Knowledge Integration in Impact Assessment: A Case Example from Panama

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INTRODUCTION

This paper describes and applies a theoretical framework for application of knowledge sharing and integration, and collaborative learning and decision-making in impact assessment. We first discuss knowledge and the process of collaborative learning in the context of the extractive sector (mining, oil and gas). This framework is then illustrated through an environmental impact assessment developed for the Cobre Panama open pit copper and gold mining project. Questions addressed include the following: What types of knowledge were available and generated on the project? Did knowledge sharing, integration and collaborative learning help to make informed, inclusive and effective decisions?

THEORETICAL BACKGROUND

Extractive projects today are undertaken in a business, regulatory and social environment of escalating uncertainty and complexity. De-risking now takes multi-disciplinary teams comprised of a range of experts and specialists, often located in multiple offices and countries. This is further complicated when people do not speak the same language (Hartman, 2000), whether linguistically, technically or even culturally. The current trend is an ever-increasing number of diverse stakeholders and a continually evolving regulatory environment, adding complexity for extractive projects. Some stakeholders are directly involved in project approval and operational processes, and their perspectives or concerns must be explicitly considered, while others are indirectly involved but often demanding greater inclusion, even though they may lack sufficient time or interest.

Knowledge sharing and integration can be challenging, demanding creativity in decision-making and new ways of thinking and interacting, particularly if good governance and sustainable development are desired outcomes. Addressing this conundrum for complex projects, Newell et al. (2009) outline a two-dimensional framework: project ecology and interdependency. The project ecology dimension comprises the complexity (simple or multifaceted) of the project context with three differentiating factors: spatial (distribution of project stakeholders), temporal (tasks simultaneously or sequentially done) and organizational (number of groups involved). The interdependency dimension (classified as either low or high) exists among various technical disciplines, agencies and stakeholders. Extractive sector projects typically have highly complex project ecology and high interdependency due to technically sophisticated work, integration of different knowledge domains (e.g., scientific, technological, commercial) and innovative thinking. Knowledge transfer is contingent upon how such interdependencies are managed (Newell et al., 2009: 115).

The oft-cited 'DIKW hierarchy' or knowledge pyramid of data, information, knowledge and wisdom (Ackoff, 1989; Rowley, 2007; Tobin, 1998) is presented in Figure 1. The lowest level consists of data, or facts and statistics collected for reference or analysis. Data needs relevance and purpose to

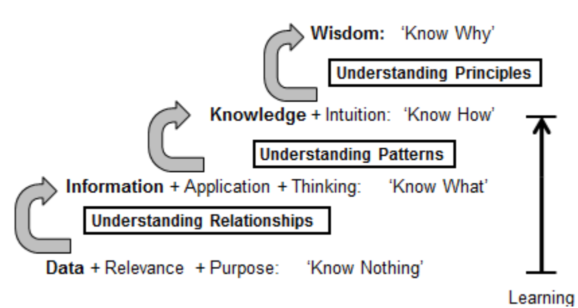

Figure 1. The DIKW Hierarchy (Tobin, 1998)

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become information, or the state of knowing 'what'. Information combined with human experience and thinking becomes knowledge, or the state of knowing 'how'. This transition is based on understanding patterns. Knowledge when combined with intuition becomes wisdom, the state of knowing 'why'. The progression from data to wisdom is the process of learning, and should involve practice, collaboration, reflection and thinking to be effective. Such processes take time, and can be further explained by Orr's (1996) fast and slow knowledge dichotomy. Fast knowledge is intrinsic to modern science and engineering, generated in universities, think tanks and corporations, and associated with political and corporate power structures. An example is the specialist knowledge of subject matter experts (SMEs). In contrast, "slow knowledge occurs incrementally through the process of community learning motivated more by affection than by idle curiosity, greed or ambition" (Orr, 1996: 31). Slow knowledge also comprises traditional or local knowledge lauded by community leaders and their advisors, and is often the focus of stakeholder views.

Knowledge sharing and integration into a project has become more challenging for at least two reasons: first, as organizations internally become more compartmentalized into functional and discipline groups, and second, as progressively more and diverse stakeholder groups demand recognition of their knowledge and position. Key challenges include the transmission (sharing) of the knowledge from the knower to the recipient, boundaries or barriers, and absorption and use (integration), and complicated by knowledge transfer boundaries such as syntactic, semantic and pragmatic (Carlile, 2004). A syntactic boundary is created between groups using different language, grammar, symbols and labels. This boundary is typically encountered within different specialist groups who employ different terminologies, often accentuated by acronyms and 'tech speak'. To span this boundary, a common language is required. A semantic boundary exists where divergent accepted interpretations and meanings between individuals are found, with each party having its own and invariably different perspective. In this case, knowledge needs to be translated so that each party is able to appreciate multiple perspectives. A pragmatic boundary is created when different interests are at stake and potential exists for conflict; special efforts may be required to translate each other's knowledge and transform their practice.

Moving from data to wisdom is the process of learning, which includes individual, collaborative, team and organizational learning. Individual learning is "the lifelong process of transforming information and experience into knowledge, skills, behaviours and attitudes" (Cobb, 2009). It requires practice and reflection, and is enhanced by teamwork. Collaborative learning involves two or more people attempting to learn something together to achieve a common goal by capitalizing on one another's strengths, reflecting the inherent social nature of learning. Team learning "starts with 'dialogue', the capacity of members of the team to suspend assumptions and enter into genuine 'thinking together' " (Senge, 1990: 10). Organizational learning is defined as "the set of actions (knowledge acquisition, information distribution, information interpretation, and organizational memory) within the organization that intentionally and unintentionally influence positive organizational change" (Templeton et al., 2002: 189).

Learning also occurs on three integrated levels (Figure 2). Single (loop) level learning is the process of 'doing things right'. It focuses on

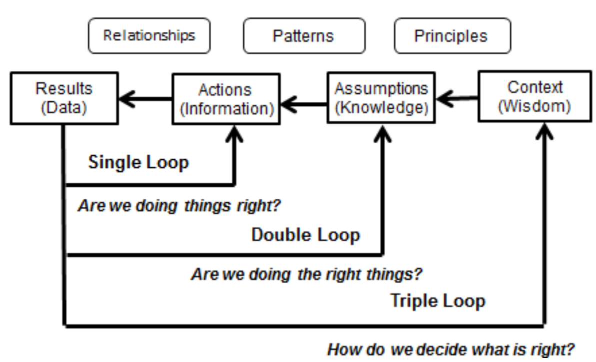

Figure 2. Levels of Collaborative Learning

actions and results, is ‘adaptive learning’ which is necessary to survive, namely acting to change behaviour, or what is commonly referred to as ‘change management’. Second level (double loop) learning is the process of ‘doing the right things’. It involves reframing and changing one’s thinking (mental models) with respect to particular issues, problems or opportunities. The third level (triple loop) learning asks ‘*how* do we decide what is right?’ It focuses on assumptions and actions, from a normative, moral or ethical sense, and on evolutionary or experiential learning. It involves transformation through “helping individuals create a shift in personal perceptions through questioning inconsistencies and incongruencies in organizations” (Kransdorff, 2006: 177).

CASE EXAMPLE: KNOWLEDGE SHARING AND INTEGRATION IN PANAMA

In this section, we reflect on the theoretical framework for knowledge sharing and integration, and collaborative learning through the lens of an environmental and social impact assessment (ESIA) undertaken for the proposed ‘Cobre Panama’ copper mine project, currently under construction in Panama. The concession is located in the Mesoamerican Biological Corridor, an area of high biodiversity stretching from Mexico to the Darién in Panama. The Project’s main facilities will include a mine site, a mill, a port site and an electric power plant. Capital expenditure to develop Cobre Panama will be approximately $6.4 billion (First Quantum, 2014).[2] The ESIA began in July 2007 and was submitted in September 2010 to the Autoridad Nacional del Ambiente (ANAM), the Panamanian environmental regulatory authority (Golder Associates, 2010). It was formally approved in December 2011, a period of 53 months from start of consultations to approval. The final ESIA document consisted of 14,913 pages bound in 40 volumes. The executive summary and a plain language summary were made available on the project website, and electronic copies (in English and Spanish) were made available on request.

The core ESIA project team encompassed about 25 SMEs and support personnel with extensive international experience in undertaking ESIAs for mine development. The core team was supported by over 100 Panamanian and international experts. During the ESIA stage of the project, intrinsic (directly affected) stakeholder groups included eight communities located within nine km of the project area of influence (including two indigenous communities within five km of the area of influence), six small communities located along the existing project area access roads, two urban centres located 32 to 46 km from the main project site (La Pintada and Penonomé), and various government, civil and private organizations. The smaller communities were primarily agricultural-based (crops and livestock). A few isolated communities previously only accessible by sea or river were located north of the mine site towards the Caribbean coast. Local economies were largely based on subsistence activities (hunting, fishing and gathering), although small-scale (illegal) mining also occurred, especially among some residents of the community of Río Caimito as well as migrant miners from other parts of Panama and Colombia. In total, over 20 communities and about 22,000 people were directly affected by the project. The extrinsic (indirectly affected) stakeholder groups included entities in the region, country and international arena, as well as Cobre Panama employees, shareholders, suppliers and customers. Over 250 meetings with stakeholders took place over the course of the ESIA to generate and share knowledge.

A clear preference for fast knowledge was evident throughout the project, most likely due to the strict timelines and the consultant’s technical approach. Determining the location and assessing the state of community water sources provides an example of how slow knowledge was captured, shared and integrated with fast knowledge. Slow knowledge intrinsic to the local communities was developed by the

[2] Annual copper production is estimated at 320,000 tonnes, and total production of other minerals for the 34 year life-of-mine includes 100,000 ounces gold, 1,800,000 ounces silver, and 3,500 tonnes molybdenum.

social team using participatory mapping techniques in 10 different communities and 6-10 resident 'experts' or representatives per community. Topographic maps or sheets of paper were used to identify any attributes considered important. This mapping activity allowed insight into the resources that communities value most, and enhanced understanding of the prevalent social, economic and environmental context in these communities. These social maps (Figure 3) indicated where the water sources were located relative to each village or town site. Global Positioning System (GPS) instrumentation was used to pinpoint the water sources pre-identified in the social maps, and digitized maps created. In other words, local and culturally embedded slow knowledge of valued resources and places was enhanced by fast knowledge (remote sensing techniques and data) and shared with other ESIA team members (e.g., groundwater, surface water, terrestrial ecology). Knowing exactly where community water sources were located and their condition helped ensure that access to and quality of potable water was not compromised by mining or related activity in communities near the project.

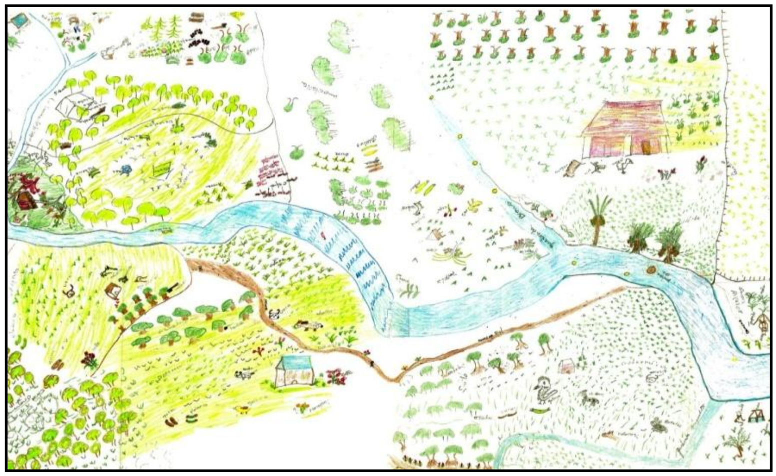

Figure 3. A Community Social Map for the Cobre Panama ESIA Project

All three influencing boundaries on the sharing and integration of knowledge were prevalent. The syntactic boundary was comprised of two language levels: English and Spanish. Since the project team mainly functioned in English, meetings involving technical experts and the exchange of expert knowledge required the use of translators and certain key documents had to be translated, slowing the process. Early meetings were unsuccessful in the two indigenous communities due to language barriers, as well as time and logistical constraints (helicopter needed to access), past negative history with another mining company and other factors. Field instruments such as questionnaires were not translated into the local indigenous language (Ngäbere) or assisted by local translators at the start.

Semantic boundaries led to different interpretations and meanings of what constituted an impact, its severity and the effectiveness of any proposed mitigation measures. To span this boundary, technical documents for distribution to local communities were summarized into a plain language format commensurate with educational levels and understanding of the technical issues. In the initial stages, both intrinsic and extrinsic stakeholders asked for increased information flow on the project, and for balanced information (i.e., not just the positives). However, consultant team members attending community meetings rarely had the requisite technical expertise to fully explain the project and answer potentially difficult questions. As a result, whenever possible, a project engineer or manager with in-depth knowledge of the full lifecycle and potential impacts and mitigation measures was present to address stakeholder concerns and to demonstrate the benefits that come from responsible economic development, including mining. During community consultations, some highly technical questions were deferred until answers could be provided. For example, some people requested the full list of chemicals used in copper mining or asked for details of mitigation plans.

The pragmatic boundary was comprised of the different vested interests. The ESIA team worked on behalf of the proponent to get the project approved, outlining appropriately designed mitigation measures and benefits that reduced significant impacts to acceptable levels. Nonetheless, communities were divided between those who felt the project would be economically, socially, culturally and environmentally damaging, even with mitigation measures in place, and those who saw numerous project benefits. Wherever possible, these boundaries were bridged through formal and informal meetings using boundary spanner facilitators; namely, individuals who had some level of expert and local knowledge, were fluent in English and Spanish (and Ngäbere in the case of the indigenous people), and who understood and appreciated the local cultures and the diversity of opinions and interests in the community.

As indicated above, the focus was on ‘getting it right’ (single loop learning), such that the ESIA would stand up to peer review. At about mid-point , the methodology was questioned by an external consultant hired by the project developer and a revised approach to impact assessment agreed. This form of double loop learning suggested reframing and changing the teams’ thinking on how to assess impacts. This learning was, however, confined to a small group of SMEs. Most likely stakeholders may have wanted to ask the questions of the project developer leading to double loop and triple loop learning. However, trust issues and power dynamics may have precluded this from happening. For example, early in the project the project’s external consultants stressed the importance of treating indigenous people as a vulnerable group, which was resisted by the in-country Cobre Panama ESIA team. Ultimately, the local decision not to recognize this group was overridden by a senior manager to enable some double loop learning to occur.

CONCLUSION

Our paper has illustrated that transparent and effective impact assessment in the complex world of extractive projects requires integrative knowledge and collaborative learning. We also illustrated that knowledge sharing, integration and collaborative learning helped to make better decisions. However, several shortcomings along the way were also pointed out, which often led to ineffective decisions and stakeholder mistrust in the process.

To improve the flow and understanding of information and knowledge in impact assessment to enhance stakeholder participation, a paradigmatic change is needed. Changing ways of generating knowledge, learning and collaboration could be difficult in a time-constrained environment and a rigid approach to the ‘rules of the game’. Somehow, stakeholders need to develop “the ability to carry on ‘learningful’ conversations that balance inquiry and advocacy, where people expose their own thinking effectively and make thinking open to others” (Senge, 1990: 9). Developers and their consultants need to respect and integrate the community’s slow knowledge (aimed at avoiding problems) with subject matter experts’ fast knowledge (aimed at resolving problems) into the project planning process, and the subsequent assessment of environmental and social impacts and the design of mitigative measures. There is also an urgent need to recognize, appreciate and integrate various types of knowledge (slow, fast, etc.) in impact assessment. Boundary spanners can assist in these mutually beneficial ‘learningful’ conversations by facilitating the sharing of different types of knowledge and overcoming syntactic, semantic and pragmatic boundaries among stakeholders. Beneficial outcomes are likely increased levels of trust and empathy leading to collaborative learning, and the development of more sustainable projects.

The extractive sector still has a long, arduous journey ahead to make a noticeable difference in integrating knowledge and learning into their decision-making processes; namely, robust decisions that are informed, inclusive and effective. To occur, those in the extractive sector would do well to integrate slow and fast knowledge into their development planning and activities. Anything less would be a missed opportunity.

REFERENCES

Ackoff, R.L. (1989). From Data to Wisdom. *Journal of Applied Systems Analysis*, 16: 3-9.

Carlile, P. (2004). Transferring, Translating and Transforming: An Integrative Framework from Managing Knowledge across Boundaries. *Organizational Science*, 13(4): 555-568.

Cobb, J. (2009). Definition of Learning. Accessed 08 February, 2015. www.missiontolearn.com/2009/05/definition-of-learning.

First Quantum Minerals Ltd. (2014). News Release, 27 January, 2014. Accessed 02 January, 2015. http://www.first-quantum.com/files/doc_news/NR%20-%2014-03%20-%20Update%20on%20Cobre%20Panama%20-%20FINAL%20%282%29.pdf

Golder Associates (2010). Environmental and Social Impact Assessment, Project Mina de Cobre Panamá. Print.

Hartman, F.T. (2000). *Don't Park your Brain Outside. A Practical Guide to Improving Shareholder Value with SMART Management*. Project Management Institute, Inc., Newtown Square, PA.

Kransdorff, A. (2006). *Corporate DNA: Using Organizational Memory to Improve Poor Decision-Making*. Gower Publishing, Burlington, VT.

Newell, S., Robertson, M., Scarbrough, H. and Swan, J. (2009). *Managing Knowledge Work and Innovation, 2nd Edition*. Palgrave Macmillan, Basingstoke, UK.

Orr, D. (1996). Slow Knowledge. *Resurgence*, 179: 30-32.

Rowley, J. (2007). The Wisdom Hierarchy: Representations of the DIKW Hierarchy. *Journal of Information Science*, 33(2): 163-189.

Senge, P.M. (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*. Currency Doubleday, New York, NY.

Templeton, G.F., Lewis, B.R. and Snyder, C.A. (2002). Development of a Measure for the Organizational Learning Construct. *Journal of Information Management Systems/Fall 2002*, 19(2): 175-218.

Tobin, D.R. (1998). *The Knowledge Enabled Organization: Moving from 'Training' to 'Learning' to Meet Business Goals*. American Management Association, New York, NY.