critical mass

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Critical mass is defined as a point at which the rate of change of demand or the gradient of the demand curve changes upward in magnitude and direction, leading to an exponential increase in the adoption of a product by consumers.

The phenomenon of critical mass is evident in network products. Examples of network products are mobile phones, e-mail software, messaging services, social networks, and collaborative gaming platforms. Gmail, Facebook, LinkedIn, Skype, and Twitter are network products, which are well past their critical mass point and widely diffused in international markets. Other more complex network products are the consumer-to-consumer business platforms of eBay and Amazon.

Network products experience a slow rate of adoption by consumers up to the critical mass point on the demand curve. Before the critical mass point is reached, the product is hardly known by consumers or considered feasible, and adoption rates are gradual. Beyond the critical mass point, the demand for the product accelerates rapidly and continues to grow until it reaches a natural limit such as market saturation.

For example, the UK mobile phone networks took 13 years, from 1985 to 1998, to reach 10 million subscribers. This was the critical mass of subscribers needed to encourage another 48 million users to join the mobile networks in the next 5 years. The demand curve settled at a stable plateau at 92% penetration of the country's population.

The usability of a network product increases as the number of other users who consume the same product increases. For example, the more people there are on a Skype network, the more users can be reached on the network, thereby increasing its usability. The increase in the usability or the utility of the product, entices even more users to register on the network.

How fast critical mass is attained depends on consumers' expectations regarding the performance of a new technology product and the final size of the network of users. The time required to achieve critical mass can be reduced by managing consumers' expectations. The higher the expectations that a new product will be successful, the faster the market will reach its critical mass point. Researchers have observed the effect through analyzing the diffusion of competing technology platforms (such as the classic case of VHS vs Betamax, and the more recent competing platforms of Linux vs Windows and Android vs iOS).

Through research on network industries, we observe that critical mass is attained when 10–20% of the population has adopted a new network product. At this level of adoption, the innovation will rapidly diffuse to the rest of the social system (*see* NETWORK EXTERNALITIES for an explanation of why this occurs). Critical mass

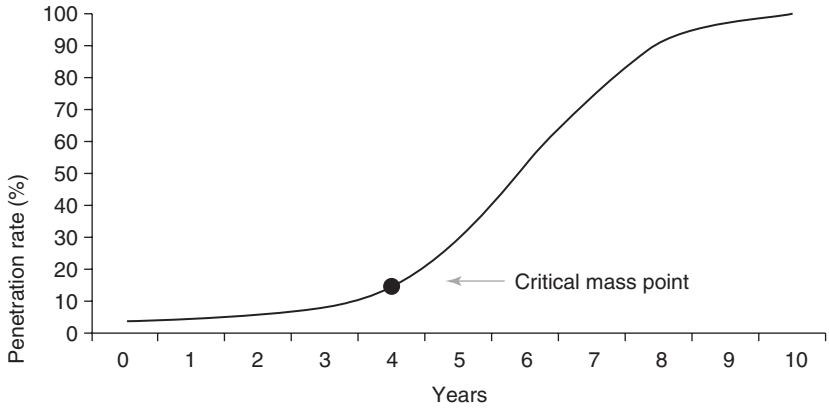

Figure 1 Critical mass on a demand curve.

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is visible as inflection points on the demand curve, as shown in Figure 1, when the rate of change or the gradient of the curve changes upward in magnitude and direction.

The concept of critical mass is derived from physics, where it is used to describe nuclear fission. An atomic pile goes "critical" when there is a sufficient mass of interacting matter to keep a reaction from fizzling out. The physical process is used as an analogy for avalanches and earthquakes that are activated when they reach the critical threshold, beyond which the system rapidly moves to a new equilibrium.

Social phenomena such as fashion, queuing behavior, political movements, and the diffusion of language can be explained in terms of critical mass and collective behavior. The adoption of new social norms is similar to the dynamics of adoption of network products. The underlying mechanism is the instinctive desire to belong, or to conform, to a growing social group as a means of survival.

See also *complexity theory*; *R&D strategy*; *network externalities*; *network industry strategies*; *technology and standards in network industries*

Bibliography

Bonaccorsi, A., Giannangeli, S. and Rossi, C. (2006) Entry strategies under competing standards: hybrid business models in the open source software industry. *Management Science*, **52** (7), 1085–1098.

Sammut-Bonnici, T. (2010) Information economy strategies in the mobile telecommunications industry, in *Understanding Global Strategy* (ed. S. Segal-Horn), Thomson Learning, Milton Keynes.

Sammut-Bonnici, T. and McGee, J. (2005) Strategy in the new digital economy, in *Strategy: Analysis and Practice* (eds J. McGee, H. Thomas and D. Wilson), McGraw-Hill, Maidenhead.

Sammut-Bonnici, T. and McGee, J. (2002) Network strategies for the new economy. *European Business Journal*, **14**, 174–185.

Shy, O. (2001) *The Economics of Network Industries*, Cambridge University Press, Cambridge.

Valente, T.W. (2005) Network models and methods for studying the diffusion of innovations, in *Models and Methods in Social Network Analysis* (eds P.J. Carrington, J. Scott and S. Wasserman), Cambridge University Press, Cambridge, pp. 98–114.

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