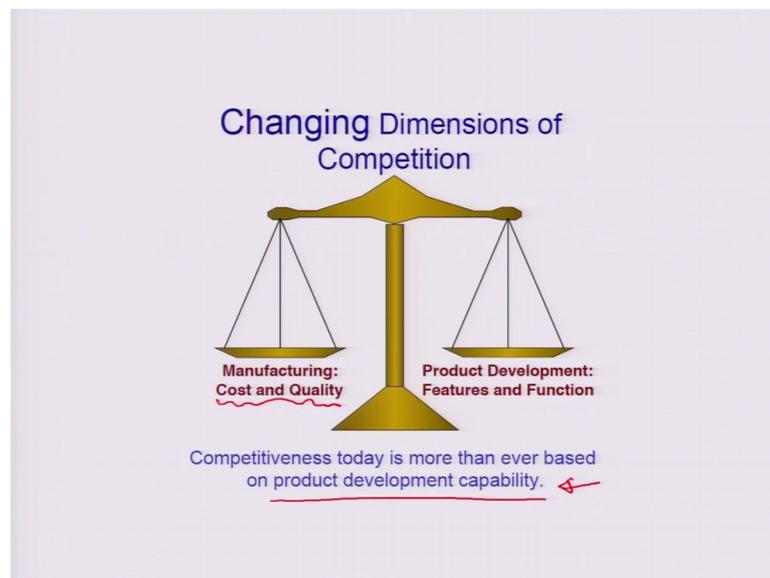


Design Practice
Prof. Shantanu Bhattacharya
Department of Mechanical Engineering
Indian Institute of Technology, Kanpur

Lecture – 02
Product Development

Hello and welcome to the course Design Practice. This is module 2 for the course. So, last lecture we were talking mostly about why design is so highly needed to develop businesses in the current context connect scenario and what we figured out is, it is all based on only one component which is the user.

(Refer Slide Time: 00:41)



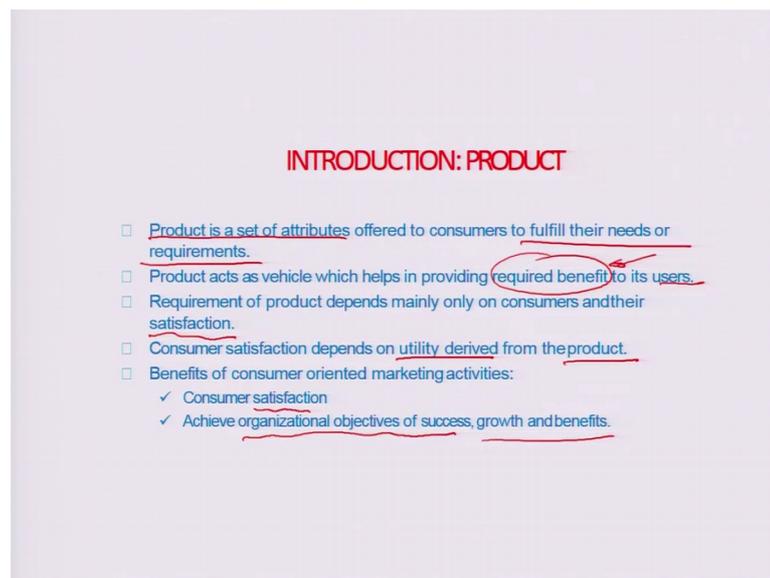
So, in these changing days of competition the dimension of competition has also changed quite a bit. If I looked at sequentially in the 60's probably people were very conscious about cost or quality and from 60's to 90's there has been a phase, when the phase manner earlier people who are just buying low cost products, but then they realize later that if we invest slightly more in the product and it comes at a better quality than the overall money cycle, which is needed to be engaged in such investments goes down because of the persistence of the product over a longer amount of time.

So, issues which are related to cost and quality almost got figured out by 90's and then, there was a need that, how you could develop products quickly with different features and functions and not only that, how you could develop based on the customer's needs or

user needs and improve the product. So, there was an aspect of customization, there were some commonality between products were felt upon the major majority opinion in the market about how a product should be, but again, because of intensiveness in the competition, people have gone into a domain now when brings about personal customization that, if I want to use a product that is convenient to me, I should be able to dictate out the needs that I have into that product. So, that it can serve you in every aspiration that I have associated with use of the product.

So, now, you know competitiveness today is more about the product development capability in terms of adding features and functions which are scaled down to the mass to the to the actual need or aspiration of the user. So, having said that, let us look at some of the very basic definitional aspects associated with the product, what really is a product.

(Refer Slide Time: 02:47)



INTRODUCTION: PRODUCT

- Product is a set of attributes offered to consumers to fulfill their needs or requirements.
- Product acts as vehicle which helps in providing required benefit to its users.
- Requirement of product depends mainly only on consumers and their satisfaction.
- Consumer satisfaction depends on utility derived from the product.
- Benefits of consumer oriented marketing activities:
 - ✓ Consumer satisfaction
 - ✓ Achieve organizational objectives of success, growth and benefits.

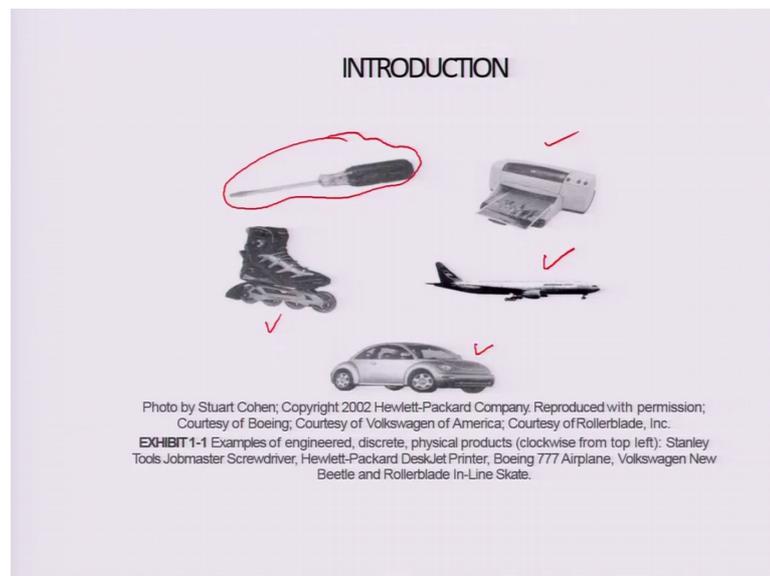
So, obviously, product is a set of attributes which are offered to consumers to fulfill their needs or requirements and they act as vehicles which provide or which help in providing some benefits to the users because of which the very existence of the product is ok. And the requirement of a product mainly depends on how to satisfy the inherent need of a consumer. Sometimes, the consumer may not be very well informed about the need because, he is not aware of the current status of products available to him in the market.

And so, therefore, his needs also get sort of construed to a direction of the most available products in the market, which actually because of the new information age and because

of the fact that now at a click of a button you can scan and know about what exists there, even if it is a very small thing which is existing there. So, therefore, the consumers now want you know, they have a very high highly skewed level of need which has to be satisfied.

So, the consumer satisfaction mainly will depend on the utility that person derives from a product that he uses and whether the utility maps to his aspirations. And therefore, the benefits of consumer-oriented marketing activities are to satisfy the consumer and to also achieve of course, the organizational objectives of success growth and benefits and in a way, all these goes into what we call the product. So, there are some examples here of different products which are available in the market.

(Refer Slide Time: 04:30)



For example, there is this job master screwdriver, which is a very very simple product yet I would like to discuss with you some aspects related to this product, particularly some quantitative aspects. Probably, the sales life or how many people are involved in development process or design process and well sales revenue. So, on so, forth this right here is the Hewlett Packard desk jet a printer, there is a roller blade, skate's and Volkswagen beetle and a Boeing triple seven airplane.

So, these are all products from all different size ranges all different market segments. And if you were to look at some quantitative basis to classify such products, we can actually classify them in terms of their annual production volume maybe, their sales

overall sales lifetime, sales price, a number of unique parts which should be there in such a product and again development time.

(Refer Slide Time: 05:26)

Discuss and Debate					
	Stanley Tools Jobmaster Screwdriver	Rollerblade In-Line Skate	Hewlett-Packard DeskJet Printer	Volkswagen New Beetle Automobile	Boeing 777 Airplane
Annual production volume					
Sales lifetime					
Sales price					
Number of unique parts (part numbers)					
Development time					
Internal development team (peak size)					
External development team (peak size)					
Development cost					
Production investment					

So, the internal development team a peak size of the team which probably is related to within the organization how much how many number of people are involved or associated with the product development. And similarly, the vendor base associated with the organization which is used mostly for setting up the supply chain.

So, external development team associated with the product a product like Boeing for example, would depend mostly on suppliers because, each and every part that is there that goes into a plane it is so much, so less backwardly integrated that, there are specializations by different vendors who will have or suppliers who will differently will be differently able to cater to different aspects of parts associated with an airplane and the precision the accuracy the perform ability of what they produce, is what makes the super functionality associated with such a product as an airplane. Mind you, if the airplane is in air there is no control. So, it needs to be all functional and well to do and highly reliable whatever gets into such a system.

So, probably the external development team size in this case would be much much more. Then the development cost and the production investment that is needed for starting of these products on or selling these products on the market. So, there has been modules

earlier with students that have personally carried out where, some students have answered these in their own manner.

(Refer Slide Time: 07:24)

Your Response

	Screw Driver	Skates	Printer	Beetle	Boeing Airplane
→ Annual Prod. vol	5 Million	1 Million	1 Million	2000	50
→ Sales Lifetime	5 YRS	6 YRS	5 YRS	6 months	2 years
→ Sale price	200-300	2500₹	2000₹	2 Lac	10 Billion
→ No. of unique Parts	2-3	3-5	17-18	750	1 million
→ Develop. time	10 hrs	1 Day	3 days	1 month	3 months
→ Inst. team size	50 persons	30 PYS	13-14	150	200
→ Ext. team size	0	5-6	10	300	2000
→ Dev. Cost	20	400	1000	10 LAKHS	1 MILL
→ Prod Inv.					

And, what I request the audience here to do is, to without proceeding further in this video if you could actually answer it yourself. And then, later on compare with the numbers that I will share just in the next slide you may know what is your apprehension of some products of different ranges or capacities as I showed before in terms of these numbers or quantizations.

For example, the student group working on this problem just last semester with us here recorded the different products the screwdriver, the skates, the printer, the beetle and the Boeing airplane to have these numbers. So, for example, the annual production volume was recorded as 5 million for the screwdrivers, about 1 million for the skates ok, for the printer another million, beetle about 2000, Boeing airplane about 50.

And similarly, all the different aspects like sales lifetime, sales price, number of unique parts, development time, etcetera were recorded. Note how the thinking process is that people do think that, development time needed for a smaller system like screwdriver is probably much much lesser in comparison to that which is used for development of an airplane although, they are very very optimistic estimates and the probably way of the actual values which should be there ok.

So, this is a kind of a psychological map about what you know about products and what you would typically respond to when you talk about discussing products. And when you actually see, what these numbers are has furnished by from the manufacturers well the annual production volume, for example, which was recorded in the last slide by the student responses is about 5 million, is not even 100000 ok.

(Refer Slide Time: 08:59)

Actual Values

	Stanley Tools Jobmaster Screwdriver	Rollerblade In-Line Slate	Hewlett-Packard DeskJet Printer	Volkswagen New Beetle Automobile	Boeing 777 Airplane
Annual production volume	100,000 units/year	100,000 units/year	4 million units/year	100,000 units/year	50 units/year
Sales lifetime	40 years	3 years	2 years	6 years	30 years
Sales price	\$3	\$200	\$300	\$17,000	\$130 million
Number of unique parts (part numbers)	3 parts	35 parts	200 parts	10,000 parts	130,000 parts
Development time	1 year	2 years	1.5 years	3.5 years	4.5 years
Internal development team (peak size)	3 people	5 people	100 people	800 people	6,800 people
External development team (peak size)	3 people	10 people	75 people	800 people	10,000 people
Development cost	\$150,000	\$750,000	\$50 million	\$400 million	\$3 billion
Production investment	\$150,000	\$1 million	\$25 million	\$500 million	\$3 billion

So, it is about close to 1 lakh units per year. So, they are off shifted quite a bit in terms of understanding of the market size. I hope that you probably do better in terms of your estimates.

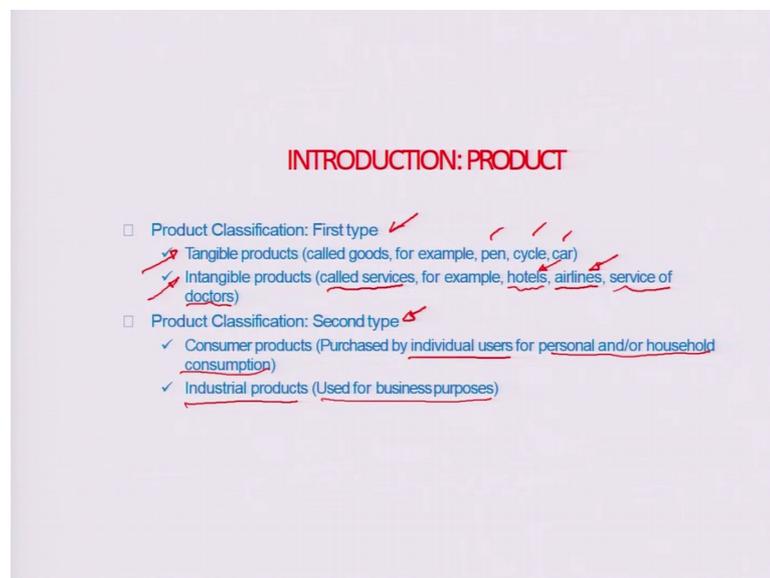
Similarly, the rollerblade is again 100000 the Hewlett Packard desk jet is actually 4 million units. It is pretty close to what people approximated here they said 1 million is about four times the size. And the Volkswagen new beetle automobile is about 100000 and of course, Boeing airplane is quite accurately mapped to 50 units per year, but when we talk about the years of development or the total development time, as you can see, a Boeing airplane takes about close to 4.5 years about 5 years to get developed whereas, the Volkswagen beetle about 3 and a half years or if I just talked about a Stanley screwdriver, it will actually take about 1 year to develop and make this product ok, come into place or come into production.

So, the estimates given by again this workgroup were quite off centered or what quite off values, particularly because, they mentioned 3 months to be the development time of an

of an airplane ok. So, it gives an idea of what is the gauging behind different products which exist in society by a general group of audience which is untrained in the area of product design.

So, having said that I would urge all of you to actually compare the values; that you have written down probably in our earlier slide and you know, you could actually compare now and see, how you know about products or how you know about new products and that exists in the society of all different scales. A similar exercise could be done with other products as well, just to find out your apprehension about how useful products in the society map with respect to these quantities right here.

(Refer Slide Time: 11:30)



So, when we talk about how to classify products, there are 2 different types of classifications that could be possible. The first of course, is classification based on whether it is going to be something which you use directly or something where there is a value addition overall to your aspiration ok. But you cannot use something physically directly.

So, such physical products are known as tangible products, like for example, goods like pen, cycle, a car ok. These are some things which you use ok. There is a thing and this thing can be used directly by a user and so that is why, you can call it a tangible product. On the other hand, there are certain products, where you know you can actually get services out of them. For example, let us say, a doctor is a person per se, but he provides

service to you or so does an airlines so does the airlines or the hoteling industry that they do product they do provide their products, but products are in terms of services ok, which can be used again by the user.

So, this is the basic classification of the first type, that is something which is more in a goods form a tangible product which you are able to touch, feel, associate with perform and then have a sense of satisfaction out of it the other one is where you actually use something which is a service provided by a system which is already in place and through that satisfaction, you derive mental pleasure or satisfaction.

So, this is the first type of product classification. The second one of course, is based on who are the buyers or the users. So, there can be products bought by individual users. Particularly, for personal or household use or consumption so, these are known as consumer products or consumer goods. And then there of course, industrial products which are developed for a large-scale application mostly used for business purposes. So, mostly like for example, a chained gantry lifts or a forklift or even a roller conveyer and an ordinary conveyer for mass production. So, these are products which again can be used on a large scale by industry houses which are in the process of manufacturing at a very high rate.

So, those are industrial products so, having said that; obviously, for developing products you need a set of activities.

(Refer Slide Time: 14:10)

INTRODUCTION: PRODUCT DEVELOPMENT

- Product development: Set of activities beginning with the perception of a market opportunity and ending in the production, sale and delivery of a product.
- Successful product development results in products that can be produced and sold profitably.

And the activities must begin with the perception of that there exists market opportunity. and also, this perception should be converted into some innovative steps in between and a design which can be realized in the end as something which is which can be produced which can be sold which can be delivered and all what qualified to this which are being produced or sold and delivered by a market and appreciated by the market and used by the market is what a product is really about.

So, successful product development definitely result in products that can be produced and sold profitably and this is what they cut the one statement is which would allow a product to be in business or be valuable to the society.

So, having said that now, let us look at that value that we are talking about which acts to a society.

(Refer Slide Time: 15:09)



So, therefore, the baler major buzzword or a goal here is, how to create value through the product development process ok. So, it is all about the product. What the product has to offer? For example, will give you an idea of where the value ok, that it can create you know through his existence in a in a particular society. Look at some very famous and interesting examples.

(Refer Slide Time: 15:38)



For example, the first name which comes to us as this guy right here, apple, which has produced many of these iPods and laptops, you know and then also touch screen phones, which have changed the whole business of beat smart phones or beat music out of the music library and into the pocket. So, it is changed quite a bit of concepts by bringing out what you call simply better products and look at what happen this today. It is only because of this innovation which is driven completely through it is user experience module that they are what they are and in business.

So, I will actually take you through about 3 different products which are available on the market ok. And I would like to also share some of the opinions which have been given about these products and their features by again a student group I have been working with me in the past. But, the idea here is that, after I take you through these products, you yourself should without going any further on the video, be able to address the questions that I am asking. So that, you can see what your aspirations about the product is or how you can map it to what the real catch line on the product is or for advertising it which describes about the various features associated for such products.

So, the 3 products I would like to share with you at this time are number one this black and Decker snake light.

(Refer Slide Time: 17:06)



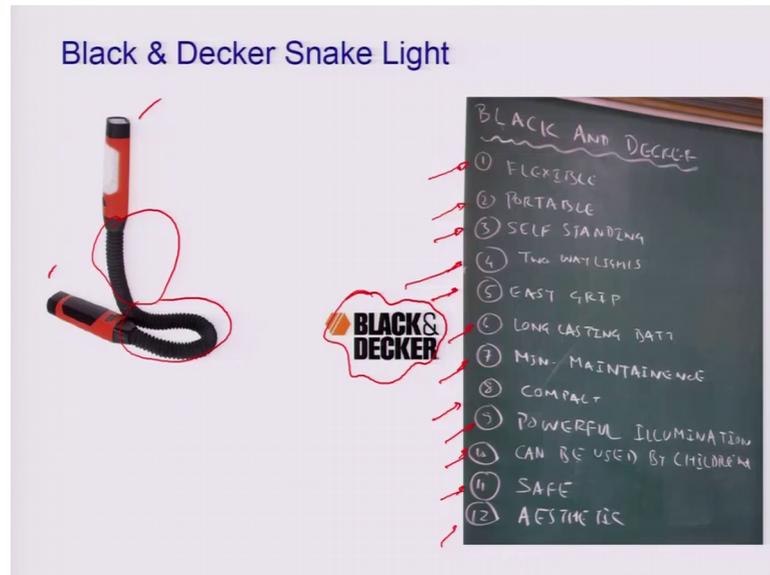
So, strong light you know which is used mostly for applications of illumination related to the under-hood area in a car. For example, or any nook and corner we would like to reach because of some reasons and are not able to do a justice in reaching because of improper illumination ok.

(Refer Slide Time: 17:35)



So, the other product that I would like to take you across is this measuring set of cups or measuring cylinders called good grips. They are angled measuring cups introduced by company called O X O and again you look at this product and try to perceive what is so

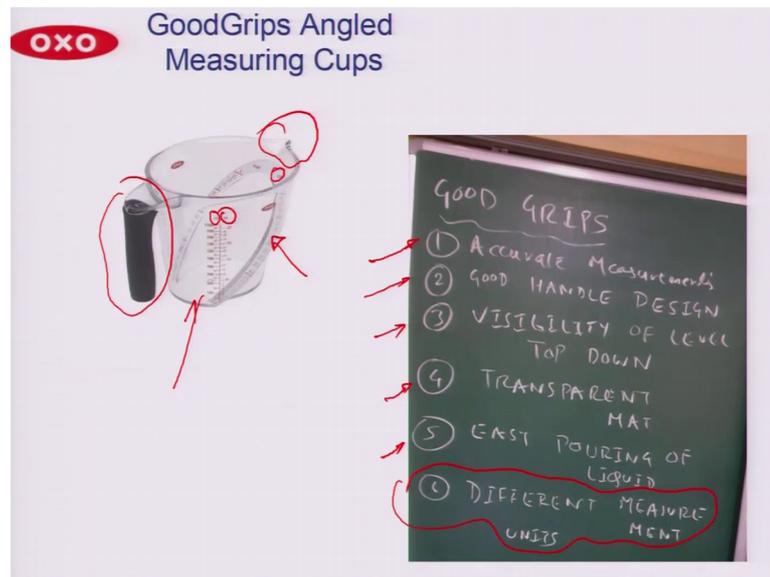
(Refer Slide Time: 18:35)



So, basically all these wires can be moved around in any part and it may be made to stand on its own. You could have lights both ways ok. So, there is 2-way lights easy grip, long lasting battery is probably minimum maintenance associated with the product, quite compact, powerful illumination, can be used by children as well. It is very safe and aesthetically pleasant. So, that is how all the student groups working with us last year sort of responded on this particular project product. Similarly, on the other product that is, the O X O.

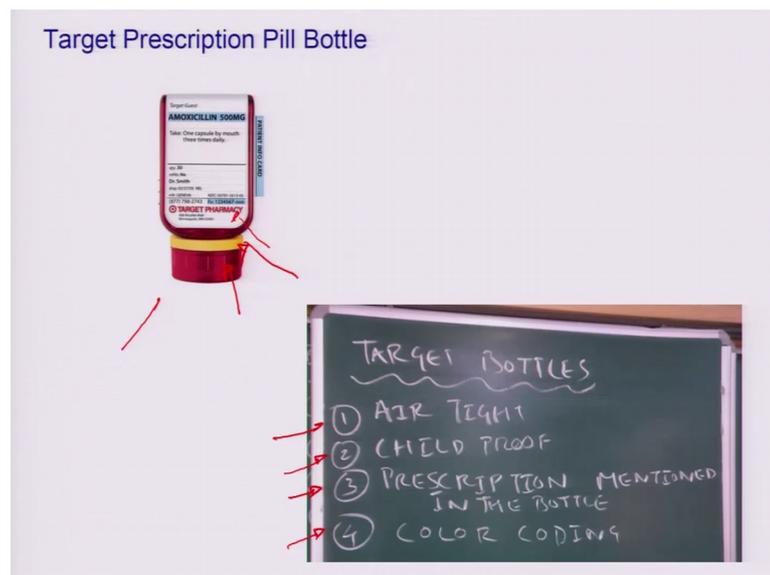
Good grips angled cup the responses recorded was accurate measurements more so, because, these angled cups have a top down approach of reading the meniscus level which otherwise, becomes a big challenge. Particularly, when seeing from the sides and trying to register good handle design, this grip seems to be pretty good in this particular product. Obviously, the visibility of level top down is much easier than side wise, the material is very transparent enabling us to see the color or the level or the aspects related to the confined product I mean confined liquid which is inside or let us say, any containment which is inside.

(Refer Slide Time: 19:24)



Easy pouring because of particularly the big shape here and you know, if you look at it closely, there are different measurement units or milliliters, so on, so forth, ok. So, there are different measurement units which are in place for people to conveniently understand in any different parts of the world. So, that is how this product is appreciated by let us say, people who are not so, trained in the product development process.

(Refer Slide Time: 20:41)

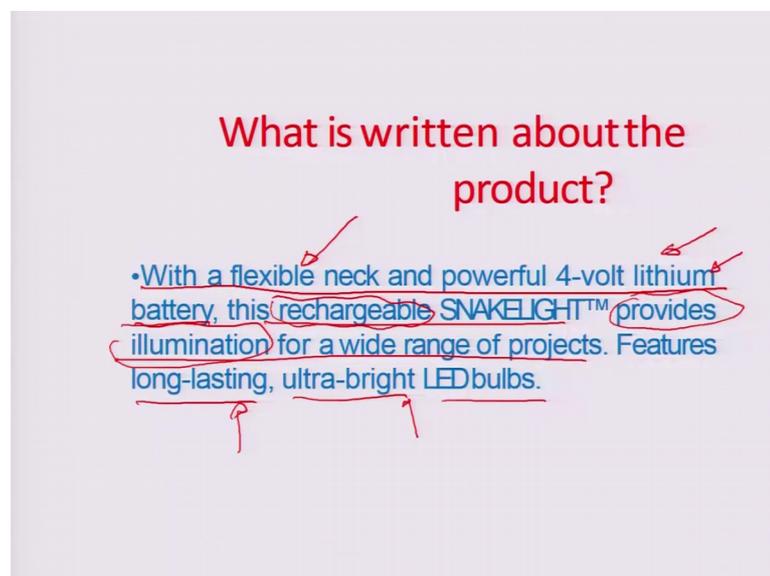


Similarly, looking at this particular pill bottle, people have given all different aspects related to air tightness of the content containment confinement, the childproof

capabilities probably of this lid right here, prescription mentioned in the bottle which is a big help for patients who particularly forget taking pills and then, there is a color coding particularly this color right here which is yellow it can change from patient to patient. So, it gives you an idea about how such bottles can be used by a group of different users.

So, in this particular product description, it so appears that, the capture of the audience is towards the basic usability needs associated with some features which are innovatively mapped on to this product. When we look at, actually the catch lines which these companies have to say for their products, for example, for the snake light.

(Refer Slide Time: 21:30)

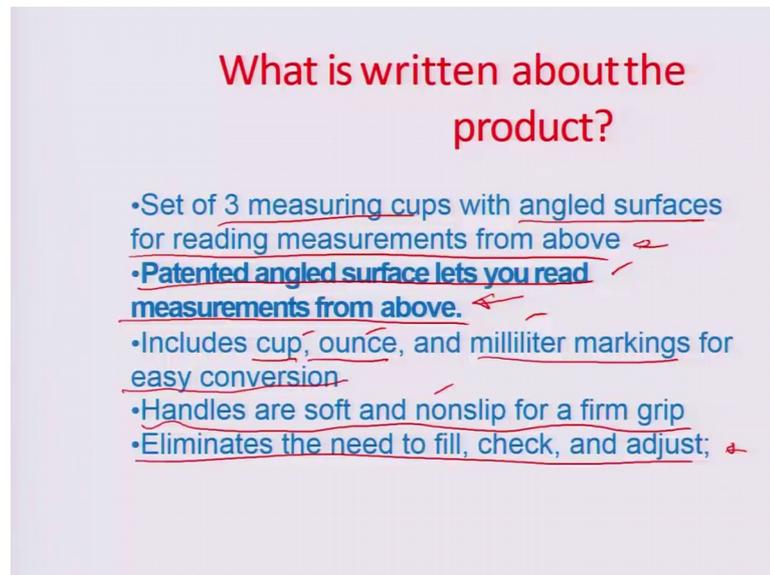


From black and Decker, the catch line which has been written to give aspects related to this product is that, with a flexible neck and powerful 4-volt lithium batteries rechargeable snake light provides illumination for a wide range of products features such as long lasting, ultra-bright, led bulbs are there in this product which is kind of descriptive about the product.

So, definitely a part of it has been captured in the response given by the students earlier. For example, this flexible neck and being you know or containing a battery which is powerful or a probably ultra-bright long-lasting feature has already been described where, I saw the features which were left over at this recharge ability. For example, or you know, even think about the reliability provided by this lithium ion batteries and so on, so forth.

So, these are some of the features which have been left out probably in the mental mapping of student group which were untrained in product development about this particular product.

(Refer Slide Time: 22:44)



When we look at the statement related to the O X O good grips cups, the statement says, set of 3 measuring cups with angled surfaces for reading measurements from above the patented angled surface let us you read measurements from above. So, this is what they are stressing most and this is what probably the most important problem is associated with checking the meniscus level from the sides every time in such measurement systems. It includes cup, ounce, and millimeter markings which makes easy conversion available for people who are untrained, but still want to use them for culinary skills, I am trying to read scales ok.

So, handles are soft non-slip for a firm grip. So, this something that has already been captured eliminates need to fill check and adjust. So, basically quite a bit of this including the different units of measurement or the good grip of the firm or for example, this patented angled measurement design has been captured from set of people who have just looked at the product from the untrained in the product development process, but still be able to certain. So, same is true for the target pill bottle, which is actually also known as the ClearRx ok.

(Refer Slide Time: 24:06)

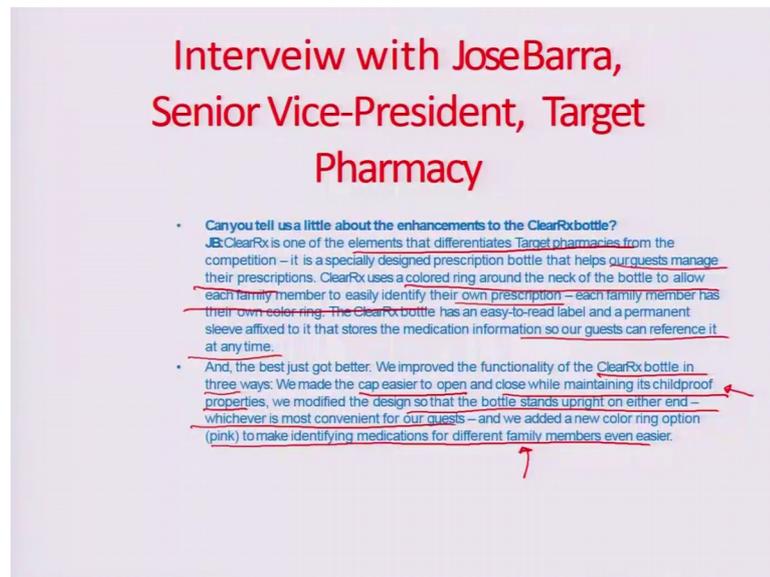
What is written about the product?

- When Target introduced ClearRx in 2005, the design of the standard prescription bottle was literally upended: The bottle now stood on its cap, featured color-coded packaging and an easy-to-read label. It has garnered tremendous praise from the design and healthcare communities, as well as our guests.

So, when target introduced this ClearRx in 2005, if the design of the standard prescription bottle was literally appended, the bottle now stood on it is cap. So, that is one aspect featured color coded packaging which has already been captured as a feature by the student group and easy to read label, which is again the prescription part which also was captured.

So, it has garnered tremendous praise from design and healthcare communities as well as our guest that is what target has to say for it is pill bottle clerics and in fact, when an interview has been conducted to senior level vice presidents of this company this say that the ClearRx is one of the elements that differentiates the target pharmacies from competitors.

(Refer Slide Time: 24:41)



It especially, designed prescription bottle that helps guests to manage their prescription apart from containing just the medication safely. It uses a colored ring around the neck of the bottle allowing each family member to easily identify the prescription given to that number and it stores medical information. So, our guests can reference it at any time particularly, let us say, a phone number of the doctor or even you know, the pharmacy which provided so on, so forth.

And the best just got better we improve the functionality of clerics bottle in 3 ways we made cap easier to open and close, while maintaining it is childproof properties this was very important it was captured remember in the response of the students. We modified the design so; the bottle stands upright on either end which is more convenient for our guests. So, there may be people who want, you know, pills may after sometime stick together, particularly, if we are talking about capsules, etcetera because of weight. So, it is probably easier to turn it around once in a while and we add a new coloring option paying to make identifying medications for different family members even easier.

So, this is what again the senior vice president of target had to say was, is involved in the product design.

(Refer Slide Time: 26:02)

**Interveiw with Jose Barra,
Senior Vice-President, Target
Pharmacy**

- We heard you had more than 90 prototypes for the original bottle design. Why so many? What does the prototype process look like?
JB: While 90 prototypes may seem like a lot, we didn't make them all at once. We would develop a design, review it with guests and then incorporate their feedback into a new prototype. Ultimately, we wanted to ensure that we had thought through all of the little details that improve the design as a whole—from the way the cap sounds when it "clicks" to the way the bottle stands up. We did not stop working on these details until they met the high standards of ClearRx.

And if we look at the number of prototypes, which really resulted in the final product, there were about more than 90 prototypes which were done in order to arrive at the final product, which is actually the ClearRx bottle, which is in the marketplace.

So, product development is again, you know, an iterative process of mapping the real need which is underlying this process of all development. So, I would like to end this particular lecture here, but probably, in the next lecture, we will look at product development is a strategy what are the different steps which are involved and get into some hardware and some tools which are needed for doing actual product skill development.

Thank you very much again.