eJAICT
ISSN 2355 1771
JOURNAL OF APPLIED INFORMATION, COMMUNICATION AND TECHNOLOGY
Published by:
Research Center of Technology and Innovation
Academic Research and Community Services
Swiss German University

Interior Design Consultant and Contractor System: Augmented Reality to Interior Design Company Performance

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Article Information

Received: 5 December 2018
Accepted: 6 February 2019
Published: 25 April 2019
DOI: 10.33555/ejaict.v6i1.59

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ISSN 2355-1771

ABSTRACT

Interior design is an industrial company that works of flow from visual drawing into implementation construction of interior design drawing on site as a framework to fulfilled demand of client needed. Each day interior design company market becomes more high competitiveness as a national or even as a global market, and demand to fulfill with adequately performance to reach global market. In this report depart from previous comprehension; augmented reality can be a purpose effort interior design application for environment experience from computing interaction.

Keywords: *Technology Encouragement Design, Augmented Reality, Interior Design,*

1. Introduction

Departs from a case from Interior design multi-service company, meaning is a company that working from planning a concept of interior design works into an implementation construction production of interior design drawing on site. In this field of designing system is working order from client demand needed to support from visual aesthetic related into functioning of comfortable and effective, based on 3 dimensions between the object and environment inside of building.

Company manage as a generally in this field of created and build from interior design multi-service form is company employ to do a job from an Accounting, finance, marketing, production of workshop and construction specialist, and a design development support such as interior designer, draftsman, and 3D specialist. At every division is having their own scope of job, but also having a connection between each division. Performance each division should important to follow on the schedule and should not cause in unable to continue the situation. Additional for particular project, a company is working together as a partnership with another related company. According to this is to giving more performance effort to handle the particular problem on project. Regarding, from a several of number a material support vendor product interior supplier (Interior cover treatment product), Architecture Company, or another outsource of subcontractor and/or sub-design support if necessity. In this case, there are a lot of peoples in same area to be directed into one and/or several project to accomplish a project with limited time of schedule that had to manage under as a same team.

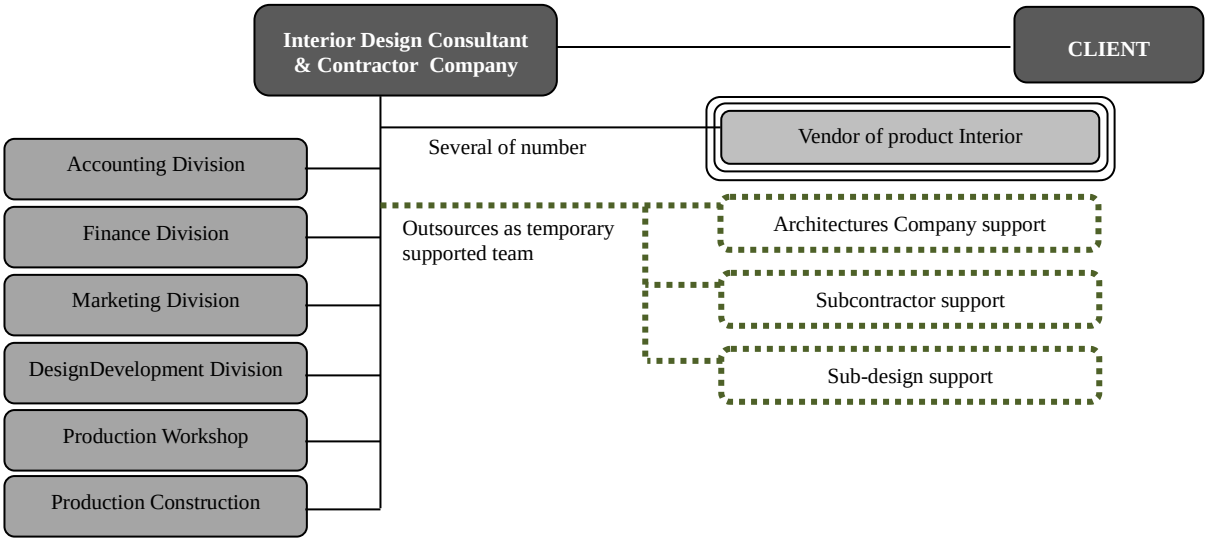

Figure 1. Schematic Interior Design Consultants and Contractor Work of Flow.

Interior design company vision is to reach a national and even at the advance stage to entry the international market as an interior design global company.
A mission from Interior Design Company is frontally for existence admitted in market to gain functional comfortable and effective design concept result without escaped from an artistic knowledge for reach satisfaction a client needed.

ID Consultant and Construction Company from the cases above are generally having a several number of advance issues problems:

- How to increasing ability and skill ID Company more action and flexibility in time to gain a satisfaction of client need?
- How to managing client and project sometimes having a separate location distance, considering of limitation time?
- How to make more productive for ID with base multi-service company from ID Consulting-Construction with additional own workshop?
- How to construct the company becomes an existence admitted in market as a mission ID company?
- How to reach a national and even at the advance stage to entry the international market as a Vision ID company?

Base on Issues problem ID Consultant and Construction Company is analyze from SWOT into the ID cases and determine from Strengths-Opportunities (OS) for develop performance as a formulation of Advance Framework Company, meaning is strategies using company internal strengths to gain advantage of external opportunities.

	STRENGTHS (S) ▪ **Multi-service Company, Consultant & construction.** ▪ **Having own workshop.** ▪ **Force with several department related skill.** ▪ **Accident & Long-term Risk support for employee and company.** ▪ **Unavoidable pollution, controlled from production & implementation on site.**	
OPPORTUNITIES (O) ▪ **Global Market, wide-scale invited client.** ▪ **Demand increasing from public interest to design and built.**	**STRENGTHS-OPPORTUNITIES (SO)** ▪ Force with several department related skill, giving more qualities performance of company. ▪ Multi-service Company is more offered for client satisfaction. ▪ Satisfaction client is increasing public interest multi-national and from global market. ▪ **Provide advance technology**. ▪ Having own workshop and construction specialist is easily too controlled from unavoidable pollution on workshop and site.	**Advance Formulation of Framework Company**: 1. Added education for managerial level. 2. Added education for competence skill employee. 3. Shuffle a competence employee to become pilot project under Project Manager to aimed increasing skill and ability character of competences employee. 4. Education and experience is to gain more dynamic and evolving as professional in competing global market demand. 5. Periodic gathering employee to solidify and gain dynamic work system between employees.

	▪ According from client known is consideration to environment is increasingly Value of company and market interest to company. ▪ Addition to increasingly value of company is from company responsibility to accident & long term of risk employee and company.	6. Utilize employee from feedback, evaluate and action of improvement to business development. From directly advisor and if necessary, from client. **7. Enhancing technological base and expertise of the organization and member, and provide specification well-design technology to support high performance.** **8. Another tendency from specification well-design technology is to reduce lack of long-distance problem between client, project and company to support national and/or global market project of limited time schedule.** **9. Develop collaboration not only from related support fields, but including with organization in order to promote to gain impact and value of ID on the human experience.** **10. Jointly produce a trade show with professional organization.** 11. Continues responsibility to disclosure accident & long term of risk. 12. Continues responsibility to unavoidable pollution into workshop production until implementation production on site.

Figure 2. Strengths-Opportunities (SO) analysis & Advance Formulation of framework ID Company cases.

Analysis result of this case from Strength-Opportunities (SO) following above, at the side to provide advance technology is become a several number advance formulations of framework for ID multi-service company direction to discover a solving suggestion problem. At this paper is development of solving suggest from understand of advance formulation framework, with provides specification well-design technology to support high performance and reach it from combine Augmented Reality as an advance technology for support ID multi-service company followed with enhancing technological base and expertise to gain impact and value of ID on the human experience.

2. Augmented Reality Literature Review

Augmented reality (AR) is an actually performance, reproduction similar from original figure, appearance of physical, and existing as an actual environment. These are part element of augmented reality (AR) or in order to improve at the side of computer-generated sensory input such as sound, video, graphic or GPS data. The expression AR as a form of acronym word, suitable computer interfaces is referring to allow the real time combine digital information process with information move towards the real environment. This concept as general is called as a mediated reality; meaning is as an action to end the disagreement between 2 objective views from modified reality into a computer as a median. These median technical functions are improving the good quality accepted perception of actual exist into a simulated.

Augmented is an officially agreement between real-time and in content of element environment. Advanced AR technology is provided a computer vision and object recognize the detail about all around actual world of the user need into an interactive and digital control of dishonesties. The environment with non-natural information and the object that create this to actual world can be part of overlay. AR as a device is as a provider to a large of sector human interaction number.

Augmented Reality (AR) is a different from the previous technology that involve a form of computer graphic on the real world, meaning is AR is also a Mixed Reality (MR) refer to a multi-axis spectrum of area that cover Virtual Reality (VR) in this ability AR as a system for introduce in different sector and other connected technology.

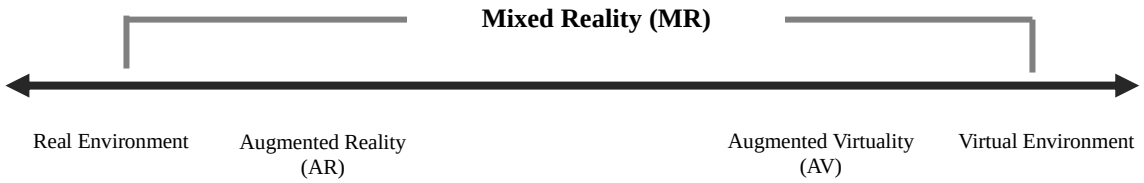

Figure 3. Paul Milgram's Reality-Virtual Continuum

This system action is movement from software and algorithm. According into a combine digital information and the real-world system as a one-experience, AR is direct into exact position of virtual object with the tracking system as an important component. And as a fundamental component are display, camera for graphic capture, and computer installed application software. Also, AR technology supported with several of number into a system action is; Hardware, Head-mounted, Eyeglasses, Contact lenses, Virtual retina display, Eye tap, Handheld, Spatial, Tracking, Input devices, Computer. According into a plan decision to reach is this support system used applies to move differently based on demand function to each sector.

3. Collaborated Design and innovation Technology.

As a fundament essential of interior design applied 3 basic principles design from color, scale and proportion with unity of space. At beginning interior design develops into a technology is an implementation an interior using a 3-dimension tools. This is delivered interior designer to able control dishonest and interaction object into a virtual space, in this case is not able to use for the global user not related to interior designer. There are rise in amount of use design tools of AR to facilitate client as a chance of success that internally develops and supply product catalogue application. As an interactive facilitator from one of several a candidate client and/or client, is as a user able to select of interior item and arrange it on the particular picture surrounding environment that desire to apply using smart device camera.

3.1 Design process function

The propose of AR environment as a knowledge of technology implementation is giving a amount of user number the flexibility to design with basic principle ID. This implementation of system design technology is separate with 2 modules development; for creating and controlling the 3D database and the other for displayed.

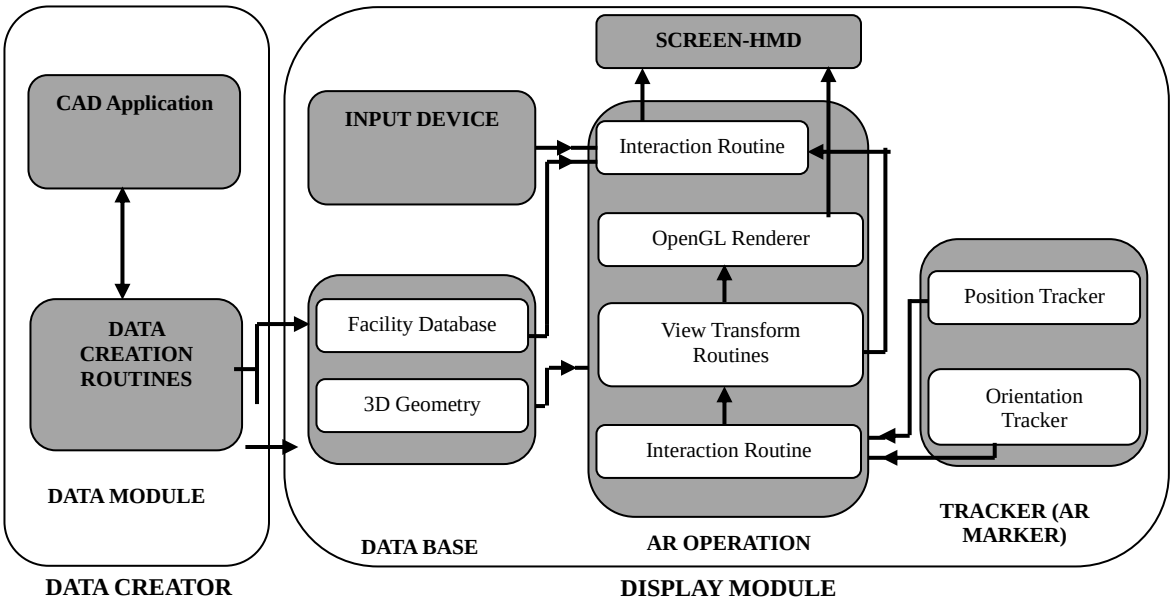

Figure 4. System Diagrams

Beginning with Extract Information of Computer-Aided Design (CAD) application is from a drawing and connection to a database. Geometrical information for giving a space is continues to extract from 3D database of furniture. After containing geometric is calculate based on data marker tracking from the view of position and direction. At the same time, the location and position based geometric data are completely change the appearance using transformation matrix to manufacture images to refer align beside different object in real environment. An Important Element of AR system and the Development AR technology are from the position tracker and Orientation tracker.

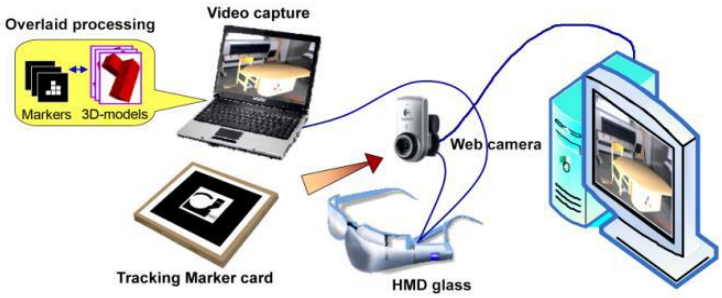

Figure 5. AR Tracking & Display Process: The Computer-Generated Graphics are integrated into user's view

Data based generated at the side of CAD application, e.g. 3DSMAX software are saving the property of the furniture graphic during OpenGL renders the final graphic. Additional, library of an ARToolKit software is calculated the 3D position and orientations of the virtual furniture.

3.2 Software and Hardware.

Operated the management of the building geometry data and continues to a database are CAD application provided. The AR software computing find and get back data with display the position and orientation data in the define environment. Difficulty of develop an AR application is involve tracking the user's viewpoint. The AR application needs to discover the viewpoint of users in the real environment is a tendency to discover from viewpoint to purpose aligns the virtual imagery with real-world objects. ARToolKit software as a solution to this problem is as a particular purpose computer vision algorithm, as describe the virtual camera position and orientation referring to physical market in real time is from an ARToolKit video tracking library.

According from hardware to AR system is based on a regular personal Computer (PC) operating system plus a webcam Logitech Quickcam Vision Pro is used to capture the sense image. The user's camera is ability of detect patterns from a single image and deceit the 3D position and orientation for world-space. After that is put an image on top of another based on marker tracking from the virtual object (furniture, partition, walls, doors, etc). At the side of ARToolKit library are accurate and strong from several of tracking markers used. For implementation, several marker pattern and submarker templates for Tangible AR were made beforehand [10]. For support AR Display equipment in the practical implementation, at the side using The Head-Mounted Display (HMD) can freely action into virtual furniture when they are at the view.

3.3 Implementation.

To start the augmented furniture is uploading to AR software as a marker tracking stage from capture marker image with a digital camera. Tendency is to define the style and size of the markers from interface in purpose to suitable to room environment viewing distance and size. Function of the augmented system is able to modify according to necessity including for handling images, moving models and re-size and also marker property and as a point for manipulating objects. Tangible AR environment as an interaction method can easily utilized for preparation real-world view to users tracking the object of interest with passive formal market. Tangible AR interface mixed a tangible user interface and AR technology.

As a solution problem of not expected direction movement if changing a view from an opposite direction, a large of number AR application is using a fixed direction in marker coordinates. This suggested idea approach as no knowledge require of the marker coordinate is naturally for user to manipulate. The virtual furniture adjusted the scale with digital image on slide screen appears on the control marker template from manipulate control marker band permission users to interact with virtual furniture, additional unit markers have to hide with the finger.

Another stage of development, an added another element interior in the room is able to order but camera is having a difficult occur when viewing the tracking marker in the sample case of virtual and real added a furniture in the same space view. From the system suggested an idea is user to allow implementation replace between the virtual furniture and the marker image as 3Dimensional connection. In this way, user as ID or ID client can arrange a marker in variety position mixed with another interior property such as furniture, partition, etc also be able to modify in real time with the Tangible AR effect. All of images and virtual models are able put the data into the memory of the system dynamically computer.

Figure 6. Two-phase AR scene-user adjusts color of virtual furniture
(Phan, V.T, C. Seung, 2010)

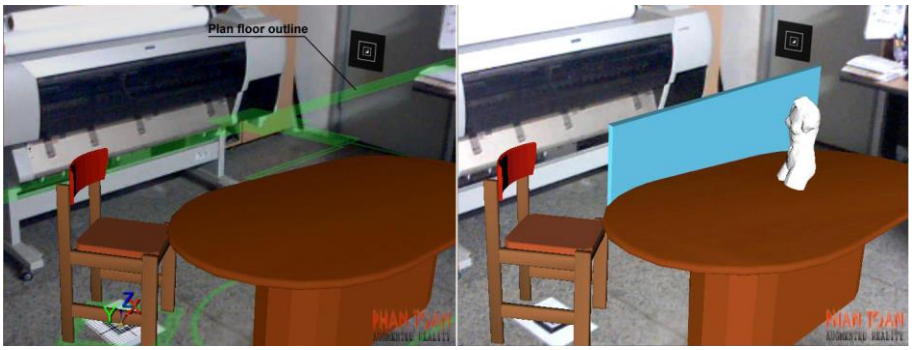

Figure 7. Chair base is moved on floor plan graphic & the statue is added on the table using AR interior design interface
(Phan, V.T, C. Seung, 2010)

Decided on value of product design most often involve a demonstration from designer work. When item of design applied become a visible part of the real-world condition, tendency of produce this visualization can be make a size, measurement and as a challenging task for developed interior design idea. The Visualization has to be enthusiasm demonstration that fits into design from concerning space and aesthetic of environment.

Previously ID to conveyance this presentation information of idea design is from created physical scale models or mock-up. And at the next stage from develop presentation technique information is delivery from CAD for a computer models, except designer having a difficult to presentation design in particular situation although design drawing can produce in a short time. From VR technique is design able to prepare in virtual situation form and examine in form of "walk-through" from an immersive interface. Consisting of communication and cooperation between a team designer participate in design and client is support directly with a design visualization AR application, more quickly in visualize and modified in the real time.

4. Available Augmented Reality

AR application system can exist in natural performance and effective publicly design in real-world situation, and it can support for products in marketing, manufacture and design. There are several of Company applied this into their software system work.

As a first example see figure 8, IKEA as a giant Retail furniture company launch of an AR application for 2010 catalog mobile of Apple's iPhone, this system is users easily to configuration a piece of IKEA product from catalog and arrange to inside the room, and modified the size to fitted with the perspective view from phone camera device.

> "The unique augmented reality features of this application made it the number-one most downloaded app in many European countries," Mr. Alberto Benbunan said, Managing Director of Mobile Dreams Factory [3]. Mobile Dreams Factory is a company that brings the 2010 IKEA catalog into a unique augmented reality from iPhone device.

AR as an application to attend as a branding tools that operate and control costumer into a real retail store as a virtual. This feature is serving a costumer to examine and decided into a real environment before pay for a product. This IKEA iPhone application is for free, although for while there is not available payment in-application mechanism in this version, it is created to increasing retail sales in product company.
From result of the IKEA application had been more 200,000 times interested viewer to download this application in the beginning week of release, and that show as a second most downloaded application in Apple's App Store.

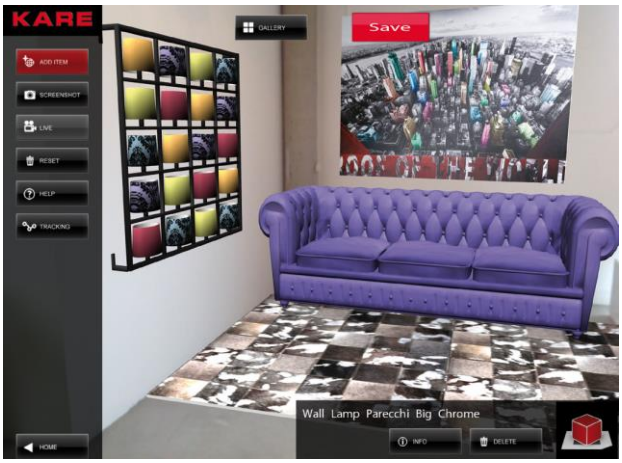

Figure 8. IKEA taps Mobile Dreams Factory for Augmented Reality app and
Figure 9. KARE app Room Designer
From Franchise with Kare. http://www.kare-design.com

For a second example see figure 9, KARE Design is the most successful vertical concept for design product franchise shop in German [9]. One from the several of business advantage list is mobile marketing tools, augmented reality APP "KARE Room Designer". KARE as a company is represent a unique experience for consumers, Contract Business partners as well as for retailers from comparable modern manufacture and consumer-oriented range also marketing strategy. KARE launch unique augmented reality sales tool is as a KARE Room Designer and available for iPhone or iPad.
KARE app Room Design is provide to server costumer depart from answer the question about fitted furniture into the room. With this AR application is each item of furniture can be viewed, arrange the position and mixed with 4 walls as 3D object using iPad and iPhone camera device. After activated application KARE app Room Designer and switches to camera

image is to provide the room environment chosen to fill with the new furniture. Exactly the same time a window appearance with more than 1300 item of furniture and furnish accessories containing to KARE catalogue. With this application proves the leadership of company not only from furniture business but also an innovation in marketing and this application is support in store sales and visit customer homes directly at the same time.

5. Conclusion

Performance of advance strategies planning is gain advantage from an existing of company strength, from this evaluation is providing specification well-design technology to support high performance of more valuable managing on time to development despite to force with, it is not considering of a number of expenses accuracy from ID Company to become an advance Company. And this performance strategies is also analysis from opportunities that is become a company target for complete vision and mission directly to increasing productivities. There already an amount of number an advance ID Company is deliverable willpower a global market into this standard process of this system method. AR technology as a new animated simulation tool for ID is a mixed form of AR scene connected into HMD, video display or PDA. Advantage of approach to AR as an ID application is ability to separated functionality the view and models and also ability for management provided of business stage.

AR form can be creating specified function for the utilization from lively, suitable and intelligent; from interactive catalog and/or for other fundamental ID Company from ID developed design conceptual to presentation design in particular situation and as a design drawing can produce in a short time with preview visualize measurement size object into real environment. AR as a software platform combining with forward movement computing and communication hardware can be useful for interaction ID and/or ID client from arrange a product company in to the form of inside space environment, and also this interactive system can gain a large of interested ID from public.

Addition to this system is Interior design directly improving ability and skill design, although as an effective implementation is giving an amount of user number the flexibility to design and a quick preview visualize measurement size object into real environment base on basic principle ID to propose of AR environment as knowledge of technology. From this system can also develop collaboration with other organization from technology as a media deliverable to jointly trade show and to effort in order promote an impact and value of ID Company from the experience of human interaction and also build as an access for global market from network technology, as a tendency to reach a goal from vision and mission generally of Advance Interior Design Multi-Services Company.

Glossary

The professional Interior Design (ID)	:	Qualified by education, experience, and examination to enhance the function and quality of interior space, definition The National Council for Interior Design Qualification.
Strengths-Opportunities (SO)	:	Strategies using company internal strengths to gain advantage of External opportunities.

Augmented Reality (AR)	:	Augmented reality is a live, copy, view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data.
The Head-Mounted Display (HMD)	:	Display device paired to a headset such as a harness or helmet to place image of Physical World and Virtual Object over field of view.
Mixed Reality (MR)	:	As a concept that covers both augmented reality and augmented virtuality.
Virtual Reality (VR)	:	Interactive, Immersive, and Information Sensitivity from frame of reference completely tied to a virtual world.
Computer-Aided Design (CAD)	:	A System that uses a power computer graphics workstation to enable product designers and engineers to draw design specification on a display screen.
Personal Computer (PC)	:	A Relative compact type of computer, the most common of all, for use in business and at home.

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