Communities of Practice and the Development of Best Practices

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INTRODUCTION

Communities of practice and the development of best practices have a particularly strong base in an industrial setting where the intellectual capital—or more correctly, the tacit knowledge—is a 'craft' bordering on 'alchemy'. The concept of 'craft' tacit knowledge in this context relates to industrial processes where the operation is often based on a *body of individuals' experience* and is not able to be determined or analysed in a scientific or repeatable manner. Some examples of industries where these processes exist include aluminium smelting and float glass manufacturing. In both of these industries, a large proportion of the production processes rely on factory floor operators utilizing 'craft' (tacit knowledge) in the pursuit of best practice. These types of situations see many individuals involved in the manufacturing process sharing a community interest, and seeking the determination of best practice as a challenge and a means of enhancing personal and group pride. Best practice is used here in both a general and a mathematical sense, since there are no deterministic solution algorithms that can be used for solving certain aspects of the processes described below.

BACKGROUND

Many mathematical models of aluminium smelting reduction cells have been developed (e.g., Grjotheim, Krohn, Malinovsky & Thonstad, 1982); however, they are usually of a macro nature and assume a given efficiency of production (i.e., the efficiency with which electric current converts the raw materials into aluminium, termed 'current efficiency'). In reality, some current is 'lost' due to the nature of the process and the way in which the reduction cells (pots) are handled by the smelter floor operators. The actions of the operators can affect the current efficiency of a particular pot for many days in uncertain ways.

An example of this is the manner in which 'anode effects' are handled. An anode effect is effectively where a wave of molten aluminium is started in the pot (as a result of gas bubbles and magnetic fields) that frequently spills out from the ends of the pots onto the pot room floor. The manner of treating this varies according to the experience and accumulated community of practice tacit knowledge. The operators, technicians, and other scientific people form very close-knit communities of practice with respect to handling these types of occurrences. In reality, the current efficiency cannot be actually calculated, only estimated. Thus, there are parts of the smelting process that are very 'soft', while others relating to the electrochemistry are quite 'hard'. Research undertaken by Rodrigo (1998) provided for the first time a method for determining current efficiency with a higher degree of accuracy than had previously been seen. This approach used Petri nets and other non-deterministic techniques in a mixed-mode modelling approach. Urpani (1997) has encapsulated the 'craft' or 'alchemy' aspect associated with how operators handle the pots on a day-to-day basis, and attempted—through an object-oriented methodology—to determine a common 'best practice' for the operation of reduction cells. However, while valuable information came from this research, together with an increased level of understanding, the attempt to define 'best practice' failed. Consequently, there is still a very strong and robust community of practice operating in the pot rooms of aluminium smelters in an attempt to achieve this elusive best practice, which is very much in-house as the improvement of pots' efficiency (i.e., increases in the current efficiency) means big increases in profitability.

In the float glass manufacturing industry, a similar situation exists to that in aluminium smelters. The production process for glass is not difficult per se. In fact the process is many hundreds of years old. It is, however, only relatively recently that float glass production has been utilized, rather than 'drawn' glass. Float glass production requires the molten glass from the furnace to be spread across a bed of molten tin. The manner in which this is achieved, and the way in which the glass moves along the float glass 'tank', determines the smoothness of the glass (i.e., the absence of bubbles, ripples and lines, etc.). This process of moving the glass along and keeping the molten tin bed as smooth as possible is the 'craft' aspect of the process. As in the case of aluminium smelting, communities of practice from across the spectrum of people within a glass manufacturing company are in existence, striving for best practice and achieving an operating procedure that will yield the ideal float glass. Again, it is not a scientific approach that is used, more the craft (or artisan) approach.

FUTURE AND CONCLUSION

The very elusiveness of the attainment of best practice and the 'craft' nature of the tacit knowledge in industries, such as the above examples, ensure existence, strength, and continuity of communities of practice. The determination of best practice using scientific means in these types of industries is still a very long way away, suggesting that there will be ongoing communities of practice for some time to come and a strong need for the same. Knowledge (albeit intuitive knowledge) difficult to quantify and codify is shared and perpetuates the essential alchemy of the industrial process.

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KEY TERMS

Best Practice: An explicit recognition of the fact that 'optimization' techniques and the goal of obtaining specific objective function maximisation or minimisation is inapplicable in the context. Best practice in the end is determined by the stakeholders and the producers, and may involve many subjective criteria.

Craft/Alchemy: The intuitive and holistic grasp of a body of knowledge or skill relating to complex processes, often without the basis of rational explanation.

Current Efficiency: The percentage of the electrical current (drawn into the reduction cell) that is utilized in the conversion of raw materials (essentially alumina and aluminium fluoride) into the end product, aluminium. The remaining percentage is lost due to complex reactions in the production process and the physical nature of reduction cells.

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