Competitive Advantage Through Knowledge Management: A System Dynamics Approach

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Introduction

The knowledge-based resources that a firm controls and leverages for competitive advantage are increasingly critical to success in the marketplace. However, the nature of these assets and their dynamic systems interactions are still poorly understood. This leads to undervaluation of their competitive worth, and even worse, counter-competitive management of the assets themselves.

This presentation describes a system dynamics model, and resulting flight simulator, which relate human and technical aspects of knowledge management with customer satisfaction and market penetration. The model was based on field-work with knowledge-management practitioners. The generic flight simulator provides decision makers with a low-risk dynamic practice field, where dialog, exploration of mental models, and organizational learning concerning knowledge management are catalyzed. Although the simulator is not intended for prediction, participants do gain practical insight into important strategic and operational concerns, such as how can one know if a firm is leveraging its knowledge assets to best achieve long-term customer acceptance?

Knowledge Management

Knowledge is developed through individual and organizational learning and is a result of investments in education, training, and recruitment. We believe knowledge is akin to professional intellect (Quinn, Anderson and Finkelstein, 1996) and consists of mastery of professional skills together with systems understanding, creativity and insight. In our scheme, knowledge is transient if it is in the heads of individuals, and by definition mobile as such individuals are free to trade their skills in competitive labor markets. Captured knowledge is created when transient knowledge is transformed into organizational memory, routines, policies, procedures and databases. Capturing knowledge into an organizational resource requires a process of embedding, through development of operations, new products/services and managerial practices. Core competencies (Hamel and Prahalad, 1990) are results of such systemic embedding. Research and development, IT management and strategic planning are some of the common business functions which promote knowledge capture.

In our view, transient (individual) knowledge is most strongly associated with the creative aspects of business development, for instance by developing innovative and attractive new products and services. Captured knowledge leads to growth in organizational capabilities, especially in support

of delivery of high-quality products and services through operational and logistics improvements. Sustained competitive advantage is a consequence of both captured and transient knowledge - to the degree to which either are valuable, rare, imitable and substitutable (Barney, 1991). Transient knowledge is more mobile and therefore less likely to prove a source of longer term advantage.

Structure of the Model

Figure 1 shows the high-level structure of the model in causal loop form. The firm holds a stock of financial capital which can be used to increase physical assets or human capital. Physical assets are the productive capability of the firm which allow it to fill customer orders for products and services. Human capital is represented by captured and transient knowledge. Various feedback loops are apparent, for instance between physical assets orders filled, customer satisfaction, need to enhance assets and capability enhancement. For clarity and to foster learning a number of simplifying assumptions have been made, for instance that satisfaction with the quality, attractiveness and delivery of products and services can be measured by single measures.

A flight simulator was constructed using "Ithink" modelling a typical small craft-based business. The firm specializes in the make-over and refurbishment of mid-range sports cars. Staff skills are important, with core competencies in engine rebuilding and bodyshell remodelling. Individual (transient) knowledge is required for an innovative and quality end-product and is built up by investments in learning and training. Knowledge is captured into the infrastructure of facilities, processes and procedures for remodelling different types of cars. Computer-aided design and manufacture contribute to learning curve effects and efficiency improvements. As in many traditional accounting models, training costs are expensed when incurred. Nevertheless, the model demonstrates the longer-term strategic value of knowledge development and management.

Base Run

In the base shown run expenditures on intangible assets are restricted to a constant $ 500,000 for advertising per period. As shown in Figure 2, this leads to a temporary spurt in new orders followed by a decline as quality erodes, accompanied by depreciation in financial capital and lower customer satisfaction. In this run intellectual capital also depreciates.

Alternative Policies

Figure 3 shows the results of a mixed policy in which total expenditures per period are also a constant $ 500,000, with the exception of a one time $ 500,000 investment in facilities to cope with increased demand in period 10. However in this case advertising is accompanied by expenditures on training, learning and knowledge embedding. Far more profitable results are achieved than in the base case as intellectual capital is enhanced.

Conclusions and Suggestions for Research

This article suggests that firm performance is profoundly affected by management of organizational knowledge and learning. Many organizations are becoming more service and knowledge-based, and reliant on information technology for rapid delivery of high-quality, highly-customized products. Management of intellectual capital (Quinn, 1992) is replacing management of financial capital as a critical success factor. Unfortunately there are few practical tools and techniques to

aid managers in development of strategies to exploit knowledge as a resource. System dynamics models can help improve understanding of the underlying processes involved, despite the intangible nature of many of the key variables. Use of the flight simulator described in the article has stimulated very reflective discussions in executive development and corporate strategy contexts.

We believe future work should be directed at; (a) developing customized flight simulators for interesting generic firm and industry situations, (b) constructing improved simulations for group and distance-learning settings, and (c) testing the hypotheses of conceptual research not easily amenable to empirical verification due to data limitations or intellectual property issues.

References

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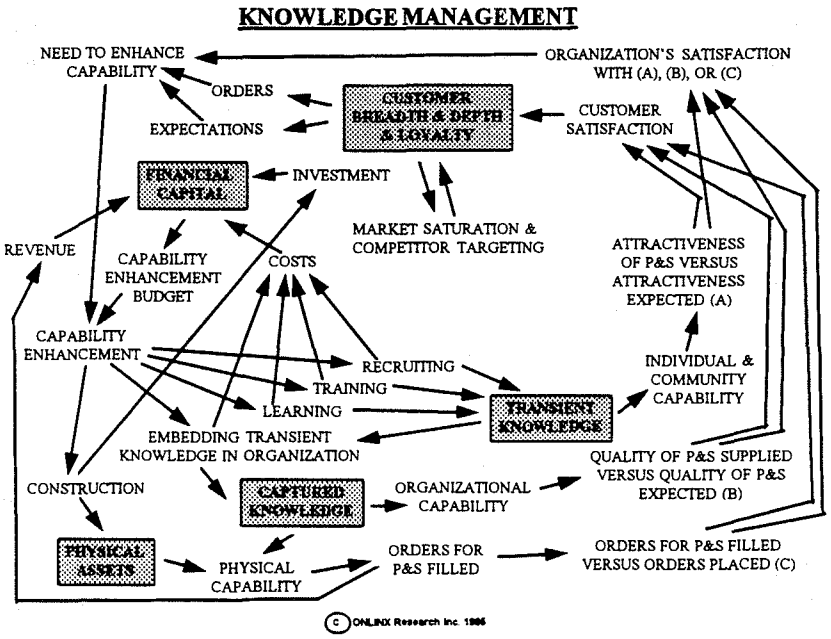
Figure 1: Structure of the Model



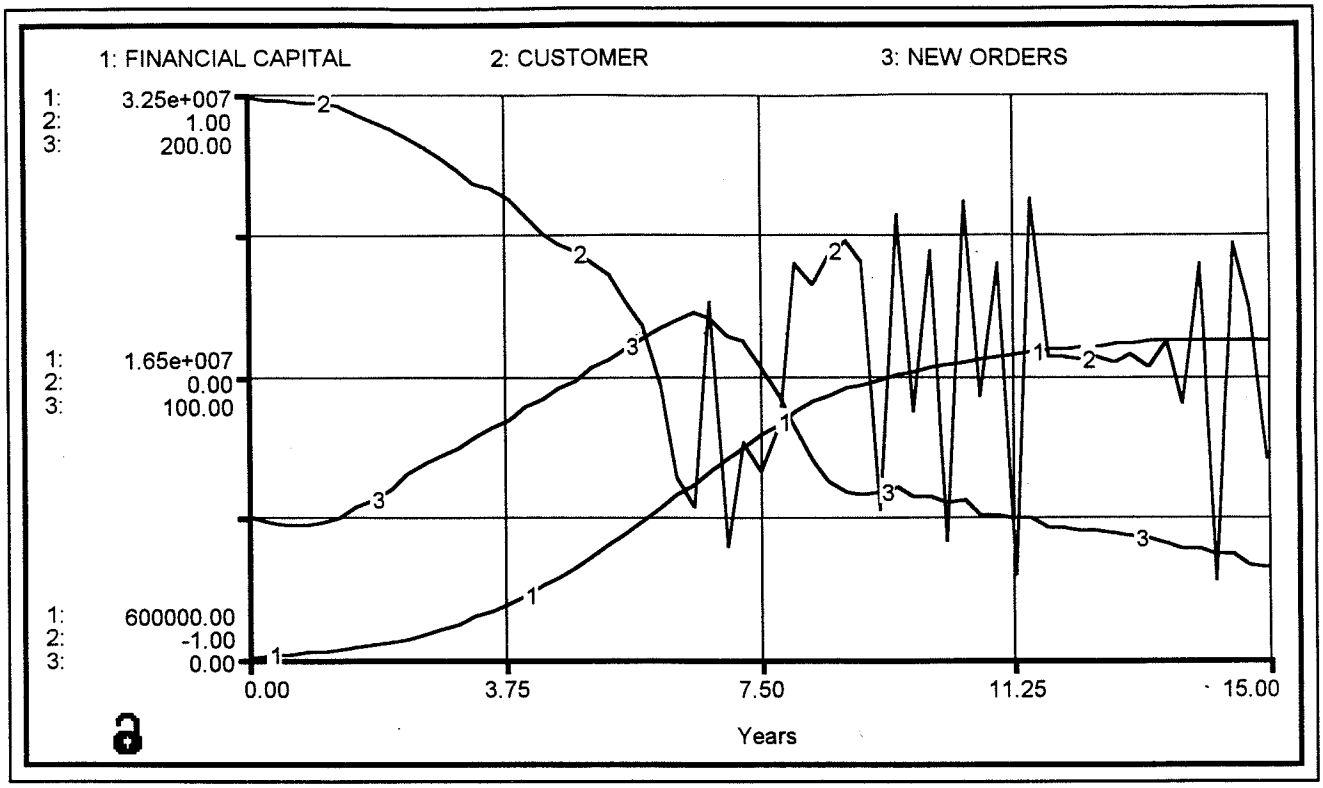


Figure 2: Base Case (above)

Figure 3: A Mixed Policy (below)