UNIVERSITY OF
LEADING
THE WAY
WESTMINSTER⌗

WestminsterResearch
http://www.westminster.ac.uk/research/westminsterresearch

An Investigation into the Potential Use of Social Media Technologies to improve the Product Development Functions within the Aerospace and Defence Industry

Richard Evans[1]
James Gao[1]
Nick Martin[2]
Clive Simmons[2]

[1] University of Greenwich, UK (now working at Westminster Business School, University of Westminster)
[2] Electronic Systems, BAE Systems, Rochester, United Kingdom

AN INVESTIGATION INTO THE POTENTIAL USE OF SOCIAL MEDIA TECHNOLOGIES TO IMPROVE THE PRODUCT DEVELOPMENT FUNCTIONS WITHIN THE AEROSPACE AND DEFENCE INDUSTRY

Richard D. Evans
James X. Gao

School of Engineering
University of Greenwich
Central Avenue
Chatham Maritime
Kent, ME4 4TB, UK
R.D.Evans@greenwich.ac.uk

Nick Martin
Clive Simmonds

Electronic Systems
BAE Systems
Rochester
Kent, ME1 2XX, UK

ABSTRACT

Competition in global markets has resulted in increased demands for improvements in manufacturing processes. Enterprises have to re-engineer work practices and have shown that the effective communication of knowledge is fundamental to Product Development (PD). It is vital that cross-functional internal and external collaboration is optimised within PD processes and this should be facilitated through early, frequent and effective communication of information and knowledge. Social Media sites represent a new stage in the evolution of the Internet. Sites such as Facebook and Twitter, offer users the ability to stay connected online with friends and colleagues around the world in real-time; similarly, they offer the ability to locate expertise, knowledge and solutions to problems. The results of an industrial investigation, carried out within a leading aerospace and defence organisation, are commented upon and an interactive groupware solution is introduced, which aims to facilitate collaboration between dispersed product development teams.

Keywords: Product Development, Social Media, Knowledge Management.

1   INTRODUCTION

The last two decades have been characterised by major developments in enterprise globalisation and technological advancement, particularly highlighted by the birth of the Internet. This has resulted in many opportunities being created for businesses, but also many problems. In an increasingly competitive global marketplace, organisations in the 21st century have had to overcome challenges presented on a number of fronts which include: (i) meeting complex requirements of customers who demand lower cost, higher quality solutions; (ii) managing the explosion of electronic data which has been facilitated by the increasing use of the internet and technological advances and; (iii) establishing effective communication channels between employees and external partners anywhere in the world (Shehab et al. 2009). The Aerospace and Defence Industry (ADI) is an industrial sector, which has a record of product innovation and where the UK enjoys a global reputation as a world leader. The sector employs highly skilled and competent work forces and is commited to promoting high performance work practices (Richardson et al. 2010). The ADI is also an industrial environment where significant development of collaborative work practices has already taken place, but where further major opportunities exist for improved Knowledge Management (KM) and the utilisation of Web 2.0 and Social Media technologies.

In today's global business environment, manufacturing companies are becoming increasingly aware of the need for on-going product innovations and efficient Product Development (PD) in order to ensure their commercial survival (Rebolledo and Nollet, 2011). A significant challenge facing companies is to facilitate the collaboration of all employees within geographically dispersed teams in order to meet common goals while sharing, developing and retaining knowledge and ideas during on-going PD processes. The use of collaborative web-based technologies, such as Social Media sites, is seen as providing the potential to address this challenge by allowing project review teams to access data, records of knowledge contributions and social interactions, all of which would benefit subsequent PD activities (McAdam, O'Hare and Moffett 2008). Similarly, it is recognised that effective enterprise collaboration may be facilitated by the integration of people, processes, information and knowledge through social media technologies. In the past, collaboration would often have taken place by phone, fax or in face to face meetings, at significant financial and time costs to organisations. With the rapid growth in the popularity and use of social media sites today, however, members of PD teams can now be located thousands of miles apart and still retain the ability to share and address issues with minimal loss of time and cost. The World Wide Web (WWW) can provide an interoperable means for collaboration, utilising software applications on a variety of platforms and frameworks.

2 WEB 2.0, SOCIAL MEDIA AND ENTERPRISE 2.0

Businesses in the ADI recognise that organisational knowledge has an essential role to play in responding to competitive pressures and, for an increasing number of companies, opportunities to establish competitive advantage lie in their ability to enhance ideas and intellectual know-how through the use of social web technologies. By making more effective use of their knowledge assets, organisations can benefit from PD breakthroughs and improved processes and practices. Web 2.0 technologies and, in particular, social media sites, have a key role to play in supporting organisational KM as they can facilitate efficient transfer, storage and integration of knowledge. The use of Social Media in organisations allows workers to connect, share information and collaborate across physical and organisational boundaries. By integrating these Web 2.0 technologies into business work processes, companies are able to (i) facilitate connectivity, sharing and collaboration across boundaries; (ii) capture a wide base of views and information that is usually informal or highly dispersed throughout the organisation and; (iii) help employees locate previously unknown experts and discover organisational knowledge.

Social media, with its emphasis on user-generated content, can help encourage open communication and information sharing and can allow for online communities of practice and knowledge to be formed (Kim et al. 2010, Smith and Kidder 2010). Expertise and solutions to problems need no longer remain "hidden" as they can be actively sought out and exploited within a social media collaborative environment. Enterprise 2.0 sites, such as Yammer and Salesforce, refer to the use of Web 2.0 tools in a business context. Users are able to upload, share and refine work-related documentation and share it with colleagues around the global operations of an organisation via the Internet. The software allows organisations to make visible the knowledge and skills that their workers already possess and make it available to colleagues elsewhere. Many businesses today appreciate the benefits of being more social in their work practices. Tools, such as wikis and micro-blogs, allow for greater productivity and collaborative innovation; they also allow for iterative communication, allowing project team members to edit each other's work in a collaborative fashion to get the best result possible. Fraser and Dutta (2009) predict that Worldwide corporate spending on Web 2.0 software will reach $4.6 billion in 2013, which represents an annual growth rate of 43% since 2008.

3 INDUSTRIAL INVESTIGATION

BAE Systems is a multi-national organisation employing approximately 100,000 people worldwide across its range of businesses. The organisation is the second largest aerospace, defence and security company in the world and is involved in the design, manufacture and provision of advanced products and

services for global markets in the commercial, military and security sectors (BAE Systems 2011). The last ten years has seen significant growth in the volume of electronic data being generated within the organisation and document management has proven to be an issue for the company. At the end of the last decade, the volume of data being generated was growing at an estimated rate of 41% per annum and the scale of the problem was doubling in size every two years with the company having to manage over 1000 different file types. Technological improvements in terms of information search and retrieval, knowledge sharing, document storage and team collaboration are seen to offer significant benefits, including increased agility when reacting to business change, improved collaboration and increased availability of good information to aid decision making.

In late 2011, an in-depth survey of nearly 150 senior managers and engineers was conducted within the company. The survey, which was hosted on surveymonkey.com, produced an encouraging 46% response rate and provided a very good insight into the use of Social Media technologies within the company. Firstly, when respondents were asked what use was being made of Social Media tools within BAE Systems, responses indicated that familiarity with and corporate usage of social media tools is relatively low with 20% of respondents stating that no use or very poor use is being made of them; furthermore, 31.4% of respondents stated that they "don't know" what use BAE Systems is making of social media tools. It is fair to say that fewer than 50% of respondents demonstrated a good understanding or a positive view towards the use of Web 2.0 and social media technologies within the company. When the investigation focussed on what opportunities existed for making greater use of Social Media within the organisation, the majority of respondents stated that interactive web tools could support "greater knowledge sharing, communication and collaboration" and allow for individuals to contribute information towards a collective project. There was a common view that across the different BAE Systems sites there are people fulfilling the same or similar roles and there is very little communication or collaboration between these people; social media presents an opportunity to address this. When questioned on awareness of social media sites, BAE Systems' employees demonstrated a high degree of familiarity with the more popular social media sites; the most recognised are Youtube (75%), Facebook (71.9%) and Twitter (65.7%), followed by Google+ (59.4%), Flickr (56.3%) and Myspace (50%) (see Figure 1).
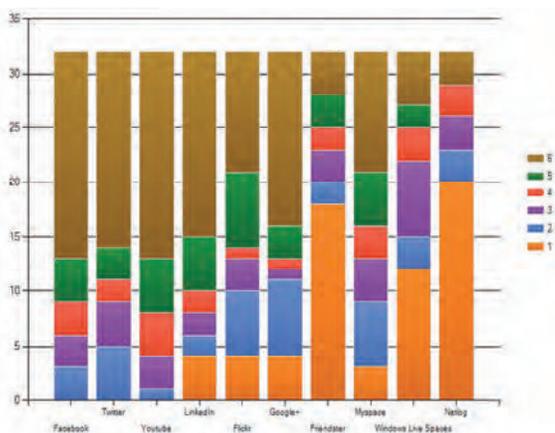

Figure 1: Employee Awareness of Social Media Websites

Linkedin, which is a social media site authorised for use by BAE Systems in the UK, is also well known to respondents (68.7%); however, it is worth noting that approximately 1 in 4 employees still

appear unaware of its existence. While a a high degree of familiarity with social media sites was in evidence among respondents, it is notable that little use appears to be made of them by employees, even when no attempt has been made to differentiate between 'business' and 'personal' use. Considering usage by site specifically, only 40% of respondents use Facebook 'more than once a week' and, in the case of Twitter and Youtube, this figure falls to only 28%. Furthermore, Google+ (18.8%), Flickr (12.5%) and Myspace (6.2%) demonstrate even less frequent usage (see Figure 2).
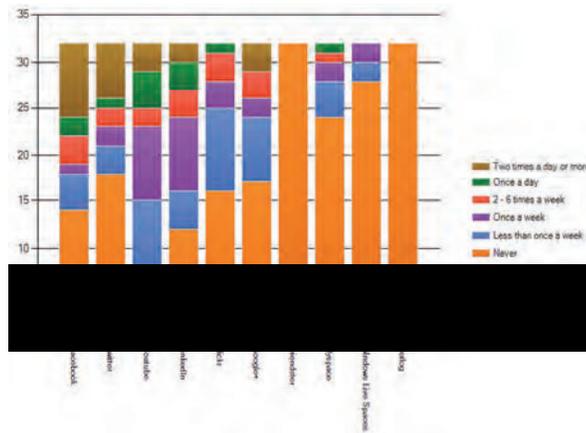

Figure 2: Frequency of Use of Social Media Websites

When the investigation focussed upon the specific process of collaboration and how employees interacted and shared knowledge and ideas within project teams, there was clear evidence that traditional methods of communication were still being used routinely, with little reference being made to more recently introduced Web 2.0 tools. Over 50% of all respondents stated that face to face meetings were the main method of communication, while 47.2% confirmed the significant role played by e-mails in communication; this reinforced the findings of Jackson et al. (2008) who reported that in July of that year 15 million e-mails had been sent internally. Video or teleconferencing is seen to play an important role within the organisation and shared document servers are seen as important by 32%. In terms of more web-based solutions, Microsoft Sharepoint sites are seen as important by 22.6% of respondents and these rank more highly than the telephone, which accounted for only 20.8% of responses. Instant messaging and Web 2.0 tools, such as wiki's, blogs and social networking sites including Yammer and LinkedIn, were identified as being important by only 13.2% or less by respondents. A detailed breakdown of the different methods of communication of knowledge is given in Table 1.

4   THE PROPOSED INTERACTIVE GROUPWARE SOLUTION

Based on the results of the industrial investigation, it is proposed to develop an interactive collaborative groupware solution, which will incorporate a bespoke BAE Systems user interface (see Figure 3). The groupware will be made accessible using a variety of devices, which will include, but are not limited to: An interactive capacitive touch screen all-in-one unit with integrated web camera; Personal computers; and Handheld portable devices, including smart phones and internet tablets. It is proposed to design a high impact user friendly and accessible front end with easy-to-use navigation and functionality, which complies with the W3C's Web Content Accessibility Guidelines (WCAG). The groupware will be designed using HTML5, CSS3 and JavaScript programming languages to maintain accessibility and usabil-

ity on a variety of devices. The associated database will be coded in PHP and content will reside on a MySQL database. The collaborative prototype will include: Fast and easy access to uploaded user-generated content; Instant messaging; Project discussion board; and Timeline file management tool. During PD activities, new concepts and lessons learned will be recorded and uploaded to the groupware site from a variety of file types including video, images, documents and presentations. These will be immediately available to view by project team members anywhere in the world who will then be able to add further comments and ideas to enhance the collaborative new product development process in real-time. Additionally, users will able to collaborate one-to-one using the embedded instant messaging facility or one-to-many using the on-screen discussion board.

Table 1: Knowledge Sharing Methods within Project Teams

Method	% of Responses
Face to Face Meetings	54.7
E-mails	47.2
Video/Tele/Web Conferencing	45.3
Shared Document Servers	32.0
Microsoft Sharepoint Sites	22.6
Telephone	20.8
Instant Messaging	13.2
Other Web 2.0 tools inc. Wikis and Blogs	13.2
Social Networking Sites, inc. Yammer and LinkedIn	11.3
Informal communication	7.5
Workshops	5.7
Face to Face Meetings	54.7
E-mails	47.2
Video/Tele/Web Conferencing	45.3
Shared Document Servers	32.0
Microsoft Sharepoint Sites	22.6
Telephone	20.8
Instant Messaging	13.2
Other Web 2.0 tools inc. Wikis and Blogs	13.2
Social Networking Sites, inc. Yammer and LinkedIn	11.3
Informal communication	7.5

5   CONCLUSIONS

The investigation showed that an increased usage of online collaboration and data exchange methods would be welcomed by respondents. It was recognised that Microsoft Sharepoint, which has been introduced at various business units over the past few years, had impacted positively on practices within the organisation and there was recognition that the internet could provide employees with more dynamic interactivity, rather than merely relying on more passive methods of communication, such as e-mails. It was suggested that interactive functionality could allow for formal record keeping, logging of decisions, sharing of information and discussion of ideas. It was also proposed that increased use could be made of Web 2.0 tools, such as wiki's and blogs to improve collaboration and inform work practices. Social media applications, such as chat rooms and forums, could be utilised to seek out information and answers to problems, while a central repository of corporate files could be established to improve access to data. A corporate groupware designed to enhance the sharing of information, beyond simple exchange of data, would

be received positively by respondents and, ultimately, knowledge management and collaboration could be enhanced within the organisation. It was recognised that social media tools, which are growing in use significantly in personal lives, have potential for use in corporate KM. The investigation confirmed that the internet is seen as allowing BAE Systems and wider industry the opportunity to overcome barriers to collaboration and KM, which exist within organisations. It offers enterprises the prospect of revealing concealed expertise and exposing employee knowledge and skills; ultimately, it allows dispersed teams to collaborate effectively and more efficiently on a global scale.
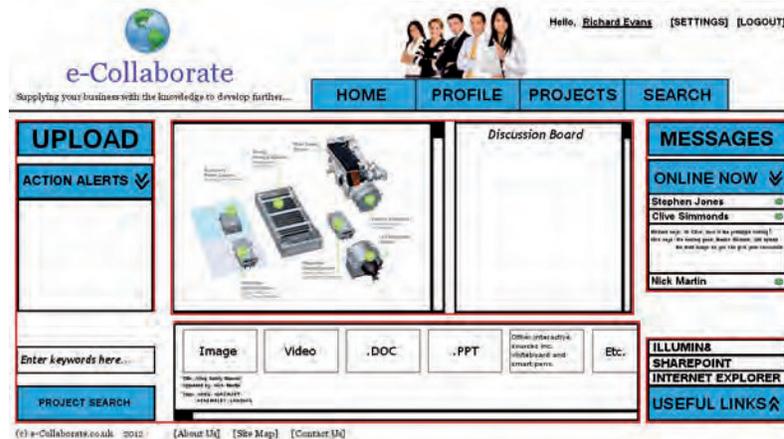
Figure 3: Design of Groupware Front End

REFERENCES

BAE Systems, 2011. *Key Facts*. [online] Available at: http://www.baesystems.com/AboutUs/FactSheet/index.htm [Accessed 15 June 2011].

Fraser, M. & Dutta, S. 2009. *Is Web 2.0 creating a staff productivity paradox?* Available at: http://www.mycustomer.com/item/134363 [Accessed 12 November 2011].

Jackson, I., Humphrey, J., Carrie, M., Hodgson, M. and Binns, J. 2008. *Document and Record Management Strategy*. BAE Systems.

Kim, W., Jeong, O. & Lee, S. (2010) On social Websites. *Information Systems,* 35**,** 215-236.

McAdam, R., O'Hare, T. and Moffett, S. 2008. Collaborative knowledge sharing in Composite New Product Development: An aerospace study. Technovation, 28(5), pp. 245-256.

Rebolledo, C. and Nollet, J. 2011. Learning from suppliers in the aerospace industry. International Journal of Production Economics, 129(2), pp. 328-337.

Richardson, M., Danford, A., Stewart, P. and Pulignano, V. 2010. Employee participation and involvement: Experiences of aerospace and automobile workers in the UK and Italy. European Journal of Industrial Relations, 16(1), pp. 21-37.

Shehab, E., Bouin-Portet, M., Hole, R. and Fowler, C. 2009. Enhancing digital design data availability in the aerospace industry. CIRP Journal of Manufacturing Science and Technology, 2(4), pp. 240-246.

Smith, W. P. & Kidder, D. L. (2010) You've been tagged! (Then again, maybe not): Employers and Facebook. *Business Horizons,* 53**,** 491-499.