

Technology-Enhanced Learning: A New Digital Divide?

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Introduction

Changes in the way we communicate and access information are having a profound effect on the learning landscape. In the first decade of the twenty-first century, there is a growing need to 'adopt and adapt to the technological capabilities that allow information and communication to be distributed anywhere, anytime' (Anderson and Elloumi 2004: xiv). Virtual communication is evolving from a read-only environment to one that enables individual participation. No longer passive recipients of text, users can interact with content, contest meaning and construct new understandings. The internet is the host of a digital revolution and this evolution has identifiable phases; the first generation became known retrospectively as Web 1.0, we are currently experiencing Web 2.0 and there are already murmurings of a semantic Web 3.0 (Anderson 2007).

The internet is an invasive medium which affects not only the educational sector but also the way we shop, bank and socialize, to name just a few of its incursions into daily life. Reliance on technology inevitably raises the question of equality of access. The term 'digital divide' was initially used to signify the difference between those with access to the technology and those without (Lenhart et al. 2002). While this remains a pertinent issue, the term as used in this chapter suggests there are other factors which need to be taken into account. The digital divide in higher education today is increasingly less about unequal access to computers and more about the unequal ways in which they are used (Warschauer et al. 2004).

Education developers in higher education are frequently asked: 'What is Web 2.0?' and the question itself may be seen as evidence of a growing new digital divide. The origins of the terms Web 1.0 and Web 2.0 may be contested but the differences between the two environments are clear. Underneath all the media hype, Web 2.0 applications frequently

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form the core of the online environment students are engaging with in the twenty-first century. Highly social and interactive, they are the antithesis of the VLEs embedded into contemporary university systems and practices. Web 2.0 applications such as Google and Wikipedia are prevalent in the student vocabulary, revealing their influence as students are faced with making relevant navigation choices through increasing quantities of information (JISC 2007, CIBER 2008). Social software provides peer support networks that often exist outside and beyond traditional campus provision. If technology is to be utilized effectively to enhance learning, educators need to keep up to date with student requirements, yet research into the student voice suggests that internet developments are outstripping institutional support at an alarming pace. The use of the World Wide Web is presenting a challenge; not only to long-established university structures but also to traditional models of teaching and learning (Laurillard 2002; Garrison and Anderson 2003).

By the end of the twentieth century the first wave of VLEs had been embedded into university infrastructures with an assurance they would transform the teaching experience. In the first decade of this new century, it appears they may have not only failed to live up to their early promise but actively contributed to growing evidence of a digital resistance. Prensky (2001) uses a pioneering analogy of 'digital natives' to describe those familiar with digital technologies compared with 'digital immigrants'; those adrift in an unfamiliar landscape of virtual communication. While division is rarely that simplistic, there is evidence that a gulf between the two, particularly in the educational sector, is widening. The skills of new generations of digital natives are increasingly embedded in Web 2.0 social tools and applications (CIBER 2008), leaving those who have yet to engage with online environments a challenging chasm to cross.

This chapter will examine the roots of this new multi-dimensional divide against the background of technology-enhanced learning in higher education. Looking first at the impact of online learning environments, it will uncover the tension between the conflicting demands of technology and the pedagogy and explore how this may have contributed towards resistance to digital delivery modes. As the read-only Web 1.0 environment transitioned into the collaborative, social world of Web 2.0, then a further strand can be added: the emerging identity of the digital student. Using the latest research into the voice of the student it will suggest answers to the question 'What is Web 2.0.' and assess implications for the university in the twenty-first century. The chapter will

conclude with recommendations for policies and practices in order to build bridges across this new digital divide to enable internet technologies to become functionally embedded into existing systems and institutional strategies.

Technological challenges to traditional practices

It is in the nature of technology to challenge traditional practice. The Luddites of the eighteenth century are not only semantically similar to laggards resisting innovation today but they have a psychological affinity too. Within the higher education sector, resistance to technology-enhanced learning may be a key to a new digital divide, evidenced in particular in the gulf between the net savvy student and those still asking the question 'What is Web 2.0?' The current explosion of open source software, social networking and student preferences for Google and Wikipedia as research tools (JISC 2007; CIBER 2008), is widening the gap between those who engage with digital technology and those who still prefer the pen to the keyboard. Within higher education it is possible to identify the specific institutional origins of this resistance, which can be clearly traced to the initial introduction of technology-enhanced learning across the sector; it will be useful to examine these before looking at the nature and characteristics of the divide in more detail.

Universities are harbingers of convention, with a culture and historical identity that ~~are~~ supportive of 'academic tribes and practices' (Becher and Trowler 2001); they are traditionally resistant to change. The National Committee of Inquiry into Higher Education (NCIHE 1997) instigated a need to reassess practice and the report's recommendations included widening participation in higher education to a broader social base. Government targets were set at 50 per cent of 18–30 year olds having some experience of higher education by 2010. Further recommendations included harnessing the power of technology to provide the sector with the means to manage the quality and flexibility of its resources and delivery (NCIHE 1997; HEFCE 2005). Harnesses took the form of a new generation of educational technologies in the form of the Managed and the Virtual Learning Environments (MLE, VLE). These were presented as potential answers to the challenge of widening access and offering opportunities for broadening the sector's social base.

MLEs and VLEs were internet browser based systems containing information about all aspects of the student's learning experience in a digital

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format. The VLE was designed more specifically for supporting teaching and learning. Hosted by an institutional network, virtual environments were embedded into existing infrastructures with the promise of not only widening access but also transforming the teaching and learning experience. Initially, the focus rested on the technology. Attention was paid to systems integration and the processes of information management, rather than the implications for a change in practice (Laurillard 2002; Salmon 2005). Failure to recognize the complex and diverse requirements of teaching and learning was costly, as the majority of managerial policies neglected to acknowledge the need for research into pedagogical change. Institutions pasted new learning technology roles onto existing ones as institutional strategy often failed to recognize that traditional face-to-face teaching activities do not translate easily into an online environment (Garrison and Anderson 2003).

Significantly, the need to address this dual strand was not unforeseen. National strategy had clearly identified the need to ensure that research into the pedagogy of subject teaching was given full recognition (HEFCE 2003) and that support should be given at all stages to the development of the appropriate digital skills (HEFCE 2005). However, consultation at departmental level regarding the use of the new learning environment was frequently absent and innovators hampered by a lack of strategic guidance (Lisewski 2004). Top-down managerial approaches, resulting in pressure to participate, encouraged replication of existing transmission models. Rather than a catalyst for re-thinking pedagogical practice, VLEs were used primarily for hosting the presentational aspects of the traditional lecture.

The VLE was promoted as a one-size-fits-all model with an impressive brief. Promises were made for enhancement of the quality of teaching and learning, enabling accessibility and widening participation (HEFCE 2005) with little acknowledgement that all changes and innovations have inherent risk. Bell and Bell (2005) tell us that 70 per cent of innovations in education fail. Rather than being catalysts to transform the learning experience there was a tendency for VLEs to reinforce existing practice, particularly where there was reluctance to relinquish face-to-face methods of delivery (Salmon 2005). The VLE challenged not only conventional practice, but posed a threat to well established transmission models whereby the subject expert had control of the learning experience (Brown and Duguid 1995). Empowering the student and positioning the learner at the centre of their learning experience contested fundamental roles and practice. As Lamb (2004: 45) says: 'To truly

empower students within collaborative or constructed activities requires the teacher to relinquish some degree of control over those activities.'

The well publicized demise of the UK e-university in 2004 appeared to support the belief that staff and students preferred contact with their colleagues rather than their computers (House of Commons 2005). Across the sector, there was a clear reluctance to abandon the lecture theatre and seminar room for a VLE without sound evidence for the benefits of doing so (Salmon 2005). Educators who recognized the need for a new pedagogical approach to learning technology advocated moving away from traditional modes of delivery and giving priority to constructivist models taking advantage of opportunities for online collaboration. Academic structures, such as the Five Step Model (Salmon 2000) and the Conversational Framework (Laurillard 2002), were instrumental in the transition of the learning process from a face-to-face environment into an online dialogue; a three way virtual interaction between ideas, colleagues and tutors that supported the collaborative construction of knowledge. These cognitive processes endorsed the value of active engagement with content. Interaction was seen as the catalyst for creating both powerful learning experiences and constructing virtual 'communities of enquiry' for the stimulation of high levels of critical debate (Garrison and Anderson 2003).

The influence of the internet

There was no single point where the Web 1.0 technology underlying the VLE became known as Web 2.0. The transition was more a gradual development of existing platforms and applications (O'Reilly 2005; Anderson 2007). While there is no single definition of these terms, there are points of difference which clearly distinguish between them. Web 1.0 enabled users with the appropriate skills to publish text and images online. The need for a specific skill set helped ensure controls remained in the hands of the few; the implications of this for higher education being an emphasis on 'how' the technology worked rather than 'why' it should be utilized. The learning curve for the non-technical individual was high. With few positive examples to demonstrate enhancement of learning, the barrier of technological competence remained unchallenged. Online resources were not hugely exciting. File compression was in its infancy, and narrow bandwidths limited the use of multimedia. As a result, the Web 1.0 phase of internet, and the VLE it supported, consisted mainly

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of text and still images. In the majority of cases, audio and video provision was patchy and problematic, and opportunities for interaction were virtually non-existent.

Web 2.0 tackled the issue of user involvement head on. It provided a different environment, one which offered file compression supporting the production of digital audio (mp3 podcasts) and digital video (mp4 videocasts). This in turn stimulated the production of reusable online learning objects. National repositories of resources such as Jorum (UK) and Merlot (US) offered free access to a broad mix of educational and often interactive blocks of learning. Dramatic shrinkage in download times eased resource transmission. The capacity of data storage devices increased while they became increasingly portable. The Web 2.0 environment matured alongside technology that was wireless and mobile. Laptops could connect to the internet without network sockets and cables. GPS enabled mobile phones offered an 'anytime, anywhere' online experience. Whereas Web 1.0 was static, Web 2.0 is dynamic, with an architecture based on open source software, one which frees the user from the restraints of commercially available programs and ensures applications are freely available to download. Interaction through social software such as blogs, wikis and bookmarking has constructed a new and vibrant network of communication systems with interaction between content and users at the centre. The resulting interactive network of communications closely resembled the original vision for the World Wide Web, which envisaged the putting in of ideas as well as taking them out.

I wanted the Web to be what I call an interactive space where everyone can edit. And I started saying 'interactive', and then I read in the media that the Web was great because it was 'interactive', meaning you could click. This was not what I meant by interactivity. (Berners-Lee 1997)

This interaction and the transfer and exchange of information supported a founding principle of the Web 2.0 environment: the more it is used the more it improves (O'Reilly 2005). As creators, sharers and editors of information, the participants themselves have value, not just as consumers but as innovators and agents of change. The user of Web 2.0 is also the creator of Web 2.0. Syndication threads track information changes and inform users of new content; tags enable the creation of categories, organizing and sharing information systems relevant to individual requirements. Web 2.0 technologies ensure the individual has a voice that can be heard and responded to with a significant amount of user control over virtual worlds and experiences. If the

pedagogical challenge of the VLE was radical, then the challenges of Web 2.0 are even greater, especially for those at the pen end of the digital divide. There is a new vocabulary to be mastered, for example blog, wiki, tag clouds and mashups. Software has deliberately mis-spelt names like Flickr, Digg and ~~Del.icio.us~~. Emphasis on the social benefits of the programs ensures users can freely personalize their own virtual environment and take advantage of a flexibility which offers multiple choices about where, when and how to interact online. Once Massively Multiplayer Online games (MMOs), and active immersive 3D virtual worlds such as Second Life are added into the mix of technologies available for educational innovation, then a threshold point is created along the continuum of online learning engagement; one which becomes indicative of the new digital divide.

Virtual Learning Environments have not been entirely left behind. The majority of institutions still support some form of browser based platform; either open source software such as Moodle or a managed environment system like Blackboard, and in recognition of the new collaborative opportunities of the internet, VLEs now incorporate additional plug-in tools.

Blogs and wikis

Opportunities for collaboration via collaborative tools such as blogs (or Web-logs) and wikis, both synonymous with the term Web 2.0, are becoming more frequent and both are increasingly being evaluated for their educational potential. Blogs and wikis consist of online web pages with a text editor facility. This enables users to have an internet presence with a minimum of technical knowledge. They are markedly different environments compared to the first generation websites and VLEs. Their open nature ensures they can be publicly available, unlike an institutional network which is restricted to registered users and hidden behind user identification names and passwords. Crucially, neither the blog nor the wiki were designed exclusively for educational purposes and this independent existence may be one of their greatest strengths. The VLE was developed to support learning. As a result there was a tendency for the technology behind it to drive the policies designed to ensure engagement. Web 2.0 tools such as blogs and wikis have no allegiance to the educational sector and exist independently from corporate control. This ensures they can be adapted and used to support learning in response to individual requirements; processes evident from their early use within the educational sector.

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The blog has been the core of personal internet publishing. Popular for its cross-discipline nature and capacity for objective public debate, its challenge to traditional academic behaviour was part of the early attraction. As Farrell (2005), a founding member of the first academic blog *Crooked Timbers* says '[blogs] are likely to transform how we think of ourselves as scholars. While blogging won't replace academic publishing, it builds a space for serious conversation around and between the more considered articles and monographs that we write'.

Unlike formal participation on a VLE discussion board, blogging traditionally incorporates a personal point of view. Blogs have been adopted as tools for reflection; their value extended by the opportunity for readers to post comments on blog entries. In addition, the software is designed to encourage users to personalize their individual online space. It has been suggested that the ability to personalize, and the subsequent sense of ownership, is conducive to wider participation. Also, the social nature of blogs, with their freedom from institutional controls, can actively encourage a broader range of perspectives (Downes 2004). Unlike the blog where comments are read-only, the wiki combines reading with the facility to edit, enabling online communities to interact and collaborate on shared documents. Wikipedia, the online encyclopaedia based on wiki technology, is increasingly popular with students (CIBER 2008). Perceived as lacking academic credibility, it was famously challenged against the Encyclopaedia Britannica. A similar number of mistakes were discovered in each; the wiki having the advantage that its errors could be corrected in seconds (Giles 2005). The wiki is an embodiment of Open Source software with a structure shaped and defined by its users. Functioning on the ethic of 'SoftSecurity' it is reliant on the community to enforce order, a treatise which has proved dependable within the Web 2.0 platform. As Lamb (2004: 40) says 'The proportion of fixers to breakers tends to be high, and a wiki will generally have little difficulty remaining stable'.

The effect of increasingly digital lifestyles on education providers

Developments and advances in mobile and wireless access ensure that exposure to the internet is continually widening. The prevalence of digital technology means that a new generation has grown up in a predominantly

electronic environment. Research suggests that increasing exposure to digitization is creating new brain patterns which may have a significant impact for teaching the learners of the future. Prensky (2001) claims that these digital lifestyles have created a new generation of digital natives who are comfortable with virtual communication. Those who find themselves adrift in this new world are the digital immigrants, speaking 'an outdated language (that of the pre-digital age) [and they] are struggling to teach a population that speaks an entirely new language' Prensky (2001: 2). Research within the United States suggests that digital competency is leading to significant shifts in lifestyle (Oblinger and Oblinger 2005). Findings include a tendency for students who can select from a previously unimaginable quantity of digital information to become more strategic, only expressing interest in what they feel they need to know. Levels of concentration appear increasingly short-lived. Instant communication via text or instant messaging is favoured and the ability to multi-task is commonly reported. The majority of students exhibit a 'bricolage' behaviour pattern where their preferred style of learning is discovery-based; exploring and manipulating a multiplicity of media (Hartman et al. 2005).

Research across the educational sector in the United Kingdom also reveals a range of new competencies and preferences, suggesting that digital learners of the future are unlikely to have a single voice (Rudd et al. 2006). Research within higher education strongly suggests that technical skills are not synonymous with the ability to learn online, reflecting the divide between the technology and pedagogy (Sharpe and Benfield 2005). In 2006, the Joint Information Systems Committee (JISC) carried out two studies; LEX, the JISC Learner Experience of eLearning (Creanor et al. 2006) and LXP, the JISC Student Experiences of Technologies (Conole et al. 2006). The findings show a wide dependence on the internet and mobile technology (JISC 2007). They provide the strongest evidence yet for a widening divide between those who use the internet as part of their daily life, and are comfortable with the digital enhancement of learning, and those at the opposite end of the continuum who have yet to begin their engagement.

The key findings from the learner's voice (Creanor et al. 2006) demonstrate clear evidence that students' lifestyles are increasingly digital. There is frequent reference to strong peer support networks via email, texting and online messaging which suggest high levels of social interaction between students. Digital networking provides a personal support system both on and off campus with personal mobile phones, laptops and PDAs all cited as

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playing a constituent role in their learning experiences. This is not always mirrored by staff. 'I think it depends on the teacher really . . . if they're on board with it a hundred and ten percent then you'll be included. If they're not then they won't use it and neither will you' (Creanor et al. 2006: 16). Both reports reveal reluctance by academic staff to be involved with learning online: 'the tutor was, like, "I've never seen this [online resource] before and I don't even know what it is and I hope I don't have to get involved in it"' (JISC 2007: 23). The university of the twenty-first century needs the prerequisite skills to understand the challenges of a digital lifestyle and there are a growing number of educators suggesting that 'claims of technical illiteracy' have no viable future (Fisch 2007). The prevalence of the internet as revealed in the voice of the learners suggests a growing need for teaching and support staff to be equipped to deal with digital competencies and lifestyles.

The reports also clearly indicate how student familiarity with a range of personal technologies, and the opportunities to personalize their learning environment, gives them confidence with a range of digital tools, for example a mobile phone can offer multiple methods of communication:

I use my phone because it's like a mobile internet to me . . . unlike the email [where] I need to go on the computer and open my mail box; but with the mobile phone, I can get any communication any time I want. (JISC 2007: 21)

Great importance is attached to digital tools, and students are reluctant to give them up even if this causes conflict with technical support once they arrive at university. 'I use my laptop. I take it away, it's attached to me, I couldn't survive without it' (JISC 2007: 18). There is a clear implication here for institutional policy. As well as supporting a corporate network, an additional infrastructure for testing the effectiveness and appropriateness of new technologies and applications would extend student technological support to a wider range of open source options; ones which it is increasingly likely students will be expecting to find and use.

There is also evidence that student confidence with technology may be superficial. A lack of depth is particularly clear when searching for information online. Digital students demonstrate a tendency to take findings at face value and spend insufficient time evaluating accuracy or relevance. The skills required to make appropriate choices are frequently absent. Internet search engines, in particular, Google, and collaborative websites such as Wikipedia

are preferred to libraries and learning centre provision for information retrieval:

Well, I use Google almost every day. And it actually turns up quite a bit of scientific data and if you go to 'Limit', or do a special search or detailed search, you can limit things down too. Well, you can take off .dot or .co.uk sites and then it tends to give you back scientific sites and I turn up quite a bit of information through that. (JISC 2007: 19)

Students cite the low cost compared to purchasing text books and the convenience of going online compared to travelling. 'They're [tutors] saying use books but books cost money so the internet is the main thing that we end up using' (JISC 2007: 23). These findings are reinforced by research commissioned by the British Library and JISC to identify the information behaviour of the researcher of the future (CIBER 2008). An over reliance on Google Scholar, a lack of effective research strategies and 'power browsing' through titles, content pages and abstracts are all cited by CIBER as evidence that electronic publishing and mass digitization are making it increasingly difficult for students to focus on text in depth. 'Everyone exhibits a bouncing/flicking behaviour, which sees them searching horizontally rather than vertically. Power browsing and viewing is the norm for all' (CIBER 2008: 8). As the internet opens up new possibilities for research, institutions may have to accept they can no longer remain in total control of access to information and that strategies need to ensure an increased focus on technical support and information literacy skills. The research shows that IT confidence should not be mistaken for IT competence and that digital literacy skills are essential for effective use of search engines and assessing the accuracy and relevance of online content.

Emerging good practice

Research into the use of digital technology to enhance the teaching and learning experience is currently funded by a number of national organizations. These provide strategic information to enable institutional policy-makers to make informed decisions that are relevant to their own e-learning initiatives.

The Joint Information Systems Committee (JISC), already mentioned in this chapter for their research into the student experience of online learning

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and digital resources, provides funding for a wide range of research into the innovative use of ICT across the further and higher education sectors (Anderson 2007; JISC 2007). Their strategic themes include e-learning, e-research and e-resources. JISC-supported services include JISC InfoNet which offers advice on the management of ICT to support teaching and research, and Intute which provides free access to examples of educational web resources.

JISC is an implementation partner of the HEFCE e-learning strategy (HEFCE 2005) along with the Higher Education Academy (HEA). The HEA works to enhance the higher education teaching and learning experience and, with JISC, has led the Pathfinder Project ~~which~~ included an e-learning benchmarking exercise to analyse institutional e-learning provision and processes, and funding for e-learning Pathfinder Projects designed to implement organizational change (Morrison 2008).

The Beyond Distance Research Alliance at The University of Leicester manages a number of Pathfinder Projects including the Advanced Design for E-Learning: Institutional Embedding (AMELIE) and the Informal Mobile Podcasting and Learning Adaptation (IMPALA). It has also created the virtual Media Zoo; an experimental online area for staff researching into the educational use of digital technologies.

The HEA funds 24 Regional Subject Centres who are all taking part in the HEA Distributed e-Learning programme (DeL) looking to engage with the HEFCE e-learning strategy and research into the use of technologies to support learning and teaching. HEA also works in strategic partnership with the Heads of e-Learning Forum (HeLF), relevant Centres for Excellence in Teaching and Learning (CETLs) and the Association for Learning Technology (ALT); all with a remit to research into the use of digital technologies to enhance the teaching and learning experience.

The Observatory on Borderless Higher Education (OBHE) is an international strategic information service and one of the leading sources of strategic information on transnational higher education. 170 organizational subscribers represent 50 countries worldwide; all being engaged in various aspects of transnational higher education and dedicated to sharing of their institutional experiences relating to the planning and managing of e-learning.

At the University of Lincoln, the Centre for Educational Research and Development (CERD) has tackled the issue of the digital divide by setting up an online LearningLab; an experimental area for staff which is dedicated to

investigating how Web 2.0 tools can further enhance teaching and learning. Current research in CERD includes an extensive study of the student experience of online learning (Watling unpublished) and the use of templates to create customizable online learning objects.

Conclusion

It may not be possible to predict the future of higher education but it will almost certainly be increasingly digital. This chapter has tried to show how developments in virtual technologies have resulted in a continuum of engagement among academic staff with a threshold point dividing those who are familiar with the new digital tools and those who still prefer a pen to a keyboard. The implications of this divide for those at the pen end of the continuum are significant. Many students arrive on campus with increasingly digital lifestyles; accustomed to access to multiple virtual landscapes. If the university of the twenty-first century is to be equipped to deal with the digital student, it must have systems and staff who are prepared to be digital too.

The internet has been called a 'disruptive technology' because it is a powerful agent for change (Anderson and Elloumi 2004). Its evolving systems of information management and social software present challenges to institutional policy which must effectively embed new technologies into existing systems and also be responsible for the diverse needs of staff engaging with them. As Beckton says in Chapter 5, there is an argument for a subtle response to enhancement but, according to Crawford (Chapter 6), the responsibility for ensuring staff continuing and professional development is far from being clearly delineated. This chapter shows how information literacy must become a fundamental part of the teaching toolbox and corporate networks have to acknowledge the need to be responsive to a diverse range of digital environments.

How can this be done? The internet and the educational sector share common foundations of knowledge and communication. It should be possible for them to augment each other rather than be divisive and for structures to be identified for creating links between the two. These bridges may include ensuring that future policies work towards a more holistic approach, creating flexible systems which can respond to new internet developments. Traditional transmission models could be translated into collaborative online activities and staff offered the apposite training and support for appropriate

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use of these new online environments. There is no single mechanism which would narrow the digital divide, and no single path across it; even if there were, it might not be the most effective option. Instead, the concept of building bridges to support both the technology and the pedagogy, allowing two-way traffic between both the analogue and the digital experiences of staff and students, would provide the opportunity to meet in the middle at whichever point is most appropriate for individual needs and lifestyles.