop using it?
o yes
o maybe
o no

8. If brand X, which is slightly efficient and time saver than brand Y, and X is 100 Dollars, how much would you pay for brand Y? • 40 - 59 • 60 - 79 • 80 - 99 • 100 - 119
9. Do you care about the appearance of new technological devices? yes maybe no
10. Do you ever have problems with using new technological devices and stop using them because of such reasons? • yes • maybe • no

House of Quality Table





Printscreen of Document Archive

