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A universal new product development and upgradation framework

Kaustubh Dhargalkar[*] , Kasturi Shinde and Yoshita Arora

* Correspondence: kaustubh.
dhargalkar@gmail.com
Welingkar Institute Of Management
Development & Research, Mumbai,
India

Abstract

When confronted with new product development (NPD), managers generally adopt quick fixes such as benchmarking with competing products and then attempting incremental changes over the competitors' product features. There are several approaches propounded in the past. Some focus on manufacturing, some on marketing and perception, and some on idea generation and stage-gating these concepts. However, a comprehensive approach seems to be missing. This paper attempts to suggest a comprehensive framework that could be used for products as well as services, by start-ups and conglomerates alike, for processes as well as organization design. This study includes an analysis of existing literature on NPD and an exploratory activity to identify all possible attributes of a product or service. The exploratory study was conducted with multiple groups of participants. Each group was given a different product or a service for analysis. They were asked to brainstorm in a systematic manner and list down everything that they liked/disliked or had suggestions about the product or service that they were analyzing. A comprehensive master-list of these attributes was then created to form the framework. An exhaustive list of forty-five attributes was compiled. These attributes are representatives of the latent needs and aspirations of consumers and can be used as a starting point of any new product or service development/upgradation process. This framework is equally applicable for processes and organizational design as it is for products and services. It can be used by managers in large as well as small organizations. It can also be used by faculty in management schools who teach Innovation and NPD as also faculty in a design school. The proposed framework can be used while designing systems for community-building too.

Keywords: New product development (NPD), Product upgradation, Service upgradation, Innovation, Framework, System design, Building blocks of a product/service

Background

"To exist is to change, to change is to mature, to mature is to go on creating one self endlessly", as mentioned by Bergson (1911). This saying holds true not only for people but also for a product or a service. In an, ever-changing world, technologies change, customer demands change, ecosystems change, competitors change and while all this is changing, if your product/service remains the same, it will cease to exist. Hence, new product development and upgradation of existing products has to be pursued relentlessly. Usually, new product development is seen as correcting the mistakes in the existing products, plugging the gaps, and trying to catch up with competitors. But,

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it is much more than that. NPD should mean giving the customer an altogether different experience. It should mean breaking the clutter and differentiating your product from others. Today customer demands keep evolving continuously, compressing product lifecycles. Product development is not an easy process. The success rate ranges between 45 and 62% (Cooper and Edgett 2010). To enhance the success rate, there exist various product development models that can help organizations in their quest to develop new products. The traditional staged process for product development had dominated industry from the seventies till the late 1990s. In the last decade, however, there have been attempts to explore other avenues. Value engineering has been suggested by Ibusuki and Kaminski (2007) as an attempt to widen the horizon of the conventional NPD process. Erat and Kavadias (2008) have pointed out deficiencies in the older processes followed from the perspective of changing business scenarios. A few models have been discussed herewith and their advantages/disadvantages analyzed by the authors. Certain models do capture the attributes to be incorporated into a new product; however, they do not provide a universal framework of attributes that an ideal product should have. Achrol and Kotler (1999) in their book, *New Product Development Model* propose a process for NPD; however, the process ends where product sales meet expectations and does not elucidate the process of making the product more relevant to the consumer. Mizuno and Akao (1994) in their Quality Function Deployment do mention taking into account the voice of the customer. However, the main shortcoming of this method is that the "voice of the customer" is tapped through the use of conventional surveys. Many a time customers are unable to voice their requirements. Moreover, these surveys contain pre-determined product attributes and the customers are only expected to react to these. Hence, companies may not be able to have a comprehensive list of customer aspirations and latent needs. The Game Board Model Building proposed by Beckley et al. (2012) helps change a specific product but does not provide a framework that can be universally applicable for any product or service. Literature emphasizes the need to capture the knowledge of customers' needs along with the technological competence when it comes to NPD (Su et al. 2007). It becomes essential to identify the features that fit to the needs of the customers while designing a framework for product development. Wells (2008) has mentioned in his research work that knowing the requirements of the customers is one of the most critical factors for innovation. Similarly, the study by Song and Parry (1996) mentions that understanding the needs of the customers and awareness about the market is a consistent theme for the success of product development. All these frameworks emphasize on deep consumer understanding. Understanding consumers takes a lot of effort, time, and money. All this effort is made to find the attributes that the consumers want in new products or services and is definitely worth. However, in today's constantly changing world, the time required to find the desired attributes is at a premium. The authors have approached post graduating students as they are the frequent users of the chosen products under study and would identify the features according to their usage. This paper is an exploratory study with its focus on generating a holistic framework of attributes of a product or a service that can be used as a starting point for any new product development process. A first principles-based approach has been used by the authors, to capture the attributes that people desire in a product or service.

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Literature review

The new product development literature reflects the importance of introducing new products in the market for the success of any sustainable business. There are numerous studies done in the last few decades that document the relevance of NPD as a key factor in business planning, profit performance, and overall growth of the company (Urban et al. 1993; Cooper, 2001). However, there is fragmented presentation about the development of an upgradation process in the literature. Some of the existing models have been critically analyzed to identify the gaps with an intention to design a framework that would fit in to bridge those gaps in the upgradation process. The Linear Stage Gate Process that was developed by Cooper (2000), which is now a registered trademark of the Product Development Institute Inc., involves continuous review of the product development process. Regular reviews keep narrowing down the options generated. Product development thus becomes a logical progression meeting defined objectives. The emphasis is on getting the next new product out to the market in the shortest possible time. The process follows six key linear stages, viz. ideation, scoping, business case creation, development, testing and validation and launch. *Scoping* involves market projections and analysis of the technical advantages of the product. The *business case creation* stage assesses the feasibility of the product and spells out the product and project definition, justification, and plan. The *development phase* includes thorough planning for manufacturing and marketing. Customer reactions are mapped during the *testing and validation* phase. The *launch* phase involves the commercialization of the product. The advantages of this stage gate process are:

 i. It speeds up the mind-to-market cycle
 ii. It reduces rework and other forms of waste
 iii. It increases the focus since projects with low projected returns are eliminated early. Besides these advantages, there are certain shortcomings embedded in this process such as:
 a) Customer feedback is sought at the *validation* stage, which is too late, thus making the cost of change enormous
 b) The project team is forced to take decisions early due to the in-built stages and gates, reducing the flexibility and further escalating the cost of change
 c) Product development, in this process, goes through a sequential process, while in reality, it is otherwise
 iv. The rejected ideas may not get documented and may be lost forever, since the emphasis is on quickly moving forward through elimination, rather than building of concepts through user feedback

The New Product Development Model proposed by Achrol and Kotler (1999) postulates the use of a funnel through which new ideas and concepts are passed. Various initial new product ideas and concepts are thought of, which are then run through this funnel and high potential products are launched. This process is not always linear. There are eight stages of new product development. The process begins with *idea generation.* The second stage involves *idea screening.* Followed by *concept development and testing phase*, where consumers test the product and its benefits. This is followed by *development of marketing strategy* and *business analysis.* Then *product development*

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and *market testing* are followed by *commercialization*. Many companies use a spiral approach where they return to an earlier stage to make improvements before going ahead. The model is too open-ended and generalistic in nature; it does not give details of the intricacies at each stage. The process ends where product sales meet expectations and does not elucidate the process of making the product more relevant to the consumer.

The NPD process by Ulrich and Eppinger (1995) helps co-ordinate between cross-functional teams and plan from idea to launch phase. It entails thorough documentation at every stage. That helps in identifying opportunities for improvement. After the initial planning, the requirement concepts are developed using industrial designs. After which, the "winning concept" is chosen. Then the concept is converted into a computer aided design. After this, the cost of manufacturing and other relevant costs are evaluated. Prototypes are then constructed and refined as required. After the design passes the testing phase, production is initiated. However, this process is too design-specific and is aimed more at industrial products.

Quality Function Deployment (QFD) method is a result of the obsession of the Japanese with quality. The exact date of the genesis of the concept has not been documented; however, it is widely believed that two Japanese professors, viz. Mizuno and Akao formulated the method in the 1960s. At that time, they realized that the then existing methods of quality assurance were reactive rather than pro-active, i.e., they were designed to fix the problem during or after manufacturing. The aim of Mizuno and Akao was to embed customer satisfaction into the manufacturing process. Later, QFD became a comprehensive design system that links customer satisfaction with various business processes and functions. It seeks the voice of customer through market surveys, compares these findings with the offerings of competitors, and maps these with the technical capability of the company. The main shortcoming of this method is that the voice of the customer is tapped through the use of conventional surveys. Many a time customers are unable to voice their requirements. Hence, companies may not be able to have a comprehensive list of customer aspirations and latent needs.

Beckley et al. (2012) have introduced the Game Board Model Building Technique to identify the desired attributes of a new product. However, they take an existing product and take into account consumer preferences to deconstruct and then reconstruct a product with their individual preferences and priorities for attributes and different combinations of attributes. The model helps change a specific product but does not provide a framework that can be universally applicable for any product or service.

Besides these models, literature also reflects upon the importance of generating a list of attributes that serves to generate new models. Pike and Steven (2003) in their paper have used Kelly (1977) to generate a list of attributes preferred by people to choose short break holiday destinations. They have emphasized on comparing options and not about generating a list of attributes. Moreover, that paper helps researchers to understand the priorities that consumers display among the attributes of competing alternatives. On similar grounds, Blijlevens et al. (2009) mentioned about the appearance attributes of designed products in the durable goods category. The study identified the perception of the consumers in a durable goods category. As reflected in the works of Alpert (1980), the determinant attributes have evoked the interests of researchers. He has highlighted that product attributes do create a preference among consumers and that attributes play an important role in product development.

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Tsafarkis et al. (2011), in their study, titled, "Consumer behaviour and new product development: an integrated market simulation approach" have proposed a conjoint analysis model to better explain the market penetration of competing products in a similar category. They have assigned weights to consumer preferences to a few product attributes. However, these product attributes have been pre-determined by the researchers and have not been sought from the consumers. They conducted a real world application wherein they compared the expected market penetration of some milk products, however, this was based on four pre-determined attributes of the products and not an attempt to seek out the attributes sought by the consumer.

The present study builds on from the identified disadvantages of the existing models and the importance of studies that highlight the role of attributes toward product development. Crawford (1987) mentions about specific strategy that can enhance the new product development projects and divided it into five categories namely: new-to-the-world, new category entries, additions to product lines, product improvements, and repositioning of products. Booz et al (1982) new product development process serves as a guide for managers seeking to develop new products in a comprehensive and appropriate fashion. It has seven stages, namely new product strategy development, idea generation, screening and evaluation, business analysis, development, testing, and commercialization. This is a widely recognized model in the literature and captures most of the prevailing practices in the industry. The seven stages bring to light that the firms are different and the industries also varies from each other hence the NPD process must be adopted to meet specific company needs. However, it is a framework that suggests each of the seven stages should happen in a linear sequence. In reality, if this is practiced, it leads to a lot of sunk costs because testing happens only toward the end of the process, by which time a lot of costs have been incurred. Design thinking, on the other hand, makes use of extensive user research, feedback loops, and iteration cycles at an early stage in the New Product Development Process and is becoming popular in the industry (Martin, 2009), since it saves a lot of sunk costs. Brown (2008) in his landmark article in the Harvard Business Review too makes the same point. Kamrani and Vijayan (2006) have shown that the time required for new product development is drastically reduced by using the Design Thinking methodology. As compared to the linear, staged framework, the Design Thinking Approach encourages quick prototyping and feedback cycles that lead to faster iteration, thus saving a lot of time in the New Product Development Process. This approach can be summarized by the double diamond diagram put forth by the Design Council of UK (2005). The four stages are discover, define, develop, and deliver. It lays a lot of emphasis on the discovery phase, which involves immersive consumer research to find the real aspirations and pain points of users. This often leads to myth-busting insights that lead to great products. The researchers have tried to build a universal framework of attributes that will encapsulate all that people expect out of a product or service and can combine the "discover" and "define" phases from the Design Council's approach.

From the above literature survey, it can be seen that the New Product Development Processes postulated by Booz et al. (1982), Crawford (1987), Achrol and Kotler (1999), and Ulrich and Eppinger (1995) and the Linear Stage Gate Process by Cooper (2000) provide a step-by-step approach to new product development but do not mention anything about the attributes required to be incorporated in a new product. Generally,

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the NPD models mentioned above focus on reducing the rate of failure and not on increasing the probability of success. Reducing the probability of failure is a typical approach that gives solutions that are sufficient but not necessarily the best ones, since they originate from the perspective of minimizing risks and conforming to standards.

For tapping into the attributes necessary for a new product, Mizuno and Akao (1994) in their Quality Function Deployment have described the need to take into account the voice of the customer. However, they have recommended the use of market surveys to compare competing product offerings. Such surveys rarely bring out the real latent needs of users. Alpert (1980) has pointed out the importance of product attributes, however, has not listed them out. Similarly, there has been an emphasis on comparing the product attributes with competing alternatives but not on creating a universal framework of attributes for new product development (Pike and Steven 2003; Blijlevens et al. 2009). The Game Board Model proposed by Beckley et al. (2012) helps change a specific product but does not provide a universal framework of attributes for new product development. The design thinking approach to new product development referred to above emphasizes the importance of in-depth consumer understanding through deep empathy and provides a structured approach to uncovering latent consumer needs and new product development (Design Council of UK, 2005; Kamrani and Vijayan, 2006; Brown, 2008; Martin, 2009). However, it does not provide a universal framework of attributes for the same.

NPD needs to be looked at from a perspective of an integrated approach that begins from a deep understanding of customer pain points and aspirations. In view of this, the present research is an attempt to create a framework that is holistic in nature and plugs the gaps identified in the above mentioned methods.

Methods
Rationale
This is an exploratory study aimed at developing a grounded understanding of attributes of products and services that are desired by the consumers. As qualitative research methods focus on in-depth exploration, a small but diverse sample is recommended (McCracken 1988). Hence, we chose focus groups of frequent users of the products and services that would help us arrive at the framework. The methodology was aimed at tapping the latent, unarticulated needs of the consumers (something that they do not say but still have). The time period for this focused group activity is 3 years. As the prime author is a professor in a management institute; convenient sampling technique was exercised to identify the post graduating students as the respondents and it would also serve as best fit for the purpose of the research as the most frequent users of the products and services. The participating students were informed about this topic and on their consent the activity was carried out. This survey sample selection process was based on the ease and convenience of the reach of the authors for the said period. Moreover, the young post graduate students seemed to be the best fit for identifying the attributes of the products. Management students pursuing their studies in different verticals like E-business, business design, belonging to diverse demographic backgrounds, and hailing from different geographies across India were approached. A sample of such students has never been used in any previous study of this kind. We used students as our sample due to two reasons, viz.

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1. They are frequent users of the chosen products and services
2. They keep trying out new products often due to which they would be a good sample to compare attributes of products or services across different categories

Detailed methodology

The study covered 215 participants over a 3-year period.

Year 1

A total of 70 respondents were involved in the first year. Fourteen focus groups with five members each were assigned eight products and six services via mutual agreement on frequently used products and services. Water bottle, pen, remote control device, tablet computer, medicine capsule strip, mobile phone, laptop computer, and umbrella were the products and educational institute, college admission process, restaurant, hospital, courier service, and bank were the services that were studied in the first year (Table 1). In the brainstorming activity, the groups were instructed as follows:

1. Look at all the positive aspects of the product/service assigned
2. Look at all the negative aspects of the product/service assigned

Table 1 List of products and services analyzed

Sr. no.	Products	Sr. no.	Services
1	Water bottle	25	College admission procedure
2	Pen	26	Restaurant
3	Remote control device	27	Hospital
4	Tablet computer	28	Educational institute
5	Medicine capsule strip	29	Courier service
6	Mobile phone	30	Bank
7	Laptop computer	31	Garbage collection
8	Umbrella	32	Insurance
9	Stapler	33	Interactive voice response menu
10	Soft-board pin	34	Billing services for a mobile service provider
11	Chair	35	Power distribution company
12	Table	36	Super market
13	Window	37	Annual maintenance contract for a device
14	Door knob	38	Automobile service center
15	Post-it note	39	Passport application service
16	Shoe	40	App-driven taxi operator
17	Raincoat	41	Cinema theater
18	Passenger vehicle	42	Fire brigade
19	Railway compartment	43	Salon
20	Dust bin		
21	Scissors		
22	Rope		
23	Calendar		
24	Confetti		

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3. List down all their aspirations from the products/services, i.e., what they wished the product/service could be

A combination of products and services were assigned to the groups.

Year 2

During the second year, 70 respondents from the new batch of post graduate students were approached with the same technique. Fourteen focus groups with five members each were assigned eight products and six services via mutual agreement on frequently used products and services. The eight products and six services identified in the second year were; stapler, soft-board pins, chair, table, window, door knob, post-it note, shoe, garbage collection system, insurance, interactive voice response menu, billing services for a Mobile service provider, super market and power distribution company. Then, a brainstorming activity was performed similar to the previous year.

Year 3

In the third year of the study, the authors approached 75 students, i.e., 15 focus groups with five members each for eight products and seven services and carried out the same exercise. The products and services studied were confetti, calendar, rope, scissors, dust bin, railway compartment, passenger vehicles, raincoat, salon, fire brigade, cinema theater, app-driven taxi operator, passport application service, automobile service center, and annual maintenance contract for a device. The students were informed about the products and services that were already studied and encouraged to identify the attributes of newer ones. Broadly, the study can be divided into two steps, viz.

Step 1. Identification of consumer needs and aspirations from a variety of products and services that they use, using Natural Language Processing to determine the true meaning of what the consumers have said. These expressions are the attributes that they desire in a product or a service.

Step 2. Combining all the attributes into an exhaustive master-list in the form of a framework, that is indicative of all the attributes that a product/service ought to have.
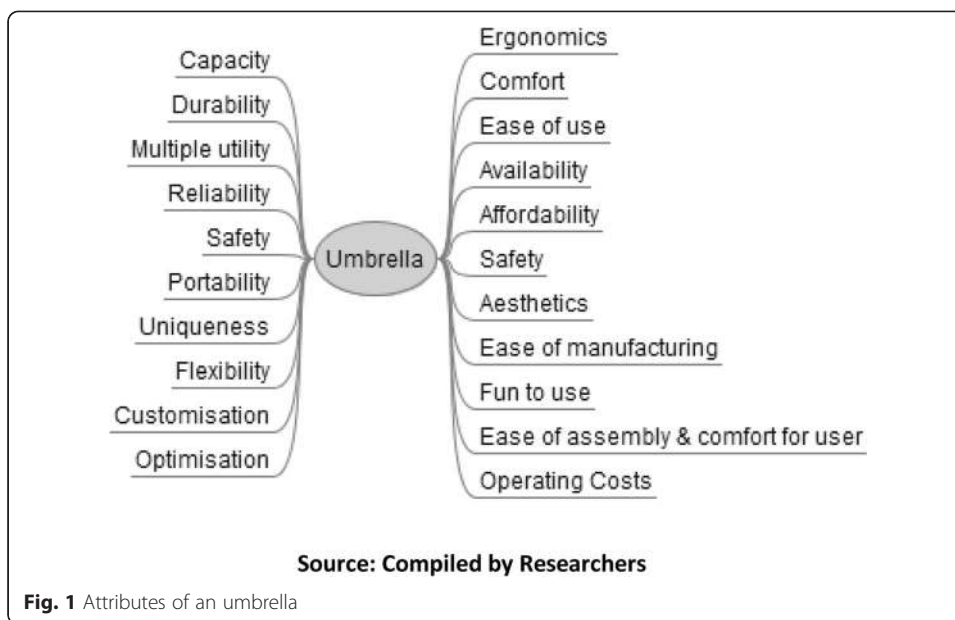
To identify consumer needs and aspirations, over a 6-year period, 43 groups (five participants per group) were assigned a product or a service. Overall sample size comprises of 215 respondents. There were 45 common attributes that appeared as the major findings of the study and are discussed in the section of findings.

Findings of the study

The attributes identified by each group were combined into an exhaustive master-list. Abridged findings from only six such groups (out of the 43 groups of students engaged) are listed below, in the interest of the length of the paper.

The attributes identified for an umbrella were capacity, durability, multiple utility, reliability, safety, portability, uniqueness, flexibility, customization, optimization, ergonomics, comfort, ease of use, availability, affordability, esthetics, ease of manufacturing, fun to use, ease of assembly for the user, and operating costs. The results are depicted in Fig. 1 in the annexures.

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Source: Compiled by Researchers

Fig. 1 Attributes of an umbrella

The attributes identified for a laptop computer were convergence to other modes, comfort, flattening the "learning curve", ease of use, availability, affordability, brand and line extension, portability, maintenance, ease of manufacturing, cycle time, after sales service, operating costs, modularity, capacity, ergonomics, durability, multiple utility, reliability, resale value, safety, esthetics, uniqueness, flexibility, fun to use, and traceability.

The results are depicted in Fig. 2 in the annexures.

The attributes identified for a mobile phone were comfort, flattening the "learning curve", ease of use, availability, affordability, resale value, capacity, ergonomics, durability, multiple utility, reliability, eco-friendly, brand and line extension.

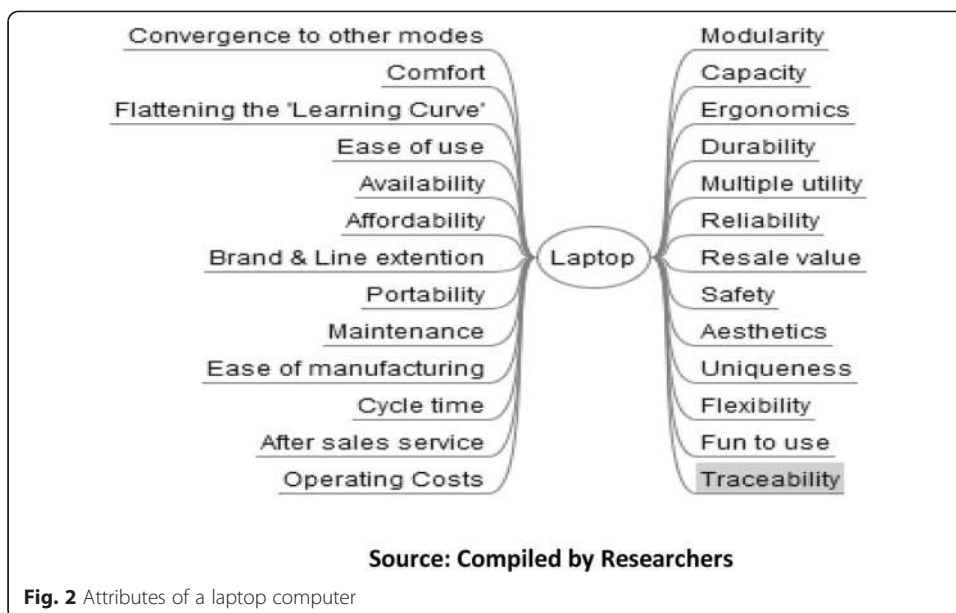The results are depicted in Fig. 3 in the annexures

The attributes identified for a stapler were convergence to other modes, ergonomics, ease of use, availability, affordability, esthetics, uniqueness, cycle time, fun to use, after sales service, operating costs, capacity, modularity, durability, multiple utility, reliability, safety, maintenance, ease of manufacturing, mode of payment, customization, traceability.

The results are depicted in Fig. 4 in the annexures.

The attributes identified for an educational institute were modularity, flattening the "learning curve", availability, affordability, safety, inter-systemic component interaction, ability to be of stand-alone use, dynamic display of usage, customization, capacity, ergonomics, non-verbal communication, reliability, brand and line extension, uniqueness, flexibility, mode of payment, fun to use, and operating costs.

The results are depicted in Fig. 5 in the annexures.

The attributes associated with a hospital were modularity, non-verbal communication, availability, affordability, portability, inter-systemic component interaction, ability to be of stand-alone use, mode of payment, traceability, capacity, ease of use, multiple utility, reliability, safety, maintenance, flexibility, cycle time, dynamic display of usage, operating costs. The results are depicted in Fig. 6 in the annexures.

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Source: Compiled by Researchers

Fig. 2 Attributes of a laptop computer

When findings from all the 43 groups were combined, there emerged a comprehensive list of 45 attributes that products and services have.

Explanations of some of the technical terms appearing in the above table

Convergence to other modes

If a product is adaptable across different media, then it is said to be *convergent to multiple modes*, e.g., a website whose interface that fits on the large screen of a laptop as well as the small one of a mobile phone or the medium sized one of a tablet is convergent to multiple modes.

Modularity

A product is said to be "modular" when it consists of standardized units or sections for easy construction. This allows the end-user to create multiple options using the same basic building blocks, e.g., LEGO. In a service offering, there could be different features which could be added or deleted to enhance the user-experience. Addition or deletion of any feature(s), in this case, does not affect the performance of the core offering.

Flattening the learning curve

When a product is so designed that the learning phase for using the same is very negligible, e.g., a writing pen, the moment one looks at it, one realizes how to use it. One does not have to read an instruction manual to understand how to use it.

Non-verbal communication

When a product communicates without any written or spoken text for completion of the usage cycle, e.g., a Duracell battery has small, dynamic strip on the surface, the length of which indicates the amount of charge that it holds at that point in time. The length of this strip reduces as the charge diminishes.
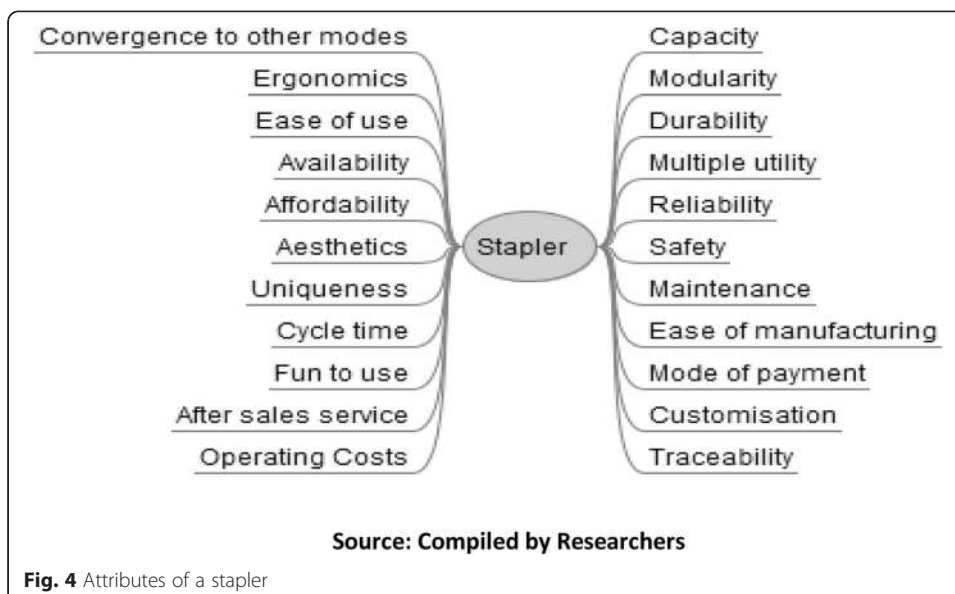
Source: Compiled by Researchers

Fig. 3 Attributes of a mobile phone
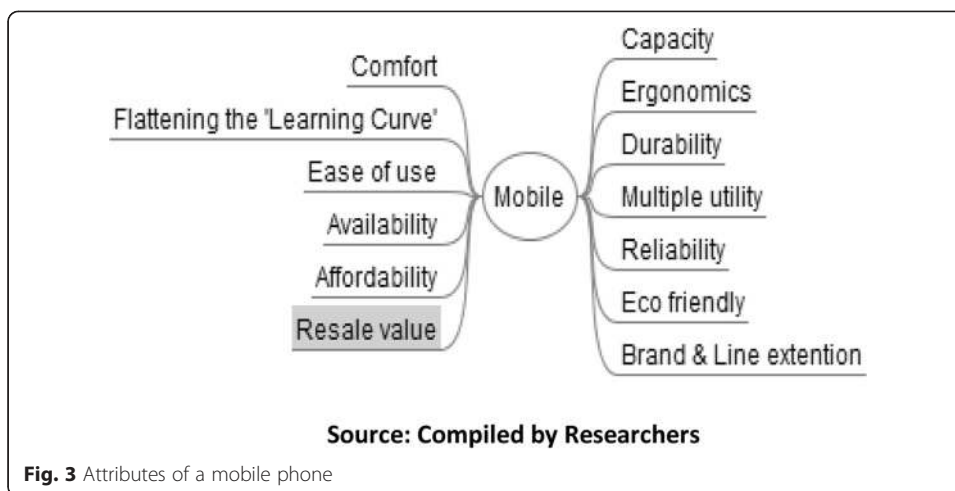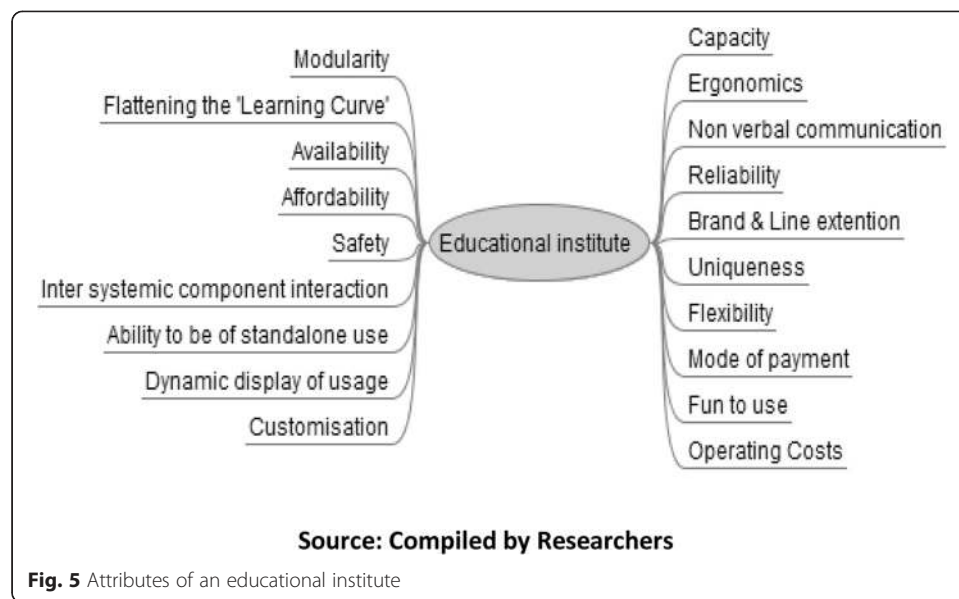
Inter-systemic component interaction

When a product is used, it is always used in a larger ecosystem, when the product interacts with its surroundings, there should be seamlessness (no damage), e.g., a pest control product that is stuck on walls should not damage or disfigure the walls.

If there were two companies offering pest control products of equal efficacy, but one of them left stains on the wall, a consumer would choose the one that did not, i.e., the one that did not interact adversely with the wall.

Ability to be of stand-alone use

When the usage of a product is not dependent on an external accessory, that product is said to have the ability to be of stand-alone use, e.g., calculators that use photovoltaic cells work whenever any light is incident on its small panel, wiped out the then existing

Source: Compiled by Researchers

Fig. 4 Attributes of a stapler

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Source: Compiled by Researchers

Fig. 5 Attributes of an educational institute

calculators that needed external battery packs. The new calculators had the ability to be of stand-alone use.
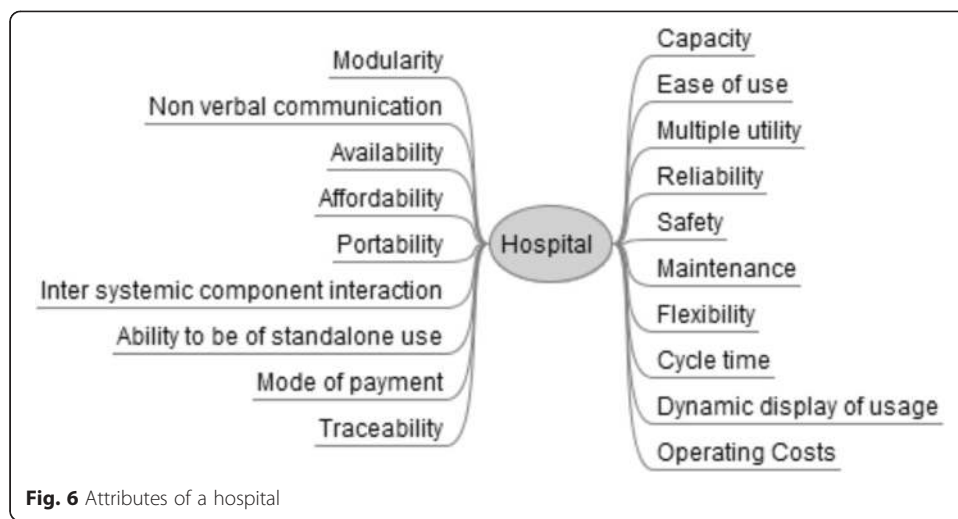
Poke yoke

When a product is mistake-proofed, i.e., it is designed in such a way that, the possibility of mistakes during usage are eliminated, e.g., all models of Apple's mobile phone after the iPhone 5 have a charger that can be inserted into the phone in any orientation (face upward or downward)

Bundling of accessories

When a product is available together with the necessary accessories, e.g., people would prefer a mobile phone that had an in-built charger, as against the conventional charger that one has to carry separately and which one forgets many time. A built-in charger would avoid those inconvenient experiences.

Results and discussion

All the attributes listed out by all the participants have been combined into a comprehensive list as Table 2. It comprises a comprehensive list of attributes that an ideal product/service may possess. Thus, it covers an exhaustive list of all attributes that a product or a service should have. Such a list can be used while creating a new product or upgrading an existing one. Each of the attributes could be analyzed in detail and then a decision about how to embed the same in the product or service can be taken. After due deliberations, the decision could go for or against embedding the attribute. Companies usually decide to differentiate their products/services by heightening their focus on one or two of these attributes, while maintaining the status of the other attributes. This is also in line with the Blue Ocean Strategy framework of eliminate, reduce, raise, create (ERRC) suggested by Chan Kim and Mauborgne (2005). A couple of examples have been listed below to illustrate the practical implications of the proposed framework.

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Fig. 6 Attributes of a hospital

Table 2 Master-list of product/service attributes

No	Attribute	No	Attribute
1	Capacity	23	Maintenance
2	Convergence to multiple modes	24	Uniqueness
3	Modularity	25	Ease of manufacturing
4	Comfort	26	Sensory Appeal
5	Ergonomics	27	Inter-systemic component interaction
6	Flattening the "learning curve"	28	Versions
7	Durability	29	Flexibility
8	Ease of use	30	Ability to be of standalone use
9	Non-verbal communication	31	Cycle time
10	Multiple utility	32	Mode of payment
11	Availability	33	Dynamic display of usage
12	Reliability	34	Fun to use
13	Affordability	35	Transference of use
14	Eco friendliness	36	Disposability
15	Turnaround time	37	Customization
16	Resale value	38	Ease of assembly and control to user
17	Brand and Line extention	39	Optimization of material and functionality
18	Safety	40	After sales service
19	Portability	41	Traceability
		42	Operating Costs
20	Esthetics	43	Bundling of accessories
21	Poke yoke (mistake-proofing)	44	Customized dosage
22	Identity/branding	45	Ease of use for the physically challenged

Source: compiled by researches

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Attribute from the framework

Resale value

This attribute gives a value to the product even after it has become redundant or obsolete for the user, e.g., Tanishq Jewelery from the house of TATAs.

Tanishq has used resale of its jewelery and coins to its advantage. Tanishq offers a buy-back policy which is trusted by consumers. After branding the gold jewelery with its logo on every piece, it has started using it as a mark of trust, thereby enhancing its resale value.

Attribute from the framework

Traceability

This attribute adds the feature of the object being located easily, thereby leading to accessibility and safety.

For example, tagging through barcode marker FedEx was the first company to empower the consumer with the ability to know where exactly the parcel that she/he has sent is at any moment in time, along its journey. FedEx has employed a complex IT platform to enable this. Each packet has a barcode and at various points during the parcel's journey, different barcode readers feed the location of the parcel to the company's IT platform which can be accessed by the consumer. This has provided consumers tremendous peace of mind and enabled FedEx to capture a substantial market share in the last decade or so.

The above framework would prove to be a good starting point for NPD as well as a product/service upgradation process. The framework provides a fast-track method to list out and examine what attributes a product should have.
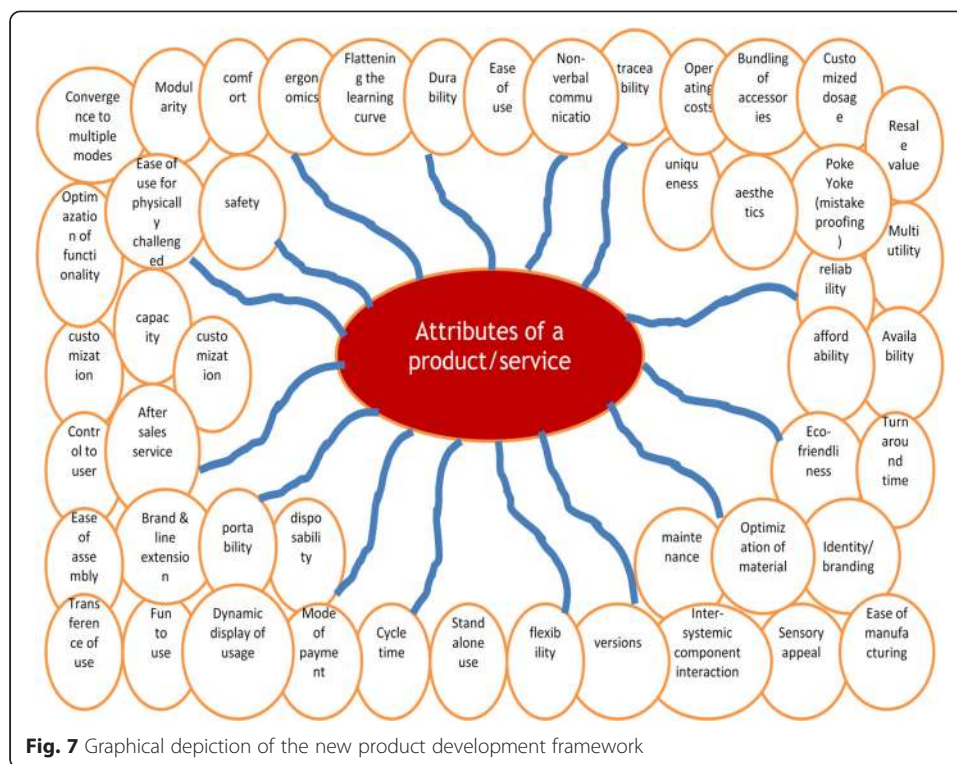
Scope for further research

A comprehensive model could be created taking into account the weightage of consumer preferences across attributes for different products. For this model, user inputs about their preferences of the attributes involved could be taken and due weightages created for the same. Products or services in competing categories could be rated on the basis of this model with a score of "user desirability." A "user desirability quotient" could be created to enable product managers to design the best possible "product-market fit." Such a "user desirability quotient", created in advance, would be highly useful for any executives involved with either new product development or upgradation of existing products/services (Fig. 7).

Conclusions

The proposed model begins with the consumers expectation (which is the key to any upgradation process); it is a holistic one since it gives an accurate picture of the consumers' expectations vis-à-vis every attribute necessary to make a product or a service successful. The framework in Table 2 provides various attributes which can be treated like a checklist for the creation of any product or service. Thus, the process can be used for upgrading an existing product or a service as well as creating a new product or a service. It would also shorten the product

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Fig. 7 Graphical depiction of the new product development framework

development lifecycle. It can be used by faculty of management and entrepreneurship in business schools, as well as by faculty in design schools for either upgrading an existing product/service or creating a new one.

Since the proposed framework is a comprehensive framework, it can be used by new product or service developers irrespective of what stage their offerings are in the product lifecycle, whether in inception or maturity stage and can be adopted by all organizations, big and small, for profit and not for profit or for both, products and services.

Moreover, the framework can be applied to process as well as organizational innovation, since the building blocks of the framework stand for attributes that are universal in nature, e.g., "portability" for a process means ability to be applied across domains, the same for an organization structure means ability to replicate a departmental structure across functions.

The proposed framework can be used for system design too, such as habitat design for migrant workers, wherein each of the identified attributes from the proposed framework need to be considered to create a holistic habitat. The proposed framework is truly universal.

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Authors' contributions

KD conceptualized the research and conducted every focus group and has written the final version. KS and YA, the co-authors, helped conduct some of the focus groups and drafted the first version of the paper. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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