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The information environment and information behaviour of the Offshore Installation Manager (OIM) in the context of safety and emergency response: an exploratory study

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Abstract

The offshore installation manager (OIM) is a unique role in the oil and gas industry with the legal responsibility for the health and safety of individuals on an offshore installation, as well as holding commercial responsibilities. Using exploratory, qualitative data based on 10 interviews conducted with OIMs, the information environment and behaviour of the OIM is described and areas for further research are explored. The OIM's information environment is one which is complex and relies heavily on both formal and informal sources of information. Two modes of OIM information behaviour are identified; everyday information need, in which the OIM seeks, uses and shares information to maintain safe operations; and emergency information need, in which there is both reliance on information which must be known in order to react to an emergency situation, as well as a need for information to be accessible about the status of a rapidly changing environment. The OIM is both the user of information as well as a source of information for others and as such must be trusted, reliable and automotive.

Keywords

Information environments; information use; workplaces; offshore; oil and gas industry.

Introduction

The extraction of hydrocarbons from geological formations is a challenging process which involves operations both onshore and offshore. Such operations have been at the forefront of technological innovation and are boundary stretching, often conducted in inhospitable environments and unsafe conditions. The United Kingdom Continental Shelf (UKCS), principally the North Sea, is regarded as one of the most challenging offshore environments in the industry. Offshore installations are remote, often subject to treacherous weather conditions, and the workforces who operate them undertake demanding shift patterns. The workforce may be comprised of permanent staff employed directly by the operators of platforms, but more regularly consists of a mixture of operator employees, contractors, sub-contractors and self-employed experts. A research team at Aberdeen Business School has over a number of years conducted research into the management of health, safety and competence [1, 2, 3], supported by OPITO (Offshore Petroleum Industry Training Organisation), a focal point for skills, training and workforce development in the oil and gas industry. An emerging theme from previous research projects was the criticality of safety leadership and its impact on the safety behaviour of oil and gas industry employees.

There are 107 oil platforms and 181 gas platforms in the UKCS [4]. There is a statutory requirement for all manned offshore installations to have an Offshore Installation Manager (OIM), the most senior person on board, taking legal responsibility for the health, welfare and safety of personnel on the installation, as well as responsibility for maintaining production efficiency of operations and maximising economic recovery. OIMs play a central role in creating and maintaining a safe environment on an offshore installation, yet have received limited attention from the academic community since the work of a group of psychologists in Aberdeen in the 1990s [5, 6, 7, 8, 9].

The present research sought to answer several questions: what constitutes the OIM's information environment? What role does information play in the OIM's workplace in terms of maintaining safe operations and responding to emergency situations? How does the OIMs information environment shape the OIMs information behaviour?

This paper presents the results of exploratory research from an interview-based study of OIMs, sponsored by OPITO, in which OIMs were asked to describe the types of information they required for their role in terms of health, safety and emergency response, and how they share such information, to allow the research team initial insights into the OIM's information environment and behaviour.

Literature review

Industry context

With the first producing well in the UKCS struck in 1965 by BP, the oil and gas industry is one which has celebrated many achievements but which has also been from the outset visited by periodic disaster. The first such incident occurred in December 1965 when the Sea Gem platform collapsed during transportation, resulting in the death of 13 crew members [10]. As a result of the inquiry into the Sea Gem disaster it was recommended that offshore installations have an individual in a role of authority, similar to the captain of a ship [11].

The Mineral Workings (Offshore Installations) Act 1971 [12] stipulates the requirement for an OIM to be appointed for installations in the UKCS. However there were initially no guidelines on the competence of those individuals appointed, and this resulted in the selection of individuals with either Royal or Merchant Navy backgrounds [5] as this was considered the role most similar to that of OIM.

In 1988 the worst disaster in terms of loss of life the industry has seen occurred in the North Sea. The Piper Alpha Platform was operated by Occidental and was situated 100 miles north-east of Aberdeen. On the evening of 6th July 167 men lost their lives in an accident which was caused by fire and explosion, although its root causes were attributed to poor communication and management, and in particular the performance of the OIM. A condensate injection pump, which had been disabled for maintenance by the day shift, was started by the nightshift "due to a failure in the transmission of information under the permit to work system¹ and at shift handover" [13, p. 121 Para 6.188], and was the triggering action for the incident. It was found in the subsequent Cullen

Inquiry that “in many ways merely lip service was paid to the permit to work system and that in reality communication was relied upon either by word of mouth or by habit ... [and] such an approach put too high a premium on informal communications” [13, p. 194 para 11.4]. The OIM, Cullen concluded, would have quickly become aware that all safety systems in place were rendered ineffective due to the nature of the incident, and it was “unfortunately clear that the OIM took no initiative in an attempt to save life, even if it was that the personnel should choose the lesser of two evils by getting out of the accommodation as quickly as possible” [13 p. 163 para 8.35].

Piper Alpha was a key turning point for the industry in terms of the role of OIM, with a move from that of a figurehead to one of genuine and explicit safety leadership. This move has been facilitated through changes made in the selection and training of OIMs and indeed developments are still occurring in training standards with work carried out by OPITO [14]. Post-Piper there was an attitude shift in industry more generally in terms of safety to a more proactive and mitigating approach to operations. The central recommendation by Lord Cullen was that every operator in the North Sea should prepare and submit a Safety Case to the Health and Safety Executive for approval. The Safety Case must demonstrate that sufficient precautions have been taken to avoid the realisation of a major accident hazard (MAH); incidents which could cause the death of or serious injury to five or more people, or result in significant damage to a platform, for example loss of well control, fire, explosion or even collision with another vessel. Recommendations were also made regarding the selection and training of OIMs, and specifically reference was made to the OIM’s ability to “obtain, verify and consider data communicated to him from various sources for immediate decision making, on which lives are dependent, as a unique feature of the managerial role and warrants specific consideration” [13, p. 353, para 20.59].

More recently in the Gulf of Mexico, the Deepwater Horizon rig sank on 22nd April 2010 after an explosion and fire. Owned and operated by Transocean, whilst drilling on behalf of BP, 11 workers were killed and 16 were injured; the resulting oil spill is considered the largest accidental marine oil spill in the world [15]. In 2011 the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling submitted a report to President Obama in which recurring themes were identified “of missed warning signals, failure to share information, and a general lack of appreciation for the risks involved. In the view of the Commission, these findings highlight the importance of organizational [sic] culture, and a consistent commitment to safety by industry from the highest management levels on down.” [16, 2011, p. ix]. The Commission concluded that the failures attributed to the causation of the Macondo well blow-out could in the majority of instances be “traced back to underlying failures of management and communication” [16, p. 122] and reported that the companies involved “failed to communicate adequately. Information appears to have been excessively compartmentalized at Macondo as a result of poor communication.” [16, p. 123]. There were failures in communication between companies and within companies, and as a result critical decisions were made without sufficient contextual

information or “even without recognition that the decisions were critical” [16, p.123].

Coincidentally, just hours before the Macondo well blow out, the installation was visited by four senior managers, all of whom had experience and detailed knowledge of drilling operations. However during the trip their attention was not focused on the well operations, but was an exercise to emphasise the importance of safety and transfer safety lessons. Despite this emphasis there was little attention paid to safety critical activities which were ongoing at the time [17].

Extensive evidence is thus provided from in depth post-hoc reviews of such disasters that information plays a key role in major accidents, either causally or in seeking to contain impact on personal safety and the physical environment. Information deficiencies have been found in (i) poor communication and sharing of information, with too great a reliance on informal communication; (ii) lack of awareness of information highlighting risks; and (iii) questionable ability of leadership in accessing, verifying and making sense of information, in particular where immediate decisions must be taken and situated in the context of an immediate need.

Safety leadership

Leadership is a complex interaction between the leader, their followers and the situation in which leadership takes place [18 p. 615]. With regards to safety leadership, particularly in the offshore environment, both the followers and the situation are elements which can change considerably in a short space of time. For example, a crew change or influx of specialist crew for a particular job leads to considerable variances in the employees on an installation at any time; it is unrealistic to expect an OIM to be aware of each individual’s knowledge, expertise and previous experience. Similarly the situation can change quickly, most notably in an emergency response scenario when rapid action and coordination is likely to be required. Management and leadership in the offshore environment is further complicated by the challenges of working, socialising and living with co-workers and subordinates, which has been found to influence supervisory decision making [19].

Leadership has been identified as a key component in maintaining a safe organisation; however there has been a limited amount of research into leadership in the major hazards sector. Due to deficient leadership being identified as a recurrent theme in the causation of major incidents such as Piper Alpha, Texas City² and Deepwater Horizon, the Health and Safety Executive commissioned a review of relevant literature with the aim of identifying styles, attitudes, behaviours and practices which represent effective leadership for safety [20].

In the review, ‘transformational leadership’ was identified as a style which enhances perceptions of the ‘safety climate’ - the combination of beliefs, values, and perceptions about safety within an organisation [21]. This model of leadership can also influence safety by enhancing employees’ levels of safety consciousness (i.e. knowledge) [20]. The development of trust between leaders and followers was also identified as important to

safety leadership, and this was found to be facilitated by open and accurate communication:

“Safety communication between management and the workforce is associated with a reduction in the levels of risk taking behaviour, promotion of positive safety behaviours and reduced levels of self-report work-related pain.” [20, p. vi]

A lack of open and trusting channels of communication for the sharing of safety related information was identified as a contributory factor to a major incident in 8 of the 16 cases examined by Lekka and Healey [20]. Millken, Morrison and Hewlin [22] suggest there can be a reluctance on the part of employees to share information up the managerial hierarchy if the information could be considered ‘bad news’, possibly due to perceptions that such sharing could lead to negative consequences. Hargie, Dickson and Tourish [23] do however suggest that employees generally wish to be kept ‘in the loop’ in terms of major corporate decisions and key issues, especially those which will have a direct impact on their work roles. Equally, they do not wish to be overloaded with detail. Any information shortfall may lead to an active rumour mill and heightened distrust in management; this can be overcome through the establishment of authoritative and credible communication channels for the rapid dissemination of information [23].

Focusing on the construction industry, acknowledged to be similar to the offshore environment, Conchie, Moon and Duncan [24] describe a fragmented workforce, which utilises contractors, with varying skill levels and differences in management hierarchies, languages, training and education – all of which can lead to disorganisation. In identifying contextual factors which influence safety leadership behaviours, the authors [24] define two categories; job demands and job resources. Such factors contribute to the depletion of supervisors’ energy and therefore their engagement in safety leadership. Job demands are comprised of excessive workloads, competing demands and situational constraints. These demands are especially problematic in terms of safety leadership as reduced time and energy lead to lower levels of visibility and availability, and therefore fewer safety interactions with the workforce. Also it was found that such job demands can foster a reliance on coping mechanisms such as acceleration (processing information at faster rates), avoidance of decision making, and filtration (subjective selection of information for processing) [24]. Job resources are considered as physical, social and organisational aspects of job roles which aid in the completion of tasks, help in reducing negative consequences of job demands and contribute to personal growth. Conchie, Moon and Duncan [24, p. 116] found that reducing the demands placed on supervisors is one way for organisations to aid in the development of safety leadership.

A concept strongly related to safety in offshore environments is that of Situational Awareness, described by Endsley [25, p. 97] as “...the perception of the elements in the environment within a volume of space and time, the comprehension of their meaning, and the projection of their status in the near future.” Lower Situational Awareness has been linked to increased participation in unsafe behaviours and the “prevention of

industrial accidents includes the ability of workers to maintain awareness of work environment, understand the information it holds, and predict how situations will develop." [26, p. 80]. If job demands and resources are not conducive to Situational Awareness then safety is likely to be compromised.

Information and communication behaviour

There are key concepts used both in this literature review and the analysis and discussion below which require some theoretical framing to illuminate the theoretical base of this research. Information environment has been used previously by researchers in a variety of ways, including a geographical environment (for example, Europe [27]), the environment of a particular profession (for example, managers [28]) in which both their internal and external information environments are recognised, or much more broadly as a way of describing the 'world of information' in which the LIS domain researches [29]. Davenport [30], in describing an information ecology to examine an organisational information environment, identifies six components of an information environment: information strategy, information politics, information behaviour and culture, information staff, information processes, and information architecture. In the context of this paper information environment refers to the particular sources of information, flows of information, the need for and use of information in a particular context (here, an offshore installation). Information behaviour "encompasses information seeking as well as the totality of other unintentional or passive behaviours (such as glimpsing or encountering information), as well as purposive behaviours that do not involve seeking, such as actively avoiding information" [31, p. 5]. For the purpose of the study described in this paper, information behaviour relates to all behaviour, including recognising an information need, using information and information sharing, which the OIM engages in in order to carry out their role effectively. Additionally 'sources' refers to anything an OIM sees as being informative, whether formal or informal. Within the library and information science community there has been a steadily growing recognition of the need to focus attention on workplace environments, in terms of examining information behaviour and information use, and away from the more traditional library and education environments [see for example, 32, 33, 34]. This shift has taken the discipline into business environments; workplaces which would traditionally be considered as information saturated in the conventional sense [see, for example, 35, 36], but also to less conventional workplace environments such as those of firefighters [37] and fishermen [38]. This shift in attention is driven by the understanding that the effective use of information is linked to organisational measures of business performance and success, for example Lloyd [39, p. 88] argues:

"...in an information-driven economy, employees who are able to develop information pathways and to create new corporate knowledge provide the strategic difference between a highly successful business and those that remain mediocre."

Choo [40] reports on the use of information in organisational contexts, discussing information barriers which may prevent organisations from observing and acting upon warning signals. Barriers identified include:

epistemic blind spots; the selective use of information or use of information to confirm beliefs: risk denial; when values, norms and priorities influence the use of information so that no action is taken: structural impediments; when the supply and flow of information affects the organisation's ability to detect, mitigate and recover from failures. In the context of offshore oil and gas installations such information barriers could lead to the realisation of a MAH, and in terms of health, safety and emergency response information, its effective use goes beyond being a 'successful business' or being 'mediocre', but can lead to the avoidance of a major accidents and the saving of lives. Ibrahim and Allen [41] reported on information sharing during emergency response incidents, finding that trust during such incidents can be built and maintained through the sharing of information.

One key area of information sharing, the shift handover, has long been acknowledged as a weak spot in the communication chain and, as previously stated, was a contributing factor to the Piper Alpha disaster. Brazier and Sedgwick [42] highlight the challenges of a fragmented workforce both in terms of contract and working relationships; a written policy may not reflect the reality of communication and information flow, in particular in a workforce constituted of a mix of contractors, sub-contractors and company employees. Deficiencies in shift handover can include the communication of incomplete information, the misunderstanding of information or the poor presentation of information. Joseph [43], whilst examining the information seeking and communication behaviour of petroleum geologists (who may not necessarily be based in offshore environments or hold responsibilities equivalent to those of OIMs) offered interesting insights into the changing information landscape of the industry. A greater reliance on technology for information display, acquisition and communication influences the behaviour of individuals in the industry. There is less face to face communication, and globally disparate experts can collaborate in real time to formulate solutions to problems. Joseph [43] confirms that individuals find it difficult to know where to look for specific information and there is a steep learning curve associated with the introduction of new information sources.

The oil and gas industry relies on multiple complex systems to store, retrieve, create and communicate information relating to health and safety. Safety management systems in their varying forms are constituted of several important elements: work control; supervision; competence; and effective safety leadership [44]. Knowledge is required to underpin effective systems, and can manifest itself in two ways, either through procedures, processes and operations, or through technical, human and organisational aspects [45]. Such systems facilitate the development of Situational Awareness, however there are issues surrounding the use of systems for this purpose, with Endsley [46, p. 4] suggesting "the problem with today's systems is not a lack of information, but finding what is needed when it is needed", a well-known problem to the LIS community and one which is considered by Saracevic and Wood [47] in the theory of information consolidation. Equally the problem of satisficing has been reported [48] when the effectiveness of such systems is undermined by time constraints leading to the use of information which is incomplete.

Similarly the issue of information filtering plays a role in the offshore environment, especially during an emergency response situation. Savolainen [49] describes a filtering strategy which "is based on the need to focus on the most useful information by systematically weeding out useless material from sources chosen for use", and is a strategy associated with satisficing. The impact such filtering of information could have on maintaining safe operations or in resolving an emergency situation is unknown.

Research on communication in the oil and gas industry has previously focussed on oil and gas companies' interactions with external stakeholders, often during a crisis or potential reputational damaging incidents [50] where there could be the desire to stifle or prevent information exchange with the external world. Yet communication – both verbal and non-verbal – plays a significant role in the workplace and "lies at the heart of effective management" [23, p. vi], with managers playing a significant part in the maintenance of effective information flows. The best communication practices in top companies [23] include high levels of visibility of senior management with time taken to talk to employees, and ensuring that face to face and two-way communication is extensive. Non-verbal communication plays a decisive role in conveying information and in forming judgements about others, and can be considered a more "truthful" form of communication in that it offers insights into what may lie behind verbal messages; non-verbal communication is also often associated with feelings and attitudes [23]. This is especially important as "sometimes non-verbal signals and speech contradict each other, in which case we are more prone to believe what we see than what we hear" [18, p. 173].

Dervin [51] suggested it was 'dubious' to assume that people only acquire information through formal sources, and that informal sources are used much more frequently. Case [31] in his seminal work concludes that empirical research suggests that formal information sources are rarely used, and informal sources are used much more frequently. The differentiation between formal and informal sources of information was highlighted by Kaye [52, p. 13] "Formal sources may be defined as those which are constituted in some regularized or legal manner in relation to the user, whereas informal sources have no such basis. Formal sources are often also impersonal, and informal sources are likewise often personal". Choo and Auster [1993] suggest that informal sources are even more important to managers than other work groups. The author also makes a distinction between internal and external sources of information. The importance of informal communications in workplace environments [Allen and Cohen 1969] and of information 'gatekeepers' have also been highlighted [Ladendorf 1970].

Research has been conducted in various workplace settings on the use of formal and informal sources of information with independent retail entrepreneurs [Lindblom 2008] found to equally prefer both sources, however formal source use was linked to an increase in sales in a preliminary study, and Finnish corporate finance professionals [Huvila 2013] preferring less formal and social sources of information.

Interestingly their success was reliant on their ability to combine formal information with informal cues and their previous experience, rather than not having a specific piece of information. More relevant to the present study, engineers [Ward 2001] were found to use formal and informal information sources in a complimentary way, and aerospace scientists and engineers [Guruprasad and Marimuthu 2014]. were equally found to use both formal and informal channels to satisfy both their communication and information needs.

Previous research into information behaviour and communications, therefore, highlights theoretical insights with relevance for safety and emergency response in (i) the importance of and barriers to maintaining open, trusted and authoritative channels of communication; (ii) challenges to the swift and easy access to relevant, trustworthy and comprehensible information at times of pressing need; (iii) the tendency of individuals to 'accelerate' information processing in times of emergency, filtering without due care and ultimately using incomplete or incorrect information in crucial decision making; and (iv) the criticality of two relatively unexplored categories of information, that which construes a warning signal and information which aids Situational Awareness.

Aims and Objectives

2013 marked the 25th anniversary of the Piper Alpha disaster, instigating reflection throughout the industry [see for example, 60, 61]. Given Lord Cullen's emphasis on the role of the OIM in the disaster and the subsequent developments that have taken in the industry in the selection, training and monitoring of OIMs [14], it appeared apposite to target this group as a focus for research on industry safety leadership, through a qualitative, exploratory research project designed to explore the role of OIM in leadership of health, safety and emergency response.

As part of a broader study, which considered topics such as safety culture, emergency response and the personal attributes required and feelings associated with being an OIM, the role of information and communication in health, safety and emergency response leadership was explored to allow the research team to begin to understand the OIM's information behaviour and environment.

The aim of the present study is to explore the information behaviour and environment of the OIM in terms of their role in safety leadership.

Research objectives are (i) to gather and interpret data from OIMs in order to understand the ways in which they use and communicate safety information in order to fulfil their post holding duties; (ii) to determine whether there are distinctive factors specific to the role or context of operation which influence the effectiveness of their information behaviour; and (iii) to determine if there are distinctive characteristics of safe operations which affect information behaviour.

Methodology

Of the 288 installations in the North Sea, 149 of those are manned and therefore require the presence of an OIM. There is no publically available register of all OIMs currently working in the North Sea, and indeed there are likely to be individuals who are trained as an OIM however do not

currently hold the post. Throughout the globe there will also exist individuals with a wealth of experience of working in the North Sea as OIM but who have been attracted overseas.

An exploratory approach was taken to the research, utilising interviews to gather qualitative data for subsequent analysis. Interview participants were identified through the project team's industry contacts and through a call for participants on LinkedIn. As exploratory research, 10 in-depth interviews were conducted with 11 participants, with one interview conducted with two OIMs from the same platform. Conducting intensive interviews allowed for the gathering of a high volume of qualitative data [31], enabling a rich, detailed understanding to emerge of the OIMs' picture of their role in their own words, both holistically and more specifically around their information environment and behaviour. Use of a qualitative interview method in this context elicited results which are particular to the specific circumstance; that of OIMs in offshore contexts. The offshore oil and gas industry is one little examined by the LIS community, and the OIM a position never targeted LIS researchers, therefore exploratory research was required to develop initial understanding of future potential areas of research.

Table 1 provides an overview of the employment status, industry experience and role experience of interviewees. All interviewees had held the role of OIM on more than one offshore installation, either as OIM or stand-in OIM³. Four interviewees were retired, and six were currently employed as OIMs. Both retired and current OIMs were sought as interview participants to allow the changes in safety leadership pre-Piper Alpha and post-Piper Alpha to be understood in the context of the wider study. In the context of LIS research this elicited experiences the introduced and proliferation of ICTs has brought to the OIM's workplace. All of the OIMs interviewed had experienced a critical incident, but only 5 of the interviewees had lead a team through a critical incident. All of the OIM were men.

	Employment status	Experience in oil and gas industry	Experience as OIM
OIM 1	Retired	40+ years	4 years
OIM 2	Retired	40+ years	6 years
OIM 3	Current	32 years	8 years
OIM 4	Current	20 years	6 years
OIM 5	Current	29 years	5 years
OIM 6	Current	35 years	10 years
OIM 7	Current	33 years	11 years
OIM 8	Retired	43 years	6 years
OIM 9	Current	28 years	8 years
OIM 10	Retired	32 years	8 years
OIM 11	Current	13 years	9 years

Table 1. Interviewee employment history.

Interviewees were asked what kinds of information they required for their role in terms of health, safety and emergency response and how they shared such information. To facilitate this, a modified version of the critical incident technique was then used to elicit instances of information behaviour in the workplace environment, a method which has been utilised by other researchers to gather examples of information behaviour in relation to work tasks [see for example, 62, 63, 64]. Additionally OIMs were asked to consider the sharing of best practice with their workforce and the sharing of information with other OIMs, and whether these had taken on increased significance since the Piper Alpha disaster.

The interviews lasted between 50 minutes and two hours; this highly qualitative, exploratory approach allowed for the identification of emerging themes as indicators of the information environment and behaviour of the OIMs. Each interview was recorded, transcribed and subsequently analysed by the research team; in total the interviews produced 217 A4 pages of transcribed verbatim. An iterative analytical approach was undertaken by one member of the research team, who had also conducted all interviews, ensuring coder reliability. A coding structure was developed inductively, building the codes upwards from the interview content and identifying major themes and trends. The themes coming from the interviews were largely consistent across interviewees, apart from when highlighted in the findings and discussion below.

Interviewees were assured anonymity in any research outputs and participants were open and showed willingness to talk honestly about their role, as supported by the length of some interviews. As participation in the research project was voluntary it should be borne in mind that those OIMs who volunteered may be of a more proactive and participative

inclination. While the sample size was small, the wealth of qualitative data gathered allowed the authors to test where findings illuminate or inform earlier research in terms of the development of theory as well as contributing towards the shaping of themes for future research.

Findings

The offshore installation manager's information environment

The OIM's health and safety information environment is a complex one. OIMs work shift patterns similar to other offshore workers, with typically two or three weeks offshore followed by equivalent periods onshore. They have back to back counterparts with whom they share the role. To ensure hydrocarbons are produced, not only using the latest innovations, but safely, the OIM is exposed to and requires access to substantial amounts of diverse health, safety and emergency response information from various sources. This must be used effectively along with personal knowledge and crew knowledge, communicated between their offshore workforce and the company onshore. This flow of information to and from the OIMs constitutes a significant part of the OIMs information environment, and is further described below.

Further significant parts of the OIM's information environment are documentary information sources. A commonly cited source of information consisted of emergency response manuals and plans, with seven OIMs suggesting these were sources which were essential to their role. This was often attributed by interviewees to the fact that during an emergency situation there is a heavier reliance on such procedures, as at such points conscious thought processes cannot be relied upon with participants describing the mind 'going blank': in these circumstances individuals must rely on rote memory, instinct and/or simple guidelines, checklists and mnemonics which provide clear, simple and unambiguous information about the actions to be taken. The importance of training and previous experience in terms of providing internalised knowledge and sources of information about what to do cannot be underestimated in such situations, as well as during normal operations, as a valuable source of information for OIMs: this was described by one participant as the information 'you would carry about in your head all the time'.

The safety case was also cited by seven OIMs as being an essential source of information for their role in terms of health, safety and emergency response. This is a document which details the design and efforts undertaken to prevent MAHs on offshore installations. Operating companies for offshore installations must submit, and have accepted, a safety case to the Health and Safety Executive before commencing offshore operations. Interviewees explained that as developments in technology have advanced, the safety case, a large document often comprised of several folders, is now available in electronic format – most usually a PDF. Research suggests that information users have a preference for electronic access when available [see for example, 65, 66], however the OIMs interviewed suggested that use of the safety case was dependent on the purpose of its use:

"We have the safety case in PDF format readily accessible, you can do a quick search on a word and go straight to your section. It's great ... That

said, if you want to go and leaf through it on a topic it's much easier to do it on paper than it is electronically."

Company operating procedures and health and safety regulations were also identified as a source of information required by the OIM. Such documents are often stored together in a 'big cupboard', with additional copies stored in various locations throughout the installation. They are consulted as needed, usually to refresh the OIMs' knowledge of requirements or procedure for a particular circumstance:

"...and the little light will come on at the back of your head, there's a rule, there's something about that somewhere, and then we have to spend some time to go find it."

The research team felt there was a clear sense of distinction between sometimes needed information, when it was simply necessary to know where to look for the information, and the always needed information, upon which the OIM could fall back in time of limited information access and great urgency. The interviews revealed that the existence of an emergency set aside all normal safe operation expectations and the research team believe that the means of accessing and processing information in such circumstances are fundamentally different from the normal mode. These circumstances arguably mirror those faced by the armed forces in battle conditions, when expectations regarding information processing and communication differ markedly in the field from those that prevail in headquarters. There are similarities in the offshore/onshore environments that could form useful grounds for further exploration.

In addition to the sources of information highlighted above, OIMs receive an influx of information daily through phone calls, visitors to rigs and e-mails. Interestingly despite the difference in workplace environment compared to, for example, a traditional office, ITC developments have similarly increased the amount of daily information received by the OIM. The bureaucratic duties required of an OIM were reported to conflict with the need to engage with the workforce and build relationships:

"...there were never enough hours in the day to do all the things I wanted to do. And I did find quite often that the demand coming from onshore for paperwork very often clashed with what I wanted to do in terms of getting outside eyeballing and doing things with people."

Due to the unique workplace environment of offshore operations there are always hard copies of essential documents, such as the safety case and emergency response procedures, in case of power cuts, communications failures or a need for rapid evacuation; there may not always be the capacity to consult an electronic version of information. The OIM's information environment is therefore comprised of core reference materials, such as the safety case, supplemented and updated by a constant flow of new information, for example from onshore, through operating or contracting company employees, and often received by e-mail. Information sources can be explicit in terms of documents, for example or tacit in the form of previous experience or workforce based knowledge. Equally in emergency situations, there is a supplemental need

for situational information to consider alongside guidelines on actions to take, where for example it is constantly necessary to access information about how the environment is changing and what new factors are affecting decisions that must be made.

The OIM's role in mediating and communicating information

Within a complex information environment OIMs have responsibility for communicating information to their workforce. Commitment to safety must be demonstrated from the top down, a principle which was confirmed by all interviewees and by previous research [1; 2; 3], and integral to demonstrating this commitment is the communication of information to the workforce in the operational frontline environment; a caveat also agreed upon by all interviewees. With the OIM holding legal responsibility for the health and safety of people on board their installation, the moral and legal obligation of sharing information brings an interesting dynamic, and is a significant driver for the effective sharing and communication of information to the workforce. In an emergency situation the heightened potential for loss of life was identified by the OIMs an even greater driver for effective communications.

As mentioned above, offshore workforces can be comprised of core operating staff or contractors and sub-contractors. They may not all be native speakers of English, and may have differing past experience of communication and information use. This presents a challenge for the OIM:

"...the OIM is generally the company representative. A large percentage of the crew are non-company staff. So you have to make sure the company's core principles are maintained...It could be as much as 80 or 90% of the population are non-company personnel."

In the offshore environment the OIM acts as a gatekeeper of information flow between several facets of the personnel functions on offshore installations. They act as a fulcrum through which information is exchanged between the onshore company and the offshore workforce and a multimodal approach is taken by OIMs to communicating information, both in terms of formal and informal communication. Formal communication centres on messages which may need to be transmitted to the whole workforce or a distinct subset, while less formal communication tends to take place through ad-hoc interactions. The majority of communication of health and safety information is undertaken face to face, acknowledged by all OIMs, through safety meetings, drills and exercises, shift briefs, meetings with department heads and toolbox talks (time taken out of normal work practices to discuss a certain aspect of health and safety, which may precede a particular job which requires action not regularly taken, or merely as a refresher). The emphasis on face to face communication is interesting given the comments from Joseph [43] surrounding the infrequency of face to face communications due to the proliferation of information technologies. It is also believed that face to face communication is more influential and necessary in safety leadership than in less senior or safety pertinent roles. The present results would also suggest that increased bureaucracy is reducing OIMs' capacity to engage in face to face communications.

“Plus you’ve got to manage the information flow that coming into your office. At the moment I don’t think we can take much more and do the job that we’re there to do.”

Personal engagement was also felt by OIMs to enable what was described as a ‘two way street’, providing opportunities for OIMs not only to pass on information to the workforce but also for the workforce to seek clarification through questioning and feed-back information to the OIM. Informal communication relies heavily on the visibility and approachability of the OIM, something which was highlighted by nearly all interviewees and was regarded as essential in maintaining the two way street of communication. This was seen as a way for the OIM to learn from their workforce, gathering a true picture of reality ‘at the coal face’, an opportunity for them to inform but also to become better informed. This concept of encouraging leaders to ‘listen’ for pertinent information and to understand what they hear is one that is being embraced by some oil and gas operators.

“Part of their job is actually walking round and talking to people, communicating, making sure people are working safely, got to do your rounds, got to show your face, you can’t just be isolated in your room.”

Integral to communication and personal engagement is the notion of ‘walking the walk, not just talking the talk’. All OIMs interviewed recognised the importance of the OIM not just verbally attaching importance to safety issues but confirming them by acting in a safe manner and modelling correct behaviours. This was also considered important in the communication of OIMs’ attitudes and how they are perceived by the workforce:

“...how you respond...gives the impression of how you’ll respond to various other things...You have to have a measured approach to the safety incident that you’ve had. If you go to the nth degree of analysing why someone’s jammed their finger in the door when you have something more significant, that loses all credibility”

The OIMs’ accountability for the maintenance of safety standards offshore is therefore communicated both verbally and physically. Non-verbal communication is used as a way of complementing the spoken word and conveying the company’s social and cultural identity – ‘the way we do things around here’ – but can also be important in creating open and trusting communication channels between the OIM and the workforce in establishing the genuineness, or what is increasingly being described as authenticity, of the OIM’s approach to safety management and leadership. Interviewees emphasised their sense of personal accountability for safety leadership as one with real, perhaps fatal, consequences. It is also a role that participants described as one of great personal isolation, in particular given their duty as post holder enshrined in legislation.

“I have seen, over the years, some appalling behaviour by OIMs who have abused the authority and the autonomy that they have in order to satisfy their own petty little egos. And it is utterly unpardonable. It is a great

privilege not only to be left in charge of a multi-billion pound piece of equipment ... but to be responsible for the safety and wellbeing of 100 or more people and also to have an influence on the behaviour, and dare I say it, the morality. You project your sense of right and wrong. And that's pretty scary."

Any perceived mistrust in the communication channels for safety information could potentially lead to the non-reporting of safety related incidents. For example, participants were very aware that lack of trust in communication channels can lead to the creation of an incorrect picture of the safety landscape on an installation or within a company, could present a barrier to learning from incidents and performance enhancement or lead to situations where companies are unaware of risk escalation and therefore fail to take mitigating action. Participants felt that the combination of verbal and non-verbal communication by the OIM aids in the creation of an effective, safe and trusted reporting culture.

There was evidence from the interviews of the selective cascading of information (sharing information) to the workforce which may need to be formally communicated.

"Some of it's not relevant to some people. It might be a briefing that's only relevant to the drilling guys, it might be a briefing that's only relevant to [certain] staff, that kind of thing."

This avoids information overload in the workforce and therefore better retention of information required for safe working.

Whilst there was evidence of OIMs delegating information sharing duties to departmental heads and team leaders, there was also recognition from OIMs that there are times when they must communicate information with the workforce directly in a more formal manner. This was due to nearly all OIMs understanding that messages can sometimes be misconstrued when it is not heard 'from the horse's mouth' or a message can be diluted or reinterpreted. This was felt to be especially the case if the information has negative connotations or could have negative consequences.

"So if there's a bad news item, it's better coming from me because then everyone's got one point of hate, which is fine. That's the deal, that's part of the joy of having the job. But better that because the team has still got to work together. And what you mustn't do is dilute the information."

The delegation of information sharing was evidenced by interviewees during normal operations, but during emergency response situations it was reported that information seeking would also be delegated. This allows the OIM to keep the 'big picture' with supporting roles seeking the details required for handling a situation. To OIMs, knowing where to find information is considered more important than actually knowing the information, and there was recognition that often the rapidly changing and unpredictable situation means individuals do not know what they need to know, until they need to know it.

"I've also had health incidents where I've to go to the medic and say "what is the procedure for dealing with this situation?" and he's gone and got it and we've followed that procedure."

While managing the flow of information between onshore functions and the offshore workforce, as a precursor the OIM must manage the flow of information into their own office. The plight of e-mail communication and the 'CC' button was commented upon by one OIM, with the OIM therefore having a role in separating the 'wheat from the chaff' and establishing what information is important to them and their workforce. Additionally the OIMs must ensure communication with their back to back counterparts is maintained through their handover between shifts, especially when ensuring all core and non-core crew have received specific pieces of information:

"...we always had to be wary of is the crew changes. Because it's very easy to think that you've communicated [with everyone] but actually you've missed a whole bunch [of people] because they're on the beach. So there's always the need for the OIMs to ensure that when they change out they hand over to the oncoming OIM to say that there is all this stuff that needs to be communicated to the crew who isn't here."

The notion of separating the wheat from the chaff whilst dealing with large volumes of information is an interesting one considering the importance placed on the establishment of safe and trusting channels for communication by the literature [for example, 20]. The OIM must use their, knowledge, experience, training and judgement to establish what information is indeed safety critical and necessary to be shared. If safety critical information is missed by the OIM and subsequently not communicated with the workforce, this may result in a safety incident and undermine the trust placed in the OIM.

"And it's trying to sort out the wheat from the chaff. In an emergency situation that is not easy. It is very, very difficult."

Ultimately the OIM must be a safe and trusted channel of communication for both the offshore workforce and for onshore headquarters, for both operator staff and contractors and in a context where the role is intrinsically both isolated and accountable.

Information sharing within the wider professional group

As the role of OIM has unique characteristics and OIMs constitute a comparatively small and easily identified group in the UKCS, interviewees were asked to what extent they shared health and safety information with other OIMs, if at all. The retired OIMs could not recall this ever happening in their tenure however current OIMs felt this was something which happened regularly within companies. There were several methods cited by interviewees for sharing information between OIMs, such as conference calls and internal networks. However the effectiveness of conference calls between OIMs within the same company was questioned by one OIM. Where these had formerly been informal and supportive, the participant felt that their value in encouraging open information sharing, in a

confidential and safe environment, had been diminished when they became a formal meeting for which minutes were taken. This reduced the willingness to participate freely and share "war stories" from the "school of hard knocks".

Forums for cross company information sharing through informal social networks and initiatives such as Step Change in Safety were welcomed:

"... there's a lot more openness throughout the industry in terms of safety flashes, incidents that have occurred on other installations with other operators. We tend to hear about them whereas in the past you tended to hear about those things on the train going home..."

Such sharing between companies was seen to be significant for health and safety in ensuring consistency. The increase in sharing of information between companies was attributed by interviewees to the industry as a whole "wanting to be better" and was something which had improved markedly since Piper Alpha. However, one interviewee commented that while UK legislation post-Piper had encouraged global sharing of learning:

"nobody else changed their legislation. They all took the view that that's not going to happen to us. Now if you look at Macondo, following that, the US is now driving through major changes in their legislation and enforcement of other pieces of legislation that were already there."

While traditionally sharing of information had centred around learning from incidents, when something goes wrong, a shift towards sharing more positive safety related information was reported currently. However, the interviewees expressed that there continues to be a level of reluctance or hesitation amongst OIMs to share potentially commercial sensitive with peers in competitor organisations. There was no consensus by the OIMs around whether an industry wide OIM forum would be beneficial, suggesting that there may be some way to go for the industry in encouraging a culture of transparent collaboration on safety to flourish.

Discussion

The OIM acts as a focal point in the communication of safety and emergency information in a complex and shifting information environment. They communicate with individuals onshore and offshore, often acting as a fulcrum between the two. Further they are at the centre of a matrix of onshore and offshore information sources and with sources of (i) formal and documented information sources and (ii) informal and tacit sources. Figure 1 seeks to model that role, illustrating the manner in which the OIM acts as a gateway or mode through which information flows and is filtered.

Figure 1. Information Environment of the Offshore Installation Manager. Figure 1 indicates the reliance on both formal and informal information sources in terms of health and safety information in the offshore environment. This is supported by the work earlier cited of Case [31], Dervin [51] and Choo and Auster [53], although whether informal or formal sources are preferred by the OIM will require further research.

Equally the importance of both formal and informal flows of communication is supported by Allen and Cohen's [54] previous research. The importance of an information gatekeeper, highlighted by Ladendorf [55], is certainly exemplified in the case of the OIM and their role as both a communicator of information as well as a seeker of, and source of information for the workforce, is essential to maintaining safe operations on offshore installations.

The concept of the importance of 'listening' for pertinent and critical information, both from the workforce and from company headquarters onshore, was one that was embraced by OIMs. The research team believe this listening mode to link to the concepts of information scanning, selection and filtering that is central to theory around information consolidation [47]. It might provide a very useful way of translating information behaviour research into the discipline of business management and leadership theory. It was thought to be a key skill in both demonstrating the genuineness and authenticity of leadership safety values but also in demonstrating the trustworthiness of leadership, confirming Ibrahim and Allen's [41] findings that trust can be built and maintained through information sharing. The information barriers described by Choo [40] appear to be ones which OIMs are aware of and actively seek to overcome.

The research results enrich understanding of the information environment of the OIM. While there may be similarities with other leadership contexts, the OIM role presents a particularly interesting field of study in that it demonstrates a number of very special characteristics. It is a role of immense responsibility and accountability, yet one which is very isolated. The research team believe that studying information behaviour in such a context allows the researcher to understand information behaviour more profoundly in two important contexts that have emerged from findings: (i) where the information is critical to the protection of both human life and the environment; and (ii) where the role holder must be able to act in an unpredictable and rapidly changing environment, where information need and the sources of information available may shift and change in a multiplicity of ways in a very brief time period.

The current research findings suggest that it may be useful to theorise around the existence of two modes of information behaviour. The first might be termed everyday information need, where the information actor (the OIM in this instance) can draw on all available sources of information and has the time to access, select, verify, filter and apply the information before its use, in a preventative, enhancing or mitigating manner. The second mode of information behaviour would be that of emergency information need where the information will be needed rapidly, in stressful circumstances, with limited opportunity to verify before its use, usually in a capping or containing manner to limit harm to people and the environment.

Everyday information need

OIMs seek, use and share information to maintain safe operations on offshore installations. The OIM requires all of the resources, mechanisms

and techniques for using and sharing information described above to fulfil their role in maintaining safe operations, including reliable access to information sources and expertise, as well as relying on previous experience and training.

Their role is one which is well supported, with information being provided by the company on the beach, from contracting companies and their employees and from the offshore workforce. Access to resources was not identified as an issue by OIMs in this study; however having the time to consider all information to indeed separate the 'wheat from the chaff' is a challenge. This echoes Endsley's [46] concerns regarding the use of systems to maintain Situational Awareness, as the ability to find the information required when necessary is not always possible. OIMs are aware of their responsibilities for sharing information and the degree to which this can be vital in preventing risk escalation, they report little time to undertake the necessary selection and cascading to others and are conscious that the shift handover presents particular responsibilities and challenges for them in being certain that vital information is being passed on. OIMs were also conscious that they had a responsibility not just to ensure transmission of relevant information to the right recipients but also that they must seek not to overload individuals with too much information.

The capacity to listen to information and to be regarded as a trusted source with whom the workforce and peers can share 'bad news' was highlighted but there was evidence to suggest that existing opportunities for such information exchange were not sufficiently safe in the sense of their being an assurance of confidentiality. The OIM must also consider other aspects of communication about safety, through for example, body language and modelling behaviours, and there was evidence from the current research that this was something to which participants were alert. The OIM must have an awareness of information which is required for their role, for example which regulations apply to specific circumstances or which company procedure must be followed. Equally the OIM must be able to make judgements on the relevance of information shared with them to their own role and to that of their workforce. A further challenge is presented by the extent to which the OIM gains information from multiple channels, both formal and informal, such as from systems, handbooks, and a wide array of colleagues and external contacts. Their information environment is one that could be described as 'saturated'. Particularly important for the OIM given their responsibilities is that they should have the capacity to identify information which indicates heightened risk and that they should be conscious of the potential danger presented by subjective selection of information, where they may have become complacent or blind to information that does not match with their beliefs, and where they may therefore fail to respond to a changing environment. While this was not an aspect of information behaviour highlighted by participants as problematic, the results of disaster reviews [11, 13, 16] suggest that it is one that would be worthy of further investigation.

Job demands [24] were found to play a role in the information and communication behaviour of OIMs. Workloads and competing demands were acknowledged by the OIMs to put a strain on their time however all OIMs recognised the importance and necessity of maintaining their visibility to the workforce, often coinciding with the sharing of information. Like their workforce, OIMs require safe and trusted mechanisms for the sharing of information. Whether the demands are sufficient enough to cause an accelerated processing of information [24] in an everyday environment would warrant further research, although there was evidence of selective filtering of information [49] due to situational constraints, including emergency situations. Whether this filtering is conducted in a systematic way as described by Savolainen [49] would warrant further examination. Everyday information demands on the OIM are therefore not insignificant however the extent to which this impacts safety leadership overall also requires further research.

Emergency information need

There is information which the OIM must know in order to react in an emergency situation. During such periods their environment may change dramatically in a very short space of time. They may move from an information saturated to an information deficit mode and they must have coping mechanisms to enable to undertake this shift. During an emergency response situation, as reported, it is possible to suffer from stilted recall of information or the 'blank mind' phenomenon. The role of recall is significant for the OIM, drawing on both extensive training and experience.

Filtering is much more difficult in an emergency [11] and the phenomenon of acceleration of information processing [49] which takes place during an emergency can result in a greater tendency to satisfice [48] which can result in the use of incomplete information and therefore have significant consequences in terms of maintaining safe operations during an emergency. Therefore at times when the consequences of poor or incorrect information are at their greatest, there is the greatest likelihood that individuals are less likely to use the best approaches to its acquisition and use. With warning signals becoming much more important in an emergency situation, the monitoring and awareness of these are vital. The capacity of OIMs to recognise warning signals or key information signals has not been fully tested.

Equally Situational Awareness becomes even more important during an emergency, with OIMs requiring constant information on how the situation is changing, and what further information they require to be able to manage the changing situation. As lower Situational Awareness has been linked to increased participation in unsafe behaviours [25] this is especially important for the OIM in their leading role. Information about an evolving scenario can come in many forms but often would come from real time observations by the OIM or by others. Therefore the importance of maintaining an open and trusted information sharing environment, yet in a much more constrained model, is essential to maintaining effective Situational Awareness.

Conclusions

The aim of the present study was to explore the information behaviour and environment of the OIM in terms of their role in safety leadership. Data was gathered from OIMs about the ways in which they use and communicate safety information in order to fulfil their post holding duties. The discussion has highlighted themes emerging and in particular those which are felt to provide the most fertile ground theoretically include the personal sense of responsibility and isolation felt by the OIM, creating an environment where they are frequently the sole single individual in whom all knowledge rests, with very significant accountabilities both to their employer and more broadly in terms of their legal obligations. Distinctive factors specific to the role or context of operation which influence the effectiveness of their information behaviour were found, particularly in relation to the OIMs' ability to 'listen' for pertinent and important information– the notion of being able to separate the wheat from the chaff. Further the absolute need for OIMs to represent a trusted and respected source for the workforce, both in acting in a confident and authoritative manner and in being reliable, honest and accurate in conveying and receiving information. Distinctive characteristics of safe operations which affect information behaviour include the extent to which the OIM may not be able to predict in advance what information they may need particularly in responding to an emergency. Finally the importance of internalised knowledge, especially at times when other sources of information are unavailable, mean that the OIM must also be capable of fast and accurate recall of information as well as the ability to recognise swiftly where gaps in their knowledge exist.

Implications of research findings

Whilst this research was exploratory, the findings suggest some interesting areas for further research for the information science community. Previous studies into workplace information environments have largely focused on more traditional locales; the examination of the information environment on an offshore installation, where safety is paramount, offers an interesting, non-traditional workplace. Such an examination and the findings from it can aid in the development of products (for example, safety management systems) and in enhancement of the progression of education and training for individuals who work in dynamic, safety pertinent roles. With the attribution of major accident causes to deficient communication and information behaviour this in particular should be an impactful area for further research.

The OIMs interviewed displayed a heavy reliance on informal knowledge or experiential recall, especially when dealing with an emergency situation, as a source of information. As with other workplaces and organisations more broadly this knowledge, if not formalised and recorded, will be lost with the individual in which it resides. The information science community can assist with developing knowledge retention policies and system development to make such knowledge accessible to future OIMs, workforces and beyond therefore adding value to organisational knowledge and assisting in maintaining safe operations. It has been argued in this paper that every day and emergency information needs are fundamentally different and result in different information behaviours. The whole notion of 'emergency' information

seeking could and should be further explored in differing emergency contexts, to consider whether in these other emergencies information behaviour changes.

Areas for further research

There are several areas which warrant further research from the LIS community. This line of inquiry has the potential to impact positively on the safe operations of oil and gas installations. The significance of the Cullen Inquiry and the recommendations made still resonate within the oil and gas industry, and the information and communication dimensions are especially pertinent.

The ability to synthesise information was identified by Cullen as a required, essential ability of OIMs, and the OIMs interviewed for the present research suggest this is a key part of their current role. However further research into the OIMs ability to judge the pertinence of information to maintaining safe operations, whether it is received verbally, electronically or by mnemonics, would further develop understanding of the role information, or more likely, missing or incorrect information, plays in safety and emergency response. The effect of an increased exposure to information during everyday life, largely down to the proliferation of ICT, changes the information behaviour of individuals and the impact this may have on the OIM's behaviour is as yet unexplored. Equally ICT means that whilst onshore the OIM is likely to have a greater level of communication with offshore than when Cullen made his recommendations, the research team believe there is significant scope for further investigation into the information and communication habits of the OIM in terms of safety management beyond shift patterns and the platforms themselves, but rather as a professional group. How the shift handover can be effectively managed with assurances in place that all individuals have been exposed to the right information also remains an area demanding further research; the findings for the present research however indicate that attention should specifically be given to OIM handover between shift back-to-backs.

Reliance on variant types of information to aid Situational Awareness in combination with the delegation of information seeking also provides an interesting focus for future research. How is knowledge co-created in offshore environments? At what stage does individual knowledge become group knowledge, or installation-wide knowledge? Does the composition and nature of the offshore workforce influence knowledge creation and knowledge sharing? As knowledge is required to underpin effective systems [45], be there safety management, maintenance or otherwise, this is an important area of further inquiry.

The filtering of information and a tendency to satisfice by OIMs may be unsurprising however when considered in the context of the importance of building authoritative and trustworthy channels for communicating and sharing of information – which are an active demonstration of safety leadership - it is worthy to consider whether the act of communication itself illustrates commitment to safety, or whether the quality of the information which is shared is of greater significance in maintaining those

channels. If the OIM incorrectly filters information or misses a warning signal due to satisficing, how does this impact the communication channels which have been developed? What role, therefore, does information play in authentic leadership?

The oil and gas industry, specifically in the UKCS, is one which is currently experiencing a wave of change. Political and economic conditions have instigated reflection and analysis of current conditions and future mechanisms for working [67, 68], and the future of the industry looks to be one which will be dominated by collaboration, partnerships and enhanced communications in all aspects of operations. Therefore an understanding of the information environment, behaviour and needs of OIMs and other industry professionals is timely and necessary.

Notes

1. The Health and Safety Executive currently define a permit to work as “a more formal system stating exactly what work is to be done and when, and which parts are safe. A responsible person should assess the work and check safety at each stage. The people doing the job sign the permit to show that they understand the risk and precautions necessary.” The permit to work system is effectively a means of communication between management, supervisors, operators and those carrying out the work, and as a means of coordinating work activities [39].

2. In 2005 an onshore BP refinery in Texas City, Texas, exploded and killed 15 workers and injured around 170 others. Underlying causes of the incident were attributed to poor definitions and accountability for safety at different levels of management. The Baker Panel Report into the incident highlighted the focus on personal rather than process safety as a contributing factor to a false sense of control over the potential for a MAH to be realised [20].

3. All OIMs, on completion of training, are required to act as stand-in OIM for short periods of time before taking on the role proper.

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