The Integration of the Product Design and Service Design

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Abstract:

The product form is one of the most important constituents of design and the most affected by the variables that occur to the design process in any of its fields, this is shown clearly in the product design. Given that all is produced only by human, we find that the form of the product is constantly changing. After it was just a simple picture showing a product that was only made to meet a basic need its image has evolved to become more complex to meet other requirements and needs and evolved to include other physical and sensory dimensions. This change and evolution comes of several influences that affect the established design objectives and trends and thus on their production represented by the product and its form. This influential may be another trend or a modern concept of design, concepts that comes to be integrated with the prevailing thought in design to promote the achievement of its objectives.

Service design is a modern trends in design that have emerged in recent decades, which is like other design concepts, it hasn't a single concept that express it, but it basically concerns and deals with the function and the form of the service from the customer's point of view, and which concerns to make the provided service useful, usable, efficient, effective and desirable. Service design thinking is an interdisciplinary approach that includes and combines many of the fields and activities, for example, the product design, graphic design, interactive design, strategic management, operations management.

Given to the service design and its relation to product design, one of the most important principles of the service design is holistic which is interested in the big picture of the service, despite the fact that the service is intangible but they take place in a physical environment using physical products and do in most instances generate some form of physical outcome. Thus, there is a close link between the product and the service where the product is the container of the service and its provider. Therefore, the service has become one of the constituent elements of the product, which combines with other physical and non-physical elements of composition to give the product its final form. The entry of service as one of the constituent elements of the product and its form summoned a study to determine the impact of design service on the form.

Research problem: the study of the change wrought by the service design on the product form.

Research aim: the integration of the product design and service design to gain access to the appropriate form of the product.

Research Methodology: descriptive analytical methodology

Keywords: Product form, product design, service design

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1.0. Introduction

Service is an act, something that is done to or for a customer, Service delivery system are the facilities, processes, and skills needed to provide a service.

Service package is the physical resources needed to perform the service. Many services are bundled with products. Product bundle is the combination of goods and services provided to a customer.

Designers of Product or Service adhere to guidelines, which are:

a) Produce designs that are consistent with the goals of the company.

b) Give customers the value they expect, also make health and safety a primary concern.

C) Consider potential harm to the environment.

2.0. Defining Service Design:

Service Design:"Although firm, agreed-on, clear definitions are missing, a few aspects are often mentioned when ‘service design' is described:

1) A focus on user experience;
2) Active participation of users and stakeholders;
3) IT, logistics, human resources of organizations is one of the elements or requirements ingredients.
4) The relation between producer/consumer (provider/client) is long-term. In the economy of services, there is not a single moment of transfer of ownership.
5) Brand, seen as the promise of what provider and client offer each other, is an important element for giving structure to the above relationship, whose elements may change over time.
6) A blurring distinction between design, prototypes, production, and consumption.
7) Infinite beta status of services. You cannot separate in any challenge or project, the look feel of the service and the operational systems, processes, and resources that deliver it. These two inseparable aspects of the same challenge must be resolved together.
8) Compared with products, the business models of services are more complex."[1]

- In service design the customer requirements and expectations is the target that must be determined. So, the objectives of product and service design make the customer satisfaction, understanding and needs, what the customer wants is the main focus. And the secondary focus is function of product/service, quality, appearance, cost/profit, ease of production/assembly and maintenance/service.

-"The service designers then use that information to design the service delivery system (i.e.the facilities, processes, and personnel requirements needed to provide the service)."[2]

"Product Service system is a broad concept, and therefore several definitions have been proposed in PSS research

- A Product Service system (PS system or product service combination) is a marketable set of products and services, jointly capable of fulfilling a client's need.

- A system of products, services, supporting networks and infrastructure that is designed to be: competitive, satisfy customer needs and have a lower environmental impact than traditional business models.
- Product service (PS): a value proposition that consists of a mix of tangible products and intangible services designed and combined so that they are jointly capable of fulfilling integrated, final customer needs.
- Product-service system (PSS): The product-service including the network and infrastructure needed to ‘produce 'a product-service."[3]

2.1. Service Mapping (Blueprinting)

Service Mapping (Blueprinting) is a tool for simultaneously depicting the service process, the points of customer contact, and the evidence of service from the customer’s point of view. Service blueprinting method is used in service design to describe and analyze a proposed service. A useful tool for conceptualizing a service delivery system

Figure1 Service Mapping

2.1.1. Effective service blueprinting follows five key high-level steps:

- **"Find support:** Build a core cross disciplinary team and establish stakeholder support.
- **Define the goal:** Define the scope and align on the goal of the blueprinting initiative.
- **Gather research:** Gather research from customers, employees, and stakeholders using a variety of methods.
- **Map the blueprint:** Use this research to fill in a low-fidelity blueprint.
- **Refine and distribute:** Add additional content and refine towards a high-fidelity blueprint that can be distributed amongst clients and stakeholders."[4]

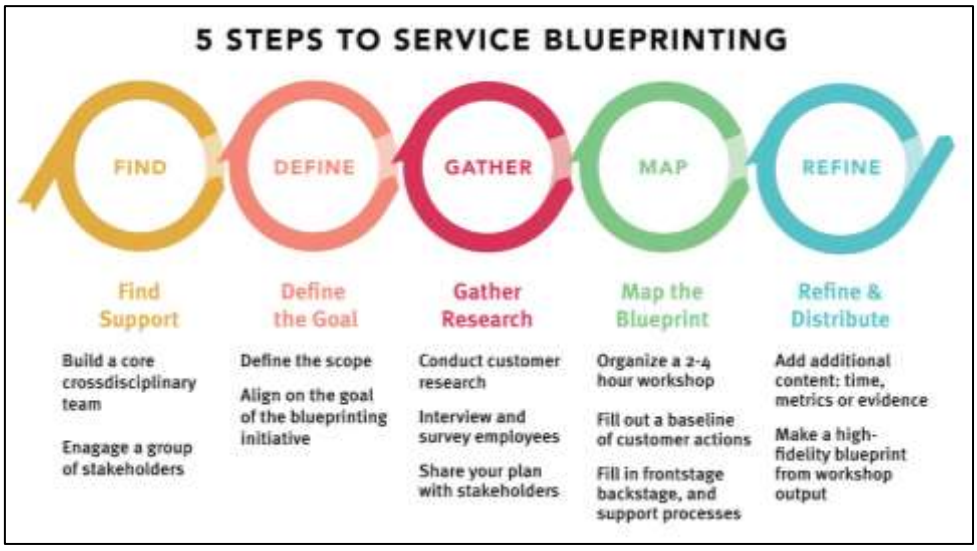

Figure2 Five Step Frame work for Service Blueprinting [4]

3.0 Differences between Product and Service Design:

In some cases, product design and service design go hand in hand. This stems from the fact that goods and services often exist in combination.

Other cases, what a customer receives are essentially a pure service. However, the vast majority of cases involve some combination of goods and services. The proportion of service might be relatively low, as in the case in manufacturing, where the emphasis is on the production of goods. As in manufacturing, services such as machine repair, employee training, safety inspections, and so on.

"- Service design begins with the choice of a service strategy, to determine the nature and focus of the service, and the target market. This requires an assessment by top management of the potential market and profitability of a particular service, and an assessment of the organization's ability to provide the service."[2]

3.1. Tangible – intangible

"Service design is different from product design in that we are designing both the service and the entire service concept. As with a tangible product, the service concept is based on meeting customer needs. The service design, however, adds to this the esthetic and psychological benefits of the product. These are the service elements of the operation, such as promptness and friendliness. They also include the ambiance, image, and "feel-good" elements of the service.

As with a tangible product, the preference for a service is based on its product design. Service design defines the characteristics of service, physical elements, esthetic and psychological benefits it provides." [5]

3.2. Services created and delivered at the same time:

The strategy and service process is based on the overall service management model. Helping the client fulfill their mission and supporting them in the pursuit of their organizational purpose, as little time as possible. Service delivery is important for continuous collaboration. Successful service delivery works on the basis that the customer is a part of the creation and delivery of the service and then designs processes built on that philosophy – this is called co-creation.

3.3. Services highly visible to customers/user:

Services are intangible and cannot be inventoried, but visible to customers/user through, low barrier to entry and variability.

"We posit that this separation in user inputs exists based on the characteristics of users at opposing ends of the experience spectrum. Expert users, on one hand, are less likely to identify usability flaws, since they have found mechanisms for adapting to or working-around usability-based challenges. Based on their experience, experts are more likely to identify potentially problematic and relevant usage scenarios that may contribute to the emergence of new design requirements from a technical perspective. Novice users, in contrast, are still in the process of mastering given tasks and are thus limited to contributing to user inputs at a more abstract (e.g. open ended and less technically defined) level. As such, their inputs have not yet been 'blurred' by learned activities, and provide a wide range of novel and creative solutions. The study's findings suggest that design engineers, who are often experts in a technical field and potentially 'blinded' by experience, can gain valuable insights from novices, especially for building and refining user interface designs and user experiences. [6] This is the main reason that the customers/user point of view is the base of the development and testing of products and services.

4.0. The role of the designer in integrating product design and service design:

"Issues related to service design are increasingly being recognized by designers and managers as relevant, even though the knowledge on how to develop a Product Service Systems and who should design it is still marginal. The conducted state of the art can generally confirm that most of the existing Product Service Systems methodologies that have a clear heritage in Concurrent Engineering and Lean Thinking, even if there is still the need of a comprehensive approach, which groups the elements and provides powerful guidelines. Being often Product Service Systems design more or less implicitly structured according to some core Lean pillars, we believe that Lean Thinking could be the best candidate to operate in the Product Service Systems design systemization"[7]. Therefore, the designer should focus on product and service development together through a study based on integration and development in light of the requirements and needs of the consumer.

The roles of designers have changed as well as the methods they use in their design work, working in managing design processes in companies, working as researcher contributing to consumer research and service that can be added. This effected on the product design in shape and function.

"In the era of industrial production it has not been customary to sell services. Or at least it has not been customary to consider industrially produced products as part of a service proposition. If wishing to embrace this reality, industrial producers face the challenges of developing a business culture of service development as well as requiring the practical knowledge of pricing and maintaining services. The aim is largely to increase profitability, growth and customer retention through the development of service propositions. Companies producing consumer products are now being challenged to develop hybrid products. Hybrid products are defined as products where the service has been designed as an inseparable part of the product. A good example of this is Apple's iPod and iTunes product package [8]. Developing such a

hybrid product means that both the product concept and a service system are developed in tandem." [9]

So, designers have to:

- Seek in practice to identify problems and latent needs in various aspects of people's lives that can be used to inspire creative generation of products.
- Respond to the emergence of new environments and user needs, as people's needs and problems change as their social, technological, and economic living environments change.
- Study users and their usage of product to develop better functions and generate knowledge that can be embedded into new designs.
- Be able to understand the value, meaning, and the ways to use the product in different situations of their daily lives.
- Work in managing design processes in companies, working as researchers and contributing to consumer research.

"Materialism is a source for creating consumer value: the value that users, owners attribute to their possessions. Value that is created by the objects can emerge through three ways:
- Through acquisition – acquisition centrality. For materialist consumers possessions and their acquisition is especially important, for them acquisition itself is an objective.
- Acquisition itself can become the pursuit of happiness. For materialist consumers the acquisition and ownership of material objects can become a source of personal satisfaction and happiness.
- Possessions can define personal success. Materialist consumers regard others' and their own success on the basis of what amount and quality of goods they have. [10]

4.1. Standards for access to a product characterized by well-designed service system and good design characteristics:

- Consistent with both missions of product and service.
- User friendly: Do customers understand it easily.
- Robust: Can perform its function under various conditions.
- Easy to sustain without too much effort.
- Economic effective, reasonable cost related to competition product and service.
- Value to customers.
- Ensure reliability and high quality.
- Aesthetic value and consistency.
- Up-to-date.
- Appropriate for production techniques.
- Ergonomic value.
- Environmental harmonization.

"One approach to evaluate design is through its contribution to its success:

- Its ability of gaining consumer notice;
- Its capability of communicating information to consumers;
- Its potential to affect the quality of our lives;
- Having a long lasting effect;

- Its capability of attracting consumers;
- Its capability of adding value." [10]

"Recently, lots of manufacturing companies have been attracted by the possibility to differentiate themselves from competitors introducing product related services in their traditional portfolio. This transition from a product-based to a service-based business model, defined as servitization of business, might allow companies in the shift toward a better competitive position with regard to their competitors.

However, it is well documented that this transition toward an enlarged value proposition can reach the expected optimum payback only if supported by proper tools and methods for the design, the implementation and the management of the new solution. Therefore, the evolution toward a service-based business model creates a strong need for methods and tools to develop handle and support decision making about the new portfolio. Indeed, when product offer is enlarged or integrated with services (i.e. Product-Service Systems- PSS) all the product development phases need to be adapted to the more complex offer scheme of Product-Service Systems considering product, service, network and infrastructure. Consequently, in the last years, numbers of researches have worked on the development of methodologies to support companies in the design of such integrated solutions. This task is extremely complex due to the fact that "service design" has to be seamless integrated with traditional product design. Indeed, service design is characterized by high levels of intangibility, uncertainty and simultaneity (service is exploited when the provider and the receivers are simultaneously available) that are difficult be managed together with traditional product design methods. As a result, the methodologies developed in the last decade lack a common vision, scope and structure." [11]

This is due to the design competition in unlimited field of application to the enlargement merging and combination between the traditional engineering approaches with "service design" approaches specifically facing service features (intangibility and simultaneity), to reach customer satisfaction.

Also, existing approaches are mainly focusing on specific phases of the design process leaving some issues still unsolved. Although, the modern design approaches and production techniques hold many solutions. In particular, as highlighted in the majority of existing methods are focused on the requirements analysis specifically on their generation and identification. Very few approaches contribute to concept development and the related evaluation phases.

"Some recent methods developed under the Value Driven Design" umbrella" term shall not be considered as limited to the Value Driven Design domain. They should rather be rather as plastic approaches to promote value driven innovation in the preliminary design stage of a products/service system, and they should belong to complimentary context overlapping both with Value Driven Design and Lean Product Service Development. This context is defined as "Value Innovation" by the authors, mainly as a bookmark on which to anchor the discussion about future research directions in the common Value Driven Design /Lean Product Service Development domain (Figure 3). [12]

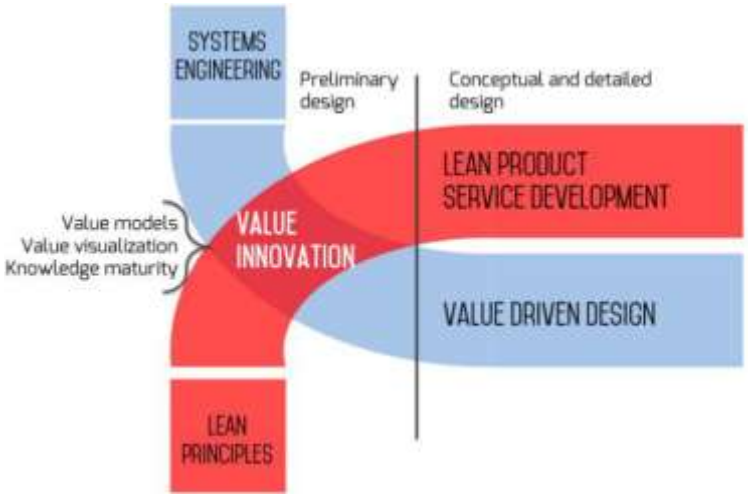

Figure 3 Value Innovation: overlapping research areas between Value Driven Design and Lean Product Service Development [12]

4.2. The designer can access development that integrates the product into the service through the following stages:

1. Create a specific value focusing the customer needs, to reach the value added through the services that can be integrated.
2. Finding multiple alternative solutions to maximize the use of the design that is integrated with service.
3. Create flow level using both the service and product development process.
4. Use strict uniformity to reduce variability and create flexibility and expected results.
5. Develop product system to integrate the service from start to finish.
6. Regulate the balance between the main product career and service and achieve multi-functional integration.
7. Integrate all stakeholders completely into the product development system.
8. Use modern technologies to add services to the product.
9. Adapt technologies related to the product or the service to suit different categories of users.
10. Use appropriate tools to introduce the new possibilities of the product after development.

"Product service system can provide customers values and functionalities, as well as physical products, to fulfill economic, social and environmental goals. Many methodologies have been proposed for designing Product service systems. Most of the existing methodologies are domain specific and were proposed to solve specific problems in certain projects. Some methodologies are generic but they provide neither guideline to practitioners and designers nor reflect the differences in various Product service system types. Product service system defined as “a marketable set of products and services capable of jointly fulfilling a user’s needs. The product/service ratio in this set can vary, either in terms of function fulfillment or economic value”. In this sense, Product service system is directly related to functional economy." [13]

5. Trends that combine product and service design:

"Out of such concerns has emerged a new domain of design thinking and new directions of professional practice. We call this domain “interaction design” because we are focusing on how human beings relate to other human beings through the mediating influence of products.

And the products are more than physical objects. They are experiences or activities or services, all of which are integrated into a new understanding of what a product is or could be. Product design has undergone changes during past decades. The design of objects is no longer restricted to form, function, material and production. "Design is arguably now focused on the interaction between people and technology, and products serve as platforms for experiences, functionality and service offerings." [14]

The digital revolution has made a remarkable leap forward in human life because it is a link to information that is the foundation of all aspects of life. Information and communications technology has witnessed rapid leaps and impacts in the human life style in recent years. This help in adding more service to product, and the product designer rapidly make benefit from these recently available technologies. These technologies have brought about many changes at all levels, social, economic, political and mainly in product and communication.

Information technology has also contributed significantly, as a result of the remarkable progress in the field of media in the development of performing arts, which was the first inspiration towards the direction of product design and its transformation into interactive design and the product as an event in the scenario of interaction with man on the stage of the workplace, When you get the job designed for them. The interaction of the transition from the traditional concept of design as an element to the idea of design as an event in which the values given to dynamic behavior and action, the services rendered, the environment and the surrounding space are more important. The integration of product and information arises from the physical dimension of the product to a set of applications that depend on the cognitive processes of the user. Information, communication, interaction, analysis, organization, generation are retrieval used in ways that are available and appropriate to the nature of the user.

6. Products that integrated different functional products to service:

With the rapid development of technology, the designer can combine many functions and services into one product. The evidence is clear in the mobile phone, which for a few years ago has been a mobile phone that can be used anytime, anyplace. And now became a camera, calculator, clock, alarm, and closer to a mini computer. This integration of jobs is one of the most important combinations between product design and service design, in addition to several models will be reviewed below.

The following are some products that act as an integration between service and product, mainly using smart and interactive technologies:

6.1. The Smart Anti-Theft Device Tracker, a simple product design that can help user to find, trace, and save any precious thing.

- The tracker can chain your easy-lost & valuable belongings together and work with smart phone to prevent loss. The tracker is also a remote control of your smart phone camera for self-portrait.
- Compatible with most smart devices, show you the last location of the Tracker via Google maps
- The tracker is a kind of Bluetooth, this tracker should be used with iTracing; an app downloaded from App Store/Google Play and pairs it to your phone via Bluetooth.
- "Suitable for: Wallet, Car, Kid, old man, Pets, Bags, suitcase or other valuable belongings.

- Function: Anti-lost, theft device, Remote control your phone and self-portrait, Keep your values within range; locate the positions of your stuffs, etc.
- In addition, the tracker can also provide a last seen pin-drop on map to help you recover your items and search your cars in parking site." [15]

Figure 4 Smart Anti-Theft Device Tracker [15]

6.2. Smart jewelry for women safety:

In the current period, safety has become a major requirement for human beings, and products have emerged to support self-preservation and property, especially as news of attacks on women and children has increased in many societies. These cases have provoked intense debate about the safety of women and children in particular and what can be done to improve the situation. So, safety wearable jewelry was designed. Although panic buttons have been around for a while, it's only recently that they've become smaller, wearable and more fashionable, but most are intended for women. It comes from a Singapore-based technology startup called Smart future but has made its way across the border now and is sold internationally on Amazon and GetmyIvy.com.

- "With Ivy, Smart future is hoping to help improve the situation, along with Government initiatives requiring all phones sold in India to be equipped with panic button functionality. Smart future is also working with NGOs in the country and the police to serve as guardians.
- Ivy can be worn as a chain necklace or a leather bracelet and to this end it comes in a smart box containing various accessories. [16]

Figure5. Smart jewelry for women safety [16]

6.3. Interactive lighting, that is now used in many places, it light just when a user path nearby its sensor, it is now used in corridors of public places to save energy mainly, and for easy use. Also the next image shows wireless auto infrared IR sensor motion detector, 4 LED night lights, motion lights, ambient light sensor.
"It can use in Keyhole, kitchen, hallway, stairway, safe cabinet and many other uses. Built-in light sensor, support movement detection, overlong standby and environmental protection and energy saving." [15]

Figure 6 Smart lock down light sensor [15]

6.4. Coffee machine

The user has become more demanding for the service that carries the comfort, not only the service and with the appearance of remote control devices, and the spread of the service and increased until the air conditioner can be operated before reaching the house to adjust the temperature required. As well as food and drink preparation products, which first emerged through the operation of a set of variables and then evolved to the next model that provides luxury through memorize their customer's favorite coffee and serve it right for them.
However sometimes we get stuck with a snobbish one who just doesn't get it right. Memory is a coffee maker that uses hand print recognition to make the right cup of coffee for the right person. Set it to your preference of weak, medium or strong coffee or even an espresso to a ristretto. Each time is assured of your favorite blend as Memory will remember your preference accurately. A simple hand scan is all it needs. It is designed by WenYaoCai at 2012.

Figure7.Memorizing the right coffee [17]

7. Discussion:

Product integration and service design depends on two main phases:

The first phase is the internal:

This phase depends on the companies, and the innovative design of the product, and the technology depends on the development of the interaction between the product and the user, in addition to ease of use, convenience, value, quality and guarantees.

The second phase is the external:

Where the customer as the user of the service and the service providers are involved in the investigation to reach the points of contact between the product and the service and implementation in accordance with the environment, as well as interact and benefit from the insights and experience of stakeholders.

Figure8. The Integration of the Product Design and Service Design

Therefore, the integration of the product and service applications of information technology is a new addition to the definition and classification of design in this age in its broader field, which can be determined by the intersection of four main inputs: plastic arts, multi-media, laws of motor performance, product design. With the advent and use of interactive and smart technology that leads to the creation of a channel of communication between a person and a product, system, or service. This communication is both physical and emotional in nature and is manifested in the interplay between form, function, and technology. The emergence of products using interactive and smart technology has led to a focus on user participation in product and service development process. Because the user is the focus of service design, and satisfaction with the product is the main factor in the marketing phase. so, the user's point of view at all stages of the design starting from the collection of information, inventory problems, find alternatives, and tests on the final prototype is a key component of the support team design.

Designers use both scientific and technological revolution in achieving the satisfaction of the user, information technology refers to the best means and devices used by man in guiding life affairs, and thus contributed greatly to the development of the field of product design in various types of kinds and fields, To improve the quality of products and their potential, making them more suitable for the nature of daily life. The field of design is one of the most important areas affected by technology in both software and hardware in general, service design and product design in particular, such as smart products.

So, designing of products and services has increased emphasis on a number of aspects of design, some of these are related to product design, while others are related to both product and service design, from these aspects:

❑ Quality management develops programs that contribute to customer satisfaction for both product and service to increased emphasis on satisfaction and release the pressure of competitive. Designing products & services that are “user friendly”

❑ Use methods and technology to reduce the time needed to introduce and produce a new product and services usually results in lower cost and higher quality.

❑ Greater attention to environmental concerns in production stages, consumption of raw materials, waste minimization, recycling parts, and disposal of worn-out products.

8. Conclusion:

The results are summarized as follows:

• One of the most important factors that helped to integrate service design and product design is the progress in digital technology and the ability to connect the internet with many products.

• The technological and digital revolution outcomes are not only limited to manufacturing and production methods in the field of telecommunications, but also used in the development of functional and service aspects and the development of user-friendly values that benefit users and facilitate their lives.

• The integration of service systems with the product is based on the main rules that the product and service objective is a cohesive one, so that the integration of the service does not represent a burden on the product or a high cost.

• The integration of product and service reduce costs by reducing consumption resources and maximizing results, where most companies sells the product with additional services to ensure the working condition of the product, services such as maintenance, repair, recycling, refilling etc. and this can be classified as the continuous improvement of products to reach quality and consumer satisfaction.

• Through the alternative use of the product; the supplier responsible for the products and services through the return, recycling and waste that reduces the renewal over the life of the product; services planned according to the product life cycle. For society this decrease public pressure on environmental issues is growing, increased supply of services; new jobs.

• The integration of product and service is the designer goal to provide a perfect solution for the customer to meet his needs. The aim of integrating the service and product is to add value such as comfort, speed, and assistance in the work stages.

• The designer have the role to develop the products to keep up with the times and include the technology within them, because of its importance and because of the interest of user to products that carry the modern technology and its effectiveness in the integration of the service with the product.

• The designers have to work on creating a common platform and a smooth and clear communication language between them, the engineer and the technician to achieve a digital interactive product combining service and function, and also with aesthetic values and balanced usage.

• The designer must make an effort to ensure that the system has the ability to handle any expected change in service requirements, including design features and checks to ensure that the service will be reliable and will provide consistently high quality, system design to be user friendly.

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