

It's all about the benefits: why extension professionals adopt Web 2.0 technologies

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Abstract. The adoption and use of three Web 2.0 technologies (web conferencing, eSurveys, and YouTube videos) were studied using the following four adoption models: the Diffusion of Innovations (DoI), the Unified Theory of Acceptance and Use of Technology (UTAUT), the Adoption and Diffusion Outcome Prediction Tool (ADOPT), and Switch: How to change things when change is hard. A web-based survey was used to identify the factors that encouraged the adoption and use of the new technologies. The study was conducted within an organisational context of a state government agriculture department. Unlike previous studies which focused on individuals in an organisational setting with factors such as perceived use, this study considered the actual usage of the technologies by government staff. A new model for the adoption and use of Web 2.0 technologies, the User benefits model, was developed for an organisational setting. It comprises four factors related to user benefits: contagious benefits, supporting benefits, working smarter benefits and noticeable, trialable benefits.

Keywords: Web 2.0, adoption, diffusion, web conferencing, eSurveys, YouTube.

Introduction

Queensland's primary producers are spread across more than 1.7 million km^2, which is seven times larger than the UK (Encyclopaedia Britannica Online 2014). The vast distance between properties provides significant challenges for providing services to these farmers. Similarly, effective industry engagement is limited by this tyranny of distance.

This is where the effective use of new communication technologies could benefit primary producers, but only if it is possible to overcome the barriers that are preventing greater adoption of these technologies by staff at the Department of Agriculture and Fisheries (DAF). Consequently, this paper seeks to elucidate the factors that influence the adoption and use of new communication technologies, and the implications for organisations in supporting this change. This will be addressed within the context of the Australian agricultural system.

Background

The concept of what has become the World Wide Web was published by Sir Tim Berners-Lee in 1989 and is now used by 'hundreds of millions around the world' (Pew Research Center 2014, p. 4) and has become 'the most significant technology of the 21st century' (Murugesan 2010, p. 1). Within America, the number of adults using the internet has steadily grown, and it was estimated that 87% of all American adults were using the Internet in 2014, and 99% of American adults living in households earning $75,000 or more were using it (Pew Research Center 2014, p. 5).

While the traditional Internet allowed the static connection of multiple web pages, Web 2.0 allows online collaboration and interaction (Anderson 2007). The term Web 2.0 was coined by Dale Dougherty in 2004 (Madden & Fox 2006) and thanks to the popularisation by O'Reilly Media and MediaLive International, within 18 months the term received more than 9.5 million citations in Google (O'Reilly 2007). These Web 2.0 technologies are enabling people to connect, communicate and create knowledge faster than ever before (Jimoyiannis et al. 2013; Tapscott & Williams 2006).

The DAF eExtension project commenced in 2008 as a department-wide project to introduce Web 2.0 over four years. At that time DAF staff were only just becoming aware of online collaboration technologies (James 2015). The term eExtension was first coined by James in 2007 (Power 2008) and is defined as 'the use of electronic technologies, especially information and communication technologies (ICT) to enhance face-to-face and paper-based interactions that enable change' (James 2010, p. 156). If extension is all about change, then eExtension is all about better involving people to enable the change.

One of the foundational theories used in extension is the Diffusion of Innovations theory (Rogers 1962) from the Rural Sociology discipline. This was based on the earlier research by Ryan and Gross (1943) which studied the rapid adoption of hybrid corn by farmers in Iowa in the early twentieth century. Subsequently a number of Technology Acceptance Models (Fishbein & Ajzen 1975; Ajzen 1985; Davis 1986; Venkatesh & Davis 2000; Venkatesh & Bala 2008; Venkatesh et al. 2003) were developed in the Information Systems discipline. In recent times, the ADOPT model (Kuehne et al. 2011) was formulated in the Agricultural Extension/ Economics discipline, and finally the Switch model (Heath & Heath 2010) arose from the Organisational Behaviour discipline. The key adoption models and a summary of criticisms are presented in Table 1.

Table 1. Summary of key adoption models

Model	Author/s, year	Background	Criticisms
Diffusion of Innovations (DoI)	Rogers, 1962	Developed from a study of the rapid adoption of hybrid corn in Iowa. Has been used in over 5000 studies worldwide.	Accused of a pro-innovation bias, individual-blame bias, recall problems, issues of equality, the linear approach, that innovativeness is a personal characteristic, and that the adoption curve is not continuous but has gaps (chasms) between the segments.
Theory of Reasoned Action (TRA)	Fishbein & Ajzen, 1975	First model to consider attitudes, distinguishing between beliefs, attitudes, intentions and behaviours.	Irrational decisions, habitual actions and other unintentional behaviours are not explained by the model. Doesn't account for the degree to which the decision maker cares about the outcome. Limited by the subject's self-reporting. Assumes people are rational and make systematic use of information available to them.
Theory of Planned Behaviour (TPB)	Ajzen, 1985	Built upon TRA adding perceived behavioural control as a construct.	Limited success in organisational settings. Assumes people are rational and make systematic use of information available to them. Does not take into account the degree to which the decision maker cares about the outcome.
Technology Acceptance Model (TAM)	Davis, 1986	Derived from TRA. Most widely used model in Information Systems research. Introduced Perceived usefulness and Perceived ease of use.	Unable to produce clear determinants which are sometimes inconsistent. Ignores changes in user perceptions and intentions overtime.
TAM2	Venkatesh & Davis, 2000	Added Social influence processes and Cognitive instrumental processes.	Results can be inconsistent and unclear.
TAM3	Venkatesh & Bala, 2008	Added Anchor and Adjustment as determinants of Perceived ease of use.	Doesn't consider group, cultural, or social aspects of decision making and usage.
Unified Theory of Acceptance and Use of Technology (UTAUT)	Venkatesh, Morris, Davis & Davis, 2003	Designed as a parsimonious model, integrating 8 previous models.	Its complexity is criticised due to its 41 independent variables for predicting intentions and at least eight independent variables for predicting behaviour.
Switch model	Heath & Heath, 2010	A relatively new concept but based on work by Plato and Freud. Coming from an organisational science discipline, this metaphorical model considers the psychological aspects to change.	Could be criticised for being more 'interesting' than theoretical, which could lead to non-replicable findings.
Adoption and Diffusion Outcome Prediction Tool (ADOPT)	Kuehne, Llewellyn, Pannell, Wilkinson, Dolling & Ewing, 2011	A relatively new model that integrates many earlier adoption and diffusion models. Estimates the likely extent and rate of adoption of a new agricultural practice/ technology.	While no specific criticisms have been found in the published literature to date, the criticisms of DoI would apply as this model is based on many of its principles.

Methodology

A survey was conducted in 2012 to determine the factors that affect the adoption of new technologies within DAF (James 2015). Three technologies were investigated: eSurveys, webinars and YouTube style videos. The majority of the survey questions were derived from four adoption models from various disciplines, namely the Diffusion of Innovations (DoI) by Rogers (1962, 1983, 1995 and 2003), the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003), Switch: How to Change Things when Change is Hard by Chip and Dan Heath (2010), and ADOPT (Adoption and Diffusion Outcome Prediction Tool) model by Kuehne et al. (2011). The aim was to compare the four models and to contrast the level of adoption between them for the three technologies.

The questionnaire consisted of 15 questions, as outlined in Table 2. Some minor modifications of the wording of the questions from the various models were undertaken, so as to increase the relevance and comprehension of the questions to the target audience of DAF extension officers.

Table 2. Key survey questions used in this study*

1. Select one of the technologies below that you have decided to use. You'll be focusing on that technology for the rest of this survey. If you have adopted more than one, just choose the one you feel most strongly about.
- eSurveys
- webinars
- YouTube style videos

2. To what degree have you used this technology (1=very rarely to 7=very often)?
Further comments (if required)...

3. What did you use to achieve similar outcomes before you adopted the technology you selected above?

4. What were the factors that encouraged (or helped) you to adopt this technology?

5. What were the factors that discouraged (or hindered) you from adopting this technology?

What motivates you to adopt an innovation?
6. Thinking of when you decided to use [Q1]... please rate the following (where 1 is very low and 7 is very high).
   To what degree is it better using this innovation compared to how it was done previously?
   To what degree is the innovation compatible with the previous approach?
   To what degree is this innovation simple to use?
   To what degree can the innovation be experimented with while it is being adopted?
   To what degree is the use of the innovation visible or noticeable to others?
   Further comments (if required)...

[Q7 to 9 repeated a similar style of questioning derived from the other three adoption models]

10. Your name (preferred name and surname).

11. Your email address.

12. Which category below includes your age? younger than 20; 20 to 29; 30 to 39; 40 to 49; 50 to 59; 60 or older

13. What is your gender? Male; Female

14. Would you like a copy of the final report and a description of the four models? Yes please; No thanks

15. Any final comments...

* For the full list of questions, refer to James (2015).

A pre-test of the survey was conducted with a small number of participants and the survey questions modified based on their feedback to improve comprehension and relevance. SurveyMonkey was used to conduct the web-based survey and 260 people who had voluntarily adopted one or more of the technologies were invited to respond to the survey. While 94 respondents completed the survey (36% response rate), not all respondents answered all questions with 9 respondents failing to fill in the ratings in questions 6, 7, 8 and 9 (for the four adoptions models), leaving 85 responses for data analysis (effectively a 33% response rate). Of those 85, 30 were SurveyMonkey users, 27 were YouTube workshop attendees and 28 were Web conference users.

Ratings in this survey were on a seven-point scale and were considered to be normally distributed with homogeneous variances across grouping terms, so that analysis of variance (ANOVA) could be used to compare ratings across groups. If significant results were found then levels within groups were compared using least significant differences (lsd) or using contrasts within the analysis of variance. In all analyses a 95% level of significance was used.

Radar plots were used to visually display the data, as shown in Figure , where a number of equi-angular spokes (representing the various variables) radiate from a central point. Predictions of average ratings in covariate analyses (when degree of usage was included in the model) were calculated at the average value of the covariate. Biplots were used to explore the relationship between the questions within each adoption model, as shown in Figure . The arrow lengths indicated the degree to which a question contributed to explaining variation between respondents. The direction of the arrows of two questions described the relationship between them, where arrows in the same direction indicated the questions were correlated, arrows in opposite directions indicated a negative correlation, and arrows that were becoming perpendicular to each other collected information that was independent of each other.

A Principal Components Analysis (PCA) was used to analyse this complex data set. PCA has been described as 'probably the most popular multivariate statistical technique' (Abdi & Williams 2010, p. 433) and is a multivariate technique that converts data to form a set of orthogonal variables (known as principal components) and displays them as points on a map. The eigenvalues represent the variance of the original data contained in each principal component, and in the data analysis tables of this study, this is referred to as Standard deviation. The data was not scaled to unit variance (as often done in principal component analysis) so the range of the ratings could contribute to differentiating the respondents. The transformed variables from the PCA were compared with the level of adoption to determine if a relationship existed. A PCA of all questions in the four adoption models allowed exploration of the relationship of information from questions across adoption models.

Results

The results pertaining to the Diffusion of Innovations model are presented here to illustrate the analysis undertaken for all four adoption models. The five questions asked in the survey (and their shorthand name in brackets) for the Diffusion of Innovations model were:

> Q1 'To what degree is it better using this innovation compared to how it was done previously?' (better)
>
> Q2 'To what degree is the innovation compatible with the previous approach?' (compatible)
>
> Q3 'To what degree is this innovation simple to use?' (simple)
>
> Q4 'To what degree can the innovation be experimented with while it is being adopted?' (experiment)
>
> Q5 'To what degree is the use of the innovation visible or noticeable to others?' (noticeable).

Analysis of Diffusion of innovations results

The arithmetic mean was calculated for each technology, as well as a combined mean for all three technologies, as shown in Table 3. The next step was to determine whether there was an interaction between the *level of use* of the technology and the ratings received, in case those who hardly used the technology rated it poorly, or vice versa. As shown in Table 4, Questions Q2 (compatible) and Q5 (noticeable) showed no significant difference between the *type* or *level of use* of technology. However the ratings for questions Q1 (better), Q3 (simple) and Q4 (experiment) did show a significant difference in the *type* and *level of use* of the technology. The positive values of the slopes showed an increasing relationship between the rating for usage and the ratings for the model questions. So the more the technology was used, the greater the rating it received for the five questions.

Table 3. Summary of responses to DoI model questions

Question	eSurvey	Webinar	YouTube	Combined
Q1 (better)	6.4	5.3	5.7	5.8
Q2 (compatible)	5.7	5.0	5.1	5.3
Q3 (simple)	6.1	5.4	4.9	5.5
Q4 (experiment)	6.0	4.9	5.7	5.5
Q5 (noticeable)	5.9	5.3	5.9	5.7
Overall average	6.0	5.2	5.5	5.6

Table 4. Results of analysis of variance of ratings from DoI model questions

Question	Type	Use	Type.Use	Slope between model and usage ratings
Q1 (better)	***	***	ns	0.271
Q2 (compatible)	ns	ns	ns	
Q3 (simple)	**	**	ns	0.246
Q4 (experiment)	***	*	ns	0.180
Q5 (noticeable)	ns	ns	ns	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Predictions of average ratings in covariate analyses (when degree of usage was included in the model) were calculated at the average value of the covariate. The predicted rating for each technology (when significantly different) is shown in Table 5. The responses to Q1 (better) and Q3 (simple) indicated that respondents who rated eSurveys gave a significantly higher rating than those who rated webinars and YouTube. Conversely, results for Q4 (experiment) indicated that those who rated webinars gave a significantly lower rating than those who rated eSurveys and YouTube.

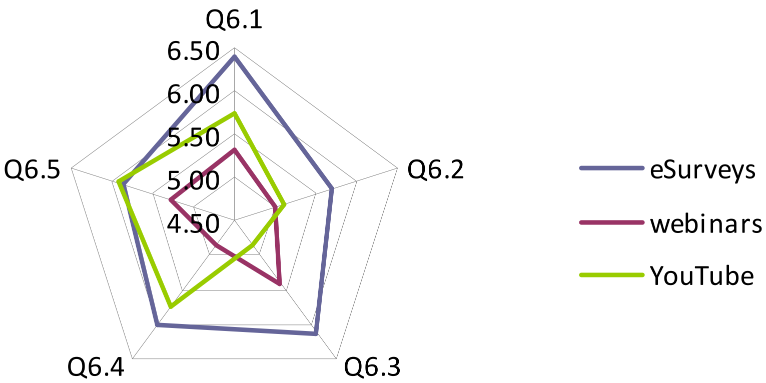
Table 5. Predictions of ratings for each technology

Question	eSurvey	Webinar	YouTube
Q1 (better)	6.4 a	5.3 b	5.7 b
Q3 (simple)	6.1 a	5.4 b	4.9 b
Q4 (experiment)	6.0 a	4.9 b	5.7 a

Note: Predictions with the same following letters are not significantly different (within a question).

The radar plot in Figure 1 was another way to display the interaction between the three technologies and the five questions. This showed that eSurveys generally received the highest ratings across the five questions, followed by YouTube and then webinars.

Figure 1. Radar plot of interaction between technology and questions for DoI model



A Principal Components Analysis showed that almost two-thirds of the variance in the data (65.1%) could be explained by the first two principal components, as shown in Table 6. The questions, in descending order, that most contributed to these two principal components were Q1 (better), Q2 (compatible), and Q3 (simple).

Table 6. Principal Components Analysis for DoI model

	PC1	PC2	PC3	PC4	PC5
Standard deviation	1.9209	1.4179	1.2511	0.9506	0.76828
Proportion of Variance	42.1%	23.0%	17.9%	10.3%	6.7%
Cumulative Proportion	42.1%	65.1%	82.9%	93.3%	100.0%

The analysis used 79 of the 85 respondents in the analysis, as respondents were dropped out if they didn't answer all questions. The absolute size of the loadings relative to each other, shown in Table 7, indicated the degree to which a question contributed to the principal component.

Table 7. Absolute size of the loadings for Diffusion of Innovations model

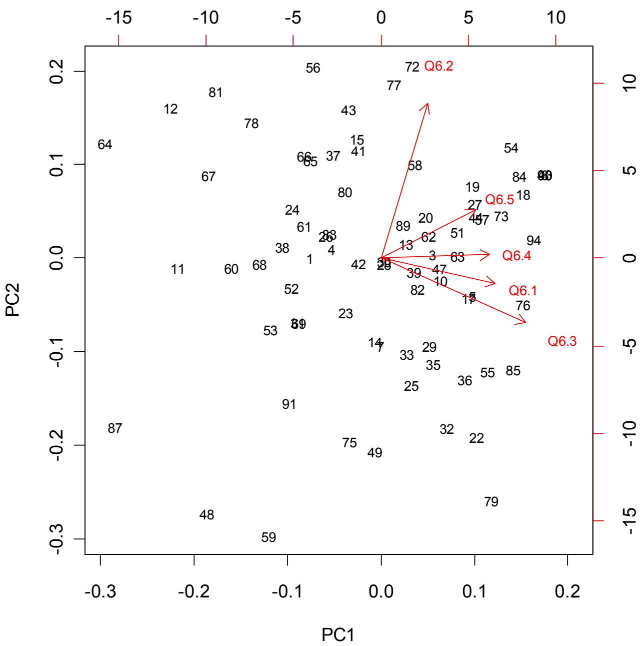
Loadings	PC1	PC2	PC3	PC4	PC5
Q1 (better)	0.477073	-0.142300	0.097162	0.079016	-0.858180
Q2 (compatible)	0.194582	0.877750	0.437228	-0.020480	0.010239
Q3 (simple)	0.606472	-0.365930	0.464988	0.242018	0.472755
Q4 (experiment)	0.456216	0.021968	-0.289280	-0.829370	0.140859
Q5 (noticeable)	0.398244	0.273705	-0.706750	0.496894	0.141737

Note: the more positive (or negative) the value of the result, the greater the intensity of the green (or red)

The biplot of the first two principal components in Figure 2 showed that Q2 (compatible) and Q3 (simple) were nearly independent of each other, as indicated by their arrows being nearly at right angles. Their arrows were also the longest, indicating that they contributed most in explaining the variation in the data. The fairly evenly spaced arrows showed a general spread of questions without any distinct question clusters. This indicates that the questions in the model have been well chosen, as there was minimal overlap between them. While having variables that can explain and predict adoption behaviour is the main criteria for well-chosen variables, there is efficiency in minimising the number of questions.

The first principal component was analysed for technology and degree of usage and this showed a significant difference between technologies and the relationship with usage, but no significant difference between this relationship across technologies. The second principal component showed no significant differences with technology or degree of usage, which indicated it was more universally applicable.

Figure 2. Biplot of the first two principal components for DoI model



Discussion

All three technologies (eSurvey, webinar and YouTube) received high ratings for each of the five variables in the Diffusion of Innovations model (better, compatible, simple, experiment and noticeable), though eSurveys received the highest ratings. So all five variables influenced the adoption of the new communication technologies.

Questions Q2 (compatible) and Q5 (noticeable) showed no significant difference between the type of technology and level of use of technology, so the rate of increase in the rating wasn't related to the usage of the technologies. However, the ratings for Q1 (better), Q3 (simple) and

Q4 (experiment) did show a significant difference in the type of technology and the degree of usage of the technology. So the more the new communication technology was used, the greater the rating it received for those three questions.

The average ratings for questions and technologies were significantly different (with their interaction approaching significance), and there was a strong overall relationship with the usage. The lack of significant interactions with usage shows that the trend was reasonably consistent across questions and technologies.

A Principal Components Analysis showed that almost two-thirds of the variance in the data (65%) could be explained by the first two principal components. A biplot showed that Q2 (compatible) and Q3 (simple) were nearly independent of each other and contributed most in explaining the variation in the data. Therefore they would be the two most important questions to include in a survey instrument if one needed to minimise the number of questions.

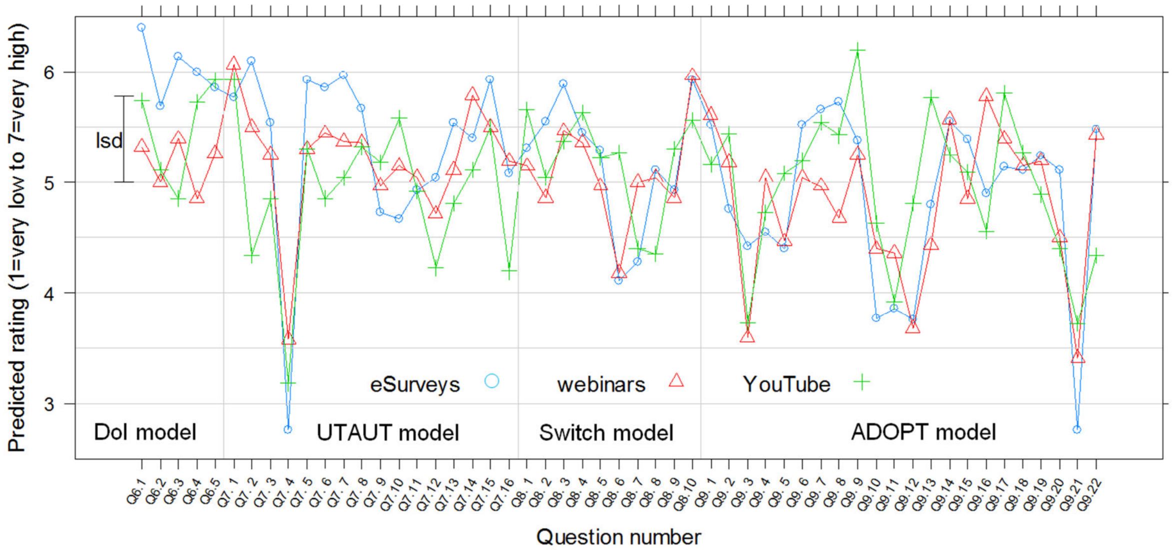
Analyses across questions

Having explored the results from the DoI model, the analysis then considered the combined results from all four models. An analysis of variance of ratings across the 53 questions showed a significant interaction across questions and technology. There was also a significant trend with usage that varied with technology and question.

A more complex model was fitted by nesting question within the adoption model. This showed that after accounting for the adoption model, questions still showed an interaction with technology. However, the relationship with degree of usage was not significantly different with questions within each model (however significantly different across models). It was therefore not possible to determine whether one of the four models was any more effective than the others at predicting adoption.

However, the research study identified a number of observations regarding the usefulness of the 53 questions used across the four models, and their effectiveness at predicting adoption of one of the three innovations. A graph of the predicted ratings across all adoption questions for the three technologies is shown in Figure 3. It is evident that questions 7.4 (promotion) and 9.21 (risk exposure) consistently rated lowly across the three technologies. This suggests that those two questions consistently poor for predicting the adoption of those technologies.

Figure 3. Predicted ratings across all adoption model questions

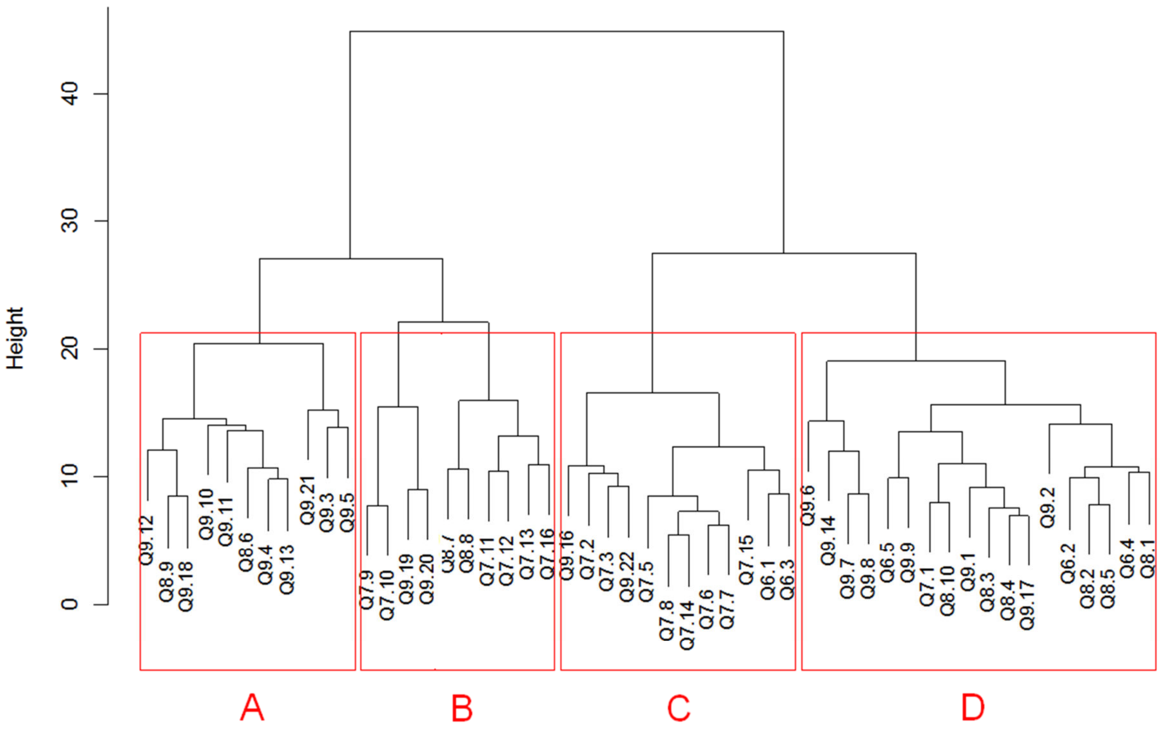


As can be seen in Figure , the questions in the DoI model generally all rated fairly highly with little variation. Whereas the other three models had greater variability, especially the ADOPT model which had five questions which generally received lower ratings – namely questions 9.3 (risk averse), 9.10 (consultants), 9.11 (groups), 9.12 (new skills) and 9.21 (risk exposure). The questions in the UTAUT model and Switch model all rated above 4, with the exception of 7.4 (promotion).

Principal component and hierarchical cluster analyses removed a respondent if any of their values was missing. The chances of losing the use of a respondent's data increased when more questions were used in an analysis. The analysis across all four models reduced the number of respondents to 43 out of a possible 85. In this study there was a total of 53 questions and it was identified that questions 7.4 (promotion) and 9.15 (reversibility) had many missing values. In an attempt to increase the number of respondents used in the analysis these questions were dropped out, which increased the number of respondents from 43 to 49.

A hierarchical cluster analysis was then performed using the R software, on a dissimilarity matrix (using Euclidean distance) based on the core 49 respondents. The resulting cluster dendrogram (shown in Figure 4) placed questions close to each other at the end of the branches, based on respondents answering those questions in a similar manner.

Figure 4. Cluster dendrogram and the resultant four groups



Four groups of questions, labelled A to D, were arbitrarily chosen based on the third level of the branch structure, which provided groups with similar numbers of concepts, as detailed in Table 8. Questions 7.4 (promotion) and 9.15 (reversibility) were omitted due to the amount of missing data.

Table 8. Contribution of the four original models to the four groups

Model	A: Contagious benefits	B: Supporting benefits	C: Working smarter benefits	D: Noticeable, trialable benefits
DoI			2	3
UTAUT		4	8	1
Switch	2	2		6
ADOPT	9	2	2	8
Total	11	10	12	18

While some of these groupings seemed logical (for example grouping together Q5 (noticeable) and Q9.9 (observability)), other apparently similar terms weren't clustered together (for example Q2 (compatible) and Q7.15 (compatible)). One explanation is that survey respondents perceived those questions as being slightly different, perhaps based on the adjacent questions in the survey. It should be noted that the number of respondents was limited, and that the research should be replicated to confirm the validity of these results. The four resultant groups will now be described in greater detail.

Group A: Contagious benefits

Q9.12 (new skills), Q8.9 (contagious), Q9.18 (success quickly realised), Q9.10 (consultants), Q9.11 (groups), Q8.6 (sense of identity), Q9.4 (work benefit), Q9.13 (aware of other users), Q9.21 (risk exposure), Q9.3 (risk averse) and Q9.5 (long-term outlook).

This group of 11 terms was summarised as 'contagious benefits' and included two concepts from the Switch model, namely the contagious nature of others wanting to use the new technology and the sense of identity gained from using it. It also incorporated nine concepts from the ADOPT model, including concepts around the interaction that occurs through the potential user being part of a group where other members are actively using the technology or when they come in contact with a consultant who spreads the message of other people successfully using the technology. This is accentuated when it provided a work benefit to the user and the benefits accrued quickly. The innovators may be risk averse yet willing to learn the new skills required to use the innovation.

Group B: Supporting benefits

Q7.9 (influencers), Q7.10 (important people), Q9.19 (envir benefits) and Q9.20 (quick envir benefits), Q8.7 (physical envir), Q8.8 (habit), Q7.11 (senior mangt), Q7.12 (org support), Q7.13 (resources) and Q7.16 (assistance).

This group of ten terms was summarised as 'supporting benefits'. It included six concepts from the UTAUT model, namely the benefit of support gained from involving influential people (those who influence the user's behaviour) and important people (senior management). It also incorporated the benefit of the organisation supporting the use of the new system, especially senior management, and having the necessary resources and assistance to help with difficulties. The two concepts from the Switch model included the way the physical environment can support the change by forcing people to use the new system, and the benefit of having an innovation which can be habitual in nature. It also included two concepts from the ADOPT model, namely the environmental benefits from using the system and how quickly they will be realised. These might be more important at the institutional, rather than the individual level.

Group C: Working smarter benefits

Q9.16 (reduce operating costs), Q7.2 (quick), Q7.3 (productive), Q9.22 (work easier), Q7.5 (clear), Q7.8 (easy learning), Q7.14 (knowledge), Q7.6 (skilful), Q7.7 (easy to use), Q7.15 (compatible), Q1 (better) and Q3 (simple).

This group of 12 terms originated from three of the models and was summarised as 'working smarter benefits'. It incorporated the concepts from the DoI model of the innovation being better than the previous alternative and that it was simple to use. It included the following eight concepts from the UTAUT model: the innovation enabled tasks to be completed quicker, increased productivity, and was clear and understandable to use. Learning to use it was easy, users had the knowledge to use the innovation, and it was easy for them to become skilful at using it. The innovation was easy to use, and compatible with other systems. Finally, the concepts from the ADOPT model were that the innovation reduced operating costs and made the work easier and more convenient.

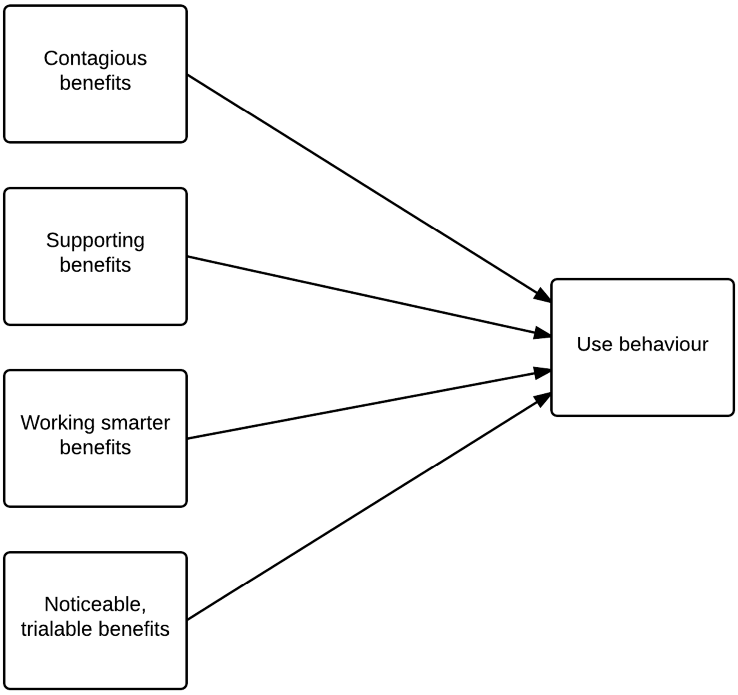
Group D: Noticeable, trialable benefits

Q9.6 (financial constraints), Q9.14 (up-front cost), Q9.7 (trialability), Q9.8 (easily evaluated), Q5 (noticeable), Q9.9 (observability), Q7.1 (useful), Q8.10 (sustainable), Q9.1 (cost efficiency), Q8.3 (outcomes), Q8.4 (emotionally engaged), Q9.17 (additional effects), Q9.2 (natural envir), Q2 (compatible), Q8.2 (clear steps), Q8.5 (small steps), Q4 (experiment) and Q8.1 (success of others).

The final group of 18 terms had representative concepts from all four models and was summarised as 'noticeable, trialable benefits'. It included the concepts from the DoI model of the innovation being compatible, able to be experimented with while it was being adopted and that it was visible or noticeable to others. The concept from the UTAUT model was that the innovation was perceived as useful. The Switch model provided the following six concepts: users could learn from the success of others who were already using the innovation and there were clear, specific steps for using it. Use of the innovation had clear outcomes and users were emotionally engaged with wanting the innovation to succeed. Small, easy achievable steps could be taken to use the innovation and the use of the innovation was sustainable in the long-term. Finally, the ADOPT model provided the following eight concepts: users were strongly motivated to maximise profit and protect the natural environment. The users were experiencing short-term financial constraints and the up-front cost of the innovation was small relative to the potential benefit. The innovation could be trialled on a limited basis and the effects of it could be easily evaluated and observed. The use of the innovation was likely to have additional effects on the future success of the user's work.

As a result of this study, a new model for the adoption and use of Web 2.0 technologies was developed for an organisational setting. The User benefits model comprised four factors related to user benefits: contagious benefits, supporting benefits, working smarter benefits and noticeable, trialable benefits. A representation of these factors is shown in Figure 5.

Figure 5. Representation of the elements of the User Benefits model.



The model was named User benefits, as there was a recurring theme in the qualitative data about users looking for benefits, and if the benefits were significantly worthwhile, then they were willing to use the technology. Quotes from the respondents in this regard included the following: 'if the benefit is there it will be time well spent', 'how we can use them [the new technologies] to benefit us internally and our clients', 'only where it is of genuine benefit to the industry clients I work with', 'if the benefit is there it [the time involved] will be time well spent', and 'I believe the benefits will be worth the effort'.

The focus on benefits was also supported by the extant literature, for example after an extensive review of the literature, Lindner (1987, p. 150) stated 'the rate of adoption as well as ultimate adoption level are determined primarily by the actual *benefits* [emphasis added] of adoption to the potential adopters is by far and away the most important result to be culled from the empirical literature on adoption and diffusion'.

Conclusions

Supporting benefits, the second element of the new model, has major implications for organisations regarding the support they need to provide if they want staff to use the new technologies. The results indicated that respondents considered the department's IT platform (hardware and software) and policies restrictive and out-dated. They felt that this stymieing their ability to use these new communication technologies, and made comments including: 'We've wanted to use blogs for years but have been hampered by dept requirements', 'Lack of access to platforms has stymied our development' and 'Put off by all the Queensland Government red tape'.

The lack of managerial support was also highlighted, with comments such as 'It is extremely important that senior managers understand the use of this Internet platform' and 'Web 2.0 is great as long as there is managerial support'. The importance of adequate training was noted with comments such as 'Need better training in their use and how to integrate them into our work environment'.

It is believed that this research study comparing four quite divergent change models is the first of its kind attempted, and similarly its focus on the adoption of Web 2.0 technologies. In the context of this research study, the User benefits model has the potential to assist DAF staff (and potentially extrapolated to the wider agricultural system) to overcome the barriers of adopting new technologies. These more efficient and effective work practices would better serve the needs of the primary producers spread across the vast area of Queensland and beyond.

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