Knowledge Management: an Open Systems Approach

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Abstract Nowadays, organizations pursue their aims in a context of distributed collaboration, creating a need not only for supporting ICT systems, but for a human-centred focus in which individual and group sense-making and learning are supported by appropriate toolsets. We argue that development of such toolsets requires an open systems approach. This paper discusses one example: non-competitive benchmarking (NCB), as a vehicle for knowledge transfer, leading to process improvement and potential for enhanced organizational performance. We use this example to explore ways in which engaged actors may be supported to create and share their contextually-dependent tacit knowledge. The foundation of open systems approaches is discussed, showing how socio-technical approaches continue to have relevance today.

Key words: Open systems approaches; socio-technical systems; non-competitive benchmarking; knowledge management practice.

Introduction

Business managers are often heard to express a view that 'People are the company's greatest asset'. However, this view is not always translated into effective practice. We believe that a holistic, socio-cultural approach to organizational change, recognizing the contextually-dependent nature of work is clearly the best strategy to pursue. In order to empower people to contribute their contextually-relevant know-how, both as individuals and in communities of practice, two pre-

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requisites can be identified. The first is an open culture of 'mindfulness' in which people feel supported to express their views, even where these conflict with accepted ideas; the second is a foundation for creativity in the form of useful and usable methodologies for inquiry and design of future practice [1].

Knowledge Management is essentially a human-centered activity. IT without an intended purpose is pointless; therefore attention is needed to human-centered design of useful systems, incorporating IT. Any technical system developed to support human activities can be regarded as pointless if it is not experienced by the engaged actors as useful to their activities [2]. In order for ICTs to be 'useful' they must play an instrumental role within an organizational setting. The purpose of IT implementation is therefore to bring about a change in organizational behavior. However, change of behavior is not determined by technologies; it requires purposeful engagement by the actors concerned. To illustrate this point, we will explore how Great Ormond Street Hospital for Children (GOSH) brought about needful change in their system for handover from one surgical team to another in infant care. This involved collaboration with the Ferrari and McClaren Formula 1 pit teams, and also with two aviator training captains. Through a process of non-competitive benchmarking, knowledge was shared among the teams and used by staff at GOSH to bring about beneficial change in their practice [3].

In this paper, we discuss ways in which creative learning spirals may be established that support individuals to escape from entrapment in established routines and generate new protocols for enhanced performance through reflection. In GOSH, staff in the infant coronary care field made use of non-competitive benchmarking with teams from fields as disparate from their normal experience as Formula 1 pit crews and pilot trainers from aviation. Their vision was to redesign their behavior and movements in the operational units concerned with infant heart surgery in order to reduce mortality rates. Through an open environment for learning, observation and communication (sense-making), they were able to reflect upon excellence in practice in these very difficult fields in order to create and develop better processes to deliver care. Catchpole et al. reports on this experiment as follows: "*The pit-stop in Formula 1 motor racing was seen as a model example of how a multi-professional team comes together as a single unit to effectively perform a complex task (change four tyres and fill with fuel) under huge time pressure (approx 7 s) with minimal error. ... This was targeted as an industry with analogies to the handover of patients from theatre to ICU where multiprofessional specialists (surgeons, anesthetist and ICU staff) reconfigure, as a single unit under time pressure, to safely transfer all equipment and information*'[3, p.471].

In the past, many writers on organizations have referred to management as a practice of goal setting/seeking. It has been suggested that organizational culture is formed over time through shared goals and values [4]. Such sharing, if possible, would require negotiation of differing perspectives held by individuals. Checkland [5] suggests that "*Consciousness makes man a meaning-endowed animal*" (p 218). As such, it is always possible for each individual to select from a range of possible meanings. We consider each individual to have a multitude of competing

worldviews, all of which change through time as a result of experience. Perceptions by different individuals within a group about the same phenomenon may overlap, but will vary from each other and will also change over time. For this reason, agreement on a single description of a 'real' human activity system will be elusive and consensus on its 'goals' impossible to achieve. Individuals coming together in organizational settings may develop views of a common good which they collectively pursue. However, it is unlikely that the collection of individuals interacting within that human activity system will all share the same perception of the nature of their system or of the nature of that 'common'. We suggest that the purpose of 'knowledge' management within an organization is creation of vehicles to support people to create and share their individual, contextually-dependent understandings. 'Know-how' is embedded within individual people and groups scattered throughout an organization. Only by co-creating understandings of one another's individual perspectives can individuals begin to appreciate the similarities and differences in their views: their visions of the common. Individual perceptions of organizational culture, climate and collective image will co-exist within interacting groups, continually shifting over time. Perceptions of a collective organizational purpose suggest that individuals experience themselves to be engaged in common endeavors within self-defined boundaries [6]. These boundaries are also individually co-created and subject to continual change. The vision statements which organizations publish from time to time, intended to reflect an inward collective identity and outward collective image, even where these are genuinely derived from dialogue among organizational actors, can only represent a snapshot of a collective understanding which is perpetually shifting.

Non-competitive Benchmarking as a Knowledge Management Vehicle

One example of an approach which could be helpful to individuals in creating and sharing both explicit and tacit knowledge is non-competitive benchmarking (NCB). In an economy where organisations are under increasing pressure to deliver operational efficiency, process improvement and competitive advantage, benchmarking can be an effective management tool. However, attempts to compare practice within the same field can lead to feelings of hostility and insecurity, leading to reluctance to share knowledge. NCB can help to overcome such feelings and help to promote sharing and learning among participants.

The expression 'benchmarking' was first used in the Xerox Corporation during the 1980's and is essentially a method used to stimulating creativity in improvement practice. Slack et al [7] define benchmarking as *'the process of learning from others*'. Over the last 30 years it has become a staple tool, traditionally focused on 'best practice', which the American Productivity and Quality Centre suggest to consist of '*those practices that have been shown to produce superior*

results; selected by a systematic process; and judged as exemplary, good, or successfully demonstrated … adapted to fit a particular organisation' [8]

This paper is focused in the value of external, non competitive benchmarking: the comparison between an operation in one organization and a comparable but dissimilar operation in another. We view this as an example of Knowledge Management practice, as it is a vehicle for knowledge creation and sharing. Organisations concerned do not compete in the same markets, but can collaborate as a virtual learning organisation, opening up novel ideas to processes, approaches and concerns. It s an opportunity for a company to observe, reflect upon and adopt and/or adapt the practices judged as 'best', with the aim to improve the performance of a given business process and so it is the processes that must have common ground, not the company or market they operate within. This contrasts with some other approaches to 'best practice' based in a naive belief that good practice can simply be transplanted, irrespective of context.

Many well-known companies have used benchmarking as a tool for improvement, e.g. Avon, Exxon, Microsoft, Ford, and General Motors [9]. Ohno reports how Toyota's new, just-in-time inventory system was developed following visits to a US Supermarket in 1956. Having observed their method for replenishing shelves, he was able to adapt what he had learned to inventory management [10]. Dorsch and Yasin [11] comment on the early Xerox Logistics and Distribution example. Functional benchmarking through a non-competitor (L.L. Bean) led to successful implementation of greatly improved warehousing systems and more efficient picking processes. A second example of a successful collaboration cited by Dorsch these authors involved Nissan and a variety of partner organizations (e.g. Disney; McDonalds). Nissan were able to discover and adapt 'best' human resource practices relating to empowerment, teamwork, and focus on customer satisfaction.

The Formula 1 and Infant Surgery

Boxwell [12] describes interactions between Great Ormond Street Hospital (GOSH) and Formula 1 motor racing teams as a form of collaborative benchmarking. GOSH wished to bring about improvement to its processes for handover of care in infant surgical procedures, and approached 'best in class' F1 teams to ask if they would be willing to share knowledge of their precision systems for supporting drivers. Use of benchmarking across dissimilar organisations may be very demanding, requiring a broad conceptualization of entire processes and careful understanding of procedures. However, it has been shown to be extremely effective.

The impetus for this exercise came from two doctors who were watching Formula 1 motor racing on TV while relaxing after lengthy surgeries at GOSH. Realising that F1 pit stops involved processes conceptually identical to those involved in changeover during infant surgery, they began to pay particular attention to

them. GOSH treat approximately 500 paediatric cardiac cases every year. Co-ordination and quality of knowledge sharing in the handover of infants from the intensive care team to the theatre team before and after complex heart surgery has been found to be crucial to the success of the procedure, since patient's particular condition is unique [13]. It became evident to the surgeons that there was a common interest in reducing error and improving quality between the two very different contexts. They believed that precision in procedures achieved by a Formula 1 pit team could hold valuable lessons for improvements in handovers during operations. Catchpole, et.al [3] and Sower et al [14] have written at length about this relationship. The pit stop in Formula 1 motor racing was seen as a model example of how a multi professional team collaborates to perform a complex task effectively, under huge time pressure, with minimal error. The aim of the benchmarking study was to observe and reflect upon this expertise and combine it with existing knowledge to develop simple, reliable, easily trainable handover protocols to improve safety and quality of patient care in the short but critical period after complex infant heart surgery.

GOSH surgical staff visited and observed the pit crew handover during a race, becoming increasingly interested in the way the team addressed possible failure 'What could go wrong?' 'What are we going to do if it does go wrong?' and 'How important is it if it does go wrong?' Benchmarking against the Ferrari team pushed the hospital to anticipate problems rather than waiting to deal with them as they arose. Observing Ferrari caused the hospital to view its own practice from a completely different perspective. Ferrari staff did not tell them what needed to be changed, or how. The hospital staff reflected upon their observations of good practice among pit crews, aviator trainers and others and adapted the lessons learned to fit their own situation.

The GOSH doctors noted the value in process mapping, process description, and trying to work out what individual tasks should be. Under the new handover process they devised, the anaesthetist was given overall responsibility for coordinating the team, acting in a way which was analogous to the pit crew 'lollypop man', and a dance choreographer was brought in to help the team position their movements so that they would not impede one another while carrying out their particular roles. Adequate time and money allows motor racing to have rehearsal after rehearsal. In healthcare, where resources are scarce and teams are dealing with living people, a process was required that was simple, easy to learn, and did not depend upon a lot of rehearsal. Through the benchmarking process, GOSH doctors noted not only how fast, but also how quiet and disciplined the pit crew was, and designed new processes for the surgical teams intended to emulate this atmosphere of calm professionalism. Development of a new handover protocol reflected this influence very strongly, emphasizing such factors as teamwork, effective leadership, rhythm, standardised processes, anticipation, and communication [3, pp 272 and 276]. Once in place, the protocol was polished further through reflection upon other contexts such as the work of aviator trainers. It was simple to understand and could be established within 15-30 min at staff induction. Results

showed that the new handover procedure broke the link between technical and informational errors. Before the new protocol, approximately 30% of patient errors occurred in both equipment and information; afterward, only 10% of the patient errors occurred in both areas. While the new system was not perfect, GOSH identified significant improvement and adopted a policy of seeking further, continuous improvement in procedures.

The development of a simple, easily trainable handover process using expertise from other high-risk industries reduced errors and improved information transfer with no penalty in handover duration and reliable training overhead. GOSH believe this work may be extrapolated to handovers in other areas of medicine, and would encourage further attempts to evaluate this protocol systematically and to combine expertise from other industries with that of health care.

We have looked at non-competitive benchmarking as a collaborative, open systems approach to surfacing and sharing tacit knowledge. In the next section we will examine some other examples of such approaches.

Conclusion: an open systems toolbox

We suggest that an open systems approach which enables individuals to explore and share their contextually dependent understandings will be helpful in supporting exchange of tacit knowledge. Human systems create problem spaces that are ambiguous, uncertain and constantly changing, as can be seen in the case example of Great Ormond Street Hospital above. Toolkits are therefore needed that can be used collaboratively, to explore inconsistent and ill-defined phenomena. The Strategic Systemic Thinking framework [15] provides another such vehicle to support and guide participants to inquire into a complex problem space by co-creating understandings of multiple levels of contextual dependencies. In a decision-making context, an opportunity is created to keep disparate views of engaged actors in consideration far into a process of inquiry, rather than screening out those considered ‘marginal’ and looking for convergence too soon. Similarities and differences in individual narratives can be identified, gradually forming a picture of the diversity of opinion within a group of actors. Participants gradually co-create a rich pool of ‘knowledge’ as a basis for informed decisions. Ownership of this ongoing process must rest with the actors themselves, with help and guidance from experienced facilitators. Context is directly influenced by the presence and activities of engaged teams, as was evident in the GOSH we have discussed.

The SST framework includes three, interrelated aspects (intra-analysis; inter-analysis and value analysis) designed to create productive learning spirals. In the intra-analysis aspect individual actors are supported to reflect and think about a problem space. A range of methods are available to actors seeking to articulate their worldviews, e.g. rich pictures, learning exercises, constructive support activities, observation, drama transfers, role plays - supporting visualization and

communication of mental models. In this way, individuals can explore and surface their contextually dependent understandings of the situation of interest. The focus of inter-analysis is support for collective creation of a learning spiral through *communication* of actors' individually-created narratives, and *sense-making* of one another's' contributions. In value analysis, actors are supported, individually and in groups, to reflect and think about scales for comparison and evaluation of narratives. Value analysis seeks to bring about a constructive dialogue between the actors and the interventee about their beliefs in the context of the inquiry.

Gregory Bateson [16] defines information as 'a difference that makes a difference' in the mind of a person engaging in sense-making. In seeking to inform themselves about the context of a systems development, users and their professional advisors need to consider not just what is commonly held to be 'best practice' or seek for a general consensus, but to consider the divergence of opinion including all participants' viewpoints. In such situations of complex knowledge sharing, a model for non-competitive benchmarking (such as the one illustrated in the GOSH example) makes sense. Similar approaches have been suggested elsewhere, e.g. Lego® have developed a 'serious play' toolkit which can be used by groups of individuals to explore a complex problem space by co-creating and sharing embodied narratives. The explanatory materials for this kit suggest:

"*It is very important that each participant gets the chance to share the story about their model. The sharing is in itself a reflection process, in that when they share their models, participants explore their own expressions more closely. Those listening also have an opportunity to explore in more detail what the narrator expresses through the model.*' [17].

This appears to reflect an open systems approach to surfacing and sharing tacit knowledge. Many other toolsets have emerged from practice in particular professions and trades to achieve a similar purpose, e.g. an architect wishing to discuss design choices with clients will use scaled-down, 3-D models suggestive of the actual dimensions, layout and appearance of the imagined building.

Another example of a socio-technical toolbox, which supports an open systems approach to analysis and design of IT-supported work systems, uses the ETHICS methodology of Mumford [18] as a frame of reference. This toolbox consists of over 20 different templates for analysis, each containing advice about its use in practice. The objective for each template is to support creation of analysis, reflection and design. In design of work and technical support systems, problem analysis, problem space identification and contextualization lead to deepened understandings of contextual dependencies and creation of possible resolutions. The documentation incorporates advice to guide discussion of wishes, possibilities and strategies, none of which is 'correct' but any of which can contribute towards a co-created resolution. Like non-competitve benchmarking, this combines analytical and convergent thinking with discursive approaches supporting divergent thinking [19].

We believe that the case of Great Ormond Street Hospital discussed above fits comfortably within the tradition, experiences and evolution of socio-technical

approaches and practices, confirming that socio-technical approaches are still very relevant in 21st century contexts. We advocate wider use of open systems approaches such as these in efforts to create systems which will be experienced as useful in Knowledge Management practice.

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