# HOW TO AVOID 'CHRISTMAS TREE' INNOVATIONS: INTRODUCING AND SUSTAINING THE USE OF LEARNING PLATFORMS IN SCHOOLS.

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*This paper reports the results of a study investigating teacher stakeholder views of the range of leadership factors that influenced their use during the first two years of a new Virtual Learning Environment (Firefly) in a comprehensive school in London. The research was broadened to include ten schools in total. Implications are identified as well as suggestions for further research. According to much of the research reviewed, maximising the benefits of a VLE is dependent on how teachers perceive innovations in general. However, some evidence was found that leaders do have an impact on the take-up of technology in schools. The determination of the overall school leader to bring transformation and modernity to the school was found to have an effect on the uptake of initiatives that are expensive and risky in the sense that they rely on new skills and knowledge that do not at first seem relevant to some teachers. The process also involves risk because of the pace of technological change. This research aims to bring together the two factors: teacher perception and leadership of change. The aim is to help school leaders ensure successful take-up and sustaining of use so that innovations, that they introduce, are not short-lived. Key questions within the evaluation survey draw on theories of leadership and on findings from the literature review about technology acceptance. The research is summarised in a visual representation of how leaders can leverage their influence, both with the initial introduction and the sustaining of the technology, to avoid the 'Christmas Tree' innovation effect: in other words, a purely ornamental technology that quickly goes out of date or fails to serve its primary purpose of improving learning (Bryk, 1992, p. 7).*

**Keywords:** Firefly, Learning platform, Virtual Learning Environment (VLE), Levels of use, Upside Down Christmas Tree.

*There is a recurrent and specific challenge in understanding and applying research evidence as it takes time for robust evidence to emerge in education, and the rapid pace of change of technology makes this difficult to achieve.*

(Higgins, Xiao & Katsipataki, 2012, p.3)

## Introduction

Technology should make our lives easier and schools are no exception. Schools are under pressure to compete with each other and rise up or keep a good position in the league tables. They are also under pressure to provide value for money. So why would a school purchase an online learning platform such as Firefly? The rationale was that it could improve community cohesion and facilitate improvements in the quantity and quality of homework as well as save teachers' time. Like all school improvements it was hoped that it would "translate into higher levels of student achievement" (Antoniou and Kyriakides, 2013, p. 29). No empirical studies had been done on the veracity of this assumption, but anecdotal evidence and online reviews led a school in London to consider Firefly as the chosen learning platform. Its particular functionalities such as merging with their Management Information System (MIS and motivating appearance led them to select it above other Virtual Learning Environments (VLEs) available. A significant impact on teacher and student engagement was noted. From the first four months, there were 418,310 instances of usage. This climbed to 3,335,567 hits for the same period one year later and again to 4,445,743 hits for the same period after a second year. Given the ease of use of this learning platform, leaders were able to encourage widespread and consistent setting of homework.

This study looks at the leadership factors taken from early literature about technology in schools in 1996 to as recent as 2017. The study looks at the factors that led to such a positive outcome, over a two-year period of using Firefly in our school, according to the teacher users. The research was also broadened to include other schools – twenty were invited to join in with the research and, in total, ten took part. Drawing mainly from the literature, a questionnaire was specifically developed to explore factors that influenced the take-up and sustaining of Firefly. The research presents nine factors that impacted on the introduction of the innovation and fifteen factors that impacted on sustaining it.

## Literature review

To carry out a literature review, I searched for "Firefly", "VLE" and other related terms on Google, in the Cambridge University libraries and the British Library. There was at that time, little mention of Firefly VLE in the published academic research. I widened the search to include the terms 'school improvement and technology'. The focus in much of the research was to present factors that influence the uptake of technology and then specifically, factors that influence take-up of VLEs, in schools. I also searched for 'sustaining technology use' and also material on school leadership generally. The findings from the literature have been presented chronologically to show the social context of some of the research claims about technology use in schools, between 1996 and 2017. The first report of the British Educational Suppliers Association (BESA) showed that in 1994, technology was only just becoming popular in schools in the UK. The first research reviewed was published shortly after this period in 1996. I sorted the findings into a list of key factors that influence the introduction of

technology innovations and created a survey. I also sorted the findings into a second list of factors that sustain innovations and added this to the survey in a separate section. The data from the survey was analysed and a metaphorical 'upside down' Christmas Tree was designed, to show leaders how to reverse the effect of ornamental innovations that do not serve their primary purpose of improving learning.

The first section looks at the factors influencing the use of technology, between 1996 when research about technology in schools was emerging and 2010 when there was general recognition that it needed strong leadership (BECTA, 2010).

## Teacher Attitudes and Schools as Anti-innovation

By 2000, the majority of research placed responsibility for the slow pace of technology uptake at the feet of reluctant teachers, rather than at the feet of school or national leaders. Mumtaz (2000, p. 320) was no exception. Robertson et al (1996, pp. 194-204), cited by Mumtaz (ibidem) argued that teachers' resistance to computer use came from their resistance to "organisational change" and "outside intervention." Three years later, Mumtaz, Zhao, and Frank (2003, p. 808) looked for reasons why schools were slow to integrate the use of available technology. They considered that schools themselves were naturally set up to resist the use of technology: lessons were either too structured or students did not all have computers at home, to follow up work. They wrote about the 'ecology' of adoption in schools as 'ecosystems'. I found that these are interesting but are not necessarily useful metaphors because I believe that ecosystems are naturally occurring whereas the behaviour of everyone within a school is not. Schools are organisations, not organisms. In this, they are also hierarchical. Teachers at any level might want to embrace innovation but their capacity to do so is restricted by their position within the organisation, rather than by a mutual growth and survival mechanism of an ecological system. Perhaps only humans construct 'anti-ecologies' in that sense. Zhao and Frank (2003, p. 808) used 19 schools but none of the questions focused on the crucial point about digital strategy, e-leadership (leadership of technology) or overall school leadership.

BECTA (2004, pp. 1-8) also identified teachers' perceptions and lack of willingness to change as blocks to technology acceptance. This was perhaps a missed opportunity as 2004 would have been a good moment to focus on e-leadership. Mobile technology was becoming more widespread and this would have moved the debate forward, away from teachers' fear of "public humiliation" if they used 'unreliable' technology or used technology incorrectly (BECTA, 2004, p. 8).

Totter, Stütz, and Grote (2006, p. 96) emphasised lack of training and time for teachers to explore the technology and the choice of constructivist as opposed to traditional teaching styles. They also reported staff "perception that technology does not enhance learning". The authors used data collected from a survey of fifty-two Swiss and Austrian teachers and claim: "only teachers who adopt a pupil-oriented, constructivist teaching style are likely to make use of new technology in classrooms". No mention was made of technology or school leadership.

Four years later, the importance of setting direction through an overall digital strategy within schools or 'technology leadership', was also recognised by Tan (2010, p. 903) when he said that "school technology leadership is a strong predictor on the level of technology use in schools". However, he went further to comment on the skills of the overall school leader and not just the 'technology leader'. He found that "transformational leadership is correlated with a principal's ICT competencies"

(ibidem) and that different types of leadership styles might create different outcomes in terms of technology uptake. Tan concluded that research findings show that transformational leadership has the biggest impact on the uptake of technology in schools (2010, p. 94).

The BECTA report (2010, pp. 26-29) echoes the thinking of Tan. The report identified specifically, conditions that need to be in place for "effective use of a learning platform" in schools. They include a sense of e-maturity, defined as how well providers use technology to meet strategic priorities (Becta, 2008, p.12). They also include a "tradition" of effective use of IT innovations, and "a coordinated, positive and enthusiastic strategic approach by senior leaders and managers". BECTA also reports that schools were not systematically organising their roll-out but instead, letting teachers 'grow' their use, preferring to let a more 'organic' form of development occur. Enthusiasm for the new technology was sparked by a particular need at the time, such as tracking performance data of pupils. This was followed by a gradual extension of the use of the learning platform across other areas of school activities (BECTA, 2010, p.14). Transformational technology leadership was not common. The next section will look at theories about the take-up of technology between 2011 and 2014.

## *The Beginning of Technology Adoption Models and the Role of School Leaders in Leveraging School Improvement*

Research by Šumak, Heričko, and Pušnik (2011, pp. 2067-2077) moved the focus of the research away from leadership and back to teachers and their growing e-maturity. Their research was an impressive meta-analysis involving 42 independent studies. The findings showed that teacher perception about ease of use and usefulness is a critical factor influencing attitudes towards the adoption of technology. The research looked at 494 causal effect sizes in 42 independent studies. However, all the adoption models considered imply that users can choose whether or not to adopt the technology, which experience tells us is not always the case. No link is made to school leadership, e-leadership or school improvement frameworks in the context of adopting technology.

Richardson, Bathon, Flora, and Lewis focused their attention, in line with Tan (ibidem) and Davies (2010, pp. 55-61), on the importance of leadership. They concluded that more research is needed into the performance criteria of school technology leaders, given the expense and the challenges of the role: "[t]echnology driven change will only continue to accelerate. The scholarly community must do its part to provide more and better investigations and literature on technology leadership in the future." (2012, p. 145)

Moreno, Moreno, and Molina (2013, p. 7) identified other factors not covered in previous research, relating to how to generate satisfaction with online learning. They found that e-learning initiatives work best if managers "take advantage of the role played by perceived usefulness, social influence and effort expectancy". This echoed Levin and Schrum's (2013, pp. 29-51) sense of albeit slow progress. Nevertheless, the need to build confidence amongst teachers to leverage school improvement was recognised.

Jackson (2014, p. 256) developed a conceptual model for evaluating expectations and recommends that over-inflated expectations should be avoided, perhaps reflecting a growing sense that technology is not a panacea. Expectations must be properly designed, articulated and realised. Unrealistic expectations that cannot be met should be avoided. By managing expectations, organisations "can achieve a strong sense of VLE benefits success" (Jackson and Fearon, 2014, p. 257). Lochner (2015, p. 63) looks at

concerns around adopting Learning Management systems in the US and uses the CBAM (Concerns Based Adoption Model). Research showed that teachers had important concerns about their ability to adopt the new learning management system. The Concerns-Based Adoption Model (CBAM; Hall, George, & Rutherford, 1979, p. 63) was used to examine user's attitudes and concerns. Lochner makes a thought-provoking claim that "although systems and organizations (sic) may adopt change, implementation of an innovation is accomplished at the individual level". This new emphasis is on professional concerns rather than on technical know-how, therefore addressing perceptions rather than knowledge. The next section will look at research found between 2014 and 2017

## *The Digital Savvy Leader, Creating 'e-maturity' Using Quality Products.*

Riveros (2015, pp. 490-494) identified two new areas that were impacting on the use of technology: being digitally and media 'savvy' as well as building maturity within the organisation. These concepts fall into the realm of leadership.

It is important to note another feature of technology leadership – keep up or end up with technology that does not serve its primary purpose: "[t]he pressures leaders experience to keep up with technology can result in procuring and implementing technology without aligning technology with clear educational goals, and essentially adopting technology for its own sake." (Webster, 2017, 33).

This echoes comments from David Fairbairn-Day, the Head of Education Strategy and Business Development at Promethean who was quoted in the BESA report (2011) saying that we are entering "a new phase: screen down – classrooms where tablets are on the desk but go unused" and that "[i]n a number of parts of the country I see schools putting in policies for every student to have access to a tablet. Sometimes, once the tablets arrive, they are scratching their heads. Now we have them, what do we do with them?" (BESA, 2011).

Hew, Latifah, and Kadir, (2016, pp. 1557-1584) move the research into the realm of the interrelation between teacher attitude and the quality of the media in question. However, once again, there is no mention of e-leadership or school leadership impacting on teachers' actions in relation to the VLE. The absence of leadership theory is all the more obvious since this is a study of the world's first government-led initiative, using FROG VLE in 10,000 schools across Malaysia – an impressive project. Once again, there is an overall assumption that teacher users can choose whether or not to take-up the innovation within their schools.

A year later, Derboven, Geerts, and DeGrooff (2017, p. 21), from Belgium, maintain the emphasis on the usability of the product as the main factor impacting on take-up. However, the language in the report is much more complex and esoteric than other research in the field and in this way offers little to school leaders. They write about a "multimodal social semiotic approach" which situates the take-up of technology as a combination of its design with its appropriation. This research does not address the scenario of compulsory use but instead describes teachers as engaging with the VLE in a 'do-it-yourself' (bricolage) way. The researchers found that users use few functions of the VLE but they did not link these findings to the levels of use (Hall, Dirksen & George 2013, p. 39) which shows that most users stay at the mechanical (stage 3) use of an innovation because "movement to higher level of use, (LOU), requires time, resources, leadership, and training" (ibidem). There are no recommendations for improving e-leadership.

*S*ummary of Influencing Factors, Found in the Literature Review

The literature reviewed found factors that influence the successful take-up of technology in schools. These included the attitude of teachers towards technology, the usability of the product, the sense of an overall digital strategy in the school and the general e-maturity of the institution and the availability of training (Levin and Schrum, 2013). This research aims to question whether these findings were relevant in the case of Firefly and whether, in fact, there were other factors at play under the umbrella of 'leadership of change' such as ensuring the introduction of the innovation is well-timed and hassle-free, relevant to the job, and aligned to educational goals. The research also aims to explore factors that influence teachers to use and sustain their use of the learning platform, such as style of teaching, ability to inspire the learners and, the feeling that the whole community is involved.

The leadership influences considered included Hargreaves' work on "Uplifting Leadership" from 2015 and Kotter's work on "Leading Change" (1996). These leadership theories have offered guidance for school leaders across all sectors and constitute required reading on school leadership training courses such as the National Professional Qualification for Senior Leadership. Halpern's theory of EAST from his work on change management "Inside the Nudge Unit" (2016, p. 200) was chosen for its relevance as it influenced the roll-out of Firefly in the main school surveyed. Some statements were derived from papers written by Ofsted (2013, pp. 1-7) or BECTA (2004, pp. 1-8). The next section will look at how the research was structured and carried out.

## Research Methods

Leadership influences on the successful implementation of Firefly were the independent variables of the study which was framed in a paradigm of interpretivism. The researcher is "part of" the research being carried out (Briggs et al, 2007, p. 24). The impact on all teacher users was the dependent variable. The first part of the questionnaire was designed to help teachers understand their level of use and to provide the school's leaders with insight into this in order to plan for f uture training. The main section was focused on exploring how teacher users of the VLE perceived the factors that might have influenced them. The research has a phenomenologist perspective, as the researcher aims to see the point of view of the respondents (Bogdan and Taylor, 1975, p. 14). The limits of interpretivism seem clear, as participants offer accounts of themselves that might differ from reality (Briggs et al, 2007, p. 26). The questions in the evaluation survey probe interpretations of readers' actions in the broadest sense and its findings are constrained by the inevitable subjectivity of responses. Working within an epistemological framework that espouses social phenomena as existing "not only in the mind but in the objective world as well" (Miles and Huberman, 1994, p.182), the research uses a mixed-method in an explanatory design (Cresswell, 1994, p. 564-568) to triangulate quantitative findings from the survey with rich qualitative data from semi-structured interviews, in order to lend a better understanding to the subject. This design also increases the transferability of the findings, especially given the reflexive nature of the researcher's perspective (having been involved in the introduction and sustaining of Firefly as a school leader).

## Data Analysis

The following steps were taken. The questionnaire answers were analysed, using an 'Informed Grounded Theory' approach (Thornberg, 2011, p. 1) and converted into charts to show the relative percentage of respondents who selected choices between the different factors listed. Correlations were drawn between the different levels of use and the awareness of leadership influences. Also, inconsistencies in some of the replies were noted and explored in follow-up interviews with staff in the main school. The questionnaire answers pointed to intra-organisational factors that had produced these impacts. The key citations are included in the findings. Two models of 'upside down Christmas Trees' are presented, showing the factors found in this research, in order of influence. The first shows the factors found that influenced the successful introduction of Firefly VLE and the second one shows the factors that influenced sustaining its use. The next section will look at how the research process followed BERA guidelines.

## Ethical considerations

The research was carried out with the primary consideration of validity and with full regard to the anonymity of respondents, both within the questionnaire and within the written findings. All attempts were made to ensure the questionnaire, which was online, was of the highest quality and easy to complete (Fogelman and Comber, 2007, p. 129). No research was undertaken without the initial and full consent of the Head teachers to whom all requests were sent. In the main school involved, the Head teacher agreed to be more involved in the process by overseeing the research. Questions to staff about the impact of leadership strategies were with full consent of the Head teacher in advance: due regard was given the sensitivity of the subject. BERA (2011) guidelines were adhered to at all times. There were no risks to participants and the principle of voluntarism was adhered to at all times. No children were involved in the research at any time. The next chapter will look at the outcomes of the research.

## Research findings

### Levels of Use

Five key functions of Firefly were chosen for staff to evaluate their level of use, using a simplified version of the 'Levels of Use' by Hall, Dirksen & George (2006, p. 17). On average, 56% of the respondents overall, were confident about their use of these functions or even able to suggest improvements to them – this is the highest level of use which can be described as altruistic, where the user reaches a state where he or she "re-evaluates the quality of the innovation, seeks major modifications […] to achieve increased impact on clients…and explores new goals for self and the system" (ibidem). The most common function used was 'setting homework' with 87% of users being comfortable with their skills. The least common was 'monitoring' or 'seeing what other staff had set on the site'. Equally, only 16% of users were communicating with parents on Firefly, despite this being a key function. Most staff evaluated themselves at level 2 for this, or 'needing more help' which reflects the key skills delineated in Level 1-3 of Hall's Levels of Use (2013, p. 17). It implies a positive approach in which the user is going through a process of "orientation" and "preparation" as well as "a stepwise

attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use".

Although 18 respondents were not at their school when Firefly was first introduced, their answers have implications on the training of new staff, who are expected to join in positively with innovations, while longer serving staff are still grappling with them. They had awareness of the factors in the questionnaire found to influence the take-up of technological innovation, in the range of 67% to 95%. This compared to staff present at the introduction, who showed awareness of the same factors of between 83% and 100%. Staff, who missed the launch of Firefly, were still overwhelmingly positive about it and no one was negatively influenced.
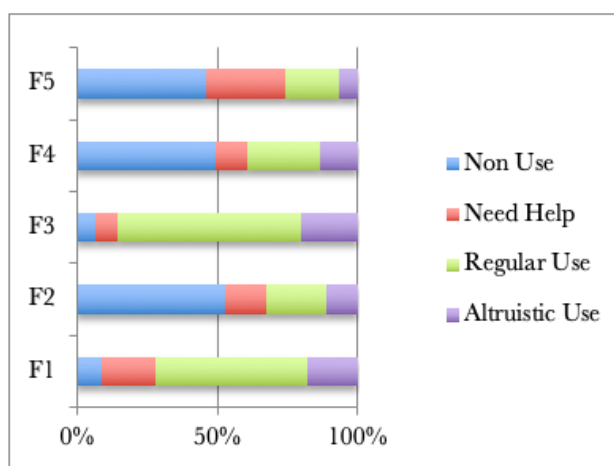


*Figure 1*. 100% Stacked Bar Chart showing all respondents self-evaluation of their own level of use of five key functions of Firefly, against a four-part Likert scale (F1: sharing resources with learners; F2: communicating with parents; F3: setting homework; F4: monitor and look at what other teachers are doing on the site; F5: seeking feedback)
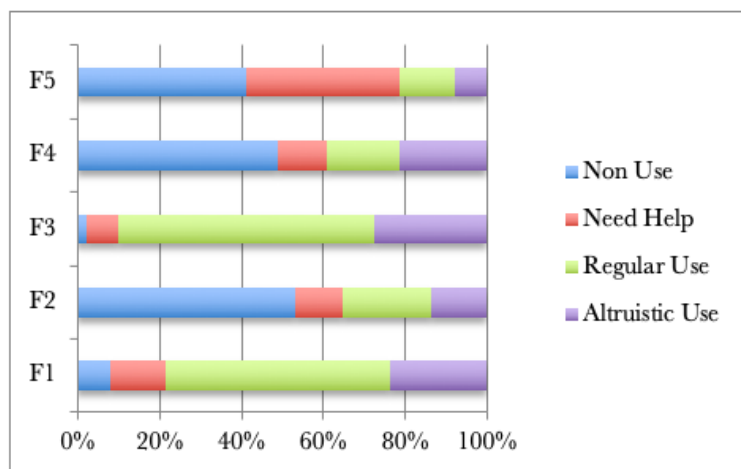


*Figure 2*. 100% Stacked Bar Chart, showing 'Named Main School' only. Staff self-evaluation of their level of use of five key functions of Firefly, against the four-part Likert scale. The difference between the main school and the rest of the sample shows increased confidence and altruistic use in three out of five measures, although this is with the proviso that 19 respondents did not name their school

## Introduction of the Innovation

The factors that influenced the introduction of the innovation and initial teacher use are listed below in order of priority so that school leaders can leverage maximum influence to ensure the long-term success of future initiatives and avoid short term, ornamental or "Christmas Tree" innovations (Bryk, 1992, p.7). I have turned the Christmas tree upside down, as a visual metaphor for reversing the temporary, superficial effect of short-term innovations.

## The 'Upside down Christmas Tree'

Perceived usefulness 83%

Relevance to job 80%

Removing the Hassle 67%

Strong support from Senior Leaders 66%

The Quality and Design of the Technology 65%

The Timing of the Introduction 64%

Attentional Spotlight – Feeling obliged 59%

Aligning innovation with educational goals 55%

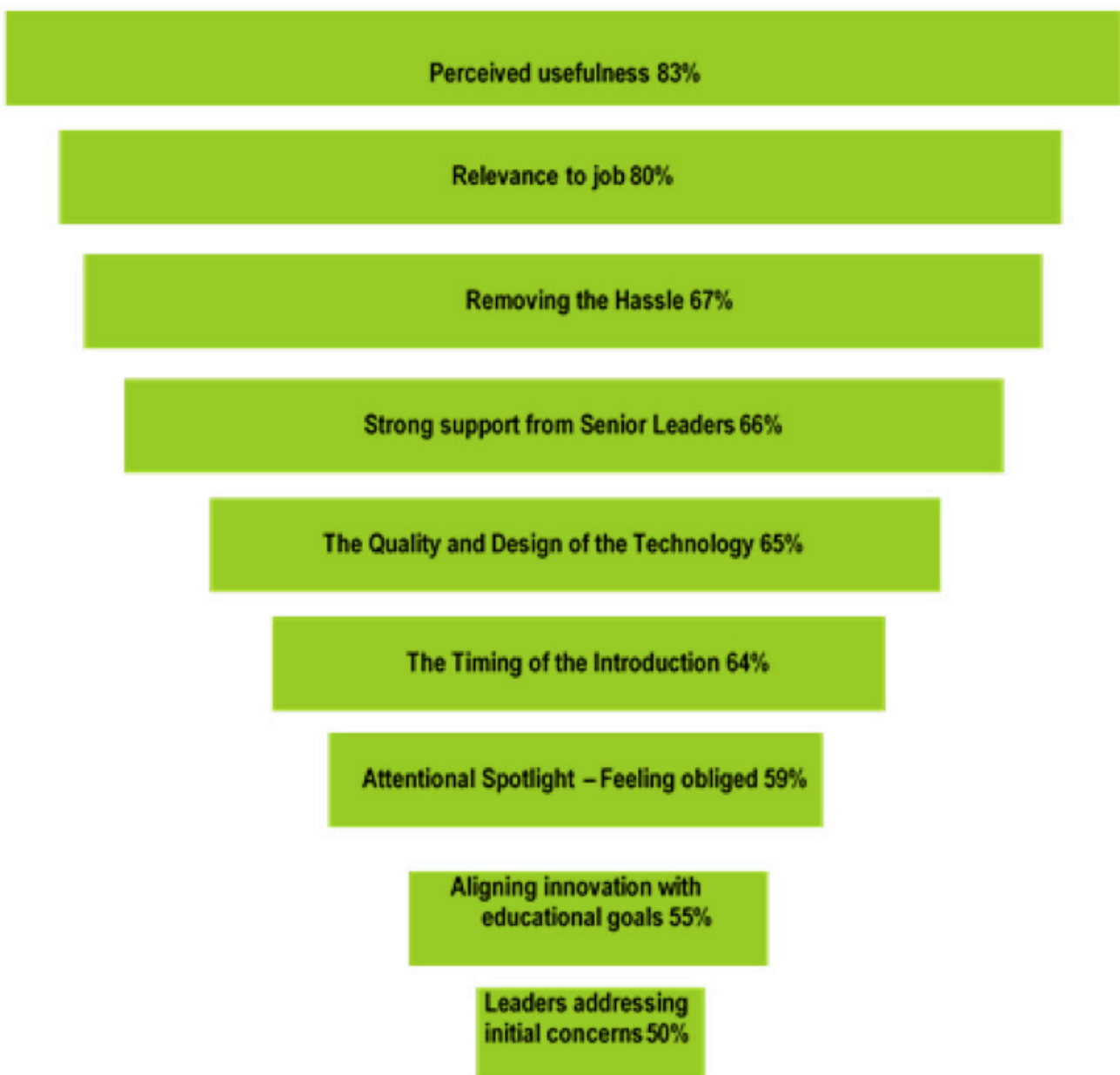Leaders addressing initial concerns 50%

*Figure 3*. The 'Upside down Christmas Tree' 1. Reverse Taxonomy of Influences on the Introduction of Firefly, showing the most significant influences that support a successful introduction of the innovation.

## Sustaining Use of Innovations

The factors that influenced sustained teacher use are listed below in order of priority. Once again, I have turned the Christmas tree upside down, as a metaphor for reversing the temporary, superficial effect of short-term innovations.
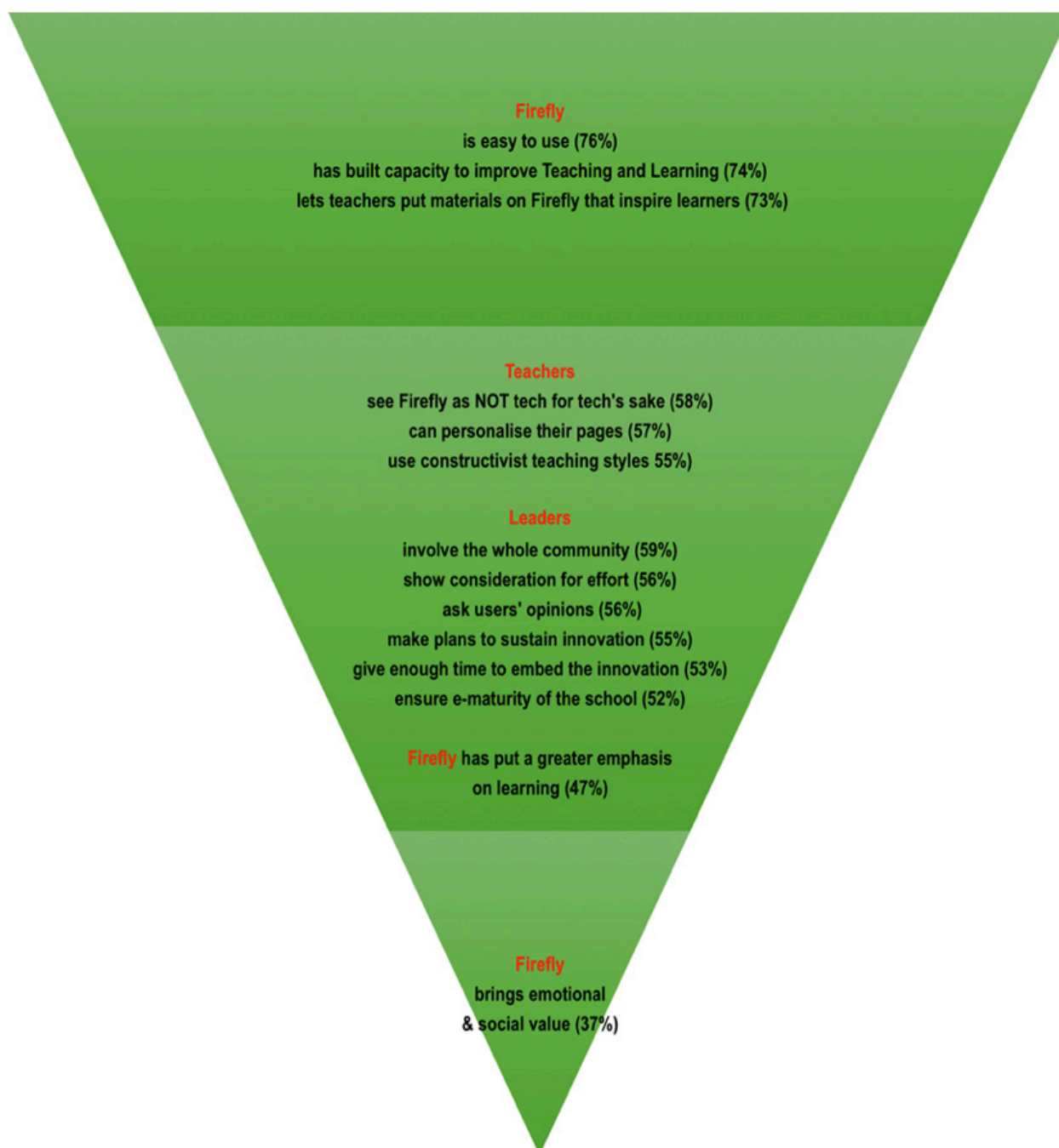


**Firefly**
is easy to use (76%)
has built capacity to improve Teaching and Learning (74%)
lets teachers put materials on Firefly that inspire learners (73%)

**Teachers**
see Firefly as NOT tech for tech's sake (58%)
can personalise their pages (57%)
use constructivist teaching styles 55%)

**Leaders**
involve the whole community (59%)
show consideration for effort (56%)
ask users' opinions (56%)
make plans to sustain innovation (55%)
give enough time to embed the innovation (53%)
ensure e-maturity of the school (52%)

**Firefly** has put a greater emphasis
on learning (47%)

**Firefly**
brings emotional
& social value (37%)

*Figure 4.* The second 'Upside down Christmas Tree' or 'How to Build Success that Lasts'. 'Reverse Taxonomy of influences' on the sustaining of Firefly, with the most significant influences at the top. This chart helps leaders to make strategic decisions about how to sustain the success of the innovation, which in our case, went from 147,000 users in the first month to nearly a million every month, one year later.

## Discussion, Limitations, and Suggestions for further study

*Discussion*

The survey questions were worded carefully so that users of Firefly had to reflect on what might have influenced them. One clear conclusion is that leaders might think they have communicated their educational goals, but this might not be the case unless clear plans are made for sustaining the innovation and goals are regularly revisited (Kotter, 1995, p.10). As Bernard Shaw allegedly once said, "the problem with communication is the illusion that it has occurred." Outcomes from this research show that around 25% of users were satisfied with the learning platform despite the way that the innovation was introduced.

Other issues for school leaders, raised in this research, show the importance of induction for new staff. Introducing innovation takes time and goes through various stages. A member of staff can join at any of these phases but not share the sense of purpose, given during the introduction. Also, leaders should plan to include any non-teachers in staff training, as they will also impact on change efforts. Awareness of various factors was considerably lower amongst non-teachers who might also wish to use the site to communicate with parents, staff, and students.

Introducing Firefly was a positive thing for the vast majority of users. Most staff users were clear that it was useful and relevant to their work. Not all staff users of Firefly were clear about who or what to credit for this: the technology itself, the timing or the strong backup from leaders. An average of 80% of users felt they had been positively influenced by the fact that they could inspire pupils with Firefly and use it easily. These factors had helped sustain the use of Firefly over a two-year period. 80% also thought it had increased the capacity to improve teaching and learning (Bryk, 1992, p. 7).

This research correlated with findings by Derboven, Geerts, and DeGrooff (2017, p. 32) who emphasised the usability of the product as well as the DIY nature of the product, as the main factors impacting on take-up. Findings also correlate to those of Levin and Schrum (2013, pp. 29-51) who looked at how technology is best used to leverage school improvement. Their research was extensive – 150 interviews and 30 focus groups across 8 schools. They concluded that technology only works if schools organise high levels of training such as induction, drop-in sessions, on-hand one to one help and follow up training over time. Technology also works best if school leaders move the curriculum away from teacher-centred delivery towards pupil-centred learning. This echoed the focus on constructivist teaching styles mentioned by Totter et al in 2006 and this also featured as a strong influence in our case. One surprising finding in the research was that users rated the social and emotional impact of Firefly as the least influencing factor, but this could simply be a reflection of the current more pressurised climate in schools, which might have skewed retrospective perceptions.

*Limitations and Suggestions for Further Study*

The questionnaire outcomes are subject to the limitations imposed by the Likert scales chosen. The research findings on which the question was based, was not visible to the respondents and so some questions might have become open to wider interpretation. The interview findings were limited by their semi-structured nature, which nevertheless lent authenticity to the subject. The research findings were also constrained by the number of respondents from each school: several schools only offered one

respondent. There was, therefore, a bias towards the researcher's main school where 51 respondents replied out of a total of 88, although a further 19 could have been from the main school but chose not to name the school. The research was also retrospective over a period of two years.

Future longitudinal studies could investigate any direct links between Firefly and academic outcomes and explore the trajectories of implementation and use. There is room for more in-depth studies to understand under which conditions VLEs can be adopted and successfully used in greater detail and with bigger samples. Further research could also investigate how school leaders can be more certain that their aims have been fully communicated. Finally, the transferability of this research could be tested out on other learning platforms or technological innovations generally.

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