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System Dynamics Simulation for Knowledge Management in a Law Firm

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Authors:

Frida Eklöf

Hilde Fiskum

Lise Haalien

Elisabeth Haugland

Bjørn Melling

Erik Spieler

Anne Lene Sværen

Oleg Tukh

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1. Introduction

Lawyers are typical knowledge workers as they are highly dependent on the speed and efficiency in the creation and transfer of legal knowledge (Gottschalk 2002e). Therefore, effective management of this knowledge is a crucial factor for competitiveness in the legal-advice business arena. Information Technology (IT) can in various ways support the effectiveness of knowledge management (KM). This paper will trough system dynamics simulation study KM in a Law Firm by focusing on the supporting role of IT.

This paper can be found in the normative discourse. Writings in the normative discourse are theory driven, aiming to provide knowledge about phenomena. The normative discourse is typically used in classical management theory, theories of leadership, contingency theories and system theories. (Schultze and Leidner 2002)

The paper is divided into five main sections. The *second section* will introduce theories of knowledge, KM role in law firms and the supporting role of IT. This section will draw on KM theories in general and Gottschalk's (2002d) KMT Stage Model in particular. The *third section* introduces System Dynamics and argues for its usefulness in clarifying interconnected processes and their behavior over time. The *forth section* applies system dynamic tools, firstly by presenting a Causal Loop diagram, which conceptualize KM in a law firm with regards to IT investments. The Causal Loop diagram demonstrates the relationships between components (variables) that contribute to knowledge creation and the role of IT in this process. Theoretical underpinnings of the most essential variables and their relationships are discussed. Thereafter, based on the Causal Loop diagram, the impact of investments in KM-supporting IT on firm performance will be illustrated in a Stock and Flow diagram. This diagram has complete specifications of the feedback structure, including specific levels and rates of the components and their interactions over time. The *fifth section* elaborates on how law firms develop through stages of KM technology. By combining the Causal Loop Diagram and Gottschalk's (2002a) KMT Stage Model, "The Iterative KMT Model" is introduced. The paper ends with conclusions.

2. Knowledge Management in a Law Firm

This section will discuss aspects of knowledge in a law firm, and how KM through IT will increase firm performance and transform through The Stages of Growth Model (Gottschalk 2002a).

2.1. KNOWLEDGE

Knowledge is an area of discussion in academic literature and has been defined in numerous ways. There has been made a differentiation between knowledge, information and data (Fahey and Prusak 1998). Drekse (1981), Machlup (1983) and Vance (1997) claim that data is raw numbers and facts, information is processed data, and knowledge is authenticated information. According to Tuomi (1999), knowledge must exist before information can be formulated and before data can be measured from information. Davenport (1998) defines knowledge as information combined with experience, context, interpretation and reflection. The approach in this paper adheres to this definition of knowledge.

Knowledge is the main component of the intellectual capital that a company possesses. It is a renewable, reusable and an accumulating resource of value to the company when applied in the production of products or services. It increases in value with employee experience and organizational life. Knowledge in an organization is commonly divided into two dimensions, tacit and explicit knowledge. Explicit knowledge can be expressed in words and numbers, scientific formulae, specifications, manuals and the like. Tacit knowledge is highly personal and hard to formalize, making it hard to communicate or share with others. (Gottschalk 2002e)

The knowledge-based perspective of the firm is founded on the resource-based theory, which was promoted by Penrose (1959). The knowledge-based perspective emphasizes knowledge as the primary resource for an organization. Knowledge based recourses are usually difficult to imitate as they are socially complex. Resources that are valuable, unique and difficult to imitate can provide the basis for a firm's competitive advantage. In order for knowledge to create sustainable competitive advantage for a company, the firm needs to effectively create, share and use knowledge through KM techniques (Alavi and Leidner 2001). Hence, KM is an important source of competitive advantage.

2.2. LAWYERS AS KNOWLEDGE WORKERS

Gottschalk (2002e, p. 49) defines a knowledge worker as *"(...) an employee who is able to find, understand and use knowledge in the organization on his or her own*". People who are knowledgeable not only have information, but also have the ability to integrate and frame the information within the context of their experience, expertise and judgment. Lawyers are typical knowledge workers. They are professionals who have gained knowledge through formal education (explicit knowledge) and work experience (tacit knowledge). A lawyer's success is highly dependent on the speed and efficiency in the creation and transfer of legal knowledge (Nahapiet and Ghoshal 1998), in order to help their clients in the best possible way. Therefore, knowledge becomes the most important source of competitive advantage for a law firm. (Gottschalk 2002e)

2.3. KNOWLEDGE MANAGEMENT

Law firms can be seen as value shops, which is a definition of a company that creates value by solving unique problems for customers and clients. Hence, managing knowledge is crucial for success in the market for legal advice. Law firms can be seen as knowledge systems with different KM processes. These are creation, storage/retrieval, transfer and application. The processes are interconnected activities among individuals, groups and organizational structures. In order to deal with the diversity in the firm, multiple management approaches and systems are required. KM has been introduced to law firms in order to assist them in these processes. Some of the benefits of effective KM are that it causes less errors, fewer questions, better decisions, less reinventing, improved customer relations, improved services, resulting in increased profitability (Alavi and Leidner 2001).

2.4. KNOWLEDGE MANAGEMENT AND IT

Law firms are well suited for KM (Gottschalk and Khandelwal 2003) and IT plays a significant role in the KM process (Alavi and Leidner 2001). IT can support these processes by enabling coding and distribution of best practices, the creation of corporate directories and the creation of knowledge networks. This is in order to ensure that a maximum degree of knowledge transfer occur between knowledge workers, leading to increased individual performance, organizational performance and inter-organizational performance.

Knowledge Management Systems (KMS) are defined as a class of IT based information systems (IS) to support the management of organizational knowledge (Alavi and Leidner 2001). KMS support a law firm's ability to use existing knowledge in order to create new knowledge, thus enhancing the competitive sustainability.

2.4.1. The Knowledge Management Technology Stage Model

Gottschalk (2002, 2004) divides Knowledge Management Technology (KMT) into four stages of growth. These stages are useful to identify both the current situation and future investments. *Stage 1* is general IT support for knowledge workers (e.g. word processing). *Stage 2* is information about knowledge sources. An information system in this stage stores information about who knows what within the firm and outside the firm (e.g. intranet). *Stage 3* is information representing knowledge (e.g. database). The final stage, *Stage 4*, is information processing. An IS uses information to evaluate situations (e.g. expert system). Since firms may differ with regard to their needs, different stages may be more appropriate than others for each particular situation. Stage 1 may be right for one firm, while Stage 4 may be right for another firm. Some firms will evolve over time to higher stages. (Gottschalk 2004) This is illustrated in figure 1 below.

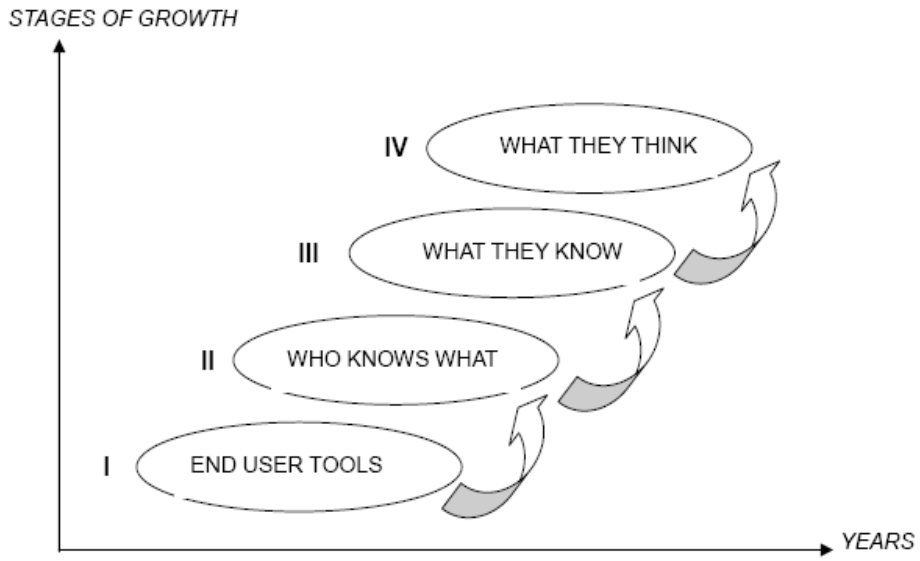

Figure 1: The Knowledge Management Technology Stage Model (Gottschalk 2002d, p. 86)

3. System Dynamics

System dynamics is a methodology for studying and managing complex feedback systems, such as one finds in business and other social systems. System dynamics is a set of conceptual tools that makes it possible to understand the structure and dynamic of such complex systems (Sterman 2000).

The field of system dynamics was developed in the early 1960's, initially from the work of Jay. W. Forrester at MIT. What makes using system dynamics different from other approaches to studying complex systems is the use of feedback loops. Causal loops capture mental models and relationships in a system. Stocks and flows help describe how a system is connected by feedback loops, which create the nonlinearity that is found so frequently in modern day problems. Computer software is used to simulate a system dynamics model of the situation being studied. Running "what if" simulations to test certain policies on such a model can greatly aid in understanding how a system changes over time. (Sterman 2000)

KMS are often very complex systems that are difficult to understand, and often produce unexpected and counterintuitive results. Such systems are very sensitive to some changes, and insensitive to others, which makes it difficult to predict the behavior of the system. The complex, non-linear interactions make a system's behavior difficult to understand. To aid understanding of the whole, and how every element is connected and influencing each other, it is important to understand the relationships between the individual parts. It is the relationships that generate performance over time. System dynamic simulation of a system will ease understanding of these relationships, and illustrates how different elements in the system will evolve. In this paper we have used the free software Vensim PLE to perform a system dynamics simulation on the effects of IT investment on firm performance.

4. Application of System Dynamics

As discussed in previous sections, knowledge is an important source of competitive advantage; hence effective KM can be perceived as vital for a law firm to be successful. The underpinning philosophy of this paper is that IT enables

effective KM, which increases firm performance. The authors of this paper illustrate this in Figure 2 below.

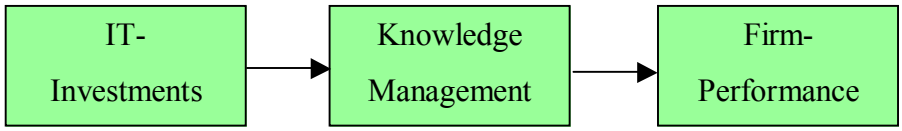

Figure 2: Model of Motivation

Figure 2 shows the Model of Motivation, which lays as a foundation for the following applications of system dynamics, in form of a Causal Loop and a Stock and Flow diagram.

4.1. CAUSAL LOOP DIAGRAM

Causal Loop diagrams are used to capture mental models and represent interdependencies and feedback processes in a system. All dynamics arise from the interaction of just two types of feedback loops, positive and negative. Positive loops tend to reinforce or amplify whatever occurring events in the system. Negative loops counteract and oppose change. (Kirkwood 1998)

The diagram in Figure 3 presents the essential components and interactions in the conceptualization of KM in a law firm.

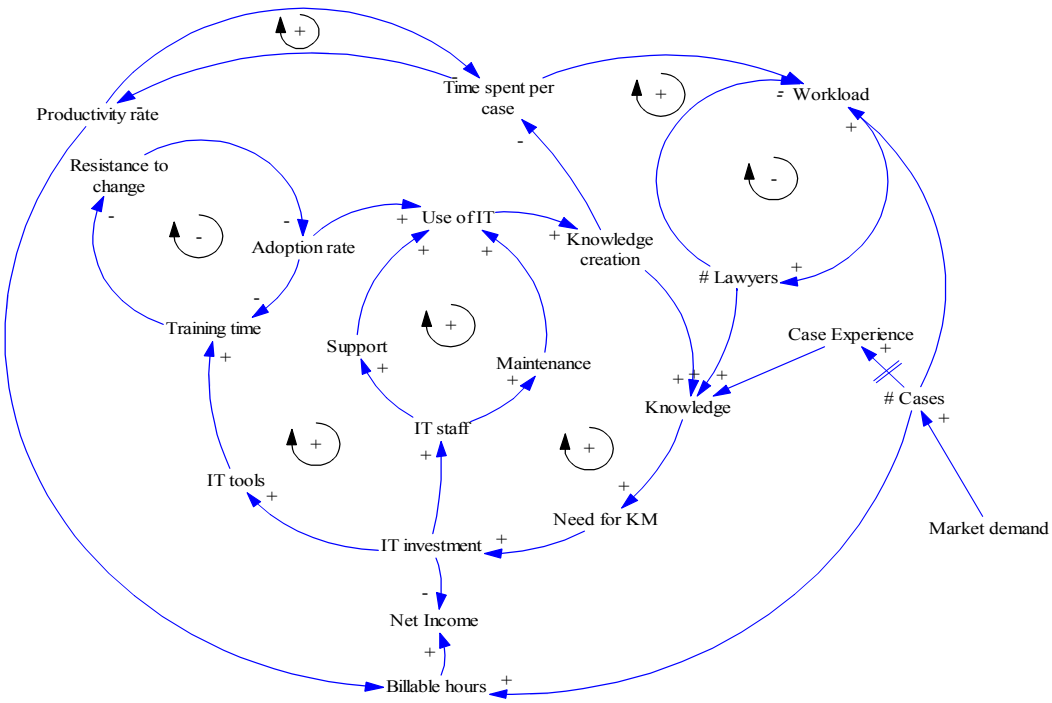

Figure 3: Causal Loop Diagram – Knowledge Management in a Law firm

The Causal Loop diagram is here employed to ease understanding of structure and dynamics of this system. However, one of the most important limitations of causal diagrams is their inability to capture the stock and flow structure of system (Richardson 1986). A stock and flow diagram with complete specifications of the feedback structure of this system including specific levels (states) and rates of the components and interactions is presented in section 4.2.

4.1.1. Validation of variables

In this part of the paper, theoretical underpinnings of the most essential variables and their relationships are discussed. It is important to note that incorporating all possible causes (and effects) in a system model is not only beyond the scope of this paper but literally impossible (Brønn 2004). Therefore, the models are based on the outcome of the discussion above, i.e. that IT enables efficient KM, and an increased level of KM leads to enhanced firm performance.

4.1.1.1. Increased knowledge leads to increased need for KM

The Causal Loop Diagram illustrates how the overall knowledge level in a firm increases as;

- New layers enter the firm (contributing with their individual knowledge)
- The lawyers in the firm gain knowledge from case experience
- Knowledge creation among the lawyers increases the overall knowledge level

Knowledge creation builds on Nonaka and Takeuchi's (1995) theory of organizational knowledge creation i.e. the SECI-process. They argue that the knowledge creation of organizations is conversion of tacit knowledge into explicit and vice versa. This happens through four different knowledge conversion processes (i.e. the SECI-process):

1. *Socialization*, where tacit knowledge is shared through shared experiences
2. *Externalization*, where tacit knowledge is articulated into explicit knowledge with the help of metaphors and analogies
3. *Combination*, where explicit knowledge is systemized and refined e.g. by utilizing information and communication technologies and existing databases
4. *Internalization*, where explicit knowledge is converted into tacit knowledge, e.g. by learning by doing

This interaction builds to a continuous spiral continuing from individual to organizational level.

As discussed in section 2, of this paper, knowledge is considered to be the most valuable resource of competitiveness for a law firm, and therefore it is of vital importance that organizations make efforts to utilize, leverage, and deploy knowledge. Thus, the models in this paper are based on the assumption that the more knowledge a law firm encompasses, the larger is the need for KM in order for the SECI process to take place.

4.1.1.2. Increased need for KM leads to increased IT investment

Although KM is not a technology-based concept, but a business practice (Kotwica 2003), technology supports KM. KM tools range from standard, off-the-shelf word processing packages to sophisticated tailor-made expert systems. Even though a company may follow a *personalization strategy*, i.e. knowledge sharing mainly through person-to-person contact (Hansen et al. 1999), IT can be used to support communication e.g. via e-conferences and databases over who knows what in the organization. An organization that employs a *codification strategy* is largely dependent on IT, where knowledge is codified, stored and distributed using IT. (Hansen et al. 1999)

Disregarding the strategic choice, contemporary IT offers huge productivity gains as it can collect, systemize, structure, store, combine, distribute and present information of value to knowledge workers (Gottschalk 2002). This enables lawyers to work more effectively, i.e. spend less time on each case, leading to more billable hours (Sørdal 2004), which in turn leads to increased net income.

An influencing factor of a firm's use of IT for KM is its number of employees. Larger firms can have practical constraints towards sharing knowledge on a person-to-person basis (Gottschalk 2004). Obviously, the number of employees is influenced by many factors. An investment of any sort is a strategic matter based on investment appraisals including the firm's objectives, the opportunities it faces, and constrains it works within (Marcousé et al. 1999).

To summarize; as IT enables efficient KM, an increased level of KM leads to larger IT investment level.

4.1.1.3. Adoption of IT for knowledge sharing faced with resistance to change

Although IT in theory enables efficient KM, in practice there are many obstacles for an IT venture to be successful. Few studies estimate IS failure rates below 30 percent (Sauer 1993) and some are up to 90 percent (Common Wealth Department of Health and Family Services 1996). There is a wealth of literature which covers reasons for IS failure (e.g. Lyytinen and Hirschheim 1987; Davenport 1994; Laudon and Laudon 2000; Mattern et al. 2003; Henderson and Venkatraman 1993; Manyika et al. 2002; Ewusi-Mensah and Przasnyski 1995). Summarizing the reasons for IS failure, as assessed in the literature, one can conclude that there are numerous reasons which can cause an IS to fail. IS failing due to technical deficiencies are today not seen as the main cause, rather, the most prevalent one is of a human nature, where individual, organizational and internal and external environmental factors influence the outcome of an IS project.

Accounting for all possible factors that could influence adoption of IT in the Causal Loop Diagram (Figure 3) is not doable. We have therefore only included the variable "resistance to change" which many writers within the business arena argue to be the largest problem facing those who are introducing change in an organization (Marcousé et al. 1999). The assumption that an introduction of new IT involves organizational change is based on a review of IS literature which reveals that nearly all IS/IT implementations imply reorganizations of business procedures and processes (Lyytinen and Hirschheim 1987; Davenport 1994; Laudon and Laudon 2003). According to Champy (1997) IT projects founder from the same failure factors that haunt all forms of organizational change. Whenever processes are redesigned or the availability of information is modified (e.g. information is made available to a larger, or simply a different group of individuals), work habits must be changed, existing social patterns are threatened, and the power and influence structure can be abruptly destabilized (Manzoni and Angehrn 1998). In any event, change involves a disruption of status quo, which is perceived as a loss of control, leading to resistance to change (Marshall and Conner 1996).

There are many ways to manage change caused by introduction of new IT. Again, it is impossible to include all variables, which can reduce resistance to change. In the diagrams presented in this paper the level of training (i.e. training time) is the variable seen as a key element for overcoming individual and organizational resistance to change. This is based on Bocij et al. (1999) argument that training is the principal way to counter resistance to technological change. Bocij et al. (1999) further maintain that managers need to explain through training why change is occurring and then train people adequately in the use of the system.

To sum up: IT implementations introduce a challenge involving a process of organizational change. Change initiatives are in general faced with the challenge of overcoming resistance to change. The adoption rate of new technology to support KM will largely depend upon the level of resistance to change in the organization. A larger degree of training reduces resistance, leading to a higher adoption rate, i.e. use of IT for KM.

4.1.1.4. Increased Use of IT Increases Knowledge Creation

The Causal Loop Diagram suggests that increased use of IT will lead to increased knowledge creation in the law firm. Gottschalk (2002e, p. 127) states that: *"The critical role of IT lies in its ability to support communication, collaboration, and those searching for knowledge, and its ability to enable collaborative learning"*. This collaborative learning may take the nature of knowledge creation, since knowledge in a law firm will be derived by extracting knowledge from peers that is stored as information in a KMS. Gottschalk (2002a) links the types of KM tools that enable the firm to create knowledge with the stages of growth model. The model suggests that tools available to the knowledge worker will increase over time, and that the investments made in those tools are defended by enabling the company to store its ever-increasing knowledge base in a more efficient and effective way. Although these tools in themselves may not facilitate knowledge creation, since this is done inside an individual's head (Fahey and Prusak 1998), they will enable knowledge creation through supporting the SECI-process, discussed in section 4.1.1.1.

4.1.1.5. Productivity Gains of Knowledge Creation

Gottschalk (2004) maintains that in a typical law firm, more time is spent on a case than what is actually being billed for. Gottschalk (2004) also reflects on the

future state of law firms, speculating that law firms at stage 4 of the Stages of Growth Model (Figure 1) may actually be able to bill the client for more hours than what is actually spent on a specific case. The firm will be able to do this because lawyers working on a specific case are in a position where they can reap the benefits of previous case experience stored in the KMS. This is a classical application of a productivity increase. Productivity is a measure of how an entity (organization, individual, etc.) coverts inputs (labour, materials, etc.) into outputs (finished goods, services) (Accel-Team 2004). In a law firm, inputs can be defined as labour while outputs can be defined as legal advice.

An ever-increasing level of productivity in law firms is essential. According to Becker et al. (2001), client loyalty to a specific law firm is decreasing because there is an increasing tendency of firms to purchase legal services upon a basis of value for money. Since clients are increasingly more price sensitive, law firms are forced to concentrate more on cost reducing efforts, altering their business strategies to focus more on cost leadership rather than pure differentiation (Porter, 1980). When using KM techniques a lawyer can produce the same result in substantially less time than before the firm implemented the KM initiative. However, comparing Gottschalk's (2004) arguments to Becker et al.'s (2001), it is evident that they are not aligned, as productivity defined by the law firm and the client differs. According to Gottschalk (2004), the law firm should rather use the increase in productivity to take on more clients/cases but at the same time to bill *the same amount* of hours for existing cases.

The middle ground of these two arguments is that the law firm could use the internal productivity increase to narrow the gap between actual labour hours and billed hours. This can enable the firm to charge less for their services, while increasing their profits, thus passing some of the increase in productivity on to the clients. In this way KMS will give the law firm a competitive advantage.

In any event, KM supported by IT will increase productivity as long as time spent per case decreases, ceteris paribus.

4.2. STOCK AND FLOW DIAGRAM

Stock and flow diagrams are a central part of dynamic system theory. They are used to capture the stock and flow structure of systems. A stock is defined as a supply accumulated for future use, while a flow describes how the stock increases and decreases, by inflow and outflows (Sterman 2000). The dynamics of the system are brought forth by examining the differences between inflows and outflows to a stock.

The stock and flow model presented below is based on the causal loop diagram in the previous section. A selection of variables from the causal loop diagram was *translated* into stocks, along with the corresponding relationships. The variables selected were chosen according to their relevance with regard to stock and flow systems, and their potential influence on firm performance though IT-investment.

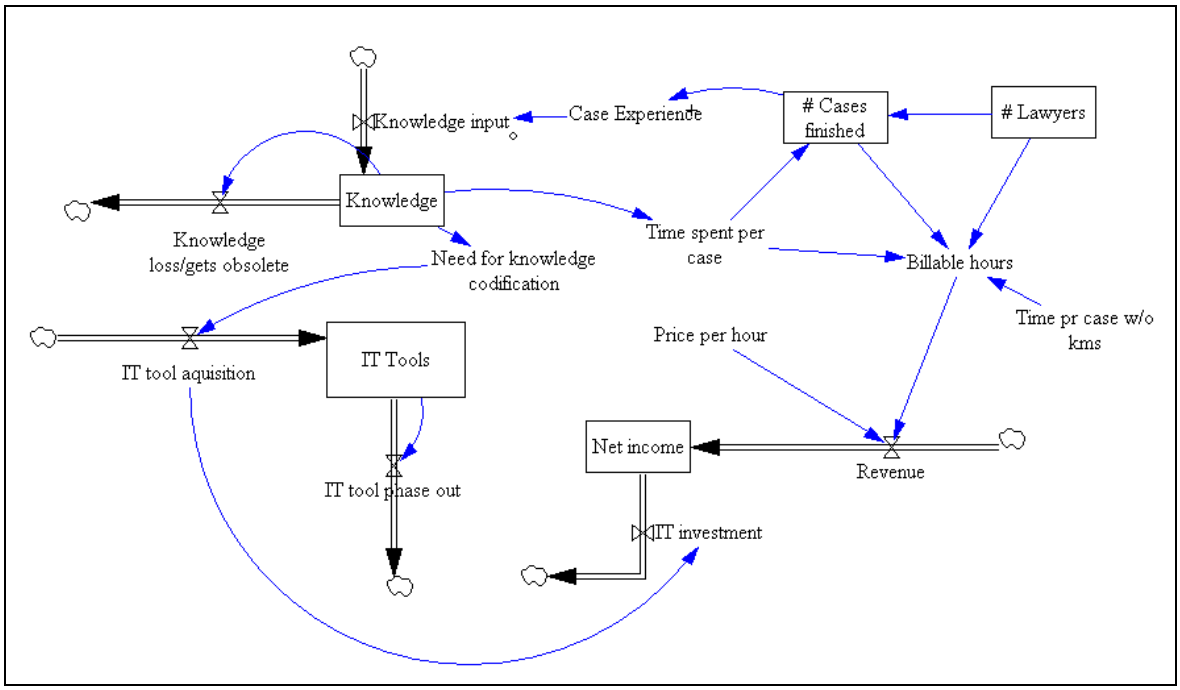

Figure 4: Stock and Flow Diagram – Knowledge Management in a law firm

4.2.1. Validation of the Stock and Flow Model

This section will discuss the selection of variables from the causal loop diagram and their relevance to firm performance through IT-investment. According to Sterman (2000), causal loop diagrams are unable to model the stock and flow behavior of systems. They are, however, well-suited for diagramming feedback

processes and mental models. Since stocks and flows, along with feedback, are the two central concepts of dynamic systems theory (Sterman 2000), the causal loop diagram in section 4.1 is modified to include stocks and flows. The reasoning behind variable selection is detailed in the following subsections.

4.2.1.1. Knowledge

The purpose of this paper is to examine the effects of investment in KMS on law firm performance. Lawyers are knowledge workers (Gottschalk 2002e) and KMS assist knowledge workers in creating, storing and retrieving knowledge (Alavi and Leidner 2001). In this respect it is relevant to examine the accumulation of knowledge in a law firm as a result of investments in KMS, since an increase or decrease in knowledge will impact the performance of both the knowledge worker (the lawyer) and the knowledge organization as a whole (the law firm). This stock measures knowledge through knowledge input as an inflow and knowledge loss as an outflow.

4.2.1.2. IT Tools

The *IT tools* stock describes the number of IT tools used in a law firm. The accumulation of IT tools is determined by the need for knowledge codification, which ties the number of tools implemented to the level of knowledge in the firm, making the stock relevant to the analysis. The need for knowledge codification influences the rate of IT tool acquisition, which occurs periodically. The tool phase out rate is calculated by phasing out a percentage of IT tools over the same period, but a different time span. The reasoning is that, over a given time period, a certain number of IT tools will be acquired and phased out.

4.2.1.3. Net income

A firm's profitability is an important measure of its performance. *Net income* is here calculated by the difference between the revenue and the *IT investment* expenses. Other possible expenses are not included in the outflow of this stock for the sake of simplicity and clarity. Since the diagram is examining the effect of *IT investment* on firm performance, excluding other factors may yield more precise results with regard to IT investment. This is done in order to clearly identify the dynamics of IT investments. Revenue is derived from the number of billable hours, which in turn, depends on the level of knowledge in the firm and the time spent per case by each individual lawyer. Incorporating knowledge in the

calculation of the income demonstrates the effect of knowledge on the inflow to *Net income*. The outflow of *Net income*, *IT-investment*, is derived from the rate of acquisition of IT-tools by implementing the same period as the rate of acquisition of IT-tools, and periodically adjusting the rate of IT-investment.

4.3. SIMULATIONS

This section present the results of running the simulation of the stock and flow diagram described in the previous section. The simulation was run over a period of 1000 weeks – approximately 20 years. The number of lawyers was kept constant in the simulation for the sake of simplicity as well as for the purpose of testing. The aim was to examine the impact of IT-investments on the current situation, regardless of the potential need to hire/fire lawyers. Furthermore, including variations in the number of lawyers would add considerable complexity to the model.

4.3.1. Simulation Graphs

This section presents the results of running a system dynamics simulation on the Stock and Flow Model (Figure 4). Graphical illustrations and explanations are provided.

Figure 5, illustrates the evolution of knowledge over time, and indicates that the total amount of knowledge increases. This implies that IT-investments have a positive effect on the knowledge level.

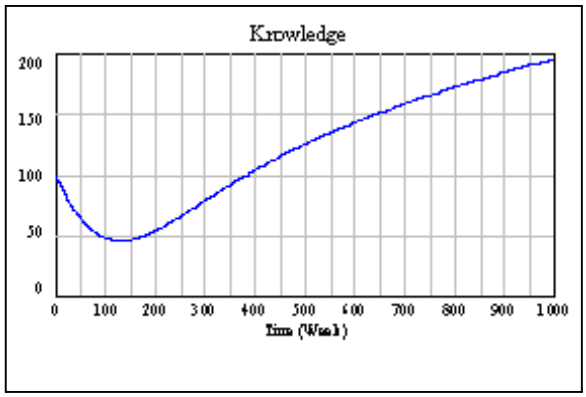

Figure 5: Knowledge over time

Figure 6 displays the time a lawyer spends pr. case. As the simulation progresses and KM tools are implemented, the time spent pr. case decreases. This decrease is a measure of firm performance, as discussed in section 3.1.1.5., and demonstrates

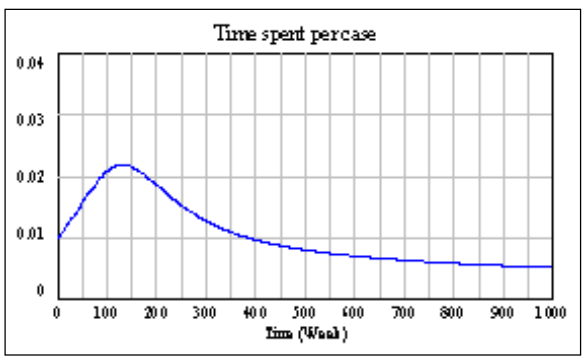

Figure 6: Time spent pr. case over time

that implementing IT-tools for KM leads to increased efficiency. It is also logical with regard to the increasing knowledge curve (Figure 5), in the sense that the more knowledge a lawyer has, the less time he/she spends pr. case. The initial increase in time (0-120 weeks) may be attributed to the time it takes to train employees in using IT.

As the time spent pr. case decreases, it is compared to the baseline (i.e. time spent pr. case without using KMS), which is constant. The number of billable hours is calculated accordingly, resulting in the growth of the curve. As mentioned in section 3.1.1.5., the number of billable hours is a measure of firm performance. Therefore, the growth of this curve illustrates the positive effect of KMS on firm performance.

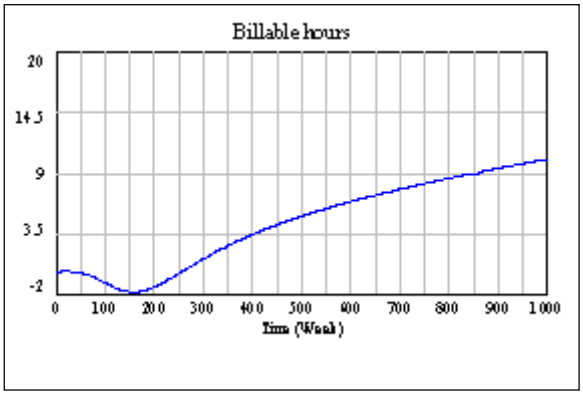

Figure 7: Billable hours over time

As the number of billable hours increases, the inflow of revenue into the *Net income* stock is also increased. The outflow from this stock is *IT investment* and the graph shows that the initial net income is negative and decreasing. After approximately 300 weeks (approximately 6 years) the investment becomes profitable and the *Net income* curve begins to increase.

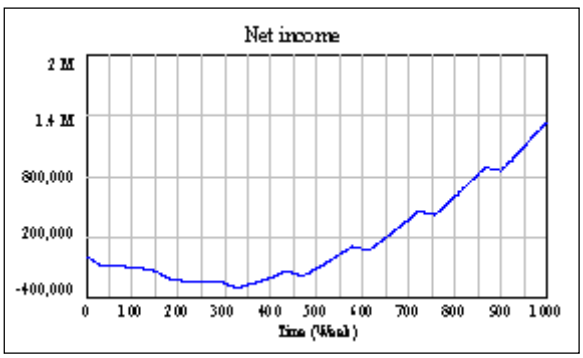

Figure 8: Net income over time

The effect of running the simulation on the *IT-tools* stock is presented in Figure 9. The pattern bears a strong resembelance to Stages of Growth Model in Figure 1. This indicates that the amount of

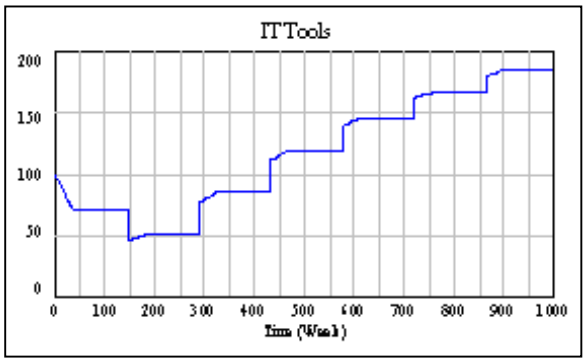

Figure 9: IT-tools over time

IT-tools in a law firm increases incrementally and in stages. The initial drop in *IT-tools* may be attributed to the time needed for the simulation to stabilize. (Sterman 2000)

4.3.2. Discussion of Simulations

Although the simulation of the stock and flow diagram yielded results resembling Gottschalk's Stages of Growth Model (2002d), presented in Figure 1, it is uncertain whether the model is correctly specified. The connections between variables have been underpinned theoretically, however the degree of influence and the mathematical formulas governing the relationships may be incorrect. Furthermore, since the model simplifies the real world by only considering *IT investment* as an outflow of *Net income*, the dynamics of other potential expenses are not included in the model. It is possible that including such outflows into the model may have yielded different resulting graphs.

The graphs only show the dynamics of the system, rather than actual numeric relationships. They are therefore to be seen as indications of pattern rather than actual numeric relationships. The simulation results contribute to the understanding of the dynamics of the system, and may not reflect reality as such.

5. The Iterative Knowledge Management Technology Model

This section will illustrate and elaborate on how law firms develop through the stages of KM technology by combining the Causal Loop Diagram (Figure 3) and Gottschalk's (2002d) KMT Stage Model (Figure 1).

The KMT Stage Model (Figure 1) is created with the purpose to provide some understanding of how IT can support KM in law firms (Gottschalk 2002a). This is done through four stages where the use of IT increasingly supports knowledge work as the firm advances through the stages. The Stages of Growth model can be employed by law firms to develop a strategy for implementing technology that guides them to higher stages in the model (Gottschalk 2004). The Causal Loop Diagram illustrates the essential components and interactions in the conceptualization of KM in a law firm. The underpinning argument is that IT

enables effective KM. As a firm's knowledge base increases, the need for KM intensifies, thus driving higher levels of IT investments for KM support.

Figure 10 has been created by the authors of this paper to illustrate the combination of the KMT Stage Model and the Causal Loop Diagram.

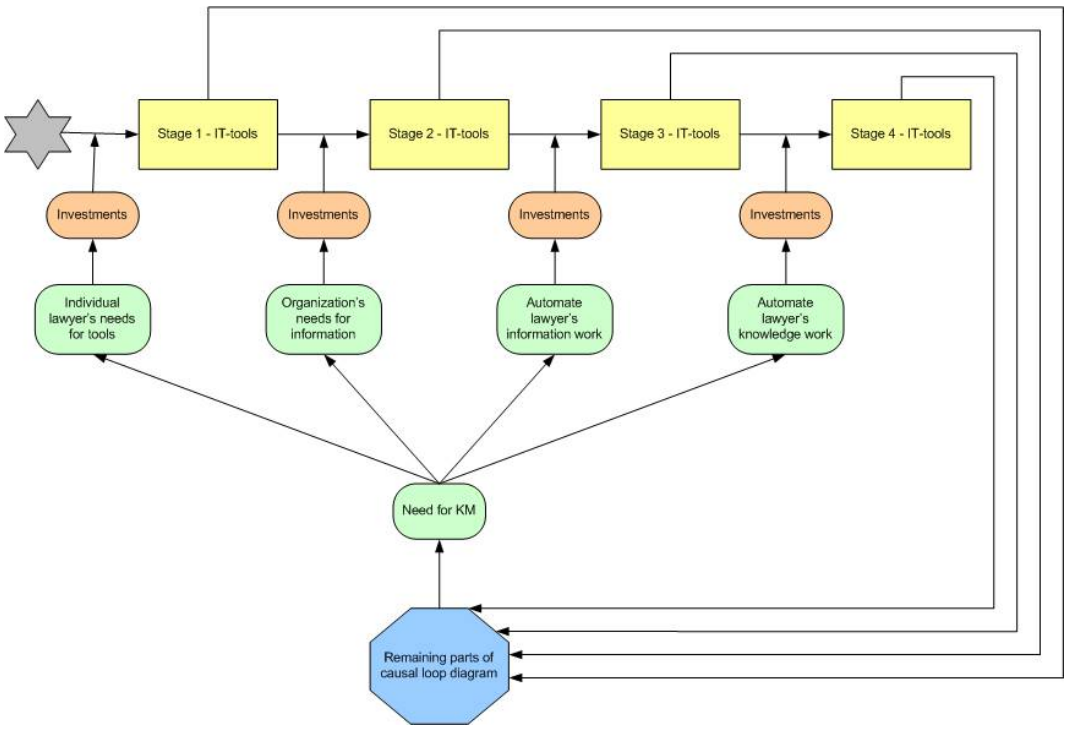

Figure 10: The Iterative Knowledge Management Technology Model

As seen in The Iterative KMT Model (Figure 10), the variables *IT-tools*, *Investments* and *Need for KM* are taken directly from the Causal Loop Diagram. Further, the variable *Need for KM* has been broken down into four sub-elements illustrating what trigger IT investments under each stage. E.g. in Stage 1, IT investments aim to support individual lawyer's needs for tools.

The goal of moving through the Stages of Growth would therefore be to, through investments and use of IT-systems, create an organization that function as an organism (Morgan 1997), where the knowledge floats as "blood through the veins", and is needed for the entire organism to function. This highlights the significance of focusing on factors that enable knowledge creation in the in order to make it capable of surviving on a sustainable basis in the world of business.

5.1. LIMITATIONS OF THE ITERATIVE KNOWLEDGE MANAGEMENT TECHNOLOGY MODEL

It is important to mark that The Iterative KMT Model (Figure 10) and the underlying Causal Loop Diagram need further investigation. This, in order to validate if the variables identified are as relevant as the proposition suggests, and that these are significant drivers for progressing through the levels in the KMT Stage Model.

6. Conclusion

The main objective of this paper has been to, trough system dynamics simulation study KM in a Law Firm by focusing on the supporting role of IT.

By employing the system dynamic simulation tools, diagrams illustrating causal loops and stock and flows have been presented with the intention to demonstrate the different variables and how they affect each other. These diagrams show variables, which influence a law firm's overall knowledge level and the need for KM. Through higher levels of investment in KM-supporting IT, the diagrams confirm Gottschalk's (2002, 2004) growth theory of the KMT Stage Model.

IT supported KM is argued in this paper to lead to enhanced firm performance, through efficiency gains. As the knowledge level in a law firm increases due to new lawyers entering the firm, case experience and knowledge creation through the SECI-process, management of this knowledge for even higher levels of knowledge creation is efficiently supported by IT tools regardless of what Stage of Growth a law firm finds itself in.

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