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A Review of Diffusion Models and Their Applicability to App-based Services in India

Tapish Panwar [*] **&** ***Kalim Khan***

[1]Atlas Skilltech University, Tower 1, Equinox Business Park, Kurla West, Mumbai, India
[2]Brains Trust, Andheri, Mumbai, India
[*]Corresponding Email: tapish.panwar@gmail.com

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Abstract

Background: Diffusion models have been used for over half a century to predict the spread of innovations, products, and services in target strata. However, the applicability and relevance of diffusion models for the new age app-based consumer services have not been researched, especially in developing markets like India.

Purpose: This paper identifies gaps in the two founding theories on diffusion– Rogers' Diffusion of Innovation Model and Bass' Diffusion Model concerning app-based consumer services in India, and attempts to deploy these theories on the diffusion of new-age applications.

Methods: The paper critically examines the diffusion theories to extract implementation gaps in the new-age platform applications. Further, it works towards proposing a reduced form equation by including a dampener in the traditional diffusion model equation offered by Bass, which can represent the diffusion curve for app-based services and thus explain the diffusion better.

Findings: A set of enablers and disablers is identified through this research, influencing the diffusion of new-age applications. Including these elements explains diffusion from the source and medium points of view.

Conclusion: Enhanced understanding of the diffusion of service applications among the population shall help app-driven businesses efficiently build products that are well accepted and adopted by the target population.

Keywords: Diffusion, Innovation, Diffusion of Innovation, Service Apps, On-demand Application

JEL Codes: O33, M31, L86, D83

Introduction

An organisation's growth and sustenance depend on the vision, speed and ease with which it churns out newer products and services (Takeuchi & Nonaka, 1984; Adeniran, 2024). The success of a new product is a factor of the audience's acceptance of the product or service. Factors such as uniqueness & superiority of the product, and voice-of-customer built-in, along with a convincing promise and execution, influence the magnitude and rate of adoption of new products. It is critical for marketers to appropriately project the adoption and acceptance of a new product by its target audience (Iqbal & Suzianti, 2021; Figueiredo et al., 2021).

Rogers (1983) in his postulated Diffusion of Innovation theory sought to explain how new product innovations spread into a population. Bass (1969) added to the theory by explaining the role of external and internal influencers in the spread of an innovation in a social system or target strata. His work also led to creating projections about time for the diffusion to occur and the peak to be achieved during the diffusion (Alcaraz & Strodthoff, 2023). The objective of a diffusion model has been defined by (Thakur et al., 2019; Croitoru et al., 2023) as presenting the level of spread of an innovation among a given set of prospective adopters over time. Bass's postulation about internal influencers aiding diffusion was in line with the earlier research on drivers of adoption by Mahajan et al. (1990).

The diffusion of innovation theory also finds its application in the larger product lifecycle literature, where the rate and extent of diffusion across the product's lifecycle is explained with the help of diffusion theory (Golder & Tellis, 2004). The theory has also been the basis to explain social conformity, which describes individuals' motivation to adopt a particular innovation (Bernhein, 1994; Stroh, Mention, & Duff, 2023) through informational cascades (Hishelifer, 1994). There has also been a body of research that explored the consumer behaviour aspect based on the diffusion of innovation (Pinho et al., 2021).

The diffusion of innovation theory and its hosts of extensions and variations have been adapted and applied in various areas like consumer durables, retail service, industrial technology, and agricultural (Bass F. M., 1969; Akinola, 1986; Golder & Tellis, 2004; Alcaraz & Strodthoff, 2023; Croitoru et al., 2023). These studies, however, have some limitations as pointed out by (Mahajan et al., 2000) specifically in terms of geographical markets that are considered to conclude the results (Dekimpe et al., 1998).

Another limitation of the literature on diffusion theory so far has been the missing text on the more contemporary new age tech-based on-demand consumer services, or app-based services (Panwar & Khan, 2021; Pitt et al., 2021).

Tech-based consumer service businesses today have found a way into various service domains like food, finance, travel & transportation tech, education, and even dating. The new age consumer tech services have at least two things in common: (i) a user-friendly smartphone interface that promises ease of access, and (ii) a strong backend operation that ensures supply to match demand and offer convenience. Some of these services often offer customers a way to engage with other customers (thus enabling and encouraging C2C conversations) (Moriuchi & Takahashi, 2022).

Due to the nature of tech-driven app-based services, they cannot be placed in parallel with conventional products and services, especially to understand the diffusion of innovation theory. For example, the information cascade or the diffusion of communication for app-based services happens on multiple platforms between different customers, with or without the knowledge of the company. The advent of the internet, particularly social media, has empowered customers to get together and discuss brands and products and their experiences, hence generating electronic word of mouth of eWOM (Moran & Muzellec, 2017). Most traditional models of consumer behaviour do not factor in the presence and strength of eWOM, which influences the diffusion of the respective app-based service (Daugherty & Hoffman, 2014; Sumardi et al., 2025). Thus, there are some limitations to applying existing diffusion models to the new age app-based services, particularly in developing economies like India.

Evolution of Diffusion Theories around Rogers' and Bass' Diffusion Models

Roger's Innovation of the Diffusion Model

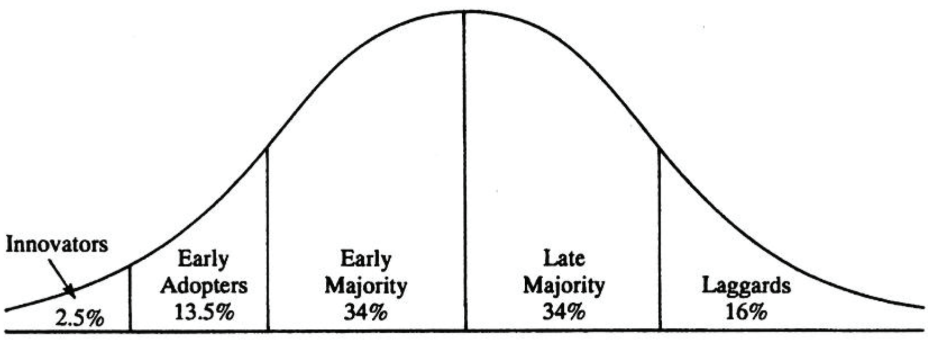
Diffusion of Innovation as a process has been defined by Rogers (1983) as a process by which an innovation is communicated or cascaded to individuals through specific channels over some time (diffusion period). A diffusion process overall is comprised of four elements – (i.) innovation, (ii.) communication channel, (iii.) time, and (iv.) social system. (Mahajan et al., 1990). Rogers (1983) went on to define factors that influence and speed up the spread and penetration of an innovation during diffusion being – (i.) Relative advantage, (ii.) Compatibility with current lifestyle, (iii.) Simplicity and convenience, (iv.) Trial-ability, and (v.) Observable results.

He posited that while mass media play a role in the diffusion of information about the innovation, the conversations lead to information cascading, resulting in the adoption of the innovation (Toldbod & Kolk, 2022). Of course, this information cascade may not always be strong, and often turns out to be fragile, leading to a reversal of sentiments (Kuran, 1989; Sampat & Saba, 2020).

Roger's (1983) diffusion model of innovation is demonstrated by a classic normal distribution, a bell-shaped curve. The area under the curve represents the number of customers buying a new product. The bell shape is explained by drawing from the normal distribution of human behaviour traits. Consumer innovativeness is one such trait that influences individual adoption, and hence, diffusion of adoption in a social system is expected to be normally distributed when plotted for all individuals in a social system.

Consumer innovativeness is the tendency among individuals to buy new products more often and more quickly than others (Li et al., 2021). Individual innovativeness (attraction towards newness) and social innovativeness (speed of adoption) play a critical role in the diffusion of innovation (Roehrich, 2004). Roger (1983) finally proposed five categories of adopters of innovation, depending upon the propensity and resistance towards adopting a new innovation (Figure 1).

Figure 1: Categories in the Diffusion of Innovation model by Rogers (1983)



(Source: Diffusion of Innovations – 5e (2003), New York, Free Press)

These categories were called 'adopter categories' and had five segments depending on when a category accepts the innovation. These categories, as given by Roger (1983), are – Innovators, Early Adopters, Early Majority, Late Majority and Laggards. These are in the order in which they adopt the product or service as customers. So while innovators are the first ones to adopt a new innovation or product, early adopters follow next.

Early and late, most join other customers somewhat later after seeing the innovation's usage and performance. Laggards are usually the last to follow, often driven by social pressure or when the innovation eventually becomes a utility. This categorisation added to creating and adopting differentiated marketing and communication strategies (Gatignon & Robertson, 1985; Tojiri, 2023) based on the adopter category, timing of the diffusion and peak of the diffusion curve.

Despite its widespread adoption to understand the diffusion of innovations in different fields, the model has some limitations. The most critical issue is the lack of predictive capability (Wright & Charlett, 1995; Hooks et al., 2022), which impairs the ability to make any practical use of the model. Further, the adopter categorisation proposed by Rogers (1983) has been challenged by many researchers for being simplistic and static (Hooks et al., 2022). Gatignon and Robertson (1985) argued that low involvement products may not have a high level of interpersonal interaction; hence, the model cannot be used as is for different product categories.

Despite its limitations, the diffusion of innovation theory provided a foundation for this research. Taking this model as the basis, researchers have extended the findings and added to the gaps identified, hence creating a new body of research in this area (Bikhchandani et al., 1992; Mahajan et al, 2000; Bass F. M., 1969; Gatignon & Robertson, 1985).

Bass' Diffusion Model (BDM)

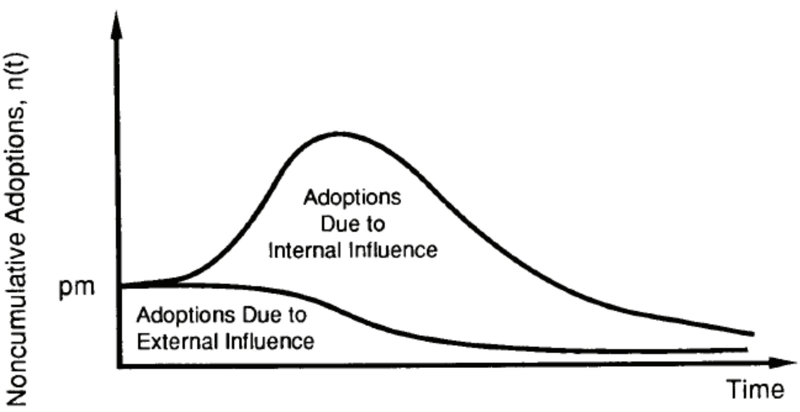
Another important model in the diffusion and adoption of products was the Bass Diffusion Model (BDM) proposed by Bass (1969). This model attempted to predict the timing of initial purchase of a new product by various categories of customers, which would reveal the diffusion process across the target strata. He tested the predictions against a data set of 11 consumer durables sold around that time to test the initial purchase time and the peak of the diffusion curve. Using the fundamentals posited by Rogers (1983), other researchers came up with growth models that predicted exponential growth in terms of product diffusion. Bass' (1969) model showed a steep graph movement, which levels off after a peak and then steadily declines.

The model considers two influences that help diffuse an innovation or product into a social system through communication: mass media and word of mouth (WOM) (Mahajan et al., 1990).

This was in divergence from other diffusion models proposed, which assumed that the diffusion process is driven only by mass media (Fourt & Woodlock, 1960) or only by word of mouth (Mansfield, 1961). Bass argued that another group is primarily influenced by interpersonal interactions, WOM, and even plain observation (Figure 2).

The BDM proposed two categories instead of the five that Rogers had proposed. While the 'Innovators' category was kept as is, the other four categories were subsumed into one category of 'Imitators'. This suggests that imitators are influenced by the decisions made by different groups of the social system when it comes to adopting a new product. These would be the innovators and some of the imitators who have adopted the product.

Figure 2: Adoptions due to external and internal influences in the Bass Diffusion Model



(Source: New Product Diffusion Models in Marketing: A Review and Direction for Research - (Mahajan, Muller, & Bass, 1990))

These assumptions formed the basis of the mathematical equivalent proposed by Bass (1969) to explain the diffusion of innovation in a social system. He suggested the following equation to explain this phenomenon:

$P(T) = p + (q/m)\,Y(T)$ ……………………..(1)

P(T) is the probability that an initial purchase will be made at a point T, when no previous purchase has been made yet.

p and q are the constants, with p being the probability of initial purchase (coefficient of innovation), and q being the diffusion rate (coefficient of imitation).

m is the total number of potential buyers in the system

Y(T) is the number of previous buyers

With the help of this equation (Mahajan et al., 1990), it was argued that the model can be used to predict the diffusion curve, especially when the peak has not been reached. This has been implemented by many organisations like Kodak, IBM and AT&T in the past, which also suggests the vast applicability of the model. Various other researchers have also used the Bass model satisfactorily in sectors such as education (Lawton & Lawton, 1979), agriculture (Akinola, 1986), and energy (Kalish & Lillien, 1986). The predictive ability was added in this model with the help of a mathematical equation, and the model evolved into a practical one, which has been successfully used in various sectors.

However, there are a few gaps in the BDM proposed by Bass (1969), which have been highlighted by various researchers. Wright and Charlett (1995) pointed out that it is unclear if the BDM can be implemented to cover products with a small inter-purchase time (smaller time between two purchase instances) and what marketing factors affect the equation proposed for demonstrating the diffusion of innovation.

Some of the assumptions made in BDM have also left scope for further clarification. The market potential (m) is assumed to be constant over the life of the product in the model, which does not resonate with the logic of continuous flux in the adopter population as explained by Kalis and Lillien (1986) (Munguia et al., 2021). Also, the diffusion process, which is assumed to be binary (an individual either purchased or did not purchase), does not consider the stages incorporated under the diffusion process. This restricts the ability of the model to represent various stages of the adoption, which are critical as far as the marketing funnel is concerned.

Limitations of Existing Diffusion Models Evolved from Rogers' and Bass' Diffusion Models concerning App-based Services

Extant literature on diffusion theory which is based on two major innovation diffusion models given by Bass (1969) and Rogers (1983) have covered areas like consumer segmenting, targeting, customising marketing and communication concerning forecasting based on the timing, speed and peak of the diffusion curve (Wells & Nieuwenhuis, 2017). However, these models' application has been tested on traditional businesses, and predominantly on product markets. While some work has been done on applying these models to the service sector, the new age services like app-based consumer services encompassing a wide range of applications like food tech, fintech and personal transport are completely untouched (Panwar & Khan, 2022).

These services are growing at a speed that warrants more academic research that may find practical application of the work. Often, these services are based on a tech-plus model[1] (Panwar & Khan, 2021) where diffusion of innovation theories can be apt for application. Also, the existing literature on diffusion models restricts its focus on the coefficients of external and internal influence, which is too narrow, since certain services (like app-based services) are dependent on more critical parameters (Gupta et al., 2020; Bassanoa et al., 2019; Mariani & Fosso, 2020).

For example, in the case of tech-driven app-based services, the internal influence may still not translate into adoption due to the customer's limited technical know-how of the tech-based services or the specific service in question. This can be a significant handicap in planning the diffusion of the innovation for these tech-driven app-based services in future. This is because technical know-how (or lack thereof) may invalidate the previous assumptions of external and internal influence on the adoption and diffusion. Further, the extant literature primarily focuses on developed and industrialised economies, which prevents a generic application towards other diverse and developing economies like India (Talukdar et al., 2002; Dekimpe et al., 1998).

Emergence and Rise of App-based Consumer Services in India

App-based services offered to customers with a strong technology component as a backbone are rising in India (Bhave et al., 2013; Bond, 2014; Panwar & Khan, 2020). Regarding services, the tech companies adopt one of the two models to bring together a seller and a buyer. Firstly, the inventory of product or service may be owned by the seller (Pepperfry[2] and Byju's[3]), and the second model, where the platform just acts as a marketplace, where the inventory is not owned by the platform (Zomato[4] and Ola[5])Tech-based consumer services allow the businesses to create and deliver appropriate solution (Wani, 2013) where while the end product may not be different (think of a haircut or food delivered at home), the way it is accessed by the customer (Urbanclap's hair expert at home or Zomato delivering food at your doorstep after you place an order and pay on its app) is unique.

[1]Service which is essentially a non-tech offering but based on a technology platform

[2]Pepperfry is an online furniture shopping portal in India (www.pepperfry.com)

[3]Byju's is a education technology and online tutoring firm which has its education portal for students (www.byjus.com)

[4]Zomato is an Indian restaurant aggregator and food delivery (www.zomato.com)

[5]Ola Cabs is an Indian ridesharing company offering services (www.olacabs.com)

The convenience, reliability, and flexibility that these tech-based services provide to the customer through service platforms (service apps) are significant factors in why customers adopt and reuse these apps (Jeon et al., 2016). Hence, the differentiation lies in how easily a customer can access the platform and how convenient the overall experience is (Service at the doorstep like an Ola cab, or on a smartphone like Byju's content).

Zomato, for example, is a food tech company that acts as an aggregator, bringing together restaurants (supply side) and hungry customers (demand side) on its platforms simultaneously. Zomato grew primarily as a restaurant review website, becoming an online ordering and booking service (Bhitvawala et al., 2016). The ride-hailing app, Ola, was almost on the same lines as promoted by ANI Technologies. It started as a basic cab-hailing service in Bangalore and soon expanded its business to 250 cities in India (Aggarwal, 2019). Ola expanded its services with time and penetrated further into the lower-tier cities of the country. From a simple cab-hailing app till eight years back, Ola now also offers rental cars, autos and even bike sharing service, which is now functional in 150 cities (Kashyaap, 2019).

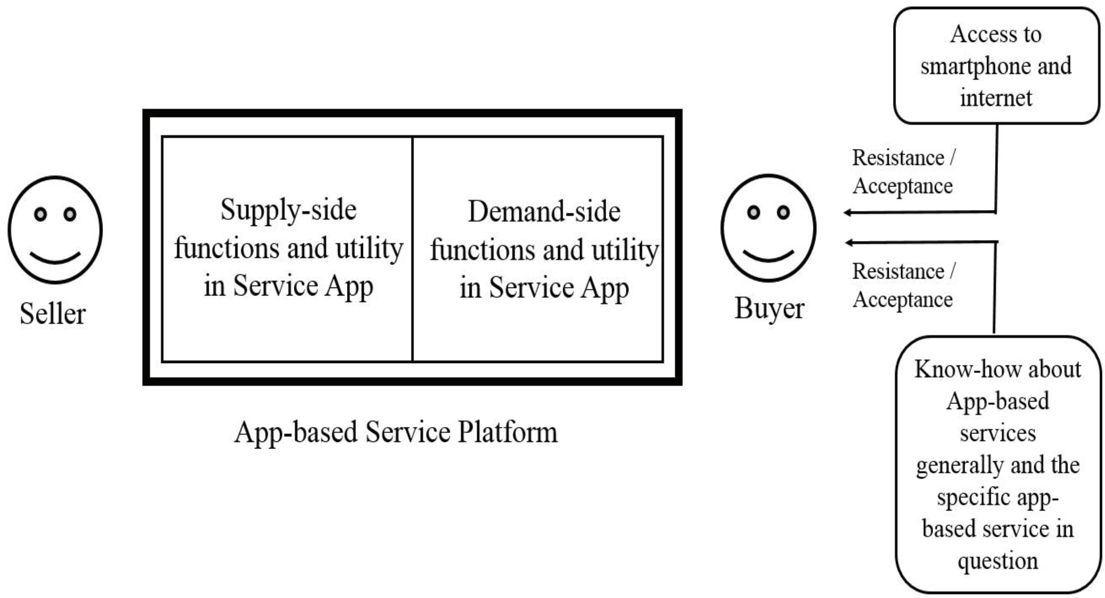
The expansion of app-based services in various categories has been symbiotic with the growth in the use of smartphones and internet penetration in India. This in turn was a factor of – (i.) availability of affordable but powerful smartphones, (ii.) infrastructure development in the telecom sector leading to faster and more reliable internet connections, (iii.) changing consumer behaviour leading to a constant look out by customers for ease of access and convenience offered by services, and (iv.) social influence by other users, especially where conformity is rewarded socially. It is important to note that consumer innovativeness plays an important role when it comes to adopting newer products and services. Changing consumer behaviour and social influences can be understood as part of innate consumer innovativeness, which leads to the adoption of new products and services (Roehrich, 2004).

Reasons for the Divergence of App-based Services from the Traditional Diffusion of Innovation Models

Unlike the products and services on which previous diffusion of innovation models have been applied, app-based tech-driven services are inherently different in terms of reasons for adoption and resistance to adoption by the new users. Also, these services are engaged with at a higher frequency (number of times a service is used) than products whose diffusion has been explained with the help of the traditional diffusion of innovation models (Bassanoa et al., 2019). Further, these services are also a function of uncontrollable factors, which other products may not be as dependent on. Hence, the adoption of these app-based services requires the preceding diffusion of smartphones and internet services in the target strata.

Lack of smartphones and reliable internet access would significantly hinder the chances of diffusion of app-based services, even though there may be a positive association and perceptions regarding the service itself. Technical know-how required by the customer to access and use a service app (generally as well as the specific app in question) plays a critical role, too (Figure 3). The diffusion of an app-based service will also be a factor of resistance shown by innovators and imitators (Bass F. M., 1969) in the adoption process.

Figure 3: Factors leading to divergence of App-based services from traditional diffusion models



(Source: Author's representation)

Also necessary in a country like India is the existence of a gap in the level of e-literacy and exposure, which affects the diffusion negatively. This is because a heterogeneous social system, due to an uneven and wide range of consumer innovativeness, would create an uneven medium for the innovation to spread (Takada & Jain, 1991; Thakur et al., 2019). This would not only lengthen the period for diffusion but also affect the rate of diffusion, especially on the adopters who are influenced by internal influence (interpersonal interaction and communication cascade) (Talukdar et al., 2002; Pitt et al., 2021).

Applicability of Diffusion of Innovation Theory on App-based Consumer Services in India

As iterated earlier, app-based services may offer ease, convenience and flexibility, but they don't necessarily provide a unique product. The end product for consumption and usage may be just as it used to be. For example, a packet of food or a cab can be used to commute from one place to another. Hence, the reason for the adoption of these services is not necessarily the primary need, which can still be satisfied with the traditional offerings. The reason for adoption here is the ease, convenience and flexibility. Thus, the diffusion of innovation theory, which is primarily based upon the diffusion of a new product or innovation, must be expanded to consider the diffusion of acceptance, rather than the diffusion of the product. It must consider the factors that add to the resistance or acceptance of individuals, which lead to the diffusion of the innovation or service.

The existing model proposed by Bass F. M. (1969) can be remodelled to accommodate the discussed factors and find applicability in India. Thus, an extended diffusion of innovation model is proposed in a reduced form equation, considering the parameters cited. These will be incorporated as a dampener, 'z', to the existing model, thus absorbing the impact of the factors discussed. The damping coefficient (z), therefore, used is a factor of two parameters – 'Enabler', represented by Enabling Coefficient (z_1) and 'Disabler', described by Disabling Coefficient (z_2).

Enablers help improve the probability of adoption, as Bass F. M. (1969) explained, while disablers reduce the likelihood of adoption. Hence, enablers and disablers impact the diffusion curve positively and negatively, respectively. Enablers aren't directly related to the app-based service in question or innovation, but they enable the diffusion through a conducive social system as defined by (Mahajan et al., 1990).

In context with the diffusion of innovation or app-based services, a set of enablers that influence the diffusion of an app-based service are – (i.) the availability and access to the smartphones (Since the access of app-based services is predominantly from smartphones (Chitra, 2016), a combination of smartphone ownership and internet access must be used), (ii.) access to internet connection, and (iii.) technical know-how.

Technical know-how, in turn, is based on the level of e-literacy and age of exposure to app-based services (not about the app-based service in question). Enablers are generic and can be applied to any app-based service in the same way for a fixed social system, since these values will remain the same for a given social system or target strata under question.

Disablers are specific to the app-based service for which the diffusion pattern will be evaluated. Disablers are based on – (i.) Performance lag as experienced by the user in the app-based service hence affecting ease of access negatively, (ii.) complexity in app functionality, further affecting the comfort as well as convenience of the user, and (iii.) complexity of the service itself, which affects the overall perception about the service negatively.

The existing equation given by Bass F. M. (1969) provides the probability that an initial purchase will be made at a point T, when no previous purchase has been made as yet.

$P(T) = p + (q/m)\, Y(T)$ ……………………. (2)

P(T) is the probability that an initial purchase will be made at a point T, when no previous purchase has been made yet.

p and q are the constants, with p being the probability of initial purchase (coefficient of innovation), and q being the diffusion rate (coefficient of imitation).

m is the total number of potential buyers in the system

Y(T) is the number of previous buyers

The above equation is remodelled to include a damping coefficient, z. To calculate z, we introduce the enabler coefficient, z_1 and the disabler coefficient z_2.

Enabler Coefficient, $z_{1,}$ is a value that would remain the same for a specific social system or target strata. This is because the factors affecting the value of z_1 stay the same for a fixed social system or target strata, irrespective of which app-based service's diffusion pattern is being tracked. This particular social system or target strata can be categorised based on geography or population segments. 'z_1'will be a pre-calculated index for a given social system or target strata where diffusion of innovation is to be tracked.

$z_1 = z_{1a} * z_{1b} * z_{1c}$ …………………… (3) $z_{1a,}\ z_{1b}$ and z_{1c} lie between 0 and 1

Where, z_{1a} – Penetration level of Smartphones

z_{1b} – Level of internet access

z_{1c} – Technical know-how of the social system target strata (This should be found out based on the adoption of similar products or services in past, and by collecting primary data from a chosen sample in the population strata)

Hence, 'z_1' as an enabler will impact the diffusion curve depending upon its value, which will lie between 0 and 1. The value of 'z_1' as an enabler allows flexibility and a wider range of applications, since it can be calculated for a range of strata depending upon business requirements.

Disabler Coefficient, $z_{2,}$ is a value specific to a particular app-based service, irrespective of which social system the diffusion curve is being tracked for.

$z_2 = z_{2a} * z_{2b} * z_{2c}$ ……………………..(4) $z_{2a,}\ z_{2b}$ and z_{2c} lie between 0 and 1

Where, z_{2a} – Performance lag experienced by the users

z_{2b} – Complexity in app functionality as experienced by the users

z_{2c} – Complexity of the service itself as perceived by the users

$z_{2a,}\ z_{2b}$ and z_{2c} reflect the consumer perception towards the service-app and the actual service associated with that service-app. Hence, the values for these parameters must strictly be collected by conducting primary research from a chosen set of samples in the population strata, and the results should be normalised to achieve values between 0 and 1.

A higher enabler coefficient will positively impact the probability that an initial purchase will be made at a point T when no previous purchase has been made. However, a higher disabler coefficient will have a negative impact. Hence, the damping coefficient, z, to incorporate into the existing equation given by Bass F. M. (1969) is provided by :

$z = z_1 / z_2$ …………………… (5)

Existing equation given by (Bass F. M., 1969) that provides the probability that an initial purchase will be made a point T, when no previous purchase have been made as yet, hence can be remodelled into a reduced form equation to incorporate the effect of enablers and disablers, specific to any app-based service.

Since enablers as well as disablers will impact both the new innovators (probability of new adopters expressed as 'p') and imitators, the R.H.S of the equation should be dampened to lead to a reduced form equation that can predict the diffusion curve for app-based service:

$P(T) = z^*\{p + (q/m)\ Y(T)\}$ …………………… (6)

where, $z = z_1/z_{2,}$ and value of z_1 and z_2 lie between 0 and 1

P(T) is the probability that an initial purchase will be made at a point T, when no previous purchase has been made yet.

p and q are the constants, with p being the probability of initial purchase (coefficient of innovation), and q being the diffusion rate (coefficient of imitation).

m is the total number of potential buyers in the system; Y(T) is the number of previous buyers

; z is the damping coefficient, which is dependent upon the enabler coefficient, z_1 and the disabler coefficient, z_2

It must be noted that when the enabler and disabler coefficients are incorporated in the existing equation to find the diffusion curve, a particular app-based service will always have the same disabler coefficient irrespective of which social system or target strata one needs to track its diffusion curve for. This is because the disabler coefficient is service-specific. Hence, the change in the diffusion curve for the same service in different social systems or target strata will only be a function of the enabler coefficient, as it changes with changing social systems and target strata.

Similarly, the diffusion curve for the same social system or target strata will always have the same enabler coefficient for different app-based services. The change in the diffusion curve will only be a function of the disability coefficient, which will change with every app-based service.

Conclusion

Theories and models around the diffusion of innovation have been making the rounds for over half a century. Starting with the seminal work from (Rogers, 1983; Bass F. M., 1969), these models have been studied, built upon as a foundation and applied in managerial decision-making till now. However, it must be noted that the business environment and businesses have changed since these models were postulated. There is a dearth of resources when it comes to applying these models in new age app-based services, which are tech-driven.

The paper reviewed the applicability and gaps in the diffusion models proposed by Rogers (1983) and Bass (1969) concerning app-based services, especially in the Indian context. The paper attempts to unearth factors that influence the diffusion curve for app-based services and then tries to incorporate these influencers in an extended model with the help of a reduced form equation.

Enablers and disablers have been defined as a set of influencers which affect the diffusion of app-based services positively and negatively, respectively. Enablers suggested in the extended model are access to smartphones and the internet, as well as technical know-how about app-based services. Disablers have been identified as performance lag in the functioning of the app, complexity in the functionality of the app, and complexity in the service itself. While enablers are defined to generically influence the whole target strata or social system, disablers are suggested to impact only the specific app-based aspects. The paper proposes a remodelled version of the probability equation in a reduced form equation, incorporating a dampener dependent upon the enabler and disabler coefficients.

Diffusion models can prove helpful in predicting the curve, time period and peak of a curve, which in turn may improve the quality of decision making at firms. However, it is imperative for managers to closely identify influencers and make amends in the models as deemed fit. The paper highlights the differential role of enablers and disablers in various scenarios between changing social systems and different app-based services to show how only one varies in each case, while the other remains constant.

Limitations

This paper is not without its limitations. The remodelled equation for diffusion is not tested on data and is proposed as a reduced-form equation, only to highlight the effect of the dampener on the diffusion curve, and is ready to be tested for select hypotheses. Hence, the factors undertaken in the proposed extended model must be thoroughly analysed before commercial application.

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