The take up of e-services — A behavioural model

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Abstract This paper is based on work to understand the needs of and factors inhibiting potential users during the design of a new government-to-business portal.¹ It was used to investigate the possible take up of a new service by small businesses and the likely impact of different marketing approaches. Through further discussions with practitioners responsible for designing and implementing new digital services and portals, and reviews of published material, the information and ideas from this study were extended to provide a model for use in the design and evaluation of new e-services and their adoption by a consumer or smaller business population. In particular, it provides a mechanism for understanding the behaviour of different groups considering, or using, an e-service and seeks to explain how a negative attitude towards new media, or to dealing electronically, can significantly modify the take up.

INTRODUCTION

The paper looks at the situation where an enterprise or public body introduces a new e-service for consumers, smaller businesses or citizens. It investigates the factors that influence the behaviour of individuals as they start to consider using the service by looking at two mechanisms likely to impact their behaviour: the 'user interest' (UI) in the service and the 'perceived risk' of using the capabilities. The components of these drivers differ by market, but still provide a general framework for researching, building and measuring their likely impact on e-services.

The paper introduces a mathematical approach that facilitates the treatment of both continuous and discontinuous

behaviour observed in a market. This gives insights into the behaviours of different groups of users and non-users of a service and is a potential quantitative methodology that could be employed in future design and launch activities.

USER INTEREST AND POTENTIAL USE

There are various influences that can positively affect a population considering, or actually making use of, a new e-service. These can be considered as part of a 'user interest' factor.

User interest is based on multiple elements. A starting point is an awareness of the service — built through, for example, advertising and promotion.

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Studies of permission marketing,² suggest that this is not always enough to trigger a willingness to consider the service. There must be, for example, perceived relevance to the individual in the content and services provided, ('the situations that affect me') and a depth of information ('information I need'). For example, a health portal must offer information that explains the conditions likely to affect the user and provide a depth of information to allow that person to take appropriate action. See, for example, Living Health, a pilot digital television service from Telewest and the NHS, which is available to 50,000 homes in Birmingham, UK.³ Intermediaries may also have an impact: for example, an individual or business uses an accountant to prepare financial returns or an architect to prepare planning applications, the use of such intermediaries may reduce the relevance of the site for the user ('I leave it to my accountant').⁴

A positive experience, either of using the service or similar services, will reinforce user interest. In studies of behaviour when purchasing services,⁵ it was noted that experiences that rated as distinctive and consistent affect positively the likelihood to continue to use the service. Another study⁶ identified that, as part of the usage experience, users were looking for access ('24-hour, quicker and easier'), efficient capabilities ('browsers, links to other sites') and support.

A third type of experience, consensus, was also noted.⁷ Here, other individuals, intermediaries or influence groups have similar experiences. The emergence of bandwagons and user groups was noted as a significant factor in a study of the adoption of standards in the computer industry.⁸ Customer lifecycle studies suggest that early adopters of services often emerge as opinion formers.^{9,10}

A final incentive may be necessary to

convert intention into actual use. These incentives may be direct, as in the case of rewards for trying or using the service, but can also include (for example) 'trigger events' — such as taking on a first employee¹¹ or the offer of an on-line consultation with a nurse¹² to meet an immediate health problem.

These factors may positively affect an individual's decision to consider using the service and continue its use instead of reverting to previous practice. The composition of these drivers and their contribution to creating user interest differs from market to market but, in general, it can be expressed as:

$$\begin{aligned} \text{UI} = & (\text{awareness}) \\ & + (\text{perceived relevance}) \\ & + (\text{perceived experience}) \\ & + (\text{group opinion}) \\ & + (\text{usage incentive}) \end{aligned} \quad (1)$$

Table 1 summarises some of the main factors influencing UI for a business market.^{13–16}

PERCEIVED RISK IS A MODERATING FACTOR

It might be expected that a significant increase in user interest would similarly increase a population's propensity to using a service. When consumers perceive risk in purchasing a product or using a service, however, marked changes occur in their behaviour.¹⁷ The 'perceived risk' in changing from a current practice can be described in a number of ways, including functional, physical, financial and psychological risk.¹⁸

Work on permission marketing suggests a possible set of personal risk elements for a new service.¹⁹ The first is a perception of functional risk that may include perceived high investment in new technology, the cost of adopting

Table 1: Factors in a business application affecting user interest

UI = Awareness + Perceived relevance + Perceived experience + Group opinion + Usage incentive				
Awareness	Perceived relevance	Perceived experience	Group opinion	Usage incentive
Maybe unprompted or prompted	Content coverage Most business situations Start up/expansion Content relevance Information I need Accurate, up-to-date Easy to understand Uses business language Provides simple explanations Representation Accountants Other professionals	Experience Rated as distinctive Rated as consistent Access 24-hour Quicker/easier to use Capabilities Points to other info Efficient search Online calculators Support Help desk	Consensus Highly rated Recommended Peer groups Advisors User groups	Price Rebates Payment holidays Trigger events First employee Moving site Tax return Other incentives Pressure of time Compulsory

new practices and, in the business environment, the impact on employees of using a new system.

The results of a project with small- to medium-sized enterprises (SMEs) confirmed, not perhaps surprisingly, that those companies that didn't currently have computers or didn't use the internet for business were nearly three times less likely to consider a proposed e-service than business internet users.²⁰ Among the sample were a number of companies who also believed that current systems or manual practices were more efficient and thus perceived a risk moving to an electronic solution.

The second personal risk element is that of changing to a new practice or reverting to an old practice. This includes the perception of the extra personal cost and effort in learning the new system; providing and updating information; and the time involved in using the service. Often these perceived risks are associated with registration and updating personal details.²¹ There are also concerns over the possible complexity of the website²² or fears of making mistakes and being unable to correct them.²³

The third element is the risk associated with security of information and systems, leading to perception of a loss of control over factors such as cash flow or a fear of contracting viruses.²⁴

The final element is privacy, which is concerned with perceptions of personal intrusion, a mistrust of the way that personal information is used and a general aversion to dealing electronically. Recent market research, for example, suggests that only 25 per cent of those living in the UK consider it safe to use the internet to provide the Government with personal information; 60 per cent consider it unsafe.

A modifying factor is thus introduced — the perceived risk (PR) of changing from one practice to another, which is based on perceived or actual experience. This can be expressed as:

$$\begin{aligned}
 \text{PR} = & (\text{functional risk}) \\
 & + (\text{personal risk}) \\
 & + (\text{security risk}) \\
 & + (\text{privacy concerns})
 \end{aligned} \tag{2}$$

Table 2 summarises the possible factors affecting the perceived risk of using a new service for a business application.

Table 2: Possible elements of perceived risk business

PR = Functional risk + Personal risk + Commercial risk + Private risk			
Functional risk	Personal risk	Commercial risk	Private risk
Cost of technology Don't have computer Don't have internet Uncertain over costs Impact on employees	Concerns over use Fear of making mistakes Hidden pitfalls Confidence in information	Information security Worried about internal security Confidentiality	Confidentiality Privacy
Current practice Believe quicker manually Believe current system works well Problems with acceptance of new system	Complexity Over complicated Complex registration	System security Viruses and worms	
	Personal cost/time to use Time to use Cost/time providing and updating information	Loss of control Cashflow	
	Personal investment in learning No time to learn new systems Won't understand		

CONSIDERING USER INTEREST AND PERCEIVED RISK TOGETHER CAN PROVIDE INSIGHTS INTO TAKE UP OF A NEW SERVICE

Situations with low perceived risk

In situations with low perceived risk, studies of the take up of services suggest that an increase in user interest will result in an increase in the likelihood of potential users considering the service, as the effect of any small perceived risk is overcome.^{25,26} Similarly, a decrease in user interest will result in a decrease in the likelihood of the service being used (see Figure 1). This suggests a strategy for early adopters of a service who are likely to be entrepreneurial, e-enabled, used to dealing electronically and who have a lower level of perceived risk of changing from current practices. Marketing programmes designed to raise user interest should emphasise the positive benefits and relevance to the individual.

As user interest rises, the likelihood of a potential user considering the service will increase to a point where an incentive — such as a rebate or a time

pressure to submit a financial return — will trigger first use of the site. Having become a user of the new service, however, these adopters may revert to old methods or change again to a newer alternative if the benefits and relevance of the service are not maintained or kept 'top of mind'.

Situations with perceived high risk

The situation is different when there is a higher perception of risk in using a service; for example, a high level of technical scepticism,²⁷ a perceived high personal cost of supplying information,²⁸ or major concerns over privacy.²⁹

Observations on the acceptance of two conflicting standards in the computer industry,^{30,31} and work on consumer acceptance,³² suggest that high perceived risk may lead to a situation where an increase in user interest will not necessarily result in a significant increase in the likelihood that an individual will consider the service until a threshold point is reached. However, a small increase in user interest beyond this

Figure 1: Effect of increasing user interest: Low perceived risk

threshold triggers a sudden and significant increase in the likelihood of potential users considering using the service. This is illustrated in Figure 2.

This behaviour was observed in a study of the take up of rival computing standards where, despite clear benefits, there was a delay in accepting the new standard due to a perceived risk in moving a company's operations to the newer technology.³³

Quantitative studies^{34,35} suggest that as the level of perceived risk increases, the higher the threshold in user interest that needs to be crossed to cause a major increase in the likelihood of potential users considering the service. This can be illustrated by plotting user interest against perceived risk. The threshold points at which significant changes in likelihood occur trace out a curve, as shown in Figure 3.

This map suggests alternative strategies for inducing significant changes of behaviour in individuals with a high perceived risk. Usually, marketing will be used to increase the user interest and

hence induce a change in behaviour as the threshold is passed (represented as path 1 in Figure 3). Alternatively, marketing could be used to first reduce the perceived risk; it would then require a smaller increase in user interest and, potentially, marketing costs to trigger possible use (path 2).

To this point, only the movement of individuals from current practices to use of a new service has been considered. The model also addresses the reversion of users to previous practices, however. If there is a low perceived risk, then a decrease in user interest will result in a smooth decrease in the likelihood that the individual will continue with the service, reverting instead to old practices.

When the individual has overcome a perceived high risk in considering or using a new service, however, then research suggests that there is a delay in reverting to old practices, even when the level of that person's interest decreases based, perhaps, on poor experience or a negative recommendation from advisors or peer groups.^{36,37} In moving to first use

Figure 2: Effect of increasing user interest: High perceived risk

Figure 3: Threshold map for different levels of perceived risk

of the service, the individual has made certain investments (such as becoming e-enabled, training, personal time in providing information, overcoming reluctance to provide information, etc). After first use, the perceived risk of change may remain high, but this time may act against reverting to old practices. Even if user interest decreases —

through, for example, unfulfilled expectations — there may be a reluctance to revert ('give it a chance'), until a threshold is reached after which the individual abandons the new service. The user interest threshold at which the individual reverts to old practices is not necessarily the same as the threshold point at which they first considered using

Figure 4: Threshold map: effect of increasing user interest in high perceived risk

the service.^{38,39} This behaviour can be mapped onto an S-shaped (hysteresis) curve, illustrated in Figure 4, showing the delay in changing behaviour as user interest increases or decreases for individuals or businesses with a high perceived risk.

The degree of hysteresis represented in the S-shaped curve will change with varying degrees of perceived risk, as illustrated in Figure 5. This provides a model for the effect on behaviour of increasing or decreasing user interest at different levels of perceived risk.

Proposition summary

The following summarises the propositions connecting user interest, perceived risk and a person's consideration of a service:

- 1 A positive (negative) change in user interest positively (negatively) affects a person's propensity to consider a service, while perceived risk will modify this behaviour.

- 2 For individuals with low perceived risk, a smooth increase/decrease in user interest results in a smooth increase/decrease in their consideration of the service.
- 3 For individuals with a high perceived risk:
 - a) there will be a threshold that the user interest will need to exceed to trigger consideration to use;
 - b) after use, there will be a different threshold below which user interest will need to drop to trigger a reversion to old practices;
 - c) the gap between thresholds will widen with an increasing level of perceived risk.

MODELS OF DISCONTINUOUS BEHAVIOUR

Many models of behaviour assume that smooth changes in control variables will result in smooth changes in behaviour. Catastrophe theory was developed by Rene Thom to understand abrupt changes in a system in response to a

Figure 5: Threshold map: effect of increasing user interest at different levels of perceived risk

smooth change in external conditions.⁴⁰ Thom was able to show that for a large class of situations involving up to four control variables, there were only seven archetypal forms. In the 1970s, Zeeman applied this theory to a number of diverse situations, such as heart rates, embryology, experimental psychology and economics.⁴¹ Until quite recently, however, statistical methods for measuring this discontinuous behaviour were not widely available. In the 1990s, methodologies such as GEMCAT II⁴² were developed and applied in a number of studies including marketing and service introductions.^{43,44}

One of the simplest models of discontinuous behaviour is the cusp catastrophe model. This describes changes in behaviour driven by two independent

control variables and can handle a number of behaviours, including sudden transitions (from using a service to reverting to old practices) and hysteresis (lags in changes in moving between using the service and old practices).

This paper poses a three-dimensional model using user interest and perceived risk as the control variables on the horizontal axis. These affect the behaviour variable, 'likelihood to consider use' which is the vertical axis. This is equivalent to putting the behaviour profiles shown in Figure 5 one behind the other, with the lowest risk profile at the rear. The curves map out a smooth folded surface as illustrated in Figure 6. A more detailed account and the underlying mathematics have been given in other published studies.^{45,46}

Figure 6: Cusp model

The cusp model can be used to examine different strategies. For example, moving an individual with low perceived risk from A to B by increasing the user interest will cause a smooth increase in the individual's likelihood to consider the service, as shown by the path on the behaviour surface. Conversely, moving an individual with high perceived risk by increasing user interest (C to D) will not cause a large increase in consideration, as shown by the path on the lower fold of the surface, until the threshold is passed (D to E) — when there is a sudden increase in the likelihood of considering the service, represented by a sudden jump to the upper fold of the surface. An alternative strategy may be to lower the perceived risk before increasing the user interest. This may result in a lower threshold for changing behaviour that can then be crossed by a smaller increase in user interest (C to F to G).

This may also provide a model of the switching behaviour observed in privatised utilities — such as telecoms, gas and electricity — where there was an initial high perceived risk of changing from the monopoly supplier. However, once the first switch occurred, this reduced the perceived risk of switching and it became easier to induce switching back to the original supplier or on to another new entrant.⁴⁷

DEVELOPING ADOPTION STRATEGIES

There is a link with the well established model of consumer adoption used in marketing that identifies groups of customers as 'innovators', 'early adopters', 'followers', 'traditionalists' and 'ultra-traditionalists'.^{48,49} The author's assumption is that the perceived risk of each of these adopter groups is different

Figure 7: Adopters, followers and traditionalists

and increases from innovator through to ultra-traditionalist. It is expected that the levels of user interest needed to trigger usage will also become increasingly large for these populations and, hence, the time for adopting the new service will increase for each group. If the prospect population shows a normal distribution of perceived risk then this will generate the classical adoption profile shown in Figure 7.

Innovators and early adopters

Innovators and early adopters account for about 16 per cent of a population and are usually targeted early in marketing campaigns.^{50,51} Typically, these groups enjoy playing with new tools or seek advantage through innovation. In business markets, they are likely to be, newer, entrepreneurial companies which are e-enabled. They are likely to have a low perceived risk of changing practices, have invested in technology and have less concern about privacy. Members of this group also act as opinion formers, good or bad, to the population of followers.⁵² Marketing will seek to raise their user interest through building awareness and stressing the relevance of

the website, to a point where the individual is persuaded to make first use of the service. If this is a successful visit, it will further increase their user interest and make them more likely to consider further use of the site. If, however, a long period elapses before the next visit, user interest may fall and, since there is a low perceived risk (now of reverting to old practices), then the individual could consider old or new methods as equally acceptable. This should suggest approaches that could include: 1) promoting relevant applications to raise awareness and convert to usage; 2) after usage, cross-selling other relevant applications to keep user interest high; 3) promoting the risk of reverting to old methods; and 4) using successful visitors both as references and as the core of user groups to raise user interest and decrease the perceived risk of follower groups.

Followers

Followers normally account for 35 per cent of a population⁵³ and take some time to make a choice based on external evidence such as case studies of, and opinions from, early adopters, intermediaries and other influence

Figure 8: Alternative behaviours

groups. They are generally looking for solutions with a low risk of introduction, which suggests a medium perceived risk level depending on their perception of technology use, the extra effort involved to use the site and, potentially, concerns over privacy. The strategy may be to lower the perceived risk by using opinion formers from the adopters and stressing ease of use. This will be accompanied by increasing awareness and relevance to raise user interest. A trigger event may then cause a flip onto the top surface (of Figure 6) representing a high likelihood of considering, or using, the site.

If the users' first experience is good, then their user interest is increased and the perceived risk of reverting to old practices is also increased, resulting in a high likelihood of further usage. As with adopters, reinforcement will be beneficial if a long period elapses before their next possible occasion to use. If the users' experience is poor, however, then their

user interest reduces and the perceived risk of reverting to old practices is reduced, causing a flip to the bottom surface and a high likelihood of using the old practice on the next occasion. It is possible that the perceived risk, now of re-using the new service, will increase, forcing the business further forwards on the bottom surface making it more difficult to cause re-use of the new e-service (see Figure 8).

It is interesting to note that, in this model, two individuals may have similar final values for user interest and perceived risk but end up with widely different behaviours, depending on their experience of using the service.

Traditionalists

The final category of potential users is the traditionalists who are motivated by security, look for no fuss, are sceptical about new applications and are less inclined to use the internet.^{54,55}

This suggests a high level of perceived risk based on the need for investment in technology, high extra cost of proving and maintaining personal information and concerns over using the internet for dealing. Even a heavy marketing expenditure may not raise user interest sufficiently to cause a major switch to considering or using the new website. In fact, marketing expenditure can be wasted if it includes heavy initial targeting of this group. It may be more effective to concentrate on reducing, over time, their perceived risk through campaigns to induce use of the internet and to reduce the level of concern over privacy issues and the impact on individuals of using the system. Campaigns can then concentrate on raising user interest.

DEVELOPING QUANTITATIVE MEASURES

This approach provides a qualitative framework useful in the design of new e-services based on an analysis of user needs and attitudes. The next step would be to develop pre- and post-launch measures that can be used in market research or collected through the website. These will be based around Equations 1 and 2, mentioned earlier.

E-surveys collected on a website could include measures that monitor changes in user interest such as awareness, relevance and accuracy of material, rating of the user experience for distinctiveness and consistency, importance of advisors and peer groups, key trigger events for the user and attitudes to incentives. Similarly, e-surveys could also monitor factors driving personal risk, such as attitudes to new technologies, impact of the service on employees, ease of use of the service, perceived risks such as fear of making mistakes or contracting viruses and privacy ratings.

GEMCAT II⁵⁶ was used in several quantitative studies^{57,58} to fit the cusp model to data on service choice and buying behaviour. This methodology could provide a future quantitative basis of measurement for evaluation and service refinement.

SUMMARY

This paper provides a qualitative model that can be used in the design phase of new e-services. Analysis of each target audience's needs and inhibitors can be developed into an understanding of the likely adoption of new e-services based on the interaction of user interest and perceived risk. This can provide an input into the research to be conducted during design.⁵⁹ The framework provides a means of identifying and understanding potential delays in the take up of services and the impact of different marketing approaches on groups of users and potential users. The model can further be used to design and build measures to evaluate the take up and acceptability of a new e-service during launch and in-life management.

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