DESIGNING A KNOWLEDGE MANAGEMENT ARCHITECTURE TO SUPPORT SELF-ORGANIZATION IN A HOTEL CHAIN

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DESIGNING A
KNOWLEDGE MANAGEMENT ARCHITECTURE
TO SUPPORT SELF-ORGANIZATION
IN A HOTEL CHAIN

A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy (PhD)
in the Faculty of Engineering and Physical Sciences

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SCHOOL OF COMPUTER SCIENCE
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Abstract

Models are incredibly insidious; they slide undetected into discussions and then dominate the way people think. Since Information Systems (ISs) and particularly Knowledge Management Systems (KMSs) are socio-technical systems, they unconsciously embrace the characteristics of the dominant models of management thinking. Thus, their limitations can often be attributed to the deficiencies of the organizational models they aim to support.

Through the case study of a hotel chain, this research suggests that contemporary KMSs in the hospitality sector are still grounded in the assumptions of the mechanistic organizational model which conceives an organization as a rigid hierarchical entity governed from the top. Despite the recent technological advances in terms of supporting dialogue and participation between members, organizational knowledge is still transferred vertically; from the top to the bottom or from the bottom to the top. A number of limitations still exist in terms of supporting effectively the transfer of knowledge horizontally between the geographically distributed units of an organization.

Inspired from the key concepts of the more recent complex systems model, referred frequently as complexity theories, a Knowledge Management Architecture (KMA) is proposed aiming to re-conceptualize the existing KMSs towards conceiving an organization as a set self-organizing communities of practice (CoP). In every such CoP, order is created from the dynamic exchange of knowledge between the structurally similar community members. Thus, the focus of the KMA is placed on capturing systematically for reuse the architectural knowledge created upon every initiative for change and share such knowledge with the rest of the members of the CoP.

A KMS was also developed to support the dynamic dimensions that the KMA proposes. The KMS was then applied in the case of the hotel chain, where it brought significant benefits which constitute evidence of an improved self-organizing ability. The previously isolated hotel units residing in distant regions could now trace but also reapply easily changes undertaken by the other community members. Top-management’s intervention to promote change was reduced, while the pace of change increased. Moreover, the organizational cohesion, the integration of new members as well as the level of management alertness was enhanced.

The case of the hotel chain is indicative. It is believed that the KMA proposed can be applicable to geographically distributed organizations operating in different sectors too. At the same time, this research contributes to the recent discourse between the fields of IS and complexity by demonstrating how fundamental concepts from complexity such as self-organization, emergence and edge-of-chaos can be embraced by contemporary KMSs.
Declaration

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To Vasiliki...
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Finally, I would like dedicate this thesis to my fiancé Vasiliki for her love, care and understanding during these intensive years of simultaneous industry work and academic study.
List of Abbreviations

BI: Business Intelligence

CPM: Corporate Performance Management

BPM: Business Process Management

BPMS: Business Process Management System

CEO: Chief Executive Officer

CoP: Community of Practice

ERP: Enterprise Resource Planning

ICT: Information and Communication Technologies

IS: Information System

ISO: International Organization of Standardization

KM: Knowledge Management

KMA: Knowledge Management Architecture

KMS: Knowledge Management System

MNC: Multinational Corporation

PM: Performance Management

UML: Unified Modeling Language

VSM: Viable Systems Model

WFMS: Workflow Management System
Thus, the task is not so much to see what no one yet has seen, but to think what nobody yet has thought about that which everybody sees

Arthur Shopenhauer
Chapter 1: Introduction

1.1 Research Motivation

Having well entered the new millennium, business organizations are confronted with new challenges. Globalization, increased competition, massive technological change as well as the pace of change itself are forcing organizations to adjust continuously to their environment in order to remain viable. The traditional model of centralized control is proving insufficient and in many cases is failing to cope with the continuous pressure for change at all levels of an organization.

A new self-organizing model of corporate governance has recently emerged in the area of complexity theories to describe the creation of new order from the bottom of the organization. This means that that there is no overall blueprint or external determinant of how the organization develops. Instead, the organization self-organizes in the sense that “the pattern of its behavior evolves or emerges from the dynamic interaction of the parts of the organization which share a path-dependent history” (Stacey 2003; Stacey et al 2002).

In the context of organizational science, the parts of the organization which share a path-dependent history correspond to the units which share similar structural characteristics and purpose, while the dynamic interactions between the parts correspond to the exchange of knowledge between those units. In order for self-organization to occur, the units of the organization need to exchange the knowledge they obtain with one another dynamically. Such knowledge is in most cases obtained when organizational units undertake initiatives for change which aim to improve their fit to their environment. However, is the knowledge created upon their initiatives for change effectively transferred across the organization so that self-organization can occur?

This thesis presents an analysis of an in-depth case study focusing on the technological tools for the sharing and reuse of knowledge within the hospitality sector. The first section of this introductory chapter presents the key elements which motivated the choice of this topic. Section 1.2 describes the objectives of the research, while section 1.3 analyzes the
different research methods used. Section 1.4 elaborates on the contributions of this work to the existing research and finally section 1.5 provides an overview of the structure of the thesis.

During the last years, the management of knowledge has become a widely researched topic. Knowledge has been recognized as a strategic resource (Nahapiet and Ghoshal 1998), as a source of competitive advantage (Stewart 1997) and of long-term sustainability and success (Nonaka and Takeuchi 1995). Given the increasing importance of knowledge management (KM), Information and Communication Technologies (ICTs) have attracted considerable interest as they can offer significant support to organizations for managing more effectively the knowledge they create upon undertaking initiatives for change. A class of Information Systems (ISs) named Knowledge Management Systems (KMSs) has emerged and is gaining notable attention. A KMS has been defined by Alavi and Leidner (1999) as “an IS designed specifically to facilitate codification, collection, integration and dissemination of organizational knowledge”. Given the applicability of KMSs, a large number of organizations nowadays have adopted KMSs as part of their initiatives for KM.

However, recent trends of the contemporary environment such as decentralization, active employee involvement and high volatility and uncertainty have created new challenges for KM and in turn for KMSs. The first challenge to note is knowledge disintegration. Historically organizations were led from the top. As a consequence, knowledge was gathered at the headquarters and usually remained in the minds of a few executives. Thus, KMSs focused on the transmission of knowledge from the top to the bottom and on monitoring the execution of top-down change. In today’s globalized era though, barriers for entering new markets have been reduced and organizations have expanded their operations into new regions. Aiming to be competitive to the local markets, organizations adopt more decentralized and flexible organizational structures which allow the lower organizational levels an increased level of autonomy. Decisions for change are no longer taken solely from the headquarters but also from the bottom. By undertaking initiatives for change though, the autonomous units which usually reside in a different geographical location become knowledge domains. This means that the knowledge created upon change is no longer kept within the headquarters but gets spread across the organization: what we coin knowledge disintegration.
The second challenge for contemporary KMSs is the increased vulnerability of knowledge due to the unprecedented turnover rate of managers. Research has shown that the frequency of top management dismissal (involuntary turnover) has increased significantly in recent years (Denis & Denis 1995; Huson et al. 2001; Lucier et al. 2006; Wiersema 2002). Thus, key people who may have been involved in important initiatives for change leave the organization more frequently, and the loss of the knowledge they “carry” with them may have severe consequences for the future of the organization.

Both challenges act as barriers for the dynamic sharing and reuse of knowledge between the parts of an organization. As a result, they delimit the ability of an organization to self-organize. Given the fact that self-organization has been recognized as a key property of all living systems which allows them to adapt to their environment in order to survive, I was particularly motivated to explore how KMSs treat the challenges of our contemporary era and to what extent they support self-organization. This introduces us to the objectives of this research which will be described in the next section.

**1.2 Research Objectives and Scope**

This research aims to achieve the following three objectives:

**Objective 1:** To identify the limitations of the existing KMSs in terms of supporting self-organization in the hospitality sector.

**Objective 2:** Propose a Knowledge Management Architecture (KMA) for re-conceptualizing KMSs in the hospitality sector to support more effectively self-organization.

**Objective 3:** To develop a KMS on the basis of the proposed KMA and apply it in the real case within the hospitality sector

The first objective of this thesis is to explore the extent to which the contemporary KMSs used by hospitality professionals facilitate self-organization. In order for self-organization to occur in a geographically distributed organization, the units which have a similar purpose but happen to operate in different regions should be able to exchange dynamically with
each other the knowledge they obtain. Two elements of KMSs in particular are studied. First, KMSs are examined in terms of their ability to target knowledge to the appropriate organizational units. Do KMSs allow a manager of a unit to filter easily the relevant knowledge created by units belonging to the same class? Is it possible for example for the manager of the marketing department of a large multinational to find easily all the present and past initiatives for change undertaken by other marketing departments operating in different countries across the globe?

The second aspect studied is the “quality” of knowledge which is transferred internally through KMSs. Even if a change has been targeted effectively towards the appropriate units, has the process of change been captured in a systematic manner so that change can be reapplied easily by other units? Argote and Ingram (2000) define internal knowledge transfer as “the process through which knowledge acquired in one situation can be applied to another”. From this definition it becomes evident that effective internal knowledge transfer implies not only the sharing but also the reusability of knowledge within an organization. Following the previous example, let us assume that the marketing department identifies all the actions undertaken by other marketing departments which have altered the existing architecture or performance. Has such knowledge been captured systematically in a KMS so that a successful action can be reapplied by another marketing unit which operates in a different geographical location? Has the rationale, implementation plan and lessons learnt from every new initiative for change been documented?

Based on the limitations of the existing KMSs for the hospitality sector which are identified, the second objective of this research is to propose a KMA which can act as a guide for re-conceptualizing KMS to support more effectively self-organization. The proposed KMA is based on two key ideas. First, it perceives the organization as a biological organism which has been “reproduced” in different regions. Such a fractal conception of an organization has very important implications for KM. Since the units—children which are operating in different regions have similar structural characteristics, they should not remain isolated with each other due to geographical barriers. Instead, they should exchange all the knowledge they obtain with the other members of the same family or else referred community of practice. Communities of practice (CoP) have been defined by Wenger et al (2002) as: “groups of people who share a concern, a set of problems, or a
passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis”. Hence, every change undertaken by a particular organizational unit should be shared with the other members belonging to the same CoP.

Secondly, the proposed KMA treats every initiative for change as an act of emergence of an organizational unit into a newer version which aims to achieve a better fit to its environment. Therefore, all the details of every change initiated by a particular member of the community should be captured so that such a change can be then easily reapplied by another member of the CoP. Such knowledge is referred in this research as architectural knowledge.

Architectural knowledge is defined as “the integrated representation of the architecture of an organization, along with the underlying design decisions, assumptions, context, and other factors that together determine why a particular solution is the way it is” (Kruchten et al 2006). According to Nadler et al (1992) “architecture” refers not only to the specifics of organizational structure – what is in the boxes and which lines connect them, but also to the design of work practices, the nature of the information organization or operating style, and the processes for selection, socialization, and development of people.

In search of a better understanding of the architectural knowledge created upon the process of change, the study entered the area of organizational change. After studying a number of models of change, it was then concluded that architectural knowledge is created upon three main phases of the process of change: i) the brainstorming phase, ii) the implementation phase and iii) the evaluation phase. While knowledge exists in all three phases, the proposed KMA emphasizes the importance of capturing the knowledge created upon the evaluation phase, which includes the effects of change on the existing architecture and performance.

Finally, the third objective of this research was to develop a KMS to support the proposed KMA. This was considered essential for the understanding of the dynamic dimensions that the KMA proposes. As it will be shown in Chapter 5, new dimensions of knowledge which aim to capture the emergence and the extent to which the organization approaches the edge of chaos are now enabled.
Before proceeding to the analysis of the methods used for this research, it would be useful to make two clarifications. Although this research may well apply to small or medium size firms, its focus will be on ‘enterprises’ which correspond to large and complex private organizations with a geographically distributed structure. Thus, from now on, the use of the term *organization* shall refer mainly to enterprises. Secondly, when referring to knowledge management or knowledge transfer, the focus will be placed on the knowledge transferred internally between the organizational units that reside within the organization. The stream of external knowledge transfer which addresses the knowledge transfer across the enterprise’s boundaries through methods such as strategic alliances and acquisitions is beyond the scope of this research.

### 1.3 Research Methodology

This section presents an overview of the methodological choices that have informed the thesis throughout each stage of the research. In order to justify the contributions of this research, a case study of a single organization has been chosen as the main research strategy. Yin (2003) defines a case study as an empirical research that “investigates a contemporary phenomenon within its real life context, especially when boundaries between phenomenon within its real life context are not clearly evident”. According to Walsham (1995), the method of a case study is well suited for assessing a given phenomenon within a particular context. In this research the phenomenon is the sharing and reuse of knowledge and the context is the complex organization of a hotel chain.

According to Sjoberg et al (1991), the unit of analysis of the case study can potentially be an individual, a community, an organization, a nation-state, an empire or a civilization. In this study, the unit of analysis is a hotel chain in Greece. A hotel chain constitutes a complex, geographically distributed (six hotels in different locations) which operates in a dynamic and important sector for the national economy. It is also an almost “alive” organization, as it operates 24 hours, 365 days a year. At the same time, the chosen hotel chain constitutes a dynamic organization which in recent years has expanded its operations in new geographical locations. For all these reasons, the selected organization serves as an important case and falls under the definition of the organization as adopted by the study.
The initial phase of the empirical study began with an investigation of the existing systems in place for managing organizational knowledge within the hotel chain over a one-year period. The primary data consisted mainly of documentary information and physical artifacts as well as confidential information. A significant amount of data was also found within the quality management system used by the hotel chain. The researcher had full access to these kinds of data, as he actively participated in business meetings while serving as an IT consultant. The primary data was then triangulated with secondary data collected by performing in-depth semi-structured interviews with the two managing directors of the chain, three hotel managers and three managers of hotel units. All the methods used are described in detail in Chapter 3.

After a thorough study of the KMSs used by the hotel chain, it has been noticed that they provided limited support towards capturing and sharing all the initiatives for change undertaken at all organizational levels of the hotel chain. Moreover, even if at times the KMSs available for the hospitality sector managed to capture certain initiatives for change initiated usually by the top, they failed to record systematically the knowledge incorporated within the process of change. This meant that valuable knowledge created by the change process could not be easily traced and reused across the hotel chain. As a consequence, changes that were proven successful could not be easily reapplied across the hotel chain, since they had not been documented sufficiently. Hence, change was typically driven from the top.

Aiming to identify a solution to the above problems, the research then focused on studying the characteristics of the dominant models in management thinking. Given the fact that KMSs are socio-technical systems and thus follow the characteristics of the prevailing models in organizational science, their limitations could be well attributed to the assumptions of the models they aim to support. As Hoverstadt (2008) notes, “models are incredibly insidious and that they slide undetected into discussions and then dominate the way people think”.

According to Ackoff and Gharajedaghi (1996), the main models in organizational science are three: i) the mechanistic, ii) the systemic or else referred as organic and iii) the complex-systems model or else referred as complexity theory. Thus, the key concepts of
the models, as well as their implications to KM and KMSs were critically reflected. While the key concepts of the mechanistic and systemic models were found to be well embraced by the existing KMSs, this was not the case for concepts recently introduced by the complex systems model such as self-organization, emergence and edge of chaos. Jacucci et al (2006) confirm that ISs “need to change, adapt and deepen the range of theoretical frameworks that help conceptualize and understand complexity”. Also, Fingar (2006) suggests that the current state of the BPM lifecycle is based on “command-and-control” and suggests that “it is time for IS to model a self-organizing, self-governing, adaptive, nonlinear organization, the behavior of which harmoniously blends characteristics of both chaos and order”.

Thus, a novel KMA was developed on the basis of the complex systems model, aiming to re-conceptualize KMSs towards enhancing internal knowledge transfer which in turn can enable self-organization.

In order to comprehend the dynamic dimensions of the proposed KMA as well as apply the KMA in practice, the development of a KMS was considered essential. Thus, the next phase of the research was the development of a KMS to support the proposed KMA which would then be applied in the case of the hotel chain. The KMS was the result of a longitudinal three year iterative process of simultaneous data collection and data analysis. It included a number of iterations which were the result of close cooperation with the executives of the hotel chain. The KMS that was developed was then applied to the hotel chain for a period of fourteen months.

During its application, a number of socio-technical problems which acted as barriers for knowledge transfer were noticed. “Soft” elements such as incentives for sharing knowledge and the level of IT skills, were dealt adequately to ensure the successful application of the KMS to the hotel chain. In order to verify the impact of the KMS, follow-up interviews with the key users of the system were conducted. Users were asked several questions with an aim to evaluate not only the utility of the KMS for the hotel chain but also the theoretical frameworks incorporated within the design. Did the KMS target more effectively the knowledge between the unit-members of the same community? Did the KMS achieve the
systematic recording of every initiative for change so that such change can be easily reapplied? And finally, did the KMS manage to support more effectively self-organization?

Overall, the proposed KMA, as well as the KMS which was developed proved to be successful in terms of improving the recording and sharing of the architectural knowledge of the hotel chain in focus. Managers could now trace not only the past architectural knowledge related to their unit, but most importantly the knowledge created by all other units of the community in which they belonged to. The interviewees agreed that the enhanced transfer of architectural knowledge within the hotel chain improved the capability of the hotel chain to trace and reapply successful changes without the intervention of top management. They also noted that the KMS improved the cohesion and pace of innovation, the level of management alertness as well as the integration of new members in the hotel chain. In essence, their answers revealed that the main characteristics of self-organization were present within the hotel chain. However, the research revealed the significance of socio-technical issues which need to be carefully considered alongside the application of the proposed KMA so that self-organization can take place.

The phases of this research, their duration and the methods used to achieve the research objectives are presented in the table below:
<table>
<thead>
<tr>
<th>Objective</th>
<th>Method and Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the limitations of the existing KMSs in terms of supporting self-organization in the hospitality sector.</td>
<td>Case study of a hotel chain. Data collection from documentary information, study visits, participant-observation technique, in depth semi-structured interviews with key stakeholders. Study of the KMSs used by the hotel chain as well as KMSs available in the hospitality sector (1 year)</td>
</tr>
<tr>
<td>Propose a Knowledge Management Architecture (KMA) for re-conceptualizing KMSs in the hospitality sector to support more effectively self-organization.</td>
<td>Study of the key concepts of the main organizational models with particular focus on the complex systems model and understanding of their implications to KM (3 years)</td>
</tr>
<tr>
<td>Develop a KMS on the basis of the proposed KMA and apply it in the real case within the hospitality sector</td>
<td>Agile software development methodology. Semi-structured interviews with the users and participant observation technique to evaluate the KMS (2 years)</td>
</tr>
</tbody>
</table>

Table 1: The methods used for achieving the research objectives

Having presented the motivation of the study along with the methods of the research, we will now move on to the contributions that the study aims to make.

### 1.4 Contribution

The work presented in this thesis contributes to the evolving discourse between the IS field and complexity theories. A number of authors have underlined the value of adopting ideas borrowed from complexity theory in order to enhance the functionalities offered by contemporary ISs. Merali and McKelvey (2006) for instance have illustrated the need for a paradigm shift in the IS community using as a basis the science of complexity. Merali (2006) suggests that “the emergence of the network economy and network society necessitates a paradigm shift in the IS discipline, and that complexity science offers the apposite concepts and tools for effecting such a shift”. Jacucci et al (2006) maintain that IS scholars should rather acknowledge complexity as a phenomenon and not as a marginal
feature of IS designs. Finally, Knight and Halkett (2010) state that “the complexity paradigm offers the opportunity to the IS discipline to become truly innovative” and that “without such a discourse, IS may stagnate in the detail, and (alas) in the relative monotony, of the deductive analysis of that which is already known”.

Most of the existing approaches though have related the concepts from complexity to the “hard” aspects of IS design, such as artificial intelligence and algorithms. In contrast, this research suggests that the role of KM in terms of embracing complexity has not been addressed explicitly. More specifically, this research suggests that by enhancing the functions provided by contemporary KMSs for knowledge sharing and reuse, the vision of a self-organizing system can be achieved.

After performing a thorough study of the KMSs available in the hospitality sector, it was shown that the KMSs for the hospitality sector are still grounded on the dominant assumptions of the “mechanistic” model proposed by Taylor (1911). This means that the design of KMSs has focused mainly on supporting the transmission of knowledge from the top to the bottom, as well as on providing functions for monitoring of the implementation plans of change. Despite the recent enhancements of KMSs with new functions for enabling participation and dialogue with the use of Internet technologies, KMSs still have significant space for improvement in terms of embracing the key concept of the complex systems model: self-organization. Several improvements are still required in terms of supporting the capture, sharing and reuse of architectural knowledge within a geographically distributed organization such as a hotel chain. This observation is an important step towards advancing KMSs. Henri Bergson, a twentieth century French philosopher notes the significance of identifying the problem: “the truth is that in philosophy and even elsewhere it is a question of finding the problem and consequently of positing it, even more than of solving it” (Bergson 1946). It is claimed that stating and solving the research problem are intertwined and equally important in this study.

Moreover, this research not only identifies the problem but contributes to the discourse for applying complexity theories in the field of ISs. More specifically, a KMA is proposed to support fundamental concepts from complexity theories. The proposed KMA demonstrates that by enhancing the support for capturing, sharing and reusing architectural knowledge,
valuable concepts from complexity theories are in essence embraced. Such concepts include the notions of self-organization, emergence and edge of chaos which will be analyzed in Chapter 4.

Taking into consideration that a hotel chain is an indicative case of a large organization which is geographically distributed, the proposed solution could well be applicable to other complex and geographically distributed organizations operating in other sectors of the economy too. As Flyvgjerg (2006) highlights, “a case study cannot provide reliable information about a broader class, but it may be useful in the preliminary stages of an investigation since it provides hypothesis which may be tested systematically with a larger number of cases”. Thus by generalizing the case, it is believed that the work presented in this thesis could well lead to the re-conceptualization of the broader class of KMSs developed for large and complex organizations.

In conclusion, this research identifies the limitations of the existing KMSs in terms of embracing key concepts from complexity theories such as self-organization, emergence and edge of chaos. Furthermore, it demonstrates how such concepts can be embraced by enhancing the existing support for knowledge sharing and reuse within an organization.

1.5 Thesis Structure

Following the introductory chapter, the thesis is divided into the following six chapters.

Chapter 2 introduces the area of KM. It is where the key terms of the field of KM and the existing research for internal knowledge transfer is reviewed. Particular emphasis is placed on the intrinsic problems of KM which include the “soft” factors which often act as barriers for knowledge sharing. More importantly, the main methods and technology-based KMSs are described. Examples of KMSs which are relevant for this research are analyzed.

Equipped with a good understanding of the role of KMSs, Chapter 3 describes the hotel chain which has been chosen as the case study of this research and then focuses on the existing KMSs which are in place. A number of limitations of the KMSs used are identified particularly in terms of diffusing the knowledge created within a hotel chain. The
consequences of such limitations particularly in terms of supporting self-organization are then critically reflected.

Chapter 4 describes the transition of the organizational science from the mechanistic, towards the organic and then towards the complex systems model. At the same time, the implications of each model for KMS are elaborated. Then, the extent to which contemporary KMS support the key concepts of each model and particularly those proposed by the complex-systems model is discussed.

Chapter 5 then analyzes the KMA architecture which is proposed to support the core concepts from the complex systems model and particularly the core concept of self-organization. The KMA is formally represented with the use of the Unified Modeling Language (UML). A basic syllabus of the UML is provided in the Appendix A. The chapter continues by presenting the KMS which was developed on the basis of the proposed KMA. The main functionalities of the KMS are then contrasted with the key characteristics of the prevailing organizational models.

Next, Chapter 6 evaluates the proposed KMS and hence the KMA. The main functionalities of the KMS which was developed for the purpose of this research are described. Subsequently, the insights gained from the interviews with the managers and directors who used the KMS are analyzed. A number of interesting observations and conclusions are derived.

Finally, Chapter 7 revisits the whole thesis from a more critical perspective. It justifies the contribution of this research and provides numerous areas that could be pursued in future research.
Figure 1: Thesis structure
Chapter 2: Overview of Knowledge Management Concepts and Systems

2.1 Introduction

This chapter introduces the KM discipline. Initially section 2.2 analyzes the key concepts of this research: ‘organizational knowledge’, ‘architectural knowledge’, ‘organizational architecture’, ‘organizational performance’, ‘organizational change’ and ‘knowledge management’. Given the importance of socio-technical factors for the success of every KMS, section 2.3 elaborates on a number of soft factors that influence KM in organizations. The notions of tacit, implicit and explicit knowledge are also distinguished. Finally, section 2.4 describes the most common methods and tools for KM. The most relevant types of KM, as well as a number of examples commercially available tools for the hospitality sector are presented.

2.2 Defining the Key Concepts of the Research

2.2.1 Organizational and Architectural Knowledge

In recent years, the concept of knowledge in organizations has become increasingly popular in the literature. Alvesson and Karreman (2001) suggest that although knowledge has always been an important factor in organizations, only until recently has it been considered as a strategic resource (Nahapiet and Ghoshal 1998; Demsetz 1988; Conner and Prahalad 1996; Grant 1996; Spender 1996), as the primary source of competitive advantage (Stewart 1997) and critical to the long-term sustainability and success of organizations (Nonaka and Takeuchi 1995).

Various definitions of knowledge exist in the literature. According to Alavi and Leidner (2001), some authors, most notably in the IT literature, address the question of defining knowledge by distinguishing among knowledge, information and data. A commonly held view is that data are raw numbers and objective facts concerning events, information is
processed data, and knowledge is authenticated information (Dretske 1981; Machlup 1980; Vance 1997). Webb (1998) associates the triple set data/information/knowledge with the capacity for action and, eventually, decision making: “…by selecting and analyzing data, information can be produced; by selecting and combining information, knowledge can be generated; from this decisions can be made and actions taken…” . Alternative perspectives view knowledge as a justified belief that increases an entity’s capacity for effective action (Huber 1991; Nonaka 1994).

Given the strategic character of self-organization, this research focuses on “architectural” knowledge related to the structural evolution of the architecture of an organization. Architectural knowledge is usually referred in the management literature with the terms “organizational memory” or “organizational intelligence”. In this research though, the term “architectural knowledge” is preferred in order to emphasize the focus of this research which is on the knowledge underlying the architecture of an organization and the effectiveness of such architecture. In contrast, administrative knowledge which is related to the support operations in an organization such as administering benefits or troubleshooting problem accounts (Garvin 1997) is out of the scope of this research.

The notion of architectural knowledge has been introduced within the field of software engineering. Kruchten et al (2006) define architectural knowledge as:

“the integrated representation of the architecture of a software system, along with the underlying design decisions, assumptions, context, and other factors that together determine why a particular solution is the way it is”.

The IS field has recognized the importance of recording all the design decisions related to the development of a system. In this research, the notion of architectural knowledge is reapplied in the context of organizational science to describe the value of managing effectively the design decisions and assumptions that determine every version of the architecture of an organization. Inspired by Alexander (1970) who views the form of a system as “consisting of a history of states, each of which corrects a past organizational misfit”, this research conceives the management of organizations as a timeless design problem: acknowledging the potential misfits of the existing architecture and rectifying them continuously.
Whereas in the software field, the software developer decides upon the architecture of the software system, in the management field it is usually the manager of an organizational unit who acts as an architect and takes design decisions. Such decisions though refer to the choice of the appropriate variables so that the organizational architecture can achieve a good fit with its environment. It is not a surprise that Howard (1992) names the CEOs as “organizational architects”. The concept of organizational architecture is now further elaborated.

2.2.2 Organizational Architecture

‘Architecture’ comes from the Greek word “αρχιτεκτονική” which means the higher than ordinary ‘tecture’ (that is ‘construction’ or ‘building). Janson (1991) defines architecture as “the art of shaping space to human needs and aspirations”. Therefore, analogously to architecture, the term organizational architecture refers to the shaping of the “organization’s space”. Many consider the architecture of the organization as identical to the organizational structure; nevertheless the term “architecture” is wider in scope. Nadler et al (1992) suggest that architecture refers “not only to the specifics of organizational structure – what is in the boxes and which lines connect them, but also to the design of work practices, the nature of the information organization or operating style, and the processes for selection, socialization, and development of people”.

Although not the sole determinant of success, the architecture of an organization is a starting point in order to construct a high-performance organization. In order to identify the key components of the architecture that an organizational architect can re-design, a number of models for capturing the organizational architecture were studied in both the management and software field. From the business field, several approaches have been proposed by various authors such as Nadler and Tushman (1997), Merron (1995), Henning (1997) and Churchill (1997) under the area of “Organizational” or else called “Business Architecture”. Most of them conventionally suggest that organizational architecture consists of the formal organization (organizational structure), informal organization (organizational culture), business processes, strategy and human resources (Zugaj and Schatten 2005). In contrast to these approaches, Galdbraith (1995) emphasizes the role of
soft aspects such as rewarding systems but also the importance of the relationships between the units of the organization.

The capture of the organizational architecture has attracted considerable interest from researchers from the software field too. In an effort to comprehend the organization holistically so that all its operations and thus requirements are considered when designing a new information system, a number of approaches have been proposed. Theoretical approaches that aim to model the architecture of an organization in the software field are found in literature usually under the umbrella terms “enterprise modeling” and “enterprise knowledge modeling”.

Enterprise Modeling is viewed by Vernadat (1996, 1998) as “a technique to represent and understand the structure and behavior of the enterprise, or as a technique to analyze business processes and in many cases as a support technique for business process reengineering”. Giaglis (2001) has grouped the Modelling techniques into i) Business Process Modelling (BPM) techniques and ii) Information Systems Modelling (ISM) techniques which are analyzed further in sections B1 and B2 of the Appendix.

Enterprise Knowledge Modeling is a discipline that deals with issues addressed in the fields of business process transformation, business modeling, system analysis and information systems development (Loucopoulos 2004). The most famous models identified in literature are the CommonKADS, UML and the Multi-perspective modeling theories which are further analyzed in the Appendix (B3).

From the study of all the above models of organizational architecture, the variables that were considered as the most applicable for the hospitality sector were five: i) structure, ii) roles, iii) resources iv) rewards and v) business processes.

The organizational structure refers to the departmentalization of the organization, a process of grouping activities into departments. Each department, which will be referred as unit, has a meaningful accountability and can be distinguished from the purpose it serves.

A role refers to an entity which can be a person, group, organization, team, or even an automated system. For example, the roles in a reception unit of a hotel are three: chef de reception, receptionist and porter. Each role has a cohesive set of responsibilities. A
responsibility corresponds to the actions and activities that a role is responsible for. For example, the responsibilities of the head of reception differ to those of the porter.

The resources typically refer to material resources and assets. The specifications for each material resource or asset which are required to fulfill a certain standard of quality, as well as the chosen suppliers who can supply them, constitutes valuable knowledge that is useful to capture. For example, the choice of the materials used as toilet amenities in a hotel room, incorporates knowledge. The type of shampoo for example, its price, the quantity in each pack, the size of the soap and its packaging, as well as the choice of suppliers constitutes knowledge which is valuable to be recorded.

The rewards refer to the incentives provided to individuals with the aim to increase their motivation towards achieving their goals. The choice of the rewarding system in place may have detrimental impact on performance. Thus, the chosen rewards, their rationale and method of application constitute valuable knowledge that should be captured. Following the classification of rewards by Gerhart and Milkovich (1993), the rewards are classified into monetary, which require a financial motive and non-monetary such as symbolic gifts. Monetary rewards are in turn classified to three further categories: i) collective rewards such as team based rewards or profit sharing”, ii) individual variable rewards such as a bonus depending on performance and iii) fixed individual rewards such as a pay increase to an individual.

Finally, an organizational process, also referred as a business process, is a collection of related, structured activities or tasks that produce a specific service or product for a particular customer or group of customers. Every process has a specification which describes the details for implementing the process. The specification of each process includes all the procedures required for the delivery of the process.

2.2.3 Organizational Performance

The configuration of all the above architectural components produces a certain “fit” with a context, which in organizational science corresponds to the local environment of the organization. Vencatraman and Camillus (1984) have elaborated extensively on the meaning on “strategic fit” while Hoverstadt (2008) uses the term “opening and closing of
the strategic gap” to describe the continuous interplay of the organization to its environment. The fit of an organization to its environment is assessed in the business world by setting performance measures.

The importance of having performance measures in organizations can be understood by two widely known axioms suggested by Boyett and Conn (1993): “what you measure is what you get” and “if you can’t measure it, you can’t manage it, because you won’t know if it improves”.

In order to identify the aspects of performance of the organization, the area of corporate performance management (CPM) or else referred as Performance Management (PM) was studied. PM is a broad and multidisciplinary topic (Neely et al 1995; Dumond 1994). Business performance is typically measured in terms of financial results. However, more recent theories suggest additional perspectives of performance. The focus should not only be placed on the financial performance of each unit but on additional perspectives which capture the performance more systemically. A commonly used methodology to assess the performance of an organization more systemically is the Balanced Scorecard (Kaplan and Norton 1996). According to Hayes (2002), the Balanced Scorecard provides a template that can be adapted to provide the information that managers need to monitor and review the effects of their interventions and to make plans for moving the organization towards a more desirable future state.

The Balanced Scorecard suggests capturing performance in terms of four perspectives: the financial, the customer, the business process and the learning and growth perspective (Figure 2).
Figure 2: The five components of architecture as suggested by the Balanced Scorecard

A brief description of each of the four perspectives has been provided by Simons (2000) and is now presented alongside examples from the hospitality sector.

The financial performance refers to metrics such as revenue, cost and profit. The rationale of each measure, the method used for measuring the results, the frequency of assessing such measures, the goals which have been set for each measure and the tolerance limits in terms of divergence from the goal constitute useful knowledge which should be captured.

The customer perspective refers to the recording of the customer satisfaction for all units such as reception, restaurant, bar, housekeeping, maintenance. Such measures can be typically captured using methods such as questionnaires or through monitoring guests’ reviews in online portals. The rationale of each measure, the frequency of each assessment, the goal and tolerance limits which have been set constitute valuable knowledge which should be captured.

The business performance perspective refers to the effectiveness of the business processes in place. Examples of measures related to this third perspective include the average reply time for responding to reservations request, the average time of serving a meal and also
ratios such as the sales produced by every unit in relation to the cost of the human or material resources. The rationale of each measure, the method and frequency of each assessment, the goal and tolerance limits which have been set constitute valuable knowledge that should be captured.

Finally, the learning and growth perspective refers to the performance of the hotel chain in terms of developing its human resources. Often, this perspective stands usually lower in the priorities of management as it involves costs. However, the importance of training and developing further the human resources is undeniable. Measures such as the number of trainings per year per employee for example constitute valuable knowledge. Again, the rationale of each measure, the method and frequency of each assessment, the goal and tolerance limits which have been set constitute valuable knowledge to capture.

The performance measures in place within an organization constitute a valuable source of knowledge that should be recorded. Such knowledge also includes the goals which have been set, the actual results from all four perspectives and the frequency of assessing the results. Whenever the actual results fail to conform to the goals which have been set, the existing configuration of the architecture is typically reconsidered. This brings us to the notion of organizational change which is elaborated in the section that follows.

### 2.2.4 Organizational Change

Organizational change concerns the transition from an initial organizational situation, which is unsatisfactory in some aspect, to a desired situation where the problem is treated (Kavakli and Loucopoulos 2006). Using an analogy inspired from software, a change corresponds to the breaking of the symmetry of the existing architecture (Zhao 2008).

Change is not a phenomenon which seldom takes place. Bates (1994) states that “change is constant as organizations realign themselves to the continual environment change”, while Tsoukas and Chia (2002) use the term “becoming” to affirm that change is a normal condition of organizational life.

An organizational change may be triggered not only internally, due to failure to achieve the pre-specified goal, but also by external forces. The most important forces that lead to change according to Nadler et al (1992) are the increasing competition, the massive social
and technological change, the increasing government participation in economic affairs, the evolution of global markets and thus global competition as well as the increased pace of change. Irrespective of the type or rate of a change, since a change constitutes an effort to realign the organization to its environment, it incorporates valuable knowledge.

An initiative for change undertaken by a manager though is a complex process which still remains ambiguous. Macredie et al (1998) state that although there is a general recognition for the need to successfully manage change in modern organizations, questions regarding the substance of change and how the process can be managed in today’s context remain largely unanswered. Tsoukas and Chia (2002) also note that “we do not know enough about how change is actually accomplished” and stress the existing limitations in understanding how change actually leads to the evolution of an organization:

“even if we can explain, ex post facto, how and why organization A moved from archetype X to archetype Y, or from position A to position B, our explanation would not be fine-grained enough to show how change was actually accomplished on the ground – how plans were translated into action and, by so doing, how they got modified, adapted and changed” (Tsoukas and Chia 2002).

Various models exist in the change management literature to describe the process of change. A model which has received significant recognition is the Hayes and Hyde model (Hayes and Hyde 1998). The Hayes and Hyde model suggests that the process of change consists of six main phases which are depicted in the Figure below:

![Figure 3: The Hayes and Hyde model for managing the change process](image-url)
The recognition phase involves the processes of perception, interpretation and decision making. The start of the change process involves translating the need for change into a desire for change and deciding who will manage the change. The diagnosis phase includes the reviewing of the present and future state. Although the two states seem at first sight to be separate activities, they are often integrated in practice. The planning phase includes a long list of acts which will need to be done in order to make the proposed change a reality. In the implementation phase, the focus shifts from planning to action, while attention needs to be given to monitoring and controlling to ensure things happen as intended. Finally, the review phase includes the reflection on ongoing activities as well as a post-implementation review.

From the above model it can be understood that valuable knowledge is created upon different phases of the process of change. This brings us to the concept of managing architectural knowledge, which from now on will be referred as knowledge management.

2.2.5 Knowledge Management

During the last years, the management of knowledge has become a widely researched topic. It has actually been theorized that firms that effectively manage knowledge are more successful than those that do not effectively manage their knowledge resources (Lippman and Rumelt 1982, Winter 1995, Zander and Kogut 1995).

KM is wide area and includes a number of streams. As mentioned in the introductory chapter, this research will focus on internal or else referred “intra-organizational” knowledge transfer. Internal knowledge transfer is defined as “the process through which knowledge acquired in one situation can be applied to another” (Ingram 2000). From this definition, it can be deduced that internal knowledge transfer implies not only the sharing but also the reusability of knowledge within an organization.

Existing research in the stream of internal knowledge transfer has focused on the context of knowledge transfer in multinational corporations (MNC) operating in different markets (Eisenhardt and Santos 2002; Szulanski 1999, Schultz 2003). Studies of knowledge sharing in MNCs, as pointed out by Chini (2004), are diverse and approach knowledge sharing from disparate perspectives. Within the frame of reference, Ciabuschi (2005), Gupta and

Given the importance of internal knowledge transfer, it comes as no surprise that the number of organizations which attempt to set up KMS and practices with an aim to use their knowledge more effectively is increasing. According to Davenport and Prusak (1998), most KM initiatives have one of three aims: i) to make knowledge visible through maps, yellow pages and hypertext tools, ii) to develop a knowledge-intensive culture by encouraging and aggregating behaviors such as knowledge sharing and iii) to build a knowledge infrastructure – not only a technical system, but a web of connections among people given space, time, tools, and encouragement to interact and collaborate.

A KM initiative is a multifaceted and complex topic. A number of factors exist and prevent the effective knowledge sharing and reuse within an organization. It is important that such factors are considered when attempting a KM initiative, as they can undermine the success of any KMS intended to be applied in an organization. Such factors are analyzed in the section that follows.

2.3 Soft Factors Influencing KM

Most of factors that influence the management of organizational knowledge are related to the human element. Bollinger and Smith (2001) suggest that the process of building knowledge repositories can be time consuming and labor intensive. At the individual level, people are often reluctant to share information as professional knowledge is perceived as a source of power (Quinn et al 1996). Davenport et al (1998) add that knowledge is intimately and inextricably bound with people’s egos and occupations and does not flow easily across the organization, while Cole-Gomolski (1997) notes that people tend to have feelings of “ownership” and hoard knowledge.

Ipe (2003) has provided a comprehensive framework which has classified the main factors that influence knowledge transfer into four interrelated categories: i) the nature of knowledge, ii) the motivation to share, iii) the culture of the work environment and iv) the opportunities to share (see Figure below).
A brief description of each category is provided in the next paragraphs.

2.3.1 Nature of knowledge

The first category of factors that influence KM is related the nature of knowledge and the extent to which knowledge can be codified. Knowledge has been categorized as tacit, implicit and explicit. Tacit knowledge has been described by Polanyi (1966) as hidden knowledge; hidden even from the consciousness of the knower. As Wilson (2002) claims, tacit knowledge is an inexpressible process that enables an assessment of phenomena in the course of becoming knowledgeable about the world and thus cannot be captured.

In the KM literature, the term tacit is often confused with the term implicit. Implicit knowledge refers to the previously unexpressed but expressible knowledge (Nonaka and Takeuchi, 1995). Thus, as Wilson (2002) confirms, tacit knowledge can never be captured. In contrast, implicit knowledge, although it is not easily codifiable and tends to be “sticky” in nature, can be captured. Von Hippel (1994) in particular, defines stickiness as the incremental expenditure involved in moving knowledge in a form that is useable and easily understood by the information seeker. In contrast, explicit knowledge can be easily
codified, stored at a single location and transferred across time and space independent of individuals (Lam 2000). Explicit knowledge therefore has a natural advantage over implicit and tacit knowledge, as it is easier to disseminate and communicate (Schulz 2001).

It is worth presenting here the notion of conversion schemes between implicit and explicit knowledge which has been introduced by Nonaka and Takeuchi (1995). These schemes are captured through the terms socialization (implicit to implicit), externalization (implicit to explicit), combination (explicit to implicit) and internalization (explicit to implicit). This research will focus mainly on the second conversion scheme where implicit knowledge is externalized with the support of KMSs.

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Description</th>
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<tbody>
<tr>
<td>Socialization</td>
<td>Describes the modification of implicit knowledge to other types of implicit knowledge. This process includes the sharing of experiences, ideas, images, mental models and technical skills. It takes place through joint activities, observation, imitation and practice rather than written or verbal instructions.</td>
</tr>
<tr>
<td>Externalization</td>
<td>Refers to the conversion of implicit knowledge to explicit knowledge; hidden implicit knowledge, as ideas, concepts visuals, metaphors, analogies, is articulated and takes an understandable format. Computer-based techniques that are able to support individuals to describe, express and explain their inherent conceptualization are prominent in the externalization phase.</td>
</tr>
<tr>
<td>Combination</td>
<td>Declares the explicit-to-explicit conversion. It involves the mixture of different bodies of explicit knowledge producing more complex sets of explicit knowledge. The codification of knowledge, and second, its communication, diffusion and integration, are integral parameters for the efficient and valid function of knowledge combination.</td>
</tr>
<tr>
<td>Internalization</td>
<td>Refers to the extension of explicit knowledge to implicit knowledge. Learning by doing, on-the-job training, learning by observation, face-to-face meetings listening to others’ stories, simulations and experiments are some of the usual practices establishing internalization procedure.</td>
</tr>
</tbody>
</table>

Table 2: Conversion schemes between implicit and explicit knowledge (adopted by Diakoulakis et al 2004)
Another important aspect with regards to the nature of knowledge refers to its commercial value. Empson (2001) suggests that the sharing of knowledge with high commercial value may potentially result in diminishing the value of the individual, creating a reluctance to engage in knowledge sharing activities. Weiss (1999) also states that professionals in particular tend to guard their knowledge as they perceive that their own value to the firm is a product of the knowledge they possess.

2.3.2 Motivation to Share

The second category of factors that influence the transfer of knowledge refers to the motivation for sharing. The factors that influence the motivation for sharing are distinguished into internal and external. Internal factors include the perceived power attached to the knowledge and the reciprocity that results from sharing. Davenport (1997) suggests that if individuals perceive that power comes from the knowledge they possess, this is likely to lead to knowledge hoarding instead of knowledge sharing. Hibbard and Carrillo (1998) also suggest that there can also be fear that there will be a diminished personal value after giving up know-how.

Reciprocity, or the mutual give-and-take of knowledge, is another important factor that needs to be considered. Hendriks (1999) suggests that reciprocity can facilitate knowledge sharing if individuals see what the value-add to them depends on the extent to which they share their own knowledge with others. According to Gouldner (1960), the contributions that individuals make to an organization are considered to be elements of reciprocal arrangements. Reciprocal arrangements occur when an individual performs some type of action for another individual, group, or organization without expecting an economic return. Van der Vegt and Janssen (2003) suggest that an individual who performs such an action does so because he/she believes that the action will be reciprocated at some future time, through the exact time and nature of the reciprocal act is unknown and unimportant.

External factors include the relationship with recipient and the rewards for sharing. The relationship between the sender and the recipient includes two critical elements: trust and power of the recipient. Kramer (1999) referred to trust as being a critical factor that
influenced the way knowledge was shared within these communities. According to the same author, barriers to trust rise from perceptions that others are not contributing equally to the community or that others might exploit their own cooperative efforts. Furthermore, power also affects the sharing of knowledge. Krone et al (1987) state that issues of power mediate the relationships between individuals involved in such exchanges and influence whether and how knowledge is shared. Huber (1982) has also found that individuals with low status and power in the organization tend to direct information to those with more status and power.

Furthermore, another key element for sharing knowledge is the rewarding systems in place. Alavi and Leidner (2001) have identified “incentives for knowledge contribution and sharing” as an important research issue in KM. Markus (2001) advises that for successful knowledge re-use, close attention needs to be placed on the incentives provided to knowledge producers in order to contribute to knowledge repositories. Stenmark (2001) claims that people without strong personal motivation are not likely to share knowledge. Rewards have also been considered important to knowledge sharing within intranets (Hall 2001), in the creation and sustenance of knowledge-sharing networks (Dyer and Nobeoka 2000), and the success of knowledge management initiatives within organizations (Earl 2001). Bartol and Srivastava (2002) state as an example of a reward the practice of Buckman Laboratories, which recognizes its 100 top knowledge sharers with an annual conference at a resort.

It must be noted here that the respective literature suggests that both individual and group rewards should exist in order to maximize the sharing of knowledge within an organization. As Walczak (2005) notes, “rather than individual motivation, it is also important to motivate the entire organizations and reward groups for sharing knowledge within a group but also between groups”.

2.3.3 Culture of work environment

The third category of factors which influence the knowledge creation, sharing and use is the organizational culture. Schein (1985) defines culture as a “pattern of basic assumptions” that is developed by a group as they grapple with and develop solutions to everyday
problems. De Long and Fahey (2000) suggest that an organization’s culture also shapes the perceptions and behaviors of its employees, while Gold et al (2001) emphasize the role of culture in establishing the context for social interactions within the organization.

2.3.4 Opportunities to share

The last category of factors that influence the transfer of knowledge refers to opportunities for sharing knowledge. Ipe (2003) suggests that the opportunities to share knowledge in organizations can be both formal and informal in nature. According to Brown and Duguid (1991), informal opportunities include personal relationships and social networks that facilitate learning and the sharing of knowledge. According to Nahapiet and Ghoshal (1998), informal opportunities facilitate face-to-face communication, which allows for the building of trust, which in turn is critical to sharing knowledge. The role of informal opportunities is important as research indicates that the most amount of knowledge is shared in informal settings (Jones and Jordan 1998; Truran 1998).

In contrast, according to Ipe (2003), formal opportunities provide individuals with a structured environment in which to share knowledge and include training programs, structured work teams, and technology-based systems that facilitate the sharing of work. Formal opportunities have also been referred by a number of authors as integrative mechanisms (Eisenhardt and Galunic 2000; Gupta and Govindarajan 2000; Hargadon 1998).

2.4 Existing KM Methods and Systems

The recognition of the importance of KM to a firm has led to the development of various methods and tools which intend to enhance the knowledge transfer process. Knowledge can be managed with a number of methods which do not require necessarily a technological tool. For example, a number of organization use exit interviews to capture implicit knowledge that employees “carry with them”. Also, peer assists often take place to share the learning experiences within an organization. A comprehensive analysis of the most widely used methods of KM has been provided by Brun (2005). Table 3 provides an overview of the most common methods.
<table>
<thead>
<tr>
<th>KM Method</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>After Action Reviews</td>
<td>A tool widely used by many organizations to capture lessons learnt both during and after an activity or project</td>
</tr>
<tr>
<td>Communities of Practice</td>
<td>Widely regarded as the “the killer KM application”, communities of practice link people together to develop and share knowledge around</td>
</tr>
<tr>
<td>Knowledge Audits</td>
<td>A systematic process to identify an organization’s knowledge needs, resources, flows, as a basis for understanding where and how better KM</td>
</tr>
<tr>
<td>Exit Interviews</td>
<td>A tool used to capture the knowledge of departing employees</td>
</tr>
<tr>
<td>Best Practices</td>
<td>Approaches to capturing the best practices discovered in one part of the organization and sharing them for the benefit of all</td>
</tr>
<tr>
<td>Knowledge Centers</td>
<td>Similar to libraries but with a broader remit including connecting people with each other as well as with information in documents and databases</td>
</tr>
<tr>
<td>Knowledge Harvesting</td>
<td>A tool used to capture the knowledge of “experts”, making it widely available to others</td>
</tr>
<tr>
<td>Peer Assists</td>
<td>A tool to learn from the experiences of others, especially within an organization, before embarking on an activity or project</td>
</tr>
<tr>
<td>Social Network Analysis</td>
<td>Mapping relationships between people, groups and organizations to understand how these relationships either facilitate or impede knowledge</td>
</tr>
<tr>
<td>Storytelling</td>
<td>Using the ancient art of storytelling to share knowledge in a more meaningful and interesting way</td>
</tr>
<tr>
<td>White Pages</td>
<td>A step-up from the usual staff directory, this is an online resource that allows people to find colleagues with specific knowledge and expertise</td>
</tr>
</tbody>
</table>

Table 3: The most widely used KM methods and tools (Adopted by Brun 2005)

Another important tool for KM which is not included in the above list but is widely used in the hospitality sector is a quality management system (QMS). The relationship between knowledge management and quality management has been confirmed by Ribiere and Khorramshahgol (2004). A QMS is defined as a “management system to direct and control
an organization with regard to quality” (ISO 2011). Quality management systems are not interested solely in the quality of the final products or services but in the overall operation and performance of the organization. Guler et al (2002) suggests that quality certificates are not awarded to products or services, but to quality processes within the organization which span areas such as design control, risk management, document and data control, purchasing, production, installation, servicing and inspection. The three best known QMSs are the ISO 9000:2000 standard family, the Six Sigma Approach and the National Quality Awards (MBNQA & EQA Excellence Models). While all QMS have similar generic concepts, the system that has gained significant recognition nowadays is the ISO standard which has been adopted by 887,770 organizations in 161 countries (ISO 2011). As it will shown in the next chapter, significant knowledge of the hotel chain was gathered within the documentation required by the ISO 9000:2000 standard.

However, given the need for increased decentralization in the contemporary business environment, most of the above mentioned methods are not sufficient to support effectively the management of knowledge within large and geographically distributed organizations. The individuals within enterprises are often separated in time and space and thus require an enhanced integrative mechanism to share with each other the knowledge they obtain. Such a mechanism can be offered nowadays by Information and Communication Technologies (ICTs). Bosua and Scheepers (2007) confirm that “ICTs can play an instrumental role in providing mechanisms that contribute to the efficiency of knowledge sharing, thus allowing people to interact with content and each other, even when separated in time and space”.

Numerous ICTs exist in order to support the management of knowledge within an organization. According to Egbu (2000), KM technologies are a broad concept. As Alavi and Leidner (2001) note that there is no single role of IT in KM just as there is no single technology comprising KM technologies. O’ Leary (1998) has suggested that a wide range of technologies are being used to implement KM technologies such as email, databases and data warehouses, group support systems, browsers and search engines, intranets and internets, expert and knowledge-based systems and intelligent agents. Jaime et al (2004) have identified 53 commercial enterprises, offering 224 Knowledge Management Tools while Tyndale (2002) has proposed 17 new and old categories of technology types as the most frequently used within knowledge management. Riley (2003) provides a
comprehensive analysis of the role of ICTs for supporting KM function. He categorizes ICTs in terms of seven typical functions of KM, namely searching, categorizing, composing, summarizing, storing, distributing knowledge and lastly capturing the workflows within an organization. The type of ICTs used for supporting each of these seven functions is presented in Table 4.

<table>
<thead>
<tr>
<th>Functionality</th>
<th>ICTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Searching</td>
<td>Search Engines</td>
</tr>
<tr>
<td>Categorizing</td>
<td>Computer Languages (XML, RDF)</td>
</tr>
<tr>
<td>Composing</td>
<td>Office Suite Applications</td>
</tr>
<tr>
<td>Summarizing</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>Storing</td>
<td>Storage Media</td>
</tr>
<tr>
<td>Distributing</td>
<td>Networks</td>
</tr>
<tr>
<td>Workflow</td>
<td>Groupware</td>
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</tbody>
</table>

Table 4: ICTs supporting the various functionalities in KM (Adopted by Riley 2003)

This research will focus mainly on tools for knowledge distribution. Sorli et al (2002) suggest that knowledge distribution is about ensuring that knowledge is accessible despite the fact that it may be created, stored, modified and used by different actors in different physical locations. Such tools are referred as Knowledge management systems (KMSs) and have been the subject of considerable interest. KMSs have been defined as “a class of information systems applied to managing organizational knowledge” (Gray 2000). In the same line, Alavi and Leidner (1999) define KMSs as “information systems designed specifically to facilitate codification, collection, integration, and dissemination of organizational knowledge”.

More specifically, the categories of tools which were considered as the most relevant for managing architectural knowledge are five: i) groupware tools ii) strategy management
tools iii) business process management (BPM) tools iv) enterprise resource planning (ERP) tools and v) business intelligence (BI) tools. A brief description of each type is now provided in the sections that follow.

2.4.1 Groupware Tools

Groupware tools have been defined by Robbins and Finley (1998) as the “PC software for groups”. The interest in groupware tools has increased dramatically in all sectors. Salim (1998) observed that “in our contemporary computer networked world, group working is clearly growing in popularity”, while Shaikh and Macauley (2001) added that “groupware presents a new challenge because it is a collaborative technology that impacts the way people communicate with each other”. The field which focuses on examining the design, adoption, and use of groupware, but also the competition, socialization, and play (Brinck 1998) is frequently referred nowadays with the term “Computer-Supported Cooperative Work (CSCW)”.

Groupware tools have provided new possibilities for enhancing teamworking and the collaborative decision making process within a geographically distributed organization. Kotlarsky and Oshri (2005) suggest that ongoing innovations in ICTs have made cooperation in a distributed mode possible. Groupware tools enable organizations to create intra-organizational memory in the form of both structured and unstructured information and to share this memory across time and space (Vandenbosch and Ginzberg 1996; Bosua and Scheepers 2007). Alstyne (1997) suggests that both synchronous and asynchronous technological tools can lead to the establishment of more rapid point-to-point communications with numerous members and significant reductions in information delay. Furthermore, improved communication increases the likelihood that more members contribute data. Ramanathan (2005) confirms that technologies such as groupware can now be used to embrace variability, rather than control and minimize variation. Such variability leads to significant benefits for an organization. Huber (1990) notes that as more members contribute data, and computation aids processing, improvements in accuracy, retention, and timeliness can lead to better decisions (Huber 1990). Other important benefits noted by several authors (i.e. Ching et al. (1993), Malone (1989)) are the increased coordination upon the problem solving process and the greater handling of complexity.
Brinck (1998) has categorized groupware tools into two dimensions:

i) Whether users of groupware are working together at the same time ("realtime" or "synchronous" groupware) or different times ("asynchronous" groupware)

ii) Whether users are working together in the same place ("colocated" or "face-to-face") or in different places ("non-colocated" or "distance")

Typical groupware applications include a number of both asynchronous and synchronous features. Asynchronous features include email, newsgroups and mailing lists, hypertext, group calendars, collaborative writing systems. Typical features for synchronous communication are shared whiteboards, video communications, chat systems, decision support systems and multi-player games.

According to Rodríguez et al (2010) the most widely used groupware are: IBM Jazz, Microsoft SharePoint, Google Apps, and Lotus Notes. A comparison of the functions offered by each product is provided in the Appendix (B4). Another groupware tool which was explored and is worth mentioning is GroupSystems Group Intelligence Technology. GroupSystems places more emphasis on structuring the collaborative process. It provides a platform for organizing every initiative for change and evaluating the alternative solutions which were discussed. Like this, the consensus between the decision makers is enhanced. Two screenshots from the GroupSystems groupware tool which demonstrate how the knowledge upon brainstorming over a change is managed are provided in the next two Figures.
Figure 5: Categorization and discussion upon the brainstorming phase

Figure 6: Ranking of alternatives solutions upon undertaking change through voting

To conclude, groupware tools offer valuable support particularly in terms of maximizing variation and hence the knowledge contributed by the members within an organization.
They typically focus on capturing and sharing the architectural knowledge created upon the initial stages of the collaborative process of every initiative for change and particularly the brainstorming phase of change.

2.4.2 Strategy Management Systems

On the contrary, strategy management systems typically aim to support the implementation phase of a change. They externalize the initiatives for change - usually referred as “strategies” which are undertaken within an organization. Most importantly, they provide numerous functions for externalizing the knowledge incorporated within the plan of a change and for monitoring any delays or bottlenecks.

Strategy management tools have been defined by Peng and Jiang (2011) as systems which aim to support the design, planning, implementation, evaluation and control of the enterprise strategies. Enterprise strategies in essence correspond to initiatives for change which aim to improve the fit of an organization to its environment.

According to a thorough study by Yphise (2008) the top four strategy management tools for defining, communicating and monitoring objectives and operational strategies are:

i) Cognos Metric Studio by IBM/Cognos
ii) Microsoft Office PerformancePoint Server by Microsoft
iii) SAS Strategic Performance Management by SAS
iv) SAP BusinessObjects Strategy Management by SAP

Aiming to obtain more insights on the functionalities offered by the most successful strategy management tools, the products of the two most popular vendors in Europe, Microsoft and SAP were accessed.

The Microsoft Office PerformancePoint Server relies on Office 2010 and SQL Server 2010 and includes three modules: Monitoring (dashboards and scorecards), Analytics (data analysis) and Planning (forecasting and planning). The following two figures show functions offered by Microsoft Office PerformancePoint Server which monitor performance results in comparison to the goals which have been set.
Moreover, SAP offers the SAP BusinessObjects Strategy Management solution which supports the management of strategic objectives, the measurement of performance, the execution of initiatives as well as the communication through the organization. Two screenshots from the SAP’s Strategy Management solution are now provided.
Figure 9: Initiatives for change in SAP BusinessObjects Strategy Management

Figure 10: Graphical representation of strategies in SAP BusinessObjects Strategy Management
Thus, the existing strategy management systems focus on capturing the implementation plan of a change and the extent to which the actual results conform to the goals (targets) which have been set.

2.4.3 Business Process/Workflow Management Systems

The third category of tools for KMS refers to Workflow Management Systems (WFMSs) or else referred as Business Process Management Systems (BPMs). A WFMS is defined as “a system that defines, creates and manages the execution of workflows through the use of software, running on one or more workflow engines, which is able to interpret the process definition, interact with workflow participants and, where required, invoke the use of IT tools and applications” (Lawrence 1997).

Business Process Management (BPM) is often considered to be the “next step” after the workflow wave of the nineties. Aalst et al (2003) suggest that BPM supports business processes using methods, techniques, and software to design, enact, control, and analyze operational processes involving humans, organizations, applications, documents and other sources of information. Pacicco et al (2010) view BPM tools as “the method of efficiently aligning an organization with the requirements of clients”.

BPM in essence captures how the business processes are performed and controlled within the organization. Hence, BPM tools aim to represent the entities, activities, enablers and relationships that exist within the business processes. Mertins and Jochem (2005) name ARIS Toolset, FirstSTEP, Bonapart, PrimeObject and CimTool as belonging in this area. Less frequently, BPMSs are referred as Enterprise Engineering or Business Engineering tools. A screenshot representing a business process using IBM’s BPM tool is provided in the following figure.

Figure 11: Representing a business process using IBM Business Process Manager V7.5
Both BPM and WFMS in essence capture one of the most important components of the organizational architecture which is the business processes in place. Moreover, by studying the states of the processes through time, one can identify how the processes of the organization have evolved through time.

### 2.4.4 Enterprise Resource Planning Systems (ERPs)

The fourth category of tools for managing architectural knowledge refers to Enterprise Resource Planning Systems (ERPs). An ERP system has been defined by Ramachandran and Parthasarathy (2010) as:

“a computer-based and an integrated software package (composed of various self-executable subcomponents that are working together) which has been designed to process organizational transactions and to facilitate integrated and distributed real-time planning, production, manufacturing, and customer responses”.

An ERP system constitutes a massive software architecture which aims to support the operations of a geographically distributed enterprise. At the core of ERP systems there is typically a centralized data repository which may envelop a broad range of functions (modules) such as Human Resources (HR), Supply Chain Management, Customer Relationship Management, Finance and Asset Management, Manufacturing Warehouse Management and Logistics. Frequently, an ERP system may well include a WFMS too.

The leader in the ERP market is SAP, while important players in the ERP market are also Microsoft, Oracle PeopleSoft (WhatisERP.net 2012). A detailed presentation of the market shares of each vendor is provided in the Appendix (B5).

Although ERP systems provide mainly support towards administrative knowledge, they do capture to a significant level certain aspects of the organizational architecture such as roles and responsibilities, rewards, as well as resources and assets. For example, within the Human Resources Module one can find knowledge related to the roles of every employee and the financial incentives in place. Moreover, within the Warehouse Management and Asset Management modules, one can find all materials and machinery used by an
organization. By studying the past versions of such aspects, one can trace architectural knowledge related to their evolution through the passage of time.

2.4.5 Business Intelligence (BI) Tools

Finally, the fifth category of tools for architectural knowledge management refers to Business Intelligence (BI) tools. According to Negash and Gray (2008), BI tools refer to data-driven Decision Support System (DSS) that combine data gathering, data storage and KM with analysis to provide input to the decision process. BI tools may well be stand-alone products but also a set of functionalities that are achieved from a combination of tools. They typically accumulate vast amounts of data from enterprise resource planning (ERP), customer relationships management (CRM), and supply chain management (SCM), and integrate these disparate sources.

BI tools have been developed recently by all major software companies. Evelson (2008) has performed a thorough research in Enterprise Business Intelligence Platforms and has compared them in a set of criteria which include: i) the current offering (architecture, development environment and functional and operational capabilities, ii) the strategy (how well each vendor’s plans for product enhancement position it to meet future customer demands and iii) the market presence (information about each vendor’s financial performance, customer base and number of employees across major geographical regions). A comparison of twelve different BI products is provided in the Appendix B6.

During this research, the business intelligence tools of SAP and Microsoft were studied more extensively. From their study it was concluded that BI tools are capable of integrating different sources of data into a web-based corporate portal. This means that they are capable of linking to a certain extent the architectural knowledge residing in different sources. Moreover, by incorporating scorecards, they achieve a much more systemic view of the performance of an organization. Watson and Wixom (2007) note that many vendors are implementing scorecards and dashboards as key components of CPM initiatives in an effort to visually summarize large amounts of data related to organizational performance.
After presenting the five main categories of tools which manage architectural knowledge, it can be concluded that a number of sophisticated KM tools exist, each of which captures different aspects of architectural knowledge.

2.5 Conclusions

This chapter provided a background in the field of KM. As explained, the focus of this research is on architectural knowledge and from now on the term knowledge will signify architectural knowledge. Effective KM is a complicated topic. Several soft factors exist which may affect any KM initiative. Subsequently, the role of technology-based KMSs was described. KMSs are becoming part of the agenda in many of today’s firms. The use of KMSs may well lead to increased organizational flexibility, quicker responses to changing conditions, greater motivation and improved decision-making.

The most relevant KMSs to this research were five. The role of each type of KMS in terms of managing architectural knowledge can be summarized as follows:

1. Groupware tools capture and share the architectural knowledge created upon the initial stages of change upon which the individuals collaborate in order to decide for change and choose the best course of action.
2. Strategy management tools manage the implementation plan of a change. This refers to the person in charge of the change, to the milestones which have been set and the status update of every change.
3. BPMSs and WFMSs capture the existing business processes and how they evolve through time.
4. ERPs may capture the existing rewarding systems and resources, as well as their history.
5. BI tools capture more effectively the systemic performance of an organization but also link to a certain extent architectural knowledge which usually resides within various KMSs.

Equipped with a basic understanding on the management of knowledge, we are now able to proceed to the next chapter which will examine the KMSs in the case of a hotel chain.
Chapter 3: Case Study: Limitations of Current KMSs in a Hotel Chain

3.1 Introduction

Chapter 3 introduces us to the research problem: the limitations of the contemporary KMSs in the hospitality sector. The chapter starts by describing the main case study for this research. After providing an introduction about the nature of a hotel business, the hotel chain which has been chosen as the case study of this research is presented. Particular focus is placed on the architecture and performance of the hotel chain. The first section ends by describing the dynamic and volatile nature of the hotel chain and the importance of continuous organizational change.

Equipped with a good understanding of the operations of the hotel chain and how its architecture and performance evolve through time, section 3.3 analyzes the limitations of the KMSs used by the hotel chain. At first, the existing methods and tools used by the hotel chain to manage the knowledge created by the continuous evolution of the hotel chain to its environment are described. Subsequently, the existing KMSs in place are examined in terms of their ability to support the sharing of all the initiatives for change among the similar units of the hotel chain. The emphasis is placed on the ability of the existing KMSs to target all the initiatives for change towards the units which have a similar purpose and structural characteristics. Then, the existing KMSs are examined in terms of their ability to share the detailed knowledge created upon the process of every change. As it will be explained, a change cannot be easily reapplied, unless the knowledge incorporated within the process of every change has been captured systematically. Such knowledge includes the impact of every initiative for change on the existing architecture and performance. The limitations which are identified have important consequences for the operations of the hotel chain which are reflected in section 3.4. Finally, the conclusions that were derived from the study of the hotel chain are described in section 3.5.
3.2 The Case of a Hotel Chain

A case study of a hotel chain is chosen as the main research methodology for this project. The chosen hotel chain is based in Greece. It consists of six hotels which are all classified as four stars and are located in different regions across Greece (Figure 12). The first hotel of the chain was established in 1981 in Athens and the second was purchased in Athens by the end of 1990’s. During the last two decades, the chain has expanded in four regions outside Athens with another four hotels. A number of supporting operations for all hotels take place from the headquarters which reside in Athens. For confidentiality reasons, the name of the hotel chain shall not be revealed.

The choice of a hotel chain has been a conscious decision. At first, a hotel chain constitutes an almost “alive” organization, as it operates 24 hours, 365 days a year. Secondly, the hotel chain studied constitutes also a complex and geographically distributed organization which has expanded its operations in five different regions and thus falls under the definition of the organization as adopted by the study. Thirdly, the hotel chain operates in one of the most important sectors for the national economy. The contribution of the tourism industry in the GDP growth as well as in the total employment in Greece is estimated to be around

Figure 12: Geographical representation of the hotel chain
Fourthly, the hotel chain operates in the hospitality sector which is very dynamic and volatile. This means that the hotel chain needs to adjust its architecture continuously in order to remain competitive.

A number of research methods were used to understand the architecture of the hotel chain and most importantly the tools for managing its knowledge. Evidence was collected from a variety of sources. Significant documentary information was gathered from administrative documents such as proposals or progress reports. Archival records in the form of computer files and records, such as organizational charts and budgets over a period of time, as well as personal records such as diaries and calendars were also studied. A large number of documents were documented within the “ISO 9000-2000 standard”, a quality management system adopted by a number of businesses in the hospitality sector.

In addition, the participant-observation technique was also used when the researcher served as an external IT consultant in the hotel chain. This allowed participation in a number of strategic meetings gaining insights on sensitive information which would not have been otherwise provided.

As explained in the introductory chapter, knowledge is created when the organization undertakes initiatives for change which typically alter its architecture and performance. Hence, eight indicative cases of initiatives for change which were noticed during the study of the hotel chain are presented. These eight cases are then reflected upon and discussed. Did the existing KMSs manage effectively the knowledge created upon every initiative for change? The findings are then triangulated with the conduction of interviews with key stakeholders within the hotel chain. Face to face interviews were undertaken with eleven key stakeholders. The interviews included the two managing directors of the hotel chain, the managers of Hotels 1, 5, 6 and the managers of the restaurant and maintenance units of Hotels 1, 5 and 6. The role of each interviewee is presented in the Appendix C1. The questionnaires used for interviewing both the managers and directors of the chain are found in section C2 and C3 of the Appendix.

Before proceeding to the detailed presentation of the hotel chain, some background information about the nature of a hotel business is now provided.
3.2.1 The Nature of Hotel Business

A hotel is an establishment that provides paid accommodation typically for a short-term basis. The provision of accommodation usually includes a room with a bed, a cupboard, a table, bathroom and air-conditioning facilities. Additional room facilities include a telephone, television, chairs, fridge/minibar, safe, internet connectivity, ironing board, tea/coffee making facilities. Larger hotels may provide a number of additional guest facilities such as a restaurant, a bar, a swimming pool, conference and social function services. The detailed attributes of a hotel are available and described usually in a brochure or in the hotel’s website.

Hotel guests can come from various walks of life and can be of various types. A customer may be a business traveler or a leisure traveler. They may be travelling alone or they may belong to a group. Furthermore, they may book directly with the hotel, through other travel websites on the internet or through an intermediary such as a travel agent.

If we aim to understand what the hotel as an organizational entity is, we have to identify ourselves with the different stakeholders’ objectives and standpoints each time. Hence, from the guest’s perspective, the decision to book a particular hotel depends on the value for money expected to be received from their stay (cost of stay in relation to the value received). Throughout their stay and through the use of the hotel’s services, guests gain an experience. They may share this experience in discussing with friends, in a questionnaire usually provided by the hotel or in an online travel community.

From the shareholder’s perspective, a hotel constitutes an investment that should have a satisfying return. The board of directors sets policies to monitor and direct the operations of the hotel chain.

From the employee’s perspective, a hotel provides a job and a salary which satisfies his social and financial needs.

From the government’s perspective, a hotel is an organization that offers services which are of value for the society. A hotel provides employment for citizens and generates income for the government through imposed taxes. The government ensures that the regulations set up
for the hospitality sector are followed and that every hotel operates with an ethical behavior.

From a managerial perspective, a manager aims to balance the interests between the customers, the shareholders, the employees, and the government. At first, he/she needs to assure the quality of the offered services so that the hotel satisfies its customers. He/she also needs to consider the cost of the offered services in order to achieve the financial goals which have been set. Furthermore, he needs to look after his resources, with particular emphasis on human resources and conform to the governmental regulations that exist. In a similar sense, a manager of a particular unit within a hotel is concerned about the operation of his unit. He needs to assure the delivery of the unit’s services, the cost of operations, to take care of the resources, to conform to legislation and to meet the goals which have been set.

Having all the above considerations in mind, both the hotel manager and the manager of a hotel unit need to organize operations in a way that shall fulfill the above requirements. Unconsciously, every manager is confronted with a continuous design problem: shape the appropriate architecture to achieve organizational effectiveness.

3.2.2 The Hotel Chain Architecture

In order to comprehend the existing architecture of the hotel chain, all of its components were studied. As discussed in section 2.2.2, the architectural components that were considered as the most important in the case of the hotel chain were five: i) structure, ii) roles, iii) resources iv) rewards and v) business processes.

All five architectural components of the hotel chain will be now analyzed.

3.2.2.1 Organizational Structure

In the early days, the first two hotels of the chain operated independently and each had a similar structure which consisted of similar internal units: Restaurant, Bar, Front Desk, Housekeeping, Management, Sales & Marketing, Reservations, Kitchen, Quality, Maintenance, Laundry, Accounting, Inventory & Procurement, Finance, Human Resources and I.T. In recent years however, the expansion of the hotel chain into new regions has
made the senior management realize that the overlapping of the hotel units should be reduced and synergies should be exploited, so that the chain as a whole operates more efficiently. This has led to the merging of several supporting units which are now based in the headquarters. Hence, the high-level structure of the hotel chain consists of the headquarters and the hotels.

![Diagram of Hotel Chain Structure]

**Figure 13:** High-level structure of the hotel chain

Both the headquarters and every hotel in turn consist of additional units. All hotels consisted of eight units.

![Diagram of Hotel Structure]

**Figure 14:** Hotel consisting of eight hotel units

The role of each hotel unit is now described.
**Restaurant:** Its main aim is to offer well-serviced breakfast, as well as the possibility of lunch, dinner and drinks. Some of its services include: American hot buffet breakfast, breakfast package, daily set menus, Mediterranean a la carte menu, drink and wine list, wedding party arrangements and room service.

**Bar:** Aims at entertaining guests by offering drinks and snacks. Among its services are the drink list, a snack list and room service.

**Front Desk:** The purpose of the front desk is to facilitate and provide the means for a comfortable stay. Some of its services include the answering of telephone requests, check-in, check-out, charging guest bills, informing the restaurant for number of daily meals, informing housekeeping about the room status and any special requests, program wake-up calls, organize massage and sauna services as well as currency exchange.

**Housekeeping:** The purpose of the housekeeping unit is to provide a clean and hygienic environment. It has two main services which are the cleaning of the room as well as the cleaning of the common areas.

**Laundry:** Its main aim is to provide clean linen and clothing for guest use. Some of its basic procedures are linen washing as well as guest’s cloth washing, ironing and dry cleaning.

**Maintenance:** Its main aim is assure a good operational condition of all equipment and infrastructure. Some of its basic procedures are to repair existing malfunctions and perform the required actions for preventive maintenance.

**Kitchen:** Its main aim is to offer tasty, well-presented and well cooked breakfast and meals. Some of the provided services are: American hot buffet breakfast, breakfast take away package, daily menu, Mediterranean a la carte menu and wedding parties’ arrangements.

The headquarters also include nine units (Figure 15).
Figure 15: The structure of the headquarters

**Human Resources**: Its main aim is to assure available and qualified human resources. Some of its basic procedures are recruitment and training.

**Financial Resources**: Its main aim is to assure smooth financial operations. Some of its basic procedures are to assure liquidity as well as to invest the available funds.

**Inventory & Procurement**: Its main aim is to ensure that assure the availability, cost and adequate quality of all material resources required for the operations of the organizational units.

**Accounting**: Its main aim is to ensure that accounting practices conform to the tax regulations. Some of its basic procedures are to perform payments to the suppliers and employees, the payroll, the bookkeeping, the debt collection as well as the publication of an annual balance sheet.

**Reservations**: Its main aim is to process every booking request. Some of its basic procedures are the responses to every guest request, payment modalities and the submission of the reservations into the hotel software.

**I.T.**: Its main aim is to assure smooth operations of all IT systems. Some of its basic procedures are network security, internet provision, server configuration and email setup.

**Quality**: Its main aim is to assure that the operations of every hotel or hotel unit within the hotel chain is performing according to the standards. Moreover, the quality unit is responsible of the ISO certification.
Sales and Marketing: Its main aim is to promote the sales of the hotel chain by attracting new guests, contracting with existing partners, perform advertisements and marketing actions which include internet marketing too.

3.2.2.2 Roles

Every role within the hotel chain had been described in detail within the documentation required by the ISO standard, which was the quality management system adopted by the hotel chain. Such job-descriptions included the responsibilities required for every position. An example of the responsibilities of a maintenance manager is presented in the following table:

<table>
<thead>
<tr>
<th>Role: Maintenance Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibilities</td>
</tr>
<tr>
<td>Responds to guest and staff maintenance requests and questions, and resolves needs efficiently.</td>
</tr>
<tr>
<td>Develops and monitors engineering supplies, parts, inventories and administers the purchase order system.</td>
</tr>
<tr>
<td>Supervises the day-to-day activities of all staff in Maintenance.</td>
</tr>
<tr>
<td>Assists in coordinating with outside contractors.</td>
</tr>
<tr>
<td>Sets work schedules for staff according to skill and workload level.</td>
</tr>
<tr>
<td>Responsible for training, motivating and supporting line staff to insure quality service.</td>
</tr>
<tr>
<td>Assists with the counseling, coaching, disciplines and documents performance of staff.</td>
</tr>
<tr>
<td>Communicates operational and situational information to the Manager as appropriate, consistently and thoroughly.</td>
</tr>
</tbody>
</table>

Table 5: The documented role of a maintenance manager
3.2.2.3 Resources

All the material resources as well as the machinery which was required for the operations of the hotel chain were found documented within various lists. Knowledge such as the specifications of the products required for the operation of the housekeeping unit, their price as well as their suppliers were found documented. An example of two products used by the housekeeping unit is presented in Table 6.

<table>
<thead>
<tr>
<th>Name of Material</th>
<th>Specifications</th>
<th>Price</th>
<th>Supplier</th>
<th>Alternative Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathroom Shampoo</td>
<td>Small bottle of 30 ML with hotel’s sign on the bottle</td>
<td>0,15 Euro per item</td>
<td>Hotel Amenities S.A</td>
<td>Ecolab S.A</td>
</tr>
<tr>
<td>Bath Towel</td>
<td>100% cotton, size 60x40 cm with hotel’s sign</td>
<td>2,30 Euro per item</td>
<td>Moutalaskis S.A</td>
<td>Iordanopoulos S.A</td>
</tr>
</tbody>
</table>

Table 6: An example of knowledge incorporated within the choice of a particular material resource

3.2.2.4 Rewards

A number of non-monetary and monetary rewards existed within the hotel chain. For example, the employee who received the most positive comments by guests received a bonus on a yearly basis. Moreover, the employees in the restaurant unit received a bonus based on their performance in sales on a daily basis. Nevertheless, such rewards were not typically recorded formally but constituted part of the tradition of the organization.

3.2.2.5 Organizational Processes

Lastly, a number of the organizational processes taking place in the hotel chain were found documented. An example of a process is the “Housekeeping service”. The process requires the collaboration of the Housekeeping, Laundry and Reception units. A customer expects to have his room cleaned daily. The housekeeping unit requires information on the status of
the room from the front desk so that it is prepared adequately. If the guest departs, the Housekeeping unit needs to change all the linen in the room and prepare the room for the next guest. If the guest plans to stay on for a longer period of time, the housekeeping unit will simply refresh the linen and tidy up the room. In both cases, the housekeeping will require cleaned linen and towels to be given by the laundry unit. The Housekeeping service process is represented in Figure 16 using the Unified Modeling Language (UML) and specifically sequence diagrams.

Figure 16: The process “Housekeeping service”

A process may include a number of organizational procedures. For example the replacement of linen is only one element of the procedure “Cleaning of Room”. An example of the procedure cleaning of room is provided in Table 7:
<table>
<thead>
<tr>
<th></th>
<th>Process “Cleaning the Room”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Check foul odors and Freshen</td>
</tr>
<tr>
<td>2.</td>
<td>Change bed linen and Pillow Covers with new obtained from the Laundry unit</td>
</tr>
<tr>
<td>3.</td>
<td>Clean Mirrors</td>
</tr>
<tr>
<td>4.</td>
<td>Clean dust of all surfaces</td>
</tr>
<tr>
<td>5.</td>
<td>Clean telephone sets and cupboards</td>
</tr>
<tr>
<td>6.</td>
<td>Clean Carpeted Floors</td>
</tr>
<tr>
<td>7.</td>
<td>Replace advertisement brochures within the information folder</td>
</tr>
<tr>
<td>8.</td>
<td>Cleaning windows and balcony</td>
</tr>
<tr>
<td>9.</td>
<td>Report any damages/malfunctions to the Maintenance unit</td>
</tr>
<tr>
<td>10.</td>
<td>Report any missing items to the Reception unit</td>
</tr>
<tr>
<td>11.</td>
<td>Clean bathroom tub and toilet pan, hand basin and taps</td>
</tr>
<tr>
<td>12.</td>
<td>Check and clean bathroom tub protective curtains</td>
</tr>
<tr>
<td>13.</td>
<td>Clean toilet brush</td>
</tr>
<tr>
<td>14.</td>
<td>Clean bathroom door</td>
</tr>
<tr>
<td>15.</td>
<td>Replace bathroom amenities (toilet paper, shampoo, soap, conditioner, toothbrush)</td>
</tr>
<tr>
<td>16.</td>
<td>Replace drinking glasses</td>
</tr>
<tr>
<td>17.</td>
<td>Replace towels</td>
</tr>
<tr>
<td>18.</td>
<td>Clean bathroom floor and tiled walls</td>
</tr>
<tr>
<td>19.</td>
<td>Dispose of garbage</td>
</tr>
<tr>
<td>20.</td>
<td>Inform reception about the “cleaned” status of the room</td>
</tr>
</tbody>
</table>

Table 7: The organizational process “Cleaning the Room”
Another example of an organizational process, this time taking place within the headquarters, is the “Payment of Payroll”. This process requires the collaboration between the Finance, the Human Resource unit and the Management of every hotel (Figure 17).

![Diagram of Payment of Payroll process]

Figure 17: “Payment of payroll” process

To summarize, the five most important components of the architecture which were identified in the case of the hotel chain are depicted in Figure 18. The alteration of any of these five components constitutes valuable knowledge which should be captured, since it evolves the existing architecture into a newer version.
Figure 18: Capturing the main aspects of the existing architecture of the hotel chain

### 3.2.3 The Performance of the Hotel Chain

From the study of the hotel chain it was noticed that most of the performance measures in place were related to the financial performance of the organization. The revenue produced by every unit in all hotels of the hotel chain and the occupancy rate is systematically captured on a daily basis. The cost of operations of each hotel is carefully monitored by the management of every hotel. Furthermore, the performance of the hotel chain in terms of customer satisfaction is also well documented. All the questionnaires which are completed by guests are recorded in a database which provides a number of useful reports such as an overall satisfaction rate and the satisfaction rate per unit or per hotel. The results from a number of organizational processes are also monitored at a pre-specified frequency. For example, the productivity of the human resources in the housekeeping unit is monitored on a monthly basis. Finally, the performance of the hotel chain in terms of training and developing every employee is also followed. Figure 19 presents the key perspectives of performance identified within the hotel chain.
The results from the performance measures for each unit were discussed on a monthly basis with the head of the departments and the manager of every hotel. The overall performance of every hotel of the chain was also monitored from the headquarters on a monthly basis, while a physical meeting between the general management of the chain and the hotel managers took place on an annual basis. The meeting took place in the headquarters and its duration was one business day. The participants of the meeting were all the members of the headquarters and the managers of the six hotels of the chain. The meeting did not include the managers of the hotel units of every hotel (i.e. restaurant managers, reception managers etc).

Whenever a performance measure was unsatisfactory, a corrective action was triggered. Every corrective action in essence corresponds to an act of redesign of one or more aspects of the existing architecture. This brings us to the next section which analyzes some examples of initiatives for change which were undertaken while this research took place.
3.2.4 The Dynamic Nature of the Organizational Architecture and Performance

While studying the hotel chain, numerous initiatives for change which aimed to improve the fit of a particular hotel unit, hotel or the hotel chain as a whole were undertaken. Such initiatives were usually the result of a corrective action from an internal misfit or an act of adjustment of a unit to its environment. At times though, changes were triggered by external forces. As already mentioned, the hotel chain was operating in a very dynamic sector which is globally characterized as extremely volatile and cyclical. Not only does the hospitality sector share the volatility related to economic cycles, but it also experiences high degrees of seasonal volatility. This volatility is for instance made manifest in changes in weather patterns or local economic events. In the last decade in particular, hotels in Greece have been confronted with a number of challenges which have led to significant developments within the Greek hospitality sector. Governmental funds were provided as incentives for expansion and for improving the quality of the existing hotel premises in view of the Olympic Games of 2004. This unavoidably led to an increase in the supply of rooms, as a number of new hotel units were created and numerous extensions took place. The increase in hotel rooms, coupled with the recent global and national economic crisis has resulted in intense competition and in the occurrence of a number of mergers or acquisitions. Another key change within hospitality sector is the impact of travel websites. Among others, travel websites have increased transparency and provided travelers with a wide variety of choices. A traveler can now easily compare and choose a hotel from a far wider selection that meets his particular preferences. Moreover, the possibility for a traveler to easily share the experience of his stay and travel on a number of online travel communities has created a new interaction space and added pressure for hotels to reconsider the quality assurance of their services and redesign certain processes in order to remain competitive.

No matter if changes were triggered by the internal or external environment, they had a minor or major impact to the existing architecture. To give some examples of initiatives for change which resulted in the rethinking of the existing architecture, eight indicative cases of change are briefly described. Each case corresponds to a particular initiative for change that intended to improve the fit of a hotel or of a hotel unit to its environment. The first three cases refer to a change made in a process within a hotel. The fourth case refers to a
change in the rewarding systems in place. Case five demonstrates the effect from the introduction of a new service on other units while case six is an example of a successful initiative undertaken by a particular hotel. Case seven is an example of an initiative which accumulated knowledge, but was postponed for the near future. Finally, case eight constitutes an example of an initiative which proved to be a failure. The details of every initiative for change are presented in Table 8.

<table>
<thead>
<tr>
<th>Initiatives</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case 1:</strong></td>
<td>Hotel 1 has an increasing number of guests from the UK for long stays. Guests ask for larger variety of breakfast items since the average length of their stay exceeds a week. After exploring different options, it was decided that the Restaurant unit should offer items that better suit English taste at the expense of some other nationality that would prefer something different. For example, instead of offering every day the same type of sausages, English sausages would be offered three days per week while the traditional sausages would be offered the other four days of the week. Furthermore, the Bar of Hotel 1 notices the increased interest of British guests in sports and proceeds to install Sky sports TV channel at the bar in an attempt to satisfy its guests and at the same time promote sales which actually increased by 30%.</td>
</tr>
<tr>
<td><strong>Case 2:</strong></td>
<td>The manager of Hotel 3 observes that the mini-bar service in the rooms is problematic. Various solutions are explored and it is decided that the mini bar service would better operate on a “upon request” basis. This means that the fridge in the guest room will remain empty and if a guest requires any drinks or snacks, he will phone and order them from the bar unit. The chosen items will be non-refundable and charged to the bill of the room upon delivery of the drinks.</td>
</tr>
<tr>
<td><strong>Case 3:</strong></td>
<td>Hotel 3 loses an important customer. This was a company that was sending clients regularly. One of its guests complained that he was served a soft drink which was beyond its expiry date. In order to avoid similar situations, a new control mechanism was added by Management which required the Restaurant unit to complete a form which included all items offered together with their expiry date.</td>
</tr>
<tr>
<td><strong>Case 4:</strong></td>
<td>Restaurant’s staff motivation in Hotel 1 was found low. Management decides to offer an incentive of 3% of the total amount of restaurant sales. After 10 months, it is noticed that customer satisfaction has improved from the improved service and sales</td>
</tr>
<tr>
<td>Case 5:</td>
<td>Hotel 3, in an effort to increase customer satisfaction and have a larger number of guests at the bar, decides to offer a free welcome drink to all individual guests. Such a decision for change requires an immediate action by both the Reception unit (needs to hand the welcome drink voucher upon arrival to the guest) and by the Bar unit (offer a welcome drink free of charge upon receipt of the voucher).</td>
</tr>
<tr>
<td>Case 6:</td>
<td>The maintenance unit of Hotel 1 undertakes an initiative for reducing the electricity bill. The installation of saving bulbs of a specific type (LED) in all hotel areas is chosen as a solution. Such action had immediate results and within six months the electricity cost was reduced significantly.</td>
</tr>
<tr>
<td>Case 7:</td>
<td>The manager of Hotel 5 receives a request to be included in the Golden Tulip brand of hotels. Such an inclusion is expected to increase overall sales because of its brand awareness. Such an agreement though, required a significant amount of money per month to be paid for advertisement cost. The manager of the Hotel 5 on this occasion also explores the possibility of a similar listing in the Best Western brand of hotels. After comparing both offers, it was decided not to proceed in implementing such an initiative, as both solutions at that point of time were found not to be beneficial.</td>
</tr>
<tr>
<td>Case 8:</td>
<td>The manager of Hotel 3 decides to offer a Pay-TV service, which allows guests to see movies from their TV at a small charge. The installation cost was high and after 12 months of operation it was proved that guests were not using the service frequently. Also, the monthly movie rental fee exceeded its income earned.</td>
</tr>
</tbody>
</table>

Table 8: The eight cases of change which considered the rethinking of the existing architecture

Each of the above cases of change constitutes valuable knowledge. These eight cases of change which in essence are acts of rethinking of the existing architecture will be later revisited in order to examine how they could have been captured effectively by the KMSs which has been developed specifically for the purpose of this research.
3.3 The Existing KMSs and their Limitations in Terms of Supporting Self-Organization

From the study of the hotel chain, a number of technology based systems for KMS were identified. The most extensively used IS within the hotel chain was the multi-property management system named “Protel Hotel Software”, a German software specialized for hotel chains or individual hotels. Protel Hotel Software is one of the leading software for hotels globally with more than 6000 installations in more than 70 countries around the globe (Protel 2012). It provides a number of modules for supporting the operations of the hotel units but also the units residing within the headquarters. It also offers a number of sophisticated reports which present various aspects of the status and performance of the hotel units, the hotels, as well as the hotel chain as a whole. Such reports act as mechanisms for transferring knowledge within the hotel chain.

The hotel chain was also using extensively four more ISs that operated in isolation from each other. These systems aimed to support mainly the operations of the units within the headquarters such as Human Resources (Payroll), Accounting, Inventory and Finance. Notably, in 2010, the hotel chain purchased an Enterprise Resource Planning (ERP) system, named ProtERP, with an aim to integrate the four above mentioned systems into one. Such an integration was expected to allow additional insights in terms of knowledge such as improved cost analysis. Despite the sophisticated functions offered by the above systems though, they supported the transfer of rather operational knowledge which was related to the daily operations of the hotel chain. Thus, they offered very limited support in terms of transferring architectural knowledge.

Certain more strategic functions were addressed by Google Apps for Business which had been adopted by the hotel chain in the year 2011. Google Apps refer to a collection of tools offered by Google which have already been adopted by more than four million businesses (Google 2012). One of the tools offered by Google Apps which was adopted by the hotel chain was the application of a corporate intranet. The corporate intranet was easily accessed from the Web by all members of the headquarters, to all hotel managers and to all the managers of every hotel. It included a number of synchronous and asynchronous groupware tools. Asynchronous functions included an Announcements area, a Calendar, a File
Management System, a Discussion Forum, Search functionality, a Brainstorming tool and a Strategy Management tool.

The announcements section included corporate news of the hotel chain. News was typically uploaded by the headquarters, while users had the possibility to comment on the posted news. The Calendar listed all scheduled corporate meetings and events taking place within the hotel chain, as well as the personal schedule and availability of every hotel manager of the chain.

The intranet offered a number of more strategic functions too. A file management function was available and provided users the possibility to upload and share files. The discussion forum allowed managers to post any concerns or ideas and receive answers from any user willing to share his views. Search functionality was also present and allowed users to search within the discussion forum or within the news using keywords. Furthermore, the brainstorming tool named ‘Moderator’ offered to users the possibility to raise suggestions and get votes by other users. This was particularly useful for top management as it generated feedback in the form of votes and comments from various members of the hotel chain.

In addition, the intranet included a basic strategy management tool for managing its strategies. All the initiatives for change of the chain which had been recorded were associated with a person responsible for each initiative, its detailed plan, its goal as well as its milestones. Any project update which altered the status of the initiative was recorded and shared with the authorized members. The strategy management tool also provided graphs and alerts which could indicate cases where the strategies diverged from the initial plan.

Synchronous functions included chat, Google Voice and Video Chat as well as online office applications. Managers were able to chat with one another, but also discuss through voice or video-conference functionalities. More importantly, managers were allowed to co-write easily any type of documents, spreadsheets, presentations or drawings.

Finally, the study revealed that knowledge was transferred through the use of email communication. Emails were exchanged frequently between managers and were typically
stored within the hard disks of every manager.

Nevertheless, despite the presence of a variety of KMSs used by the hotel chain, there were certain elements which delimited the possibility of the hotel chain to self-organize. As explained from the first chapter of this thesis, self-organization suggests the creation of novel behavior and order as a result of the dynamic interactions among the agents within it. Such agents share a path-dependent history and need to adjust their behavior to that of other agents (Stacey 2003; Stacey et al 2002). In the context of an organization, the agents which share a path-dependent history correspond to the units of an organization which have similar purpose and characteristics. The interactions between the agents correspond to the knowledge flows exchanged between the similar units. Thus, following the definition of self-organization, it can be deduced that two key prerequisites for self-organization to occur in a business organization such as a hotel chain are: i) to ensure that the similar units within an organization share the initiatives they undertake and ii) to ensure that the knowledge created upon every initiative for change has been captured in a manner which will allow the other similar units to adjust their behavior accordingly so that they can reapply the change.

The first element emphasizes the targeting of knowledge towards the similar units which have common structural characteristics. This means that knowledge should not be necessarily shared with all the units of the chain but should be targeted to units which are particularly interested in it. For example, the restaurant unit residing within Hotel 1 would be more interested in learning the initiatives undertaken by the other restaurant units of the chain, rather than the initiatives undertaken by the reception unit. Thus, section 3.4.1 examines the existing KMSs of the hotel chain in terms of their ability to target the changes initiated by every unit towards the units belonging to the same class.

The second element stresses the quality of the knowledge flows. This means that simply sharing the initiatives for change between the similar units may not be enough to allow them to adjust their behavior. Thus, section 3.4.2 examines the KMSs of the hotel chain in terms of capturing the knowledge created upon the process of change for reuse by the other similar units.
3.3.1 Initiatives for Change were not Shared between the Similar Units of the Hotel Chain

From the study of the KM practices within the hotel chain, the first problem noticed was that in most of the cases the similar units did not exchange their initiatives between them. Despite the fact that the similar units often faced common problems or challenges, the changes undertaken by a unit were not shared with other similar units who could be interested. For example, the hotel managers of Hotels 1, 2, 4, 5 and 6 were not aware of the new Pay-TV system installed by Hotel 3 (case 8). Surprisingly, it was noticed that even hotels located geographically close to each other did not exchange their experiences between them. For example, maintenance units of Hotel 1 and Hotel 2 which were geographically close to each other were not aware of the introduction of saving bulbs (case 6) which was undertaken by the maintenance unit of Hotel 1.

Despite the variety of methods and tools for KM used by the hotel chain, the initiatives for change were not always shared among the similar units of the chain. At first, the ISO standard was considered too rigid to promote the horizontal transfer of knowledge among the similar units. In practice, it was very time consuming to filter within its documentation the initiatives for change undertaken by a particular unit of a hotel through the passage of time. In most of the cases, the initiatives for change would be found unstructured within a report or lost in a list which included changes undertaken by other units of the hotel too. Even more difficult was the traceability of all the changes undertaken by a particular class of units of the chain. It was impossible to find in a single document all the changes which had been carried out by a particular class of units. For example, in order to find all the changes undertaken by all the restaurant units across the chain in the last three years, one would need to spend considerable amount of time while manually searching the documents of every hotel of the chain.

Secondly, the physical meetings which took place were proven ineffective in terms of sharing all the initiatives for changes between the similar units for a number of reasons. The frequency of the meetings was not sufficient due to time and cost restrictions. In addition, the duration and agenda of every meeting provided limited space for knowledge sharing among the hotel managers. References towards best practices that took place within the
hotel chain were very limited during the meetings. Knowledge was transferred among the managers of the six hotels only informally during the coffee or lunch breaks of the meetings. Most importantly, no formal meetings were scheduled among the departmental heads of every class of units due to the high travelling costs involved. It has been estimated that if all the managers of all units could meet together once every year, seven different meetings should take place and at least forty-two unit managers would be expected to attend.

The only way that every unit within the hotel chain managed to achieve dynamic sharing of the initiatives for change was through the use of technology-based KMSs. Indeed, a number of initiatives for change were found within the strategy management tool adopted by the hotel chain. The strategy management system allowed any user to create and thus share the initiatives for change he or she had undertaken. Every initiative was then associated with a particular manager who initiated it (initiative owner). Nevertheless, the changes that were articulated within the strategy management tool were not explicitly associated with a particular class of units. This means that it was difficult to trace and sort in a single view all the changes undertaken by a particular class of units, say the all reception units across the chain. Instead, changes could be filtered only based on the initiative owner.

It has also been noticed that a number of initiatives of change had not been recorded within the strategy management tool but were shared through email conversations. As a result, such knowledge could not be easily associated with the rest of the initiatives for change documented within the strategy management tool. Finally, the knowledge inherent in a number of initiatives for change that were not implemented or were left incomplete due to time or financial constraints also remained implicit. For example, the inclusion of the hotel in a global brand such as the Golden Tulip (case 7) was not finally implemented and thus has never been recorded. Despite the fact that such an initiative was decided not to be implemented, it incorporated useful knowledge which should have been recorded so that one could in the future find the detailed terms of such an agreement and the reasons for not proceeding to such an action.

The above findings were verified from the answers received from the interviews which were performed. Indeed, in the question “How easy has it been to trace the initiatives
undertaken by the similar units across the chain” both the hotel and unit managers confirmed the problem. S.K. answered “not easy”, while E.C. said she wished she could have a list of all changes which had occurred across the chain in the recent years. M.P. had also found very difficult to trace initiatives that had been undertaken by other similar units in the past. Finally, all managers of the maintenance and restaurant units agreed that the traceability of past changes required improvement. In particular, V.K. stated: “it is very difficult for me to trace all the initiatives for change undertaken in the present and past by the other maintenance managers across the chain”

In conclusion, the existing KMSs used by the chain were found to have space for improvement in terms of tracing and filtering initiatives for change undertaken by a particular class of units.

3.3.2 Changes were not Captured Systematically for Re-Application

While studying the KM practices within the hotel chain, the second problem noticed was that various aspects of knowledge created upon the process of change were found either unrecorded or disintegrated in various sources.

Assume for a moment that you are hired as the manager of the restaurant unit of a certain hotel. One of the first things you notice is that the food and drink menu is out-of-date and thus you decide to change it. Initially, you spend considerable time studying the menus of your competitors as well as the trends in the sector. Then, you choose the options that should be included in the menu, you write down their descriptions, set their prices, choose the suppliers for the new raw materials required and train the kitchen staff accordingly. Moreover, you also choose a graphic designer to create a modern design of the menu, as well as a supplier for printing the menus in a hard copy. After six months, your actions prove very successful and bring immediate results. Sales increase by 20% while guests’ satisfaction rate also improves by 10%.

All these actions required from your side a lot of effort and thus incorporate useful knowledge. Such knowledge would be useful not only to a future restaurant manager, but also to the rest of the restaurant managers in the other hotels of the chain. The details of the change would be very helpful for any restaurant managers that wish to reapply such a
change to their own restaurant unit. Nevertheless, due to the geographical constraints, your peers most likely would not be aware of the detailed aspects of knowledge created upon such a change.

The above example demonstrates that valuable knowledge is created upon the process of change, no matter if a change is implemented or not. The rationale of the change, the different solutions proposed, the implementation plan and the overall evaluation of change are aspects of knowledge which should be captured so that they can be reused. The following paragraphs reflect on the extent to which aspects of knowledge created upon the eight cases of change presented in Table 8 had been effectively managed by the existing KMSs.

At first, the aspects related to the justification of a change when recorded would be found within the minutes of meetings, within the discussion forums or within the ISO documentation. For example, the main reasons for proceeding with the alteration of the mini-bar service to an upon-request basis (case 2) were the low revenue produced by the mini-bar service, the high cost of employing a person to check stocks, as well as the fact that the products often expired. Such explanations behind the actual decision were found in minutes of meetings and within email conversations between managers.

The same applied to the knowledge incorporated within the evaluation of different courses of action considered upon a change. In the example of case 5, the three different courses of action which were initially considered when deciding upon introducing a welcome drink were: (i) Offer both an alcoholic and non-alcoholic welcome drink, (ii) Offer only soft drink and (iii) Offer a soft drink or a traditional Greek drink called Ouzo. Each solution to the problem had been evaluated. Solution (i) was found as the most expensive and time consuming. Solution (ii) was considered as less expensive but had the disadvantage of delimiting the variety of choice to the guest. Solution (iii) was found most appropriate and was in the end chosen, as it was found less expensive than (i) but also offered an additional option of a Greek traditional drink which would be interesting for the guests. After carefully examining how such knowledge had been managed, it was concluded that it was difficult to trace such knowledge because it was either not recorded or existed within
various groupware tools such as the discussion forum, the moderator tool or within minutes of meetings.

Certain elements of knowledge within the hotel chain were found better documented than others. The aspect of knowledge created upon a change which was found the most documented was the implementation phase of change. This implementation plan was usually documented within the strategy management tool of the chain. In case 1 for example, the plan which was decided for making the breakfast more suited to English guests, as well as the actions for installing the Skysports Satellite Channel had been recorded. In contrast, the aspect of knowledge which was the least supported was the evaluations and reflections on the implementation of every change. Such knowledge included the effects of every change on both the existing architecture and on the performance of the organization.

An example of an implemented change which affected the existing architecture of Hotel 3 was the change of the “mini-bar fill up service” (case 2). A person from the maintenance unit was responsible for filling-up the drinks and snacks offered in the mini-bar fridge in every room. Due to the limited revenue produced and the high cost of operations, it was decided that the process would change to an “upon request” basis. This means that the fridge in the guest room would remain empty and as soon as a guest would require drinks or snacks, he or she could phone and order them from the bar unit. The chosen items would be non-refundable and charged to the bill of the room upon delivery. However, such a change was not really conceived as an act which could alter the existing architecture and thus the knowledge created was not managed carefully. Several emails had been exchanged before proceeding with such change; nevertheless the documentation of the existing processes had not been updated. This means that the actual way that tasks were carried out was different from the documented procedures and rules. For example, the mini bar fill-up service was still considered in the ISO documentation as part of the services offered by the maintenance unit (Figure 20).
Figure 20: The documented design of the mini bar implementation

In practice though, such a service did not involve anymore the maintenance unit (Figure 21).

Figure 21: The actual practice for the mini-bar implementation

Despite the use of the strategy management tool, the effects from such a change were not usually captured by the different modules or systems used by the hotel chain to capture the architecture of the hotel chain. The problem manifested particularly when new members joined the organization. Given the increased turnover rate of managers in the hospitality sector, the lack of an updated organizational architecture caused significant problems in terms of integrating quickly within the hotel chain. Newly employed staff had to spend
significant amount of time on settling in and understanding the existing form of operations. This was mainly due to the fact that the documents describing the organizational processes were out-of-date and did not reflect the actual practices. In the example of the change of the mini-bar fill-up service, when a new member was hired in the bar unit, he or she was unaware of the responsibilities regarding the new delivery policy. Due to the fact that the effects from such a change had not been documented, the barman would not be aware of such a responsibility. He would probably realize the procedure as soon as someone ordered from him a mini-bar product. This however would lead to delays and customer dissatisfaction.

Another important aspect of knowledge which either remained implicit or was not managed effectively was the effects of every change on the existing performance. Although sometimes managers could trace some general remarks and conclusions related to the impact of a particular change within minutes or within management reports of the ISO documentation, this change would usually not have been assessed with a particular and consistent methodology in mind. This practically meant that the impact of changes on performance was not assessed systematically or on a comparative basis; there was no reflective feedback (Ramanathan 2005). For example, in case 4 where management decided to alter the rewarding scheme for members of staff of the Restaurant 1, the impact of such an initiative had not been captured explicitly.

The lack of a method to systematically evaluate every change also manifested in the ways managers were evaluated. Since the changes which were undertaken had not been assessed systematically, the evaluation of managers depended on the actual results they delivered. In order to demonstrate the consequences of the problem, let us assume that you are the managing director of the hotel chain. Your first concern would be the long-term viability of the hotel chain, which is achieved when the hotel chain adjusts effectively to its external environment. So, which are the aspects of performance you would prioritize as more significant? You would most probably be interested in the financial results of every hotel. But are financial results sufficient to guarantee that a hotel is performing well? Let us now assume that a hotel is performing financially very well, due to its privileged location and the frequent local events (i.e. exhibitions, sports events). Does this signify that the manager of that hotel is alert and undertakes the necessary actions for adjusting the hotel effectively.
to its local environment? Would it not matter to know all the initiatives that your hotel managers or managers of the hotel units have undertaken to improve performance? Would you not be interested to know whether your managers undertake actions that aim to improve the long-term viability of the hotel chain, such as improving customer satisfaction, productivity or performance of staff?

Hence, initiatives for change that would potentially have a longer-term impact on performance were not fully appreciated. The introduction of a new procedure aiming to improve the level of health and security (case 3) and the improvement of the breakfast (case 1) were examples of initiatives which were expected to bring long-term results and thus were not truly appreciated. There were even times when longer-term actions were often regarded as negative, since they increased the cost of operations on the short term basis.

Consequently, despite the variety of KMSs used by the hotel chain, it was difficult for a manager to reapply a change, due to the fact that the knowledge created upon its implementation either remained implicit or was disintegrated in various sources or IT systems. As a consequence, the knowledge created from the implementation of a change was difficult to be traced and reused. For example, if a manager wanted to understand the rationale underlying the pricing policy for Year 2012, he or she would have to spend time searching in various sources such as discussion forums, minutes from meetings or even in sources which were not easily accessible such as private email conversations. Moreover, due to the fact that knowledge had been disintegrated, unstructured or even unrecorded, it was impossible for the managers of units to query the initiatives based on their impact on the hotel chain. For example, it was impossible to filter the five most successful changes among the restaurant units across the chain, accompanied by the details of such changes.

The answers received by the interviewees confirmed the above findings and the need for a mechanism that structures knowledge. In the question “How easy has it been to reuse a successful initiative undertaken by the similar units across the chain”, the interviewees confirmed the problems. E.C. recognized that knowledge often remained implicit or was left disintegrated in a number of sources, as she stated: “it is very difficult to trace the details of past changes when deciding upon reapplying a particular change”.

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More specifically, in relation to the rationale behind the change and the alternatives considered, M.P. admitted that “the traceability of the alternatives courses of actions was possible but very cumbersome, since such knowledge had not been organized effectively”. In relation to the knowledge from the implementation phase, V.K claimed that that plan of an implemented change was usually documented within the strategy management tool. The most important limitations of the existing KMSs were noticed in relation to the effects of a change on the existing architecture and performance. M.P. recognized that the traceability of the impact of a change on the organizational architecture and performance was really hard. He mentioned the statistical records produced by customer feedback as the only documented source for tracing the impact of a change on performance. He admitted however that there was no documented linkage between customer feedback and a particular initiative that was undertaken. E.C. answered that “this is truly a weakness” and admitted that the effects of a particular initiative on both the architecture and performance had not been explicitly reflected. Finally, S.K. answered firmly: “it is almost impossible to trace the effects of the past initiatives for change on the organizational architecture and performance”.

The consequences of the limitations of the existing KMS in terms of capturing the effects on the architecture and performance were also confirmed. Based on the interviews, all managers confirmed that the documented architecture differed from actual practice and this led to frequent problems and confusion. They also stressed the difficulty they faced when joining the hotel chain: S.K. for example stated that: “even after years I still find difficulty in finding the past versions of my unit as well as the rationale of certain changes undertaken in the past”.

Finally, both managers and directors acknowledged the problems arising from not assessing every initiative for change systematically. Some managers complained that were assessed based on the actual and short-term results of their unit which often depended on external random factors. For example, the performance of a hotel unit depended significantly on the number of arrivals of tourists in the country, the presence of local events such as exhibitions or sport events, or even weather or economical factors. E.C. stated that “my initiatives which had a longer-term impact were not really appreciated”.
Directors also admitted that they failed to obtain insights related to the true level of adjustability of the chain, as well as the level of initiative and alertness of their managers across the organizational levels of the chain. More specifically, to the question “To what extent do you evaluate managers based on the level of their initiatives”, P.L. answered that their initiatives “were not evaluated appropriately”. He continued by saying that “their initiatives were evaluated rather informally, as “impressions” and not as produced results”. E.L. also admitted that their performance was evaluated based on the financial results and noted that management’s initiatives that would add value in the long-term were not fully appreciated.

### 3.4 Discussion

Following the above analysis, it can be concluded that the limitations of the existing KMSs had important consequences, the most important of which was the limited ability of the hotel chain to self-organize. With the existing KMSs in place, the managers of the hotel units failed to trace knowledge created upon the initiatives for change undertaken by other units which had similar characteristics and purpose. They could not filter easily the knowledge that was relevant for them; as such knowledge –if recorded – would lie disintegrated across various sources. Secondly, even if the managers managed to trace a change which was implemented by a particular unit, they could not easily reapply such a change. The knowledge created upon the process of change and particularly the effects of every change on the existing architecture and performance was not captured effectively by the existing KMSs so that it could be easily reused. The rationale of the change and the alternatives considered before choosing the best course of action could lie in various sources such as the discussion forum, the moderator tool, the chat-room, email conversations or within the documents of the ISO standard. The implementation plan of an initiative for change could be found within the strategy management system. Also, the effects of a change on the existing architecture and performance could be captured to a certain extent within the various modules of the ERP system or within documents of the ISO standard such as minutes from meetings.
Such limitations though had important consequences. The fact that the effects of changes undertaken by the hotel units on the existing architecture had not been captured systematically created difficulties for new managers. As a result, newly employed managers faced increased difficulty in understanding its current form of operations, as well as in identifying the rationale of the previous states of the architecture of the unit of which they were in charge. Also, the insufficient recording of the effects of the changes undertaken by the hotel units on the existing performance resulted in a rather static perception of performance. As a result, the directors failed to obtain insights related to the actual level of adjustability of the chain, as well as the level of initiative and alertness of their managers across all the organizational levels of the chain.

Most importantly, the deficiencies in terms of capturing and sharing of knowledge resulted in the continuous intervention of top management to promote change. As noticed in the case of a hotel chain, most of the changes were initiated and led from the top, either from the headquarters or the manager of every hotel. With the use of the existing KM methods and tools, knowledge obtained from the headquarters was easily diffused to the lower levels of the chain. In contrast, the knowledge obtained from the lower levels was not effectively transferred either to the top or directly towards other similar units. Very few were the cases where knowledge created by a particular unit had been shared with the rest of the hotel units using the corporate intranet. In most of the cases, whenever a hotel unit undertook an initiative for change, such change would typically move vertically towards the top and not horizontally towards the other similar units. For example, the introduction of a new Restaurant menu by Restaurant 1 would usually move to a higher organizational level, say the Management of Hotel 1 and at times the Managing Director of the hotel chain. From there, it could then be communicated towards the other Restaurant units which would potentially be interested.

A representation of the problem is provided in Figure 22. As the figure shows, the knowledge flows followed the control structure of the hotel chain. This means that knowledge was mainly gathered at the top of the hotel chain and was then transmitted towards the bottom. The use of some groupware tools provided by the corporate intranet had recently enabled bottom-up knowledge transfer. Nevertheless, similar hotel units (i.e.
Restaurant 1 and 2) typically operated in isolation with each other, since knowledge was not transferred horizontally.

![Diagram of knowledge flow and control in a hotel chain]

Figure 22: Vertical knowledge transfer as the most prevailing type of knowledge transfer

In practice though, such a process was found to be slow and bureaucratic. There were often cases where knowledge did not finally reach the other hotels or units for several reasons. Management did not always understand the “language” of every unit and often retransmitted incomplete instructions for addressing and reapplying a change. Furthermore, management often faced periods of increased workload and it was noticed that the implementation of changes was being delayed or sometimes even forgotten due to the significant effort required for intervening and monitoring the changes. Changes in staffing were also frequent and thus several interruptions and terminations in communicating knowledge were inescapable, particularly when people directly involved with the decision and implementation of a change ceased to be employed.

In conclusion, the hotel chain did not self-organize, since changes typically emerged from the headquarters or from the managers of the hotels and not from the direct interaction between the hotel units of the chain. The similar hotel units were isolated from each other and had limited chances to exchange their knowledge, since such knowledge had either not
been recorded or was fragmented in various sources. Despite the use of various KMSs, knowledge transfer within the hotel chain did not achieve its real potential.

The existing KMSs in the hospitality sector conceived the hotel chain rather as a hierarchical organization which is led from the top. Hence, KMSs were designed mainly to support top-down knowledge transfer. Moreover, the disadvantages of the deterministic approach to performance were evident within the hotel chain. Managers were mainly assessed in terms of their ability to meet the financial goals which had been set by the headquarters. The main focus when assessing performance was to examine whether the results from the financial measures such as profit, revenue and cost were within the accepted tolerance limits. Nevertheless, financial results were often influenced by external random factors such as an increase of the number of tourists or the recurrence of special local events. Most importantly, changes which could have a longer-term impact on the hotel chain were not really appreciated. While no one can neglect the importance of the financial performance, additional perspectives of performance such as customer satisfaction, productivity or staff development were not given sufficient attention. Hence, in order to draw safer conclusions on whether an organization has an effective fit within its environment, additional perspectives of performance should be considered.

3.5 Conclusions

In this chapter the existing KMSs used by the hotel chain and their limitations were presented. The first section described the architecture and performance measures of the hotel chain. Subsequently, the KMSs in place and their support towards knowledge were analyzed. As it was shown, the recent expansion of the hotel chain in new regions, as well as the increased turnover rate of management had created a number of challenges for the management of knowledge within the hotel chain.

Horizontal knowledge transfer within the hotel chain was actually very limited. The initiatives for change which were undertaken at the lower organizational levels were often not captured but remained implicit knowledge. Managers of units at various organizational levels were not really concerned about sharing their initiatives with other managers but
focused on the requested deliverables from the top. Moreover, managers did not pay particular attention in terms of recording systematically the detailed knowledge underlying their initiatives for change.

Despite the presence of a number of KMSs in place, two main limitations were noticed particularly in terms of supporting the ability of the hotel chain to self-organize. The first limitation was the insufficient recording and sharing of the initiatives for change with the current KMSs, especially at the lower organizational levels. The second limitation referred to the ineffective and non-systematic recording of the knowledge created upon the process of each change, which consequently made difficult the reapplication of the initiatives by another similar unit within the chain.

It can therefore be concluded that the limitations identified in the case of the hotel chain were manifestations of a more fundamental problem: the dominance of the tacit assumptions of the mechanistic organizational model in the field of IS. KMSs for the hospitality sector had not embraced the more recent management ideas that consider an organization as a living organism which self-organizes through the dynamic interactions of the agents between them. This brings us to Chapter 4 which presents the transition of organizational science from the traditional mechanistic model towards the more recent complex systems model and then examines the extent to which contemporary KMSs have embraced its key characteristics.
Chapter 4: The Rise of the Complex Systems Model and its Application in KMSs

4.1 Introduction

The aim of this chapter is to present the key concepts of ‘complexity theories’, an umbrella term used to describe a set of ideas that constitute a true paradigm shift in management thinking. Such concepts will be then used as a basis for proposing a KMA aiming to re-conceptualize existing KMS for the hospitality sector.

The first section of this chapter presents the characteristics of the mechanistic and systemic models which have dominated management science for several centuries before the rise of the complex systems model. This will provide a deeper understanding of the reasons underlying the recent evolution of management science towards the complex systems model. At the same time, the implications of the models to KM and most importantly to KMSs are critically examined.

Subsequently, section 4.3 analyzes the key concepts of the complex systems model which has emerged to articulate the aspects of adaptation, discontinuous change and dynamism that are attributed to the contemporary network economy. The most important complexity theories and concepts are analyzed, with particular emphasis on three concepts: i) self-organization, ii) emergence and iii) edge of chaos.

Next, section 4.4 presents the author’s insights on the implications of the complex systems model to KM and particularly to KMSs. The contemporary KMSs for the hospitality sector are then examined in section 4.5 in terms of supporting the ideas of the new model.
4.2 The Shift from the Mechanistic Towards the Systemic Model and the Implications for KM

The rise of the complex systems occurred after several centuries of dominance of the mechanistic model and subsequently the systemic model. The main characteristics of these two models are now described.

4.2.1 Characteristics of the Mechanistic and Systemic Models

The mechanistic organizational model emerged in the sixteenth and seventeenth centuries to change the medieval worldview which was based on Aristotelian philosophy and Christian theology. The discoveries in physics, astronomy and mathematics, known as the Scientific Revolution gave rise to a metaphor of the world as a machine. Rene Descartes created the method of analytic thinking and suggested the material universe was a machine which could be understood by analyzing it in terms of its smallest parts. Descartes’s theory was then completed by Isaac Newton, whose grand synthesis, Newtonian mechanics, was the crowning achievement of seventeenth-century science (Capra 1997).

The Newtopian view of the world constituted the basis for the metaphor of a business as a machine, which has been introduced by the father of scientific management, Frederick Taylor (1911). Taylorism as it has become known, deconstructed the management of an organization to component parts which were organized along hierarchical lines in order to improve efficiency and productivity. According to Thompson and Mchugh (2002), the basic principles of Taylor’s theory are four: i) developing a science for each element of work, ii) scientific selection and training of workers, iii) cooperation between management and workers to ensure that the work is done accordingly to the science, iv) equal division of work and responsibility between management and workers, each side doing what is best fitted for.

The mechanistic organizational model determines significantly the leadership of change within an organization. The approach to change followed by organizations which were operated on the basis of the mechanistic model is coined in the change management
literature with the term “planned”. Planned approaches to change suggest that change is centrally controlled and is always occurring from the top of the organization. The leaders from the top take charge and control of the change by setting objectives and instructions which explain to individuals how they need to change. Particular emphasis is placed on articulating in detail the implementation plan of every new initiative and on monitoring its successful completion. Employees at lower levels do not participate in the decision making process on the basis of the argument that it would take too much time if everybody is to be involved. As Beer and Nohria (2000) state, “a clearly planned transformation effort builds confidence with all the stakeholders of an organization”. Burns and Stalker (1961) add that “it is considered legitimate for control and direction to be exercised by senior management, the assumption being that all relevant knowledge is located at the apex of the organization”.

In fact this was considered the biggest benefit of the mechanistic model. Powell (1990) views the strength of the hierarchical organizational structure in its reliability – its capacity for producing large numbers of goods or services of a given quality repeatedly – and its accountability – its ability to document how resources have been used (Di Maggio and Powell 1983; Hannan and Freeman, 1984).

The principles of the mechanistic model brought a number of consequences to organizations. Taylor (1911) suggests that there was a need for:

“extensive work measurement to predetermine tasks; the employment of cheaper, deskill and substitutable labor in more fragmented jobs; a large increase in the number of non-productive employees to enforce, monitor and record new work arrangements; and functional foremanship that subdivided traditional responsibilities and involved reporting to the all-powering planning department”.

Wheatley (1999) has described the translation of the machine imagery of the world in organizations as follows:

“Responsibilities have been organized into functions. People have been organized into roles. Page after page of organizational charts depict the workings of the machine: the number of pieces, what fits where, who the most important pieces are”.

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Furthermore, the mechanistic model led to a deterministic approach to change and performance. This means that the focus is placed on monitoring the gap between the goals which have been set and the actual results (Figure 23).

![Figure 23: Traditional model to performance management (adopted by Hoverstadt 2008)](image)

Hence, the mechanistic model brought a number of benefits but also was the root of a number of organizational problems. Tsai (2002) has grouped the costs of the centralization caused by the hierarchical organizational structure into four categories: i) a tendency for headquarters to intervene excessively or inappropriately, ii) increased time and effort devoted to influencing activities with a corresponding reduction in organizational productivity iii) poor decision making resulting from the distortion of information associated with activities to influence and iv) a loss of efficiency as the organization adapts its structure and policies to enhance control activities (Milgrom and Roberts 1990). Youngblood (1997) describes emphatically that centralized control in complex environments is “a one-way ticket to extinction”.

The need for participation, dialogue but also feedback mechanisms shifted the focus of organizational science from the mechanistic towards a more “organic” perception of the organization. Nadler et al (1992) notes that “the need for competitive innovation has required from many firms to search for ways to increase both the sense of accountability and the degree of empowerment for teams at all levels”. Hence, a new model which has been named with various terms such as “organic”, “ecological” or “systemic” emerged.

Contrary to the mechanistic model, the organic model pictures organizations not as machines but as living organisms. The organic perception of the organization has its roots in Japanese management which emphasizes the “people” aspects. Nonaka (1991) suggests that an organic organization, “much like an individual”, can have a collective sense of identity and a fundamental purpose. Attention is devoted to developing a shared
understanding of the nature of the company, what it wants to achieve in the world and how it is going to achieve it (Jackson 2006).

One of the first differences between the organic model and Newtonianism is the focus on holism rather than on parts. A holistic perspective, which has become known as ‘systemic’, has emerged and the new way of thinking was named ‘Systems Thinking’. Capra (1997) actually suggests that the term “organic” and “systemic” are synonyms but views the term systemic as the more technical and scientific term. In this research, the term “systemic” is preferred.

The Systems Thinking paradigm places less emphasis on the parts (mechanistic, reductionist or atomistic) and focuses more on the whole (holistic, organic or ecological). This means that the behavior of a living organism as an integrated whole could not be understood from the study of its parts alone. One of the leading figures in the area of Systems Thinking was Ludwig von Bertalanffy who proposed the ‘General Systems Theory’ (Bertalanffy 1968). Bertalanffy questioned the second law of thermodynamics which claims that there is a trend in physical phenomena from order to disorder. He introduced the concept of dynamic balance in which an open system is fed on a continual flux of matter and energy from its environment in order to stay alive. Bertalanffy’s theory led to an entirely new field of investigation which had a major impact on the further development of systems thinking. Drawing from several disciplines, the new science represented a unified approach to problems of communication and control, involving a whole complex of novel ideas, which inspired Norbert Wiener to give a special name for it – ‘Cybernetics’.

The term Cybernetics comes from the Greek word Kybernetes which means Steers-man, and was defined by Wiener (1948) as the science of ‘control and communication in the animal and the machine’. Cyberneticians investigated new concepts such as feedback and self-regulation. According to Wiener (1948), feedback is the control of a machine on the basis of its actual performance rather than its expected performance. This means that feedback conveys information about the outcome of any process or activity to its source. Thus, feedback was considered as the essential mechanism of self-regulation which allows living organisms to maintain themselves in a state of dynamic balance.
The systemic organizational model inevitably altered significantly the dominant perception towards change. New approaches to change referred in the change management literature as ‘traditional’, emerged to emphasize the importance participation and dialogue which had been rather neglected by the planned approaches. Among the traditional approaches to change are the Kurt Lewin’s classical model (Lewin 1946), the socio-technical approach, the organizational development approach and the learning organization concept.

Kurt Lewin’s classical model is concerned with the forces that sustain balanced systems or those that break them down (Graetz et al 2002). According to Burns (1996), the process of change follows three steps: i) unfreezing, ii) moving and iii) refreezing. Unfreezing involves detaching by communication existing problems. Moving refers to the recognition of a need to change to establish new values and processes. Refreezing refers to the reinforcement of changes in order to achieve renewed equilibrium.

The socio-technical approach identifies the semi-autonomous workgroup as the foundation for any organization. Graetz et al (2002) confirm in the socio-technical approach, both technical and social systems of work should be utilized in order for an organization to change. In the same line, the organizational development approaches emphasize team building, personal development and participation, while the learning organization concept refers to participative management, the interconnectedness of organizations as well to the learning process. As Cummings and Worley (2001) emphasize "the learning process in the learning organization is determined through trial and error as well as goal setting and feedback”.

Stroh (2001) characterizes the above models as rather normative and continues with further models related to quality such as the Lean Production and the Total Quality Management. Lean production is based on the principles of zero defects, zero inventories and zero waste, through total integration of all systems. In Lean Production, the philosophy of continuous improvement, quality and minimum waste is achieved by motivating teams of multi-skilled employees. Similarly, Total Quality Management (TQM) applies to the whole operational system through fully integrated work teams and focuses on quality and customer requirements. Within the traditional approaches, Graetz et al (2002) include three more change models which are very much influenced by the TQM and are Business Process
Reengineering (BPR), Best Practice, and the model of High-performance Work Organization.

In contrast to the planned approaches to change, traditional approaches overall treat the organization as one purposeful whole and place emphasis on bottom-up change initiated from the collaboration of team members within an organization. Employees at lower levels are not anymore conceived in a passive sense but as active creators and shapers of the future of the organization (Beer and Nohria 2000). Moreover, change is not solely considered simply as an implementation plan but as a process of learning and experimentation.

Finally, in terms of performance management, traditional approaches to change consider additional aspects of performance beyond simply financial results. The focus is now on quality which suggests meeting the customer’s expectations. Thus, organizations are now concerned in customer feedback. This however is directly linked with employee motivation. Employees need to be more motivated in order to consider the customer perspective. For this reason, traditional approaches to change also emphasize the personal development of the employees.

Overall, system thinking treats organizations systemically and not mechanistically. Burns and Stalker (1961) provide a comprehensive comparison of the characteristics of the mechanistic and systemic organizational model in Table 9.
<table>
<thead>
<tr>
<th>Aspects</th>
<th>Mechanistic / Planned Approach to Change</th>
<th>Systemic / Traditional Approach to Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Organizational tasks are broken down into specialized functions with each employee performing his or her individual jobs without performing his or her individual jobs without much concern for the overall aims of the organization.</td>
<td>Structure is broken down into semi-autonomous teams. There appears to be a greater sense of purpose when employees perform their job, with a commitment to the achievement of the goals of the organization as a whole.</td>
</tr>
<tr>
<td>Job Definitions</td>
<td>The duties, rights, obligations, and privileges associated with each job are defined clearly</td>
<td>There seems to be less emphasis on defining jobs clearly, and also less of a tendency to stress the status attached to jobs</td>
</tr>
<tr>
<td>Communication</td>
<td>Communication between superiors and subordinates takes place on a vertical basis on matters connected with work. The chain of command is very much in evidence with instructions and directives coming down and feedback going up.</td>
<td>Employees communicate and relate to each other on a horizontal as well as vertical basis.</td>
</tr>
<tr>
<td>Control</td>
<td>It is considered legitimate for control and direction to be exercised by senior management, the assumption being that all relevant knowledge is located at the apex of the organization. The culture of the organization is typified by an inward-looking perspective, with an emphasis on loyalty and obedience.</td>
<td>The issuing of directives and instructions by supervisors is of lesser importance than a management process based on consultation and discussion.</td>
</tr>
</tbody>
</table>

Table 9: Characteristics of the mechanistic model (adopted by Burns and Stalker 1961)
4.2.2 The Implications of the Mechanistic and Organic Models for KM

The mechanistic model has determined to a significant extent the management of knowledge within an organization. At first, in order to assure accountability, the mechanistic model suggested that the organizational structure, processes, roles and resources should be documented in detail. Indeed, Nonaka (1991) and Takeuchi (1998) note that in the mechanistic model, KM is concentrated almost on explicit knowledge.

Furthermore, since organizational change is led and controlled from the top, knowledge is created and retained mainly by the leaders at the top too. This means that knowledge flows transmitted from the bottom towards the top of the organization are limited. The members of an organization do not have many opportunities to exchange knowledge since they are isolated. Tsai (2002) also notes that “formal hierarchical structures represented by centralization show a negative impact on intra-firm knowledge sharing”. Tsai (2002) concludes that “the more control the headquarters exercised on its subunits, the less the subunits were willing to share knowledge with other units”. Wheatley (1999) describes the strong isolation between the members of an organization as follows:

“in a machine, every piece knows its place. Likewise, in Newtonian organizations, we have drawn boundaries everywhere. We have created roles and accountabilities, specifying lines of authority and limits to responsibilities. We have drawn boundaries around the flow of experience, fragmenting whole networks of interaction into discrete steps”.

Hence, the mechanistic model delimits the number of stakeholders who participate in the decision making process, as well as the transfer of knowledge between the stakeholders. These findings contradict the conventional wisdom that centralization facilitates information processing within an organization (Egelhoff 1982).

In contrast, the systemic model and the traditional approaches to change have led to greater participation and knowledge sharing. Knowledge is not anymore considered as the preserve of a select few but is now shared with the members of the organization. Takeuchi (1998) confirms that traditional approaches to change suggest the involvement of all in the creation of new knowledge. This means that the decision for undertaking an initiative for change is a collaborative process and incorporates valuable knowledge created from the input of the participants. The process of change is now reconceived as a process of knowledge
generation (Balogun and Jenkins 2003). Valuable knowledge is not only incorporated in the articulation of the objectives and the implementation plan of change, but also upon the other stages of the process of change and particularly the brainstorming phase of change. For example, Kolfschoten et al (2004) break the process of change into seven phases, each of which incorporates useful knowledge. These phases are: i) understand the problem, ii) develop alternative solutions, iii) evaluate alternatives, iv) choose alternatives, v) make a plan, vi) take action and vii) monitor results. Hence, the knowledge incorporated within each of these phases should also be considered.

Given the dominance of the mechanistic and organic models from the nineteenth century until even today, one would expect that the contemporary KMSs, which are in essence socio-technical systems, would have embraced their core concepts. Indeed, from the study of the KMSs used in the case of the hotel chain, a number of functions existed to support both models. Top-down knowledge sharing was supported through email communication and the corporate intranet, while the articulation and monitoring of every initiative for change were supported by a project/strategy management tool. The strategy management tool in particular captured all the details related to the implementation plan of a change such as the initiative owner, the detailed plan of the change, its total duration, the stakeholders involved, the deadlines which had been set and most importantly the divergence of the actual results from the specified goals. Also, the structure and processes of an organization were captured in detail in shared documents.

Bottom-up knowledge sharing was also well supported through the groupware tools which were integrated within the hotel chain’s intranet. More specifically, the groupware tools provided various synchronous and asynchronous functions for dialogue and participation in the decision making process. Furthermore, the groupware tools also provided adequate support for capturing an initiative for change, for evaluating alternatives solutions, for enhancing consensus but also facilitating the documentation of the change process and the reflections for every change.

In conclusion, from the study of the contemporary KMSs available for the hospitality sector, it can be claimed that the key characteristics of both the mechanistic and systemic models have been well supported by the contemporary KMSs. Table 10 provides an
overview of the key characteristics of the two models, their implications to KM and the I.T. solutions for KM.

<table>
<thead>
<tr>
<th>Organizational Model</th>
<th>Key characteristics</th>
<th>Implications for KM</th>
<th>Support by KMSs</th>
</tr>
</thead>
</table>
| Mechanistic          | - Hierarchical structure and top-down approach to change  
- Deterministic approach to change and performance: change as a linear implementation plan | - Top-down knowledge sharing and communication  
- Emphasis on the monitoring of the implementation plan and on the divergence from the goals which have been set | Email, Project or Strategy  
Management systems, Business Process Management tools |
| Systemic             | - Network structure and bottom-up approach to change  
- Change as a process of learning and experimentation | - Bottom-up knowledge sharing and communication  
- Emphasis on brainstorming through groupwork and on feedback | Intranet, Groupware (synchronous and asynchronous tools) |

Table 10: Contemporary KMSs in their support towards the mechanistic and organic models
4.3 The Emergence of Complexity Theories

4.3.1 The Key Concepts of Complexity Theories

Despite the increased recognition of the systemic model, it is nowadays found inadequate to deal with the increased complexity of the contemporary environment. Ackoff and Gharajedaghi (1996) suggest that it can be successful “only in cultures where loyalty, conformity and commitment are seen as virtues and security is highly valued” and warn that in face of the new realities of conflict, complexity and change, a systemic perception of the organization is likely to fail.

The need for a new model to articulate the aspects of adaptation, discontinuous change and dynamism that are attributed to the network economy led organizational science towards a new area of exploration referred as “complexity theories”. In fact, a number of terms have been proposed to describe the characteristics of the new model such as “social-systemic”, “living systems”, “complex systems”, “complexity theory” or “complexity leadership”. The diversity of terms used by the various disciplines to describe the new model has been coined as “the confusion of the metaphor” (Goldstein 1994; Contractor 1999).

Complexity theories emerged in the 1960s; however as Antonacopoulou and Chiva (2007) argue, their true upsurge was not seen until mid-1980s. The term ‘complexity theories’ serves as an umbrella label for a number of theories, ideas and research programmes that are derived from scientific disciplines such as meteorology, biology, physics, chemistry and mathematics. As Manson (2001) argues, there is not one theory but a number of theories, developed by different scientific disciplines, which gather under the general heading of complexity research. According to Stacey et al (2002), the three most important ideas in complexity theories are three: chaos theory; dissipative structures theory; and the theory of complex adaptive systems.

Chaos theory is derived from Lorenz’s work on weather systems. Similarly to weather systems, chaotic systems are non-linear, unpredictable and not subject to laws of cause of effect. Lorenz (1993) defined chaotic systems as: “processes that appear to proceed according to chance, even though their behavior is in fact determined by precise laws”.

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Dissipative structures are closely related with the work of Ilya Prigogine (Prigogine 1967). Similarly to chaotic systems, a dissipative structure is a semi-stable configuration that operates in accordance with non-linear logic. Nevertheless, chaos and instability are only temporary. There will be soon a time where critical points will be reached which will in turn lead to self-organization and to the production of different structures or behaviors.

In contrast to the chaos and dissipative structures theories which focus on whole systems, the Complex Adaptive Systems (CASs) approach provides insights on the behavior of the individual elements of systems. At first, complex adaptive systems consist of a large number of agents, each of which behaves according to its own principles (rules) of local interaction which require each agent to adjust its behavior to that of other agents (Stacey 2003, Stacey et al 2002). This means that the system self-organizes, since it develops from the dynamic interactions between the agents within it, without the need for an external determinant or an overall blueprint. Cilliers (1998) provides a comprehensive analysis of the characteristics of complex adaptive systems and adds that CASs are usually open systems, are always in transition (far from equilibrium) and have a history, which means that their behavior co-exists with past behavioral patterns.

Among the wealth of ideas introduced by chaos, dissipative structures and CASs, three fundamental concepts can be distinguished: i) self-organization, ii) emergence and iii) edge of chaos. These three concepts are not clearly distinct but interrelated. Antonacopoulou and Chiva (2007) confirm that emergence and processes of becoming are endemic to self-organization. The concepts of self-organization, emergence and edge of chaos are now briefly analyzed.

**Self-Organization:** Self-organization is the most fundamental concept in complexity theories. It has been considered as the key characteristic which allows complex systems to adapt to their environment in order to remain viable. Burnes (2005) suggests that self-organization implies that there is no overall blueprint or external determinant of how the system develops; instead, the pattern of behavior of the system evolves or emerges from the local interaction of the agents within it, where the “agents” correspond to semi-autonomous entities (i.e. parts of systems) such as atoms, molecules, biomolecules, organisms, processes, people, groups, firms or industries (Ferber 1999).
Complexity theories give a new meaning to self-organization. The first models for self-organization were based on Ashby’s law of requisite variety which suggested that all possible structural changes take place within a given variety pool of structures and that the survival chances of the system depend on the richness, or requisite variety of that pool (Ashby 1956). In contrast, the new models for self-organization suggested by complexity theories include the idea of the creation of novel structures and modes of behavior in the self-organizing process. In the same line, Merali (2006) highlights the generative aspect of the concept which is beyond the early cybernetics concept of self-organization, which focused on the self-regulatory and control aspects of organization and continues by naming similar notions to self-organization such as order for free (Kauffman 1993), dissipative structure (Prigogine 1967) and autopoiesis (Maturana and Varela 1987).

Thus, it can be understood that self-organization implies that order and novel behavior are not centrally controlled but emerge through the dynamic interactions of the agents. Another key characteristic of self-organization is the fact that the agents share a path dependent history. This means that the agents have similar structural characteristics which they should retain through the passage of time. Every agent should not act independently but preserve its ties with its similar agents. Stacey (2003) and Stacey et al (2002) confirm that self-organization implies that every agent needs to adjust its behavior to that of other agents.

Emergence: The term emergence is frequently referred as a synonym for “appearance” or “growth”. Wheatley and Kellner-Rogers (1998) describe emergence as “life’s innate desire to seek new forms of expression”. However, as Corning (2002) states, “there is no universally acknowledged definition of emergence”. In fact, contradictory opinions abound regarding the recognition of emergence. Some theorists seem to take the position that emergence occurs when nobody is there to observe it; others claim that emergence does not exist if it is not perceived and that it must be apparent to an observer. As Corning (2002) suggests, emergence cannot be defined in concrete terms – “so that you will know it when you see it”.

Goldstein (1999) has identified five common characteristics of emergence: (i) radical novelty (features not previously observed in the system); (ii) coherence or correlation (meaning integrated wholes that maintain themselves over some period of time); (iii)
global or macro “level” (i.e., there is some property of “wholeness”); (iv) it is the product of a dynamic process (it evolves); and (v) it is “ostensive” - it can be perceived. He concludes that “emergence functions not so much as an explanation but rather as a descriptive term pointing to the patterns, structures or properties that are exhibited on the macro-scale”. In conclusion, the concept of emergence refers to a notable structural adjustment of an organization or organizational unit to its environment. It may be considered endemic to self-organization as self-organization occurs when a system emerges into new states.

**Edge of Chaos:** The state “edge of chaos” has been given different names such as “far-from-equilibrium” (Stacey et al 2002), “bounded instability” (Stacey 2003) or “chaordic” (Hock 1999). No matter the term used, the key idea is that organizations should inject novelty into their normal operations but without falling over the edge, which may lead to chaos. Organizations should not be neither in a state of “stable equilibrium” in which they never change and thus die, nor in a state of “explosive instability” in which they are overwhelmed by change. Fitzgerald (2002) actually views chaos and order not as opposites but as twin attributes of dynamic systems and suggests that “within chaos, a hidden order may be concealed beneath what looks like utter randomness”. Brown and Eisenhardt (1997) have described the condition of being at the ‘edge of chaos’ as follows:

“complex systems have large numbers of independent yet interacting actors. Rather than ever reaching a stable equilibrium, the most adaptive of these complex systems keep changing continuously by remaining at the poetically termed ‘edge of chaos’ that exists between order and disorder. By staying in this intermediate zone, these systems never quite settle into a stable equilibrium but never quite fall apart. Rather, these systems, which stay constantly poised between order and disorder, exhibit the most prolific, complex and continuous change”.

The notion “edge of chaos” has been increasingly popular within the business literature. Pascale et al (2000) proposes a new management model for business organizations for “surfing at the edge of chaos”, which is based on the principles from complexity theory. Brown and Eisenhardt (1998) also suggest that in order for firms to be able to compete on the edge, their strategy should be considered as a structured chaos. Basically, the term “edge of chaos” corresponds to an intermediate state between order and chaos. It aims to
describe the “explosive” nature of emergence and self-organization and the need for continuous change.

4.3.2 The Application of Complexity Theories in Organizational Science

Complexity theories introduced a number of useful ideas which have attracted the interest of organizational scientists. A number of authors treat organizations as complex systems such as those in nature, whose outcomes of actions are unpredictable but, like turbulence in gases and liquids, are governed by a set of simple order-generating rules (Brown and Eisenhardt 1997; Lewis 1994; Tetenbaum 1998). Complexity theories are being seen by academics and practitioners as a way of understanding organizations and promoting organizational change (Bechtold 1997; Black 2000; Boje 2000; Choi et al. 2001; Gilchrist 2000; Macbeth 2002; Shelton and Darling 2001). Antonacopoulou and Chiva (2007) also cite a number of several researchers and practitioners who have started to use complexity to better understand organizational and managerial issues such as: strategic management (Stacey 2003), strategic change (Stacey 1995; Brown and Eisenhardt, 1997), innovation management (Cheng and Van de Ven, 1996) and design management (Chiva 2004). Ackoff and Gharajedaghi (1996) are convinced that the Complex Systems Model is the most suitable in the modern business environment.

As explained in the introductory section 1.1, two characteristics of the contemporary environment in particular have contributed significantly to the wider adoption of the complex systems model. At first, in today’s era of globalization, the size of organizations has increased considerably. Barriers for entering new markets have been reduced and thus organizations can nowadays expand their operations into new geographical regions and across the globe much easier. The organization obtains a more decentralized structure which allows more freedom to the units which operate in geographically distributed regions. The new organizational units that operate in the new regions are provided with autonomy in order to adjust effectively to their local environment. Thus, the organization is not anymore viewed as “one whole” but more as a biological entity with a fractal structure. This means that the organization has a recursive nature since its patterns and relationships are repeated at different levels or scales. A well known model for example which has emerged to describe the recursion and autonomy of contemporary organizations is the

The second characteristic of our era is the increased flexibility in the job market. The turnover rate of managers in particular has increased dramatically. Research has actually shown that the frequency of top management dismissal (involuntary turnover) has increased significantly in recent years (Denis & Denis, 1995; Huson et al 2001; Wiersema 2002; Lucier et al 2006). This means that the members of the organization are not so loyal anymore but are likely to leave and carry with them the “intelligence” obtained through the years.

Given the decentralized structure of the organization, the complex systems model moves a step further than the systemic model and concentrates on the dynamic relationships between the geographically distributed units of the organization. It suggests that the operation of an organization should resemble the way that the human brain works. Similarly to the millions of neurons of the brain that interact with one another to produce an outcome, the interactions between the “neurons” of the organization, which in essence correspond to the parts of an organization, should be continuous and dynamic in order to create new order. The interactions between the parts of the organization should not be encumbered by neither geographical barriers nor the turnover rate of managers.

The complex systems model determines the approach followed upon organizational change too. The change management literature in particular addresses the approaches to change which are grounded on the complex systems model with the term “emergent”. In contrast to the planned and traditional approaches to change suggested by the mechanistic and systemic models respectively, emergent approaches to change emphasize self-organization which can be derived from the dynamic interactions of the units.

Emergent approaches to change alter radically the traditional role of management which should now facilitate an environment for experimentation at the lower organizational levels. Bennis and O’Toole (2000) describe the new role of management as follows:

“a successful organizational change occurs in an environment that has vast cultural differences and diverse participants where leaders are listeners and followers, rather than heroes and icons”.

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Moreover, in the complex systems model change is not only considered as a process of learning and experimentation but as a process of emergence during which the organization evolves into a new state. Depending on the type and rate of change, referred also as the “substance of change” (Dawson 1994), a change may alter the existing architecture to a smaller or larger extent. Bates (1994) considers the impact of change as either incremental (minor change) or transformational (radical change). Dunphy et al (1993) also classifies the effects of change as “Fine Tuning”, “Incremental Adjustment”, “Modular Transformation” and “Corporate Transformation” to describe the level of change in organization. Hence, the focus of emergent approaches to change is shifting towards the consideration of the effects of every change in an organization. For example, in order to tackle with the notable failure rate of traditional approaches such as Business Process Re-engineering (BPR) programs which is estimated to be 68% (Hoverstadt 2004), emergent approaches go a step further and stress the importance of anticipating and monitoring the effects of a particular change. Hoverstadt (2008) for example proposes the “mosaic transformation” methodology to stress the importance of consciously recognizing, harnessing and managing the natural dynamics of a potential change situation. This practically means that managers should prepare their change programmes gradually; in series of moves that consider the interfaces within the organization and match initiatives to resources.

Finally, the complex systems model also emphasizes the importance of assessing the performance of the organization more systemically and more dynamically. The assessment of the impact of every initiative for change should not only consider the financial perspective but additional perspectives which can assess the dynamic performance and overall sustainability of the organization too. This means that the manager of an organizational unit should not be assessed in terms of the actual results produced, but also in terms of the level of initiative and alertness of the organization to its environment.

**4.4 The Implications of the Complex Systems Model to KM**

The rise of the complex systems model has brought a number of challenges to KM. Ackoff and Gharajedaghi (1996) note that “emergent approaches to change suggest a new reality in
terms of managing knowledge within a disintegrated and less cohesive organization”. Nevertheless, the application of the complex systems model to KM still remains ambiguous. Takeuchi and Nonaka (2004) suggest that successful companies in the future need to synthesize the best of the Western and Japanese approaches to management. Nonaka and Toyama (2002) describe organizations as “dialectical beings” as they need to synthesize contradictory forces such as efficiency and creativity, exploitation and exploration, speed and time-consuming resource building, competition and cooperation, integration and disintegration. Jackson (2006) continues by stating that

“firms will never be able to rationalize away these contradictions but can however synthesize the truths offered by each pole of the different contradictions and enter a process of becoming which will take them towards the truth”.

So, what do complexity theories signify for KM theory and KMSs? A number of authors have addressed the need of enhancing KM theory by applying concepts from the complexity paradigm. Mathews et al (1999) argued that the emerging complexity science has the potential to extend and enhance our knowledge of organizational change and transformation processes. Chiva (2003) illustrated that Complex Adaptive Systems are relevant in identifying the essential factors that facilitate organizational learning. More recently, Luoma (2006) has applied principles of complexity science in rethinking management development, while Antonacopoulou (2006) has employed complexity principles to show the complex nature of learning in relation to working and living. Achterbergh and Vriens (2002) applied Beer’s Viable System Model (VSM) to KM, while Yoshida et al (2004) show how soft systems methodology (SSM) can enhance organizational knowledge creation theory and practice. Gao et (2002) suggested that managers need access to the diverse range of systems methods in order to enhance the practice of KM. Jackson (2006) also argues that systems thinking (ST), and particularly critical systems thinking (CST) can provide explicit knowledge appropriate for stimulating the further development of KM. Thus, a number of approaches exist which attempt to apply complexity theories to KM theory. However, the critical role of supporting the dynamic interactions between the parts of an organization which share the same structural characteristics, which in turn will facilitate self-organization is not addressed.
A few approaches which attempt to apply some of the key characteristics from the complex systems model to KMSs exist in the IS field too. For example, the cybernetic model of the VSM has been proposed as an architecture for designing flexible information systems (Snowdon et al 2007, Snowdon and Kawalek 2003). Herring (2002) has also used the VSM as a basis for software architecture in an aim to apply the qualities inherent in the living systems in the software field. Fernandez et al (2003) have also proposed a federated approach for achieving interoperation between domains and to support information integration. More recently, Benbya and McKelvey (2006) proposed seven principles for designing information systems which have been inspired by the complexity science. Nevertheless, most of the attempts for incorporating the complexity paradigm in IS address rather technical elements and the structure of system design, such as artificial intelligence and algorithms.

Very scarce is the research in employing concepts from the complexity paradigm in order to conceptualize the organization itself

“as an evolving, quasi-autonomous system of knowledge production and application, with emergent and self-organizing properties that are derived from the interactions of its semi-autonomous elements with one another and the external environment” (Spender 1996).

This means that the organization is not treated by the IS field as a living organism which self-organizes from the direct interactions of its parts. The concepts of emergence and self-organization constitute fundamental characteristic of all living systems, nevertheless they have not been embraced by contemporary KMSs. King and Halkett (2010) confirm that this evolving discourse is “still in the early days” since it “tends to concentrate on the “harder” areas of systems science, such as artificial intelligence and algorithm development”. This brings us to the novel approach that this research proposes in terms of embracing complexity theory in KM and particularly in KMSs.

4.4.1 Viewing an Organization such as a Hotel Chain as a set of Communities of Practice

As described in section 4.3.2, the complex systems model suggests conceiving an enterprise as a biological system with a fractal structure. This means that the architecture of the
organization is “reproduced” across new geographical regions. Similarly to the nature’s reproduction where new living organisms inherit the structural characteristics of the parent organism, the new organizational units that are created in new regions “inherit” the characteristics of parental architecture.

Let us give an example by correlating a living organism such as a tree to an enterprise such as a hotel chain. Figure 24 demonstrates a tree consisting of several branches. Let us assume that such a tree corresponds to the first hotel which was operated by a hotel chain and that the various branches refer to the organizational units (departments) within the hotel.

![Figure 24: Correlating a living organism such as a tree to a hotel chain](image)

As seen from the case of the hotel chain analyzed in Chapter 3, the operations of the first hotel proved very successful and hence more hotels were built, giving rise to a hotel chain. As the following diagram shows, the hotels of the chain soon increased to four. Each of the first four new hotels was in essence built on the basis of the first hotel which has the parental architecture. Hence, the initial tree (hotel) which was shown in Figure 23 has been “reproduced” another three times, giving rise to a larger tree (hotel chain).
Hence, this research initially points out that as an organization expands its operations into new regions, the parental architecture is reproduced in each of the new organizational units. In fact, such a conception was inspired by the work of David Parnas in the field of software engineering. Parnas ideas have been extremely influential and nowadays govern all modern programming languages (Hoffman and Weiss 2001). Parnas (1976, 1979) suggested that a software program should be developed not as a single (whole) program but as a “family of programs”. With an aim to facilitate the design of modular software systems for change, he suggests abandoning the classical sequential method of developing programs. This means that a particular member of the family should not be developed completely to the “working” stage. Instead, the next member(s) of the family should be developed by modification of the existing working programs.

In the context of organization science, the concept of family programs suggests perceiving an organization as consisting of a set of families of units. Each family of units includes units that have similar structural characteristics, irrespective of the fact that they operate in different geographical locations. Thus, every new member joining the family should be considered to be an ancestor of other family members.

The inheritance of the parental architecture does not apply solely to the hotels as wholes, but to the various units residing within a hotel. All units inherit to a large extent the parental architecture of the units of the first hotel-parent. For example, the restaurant units...
operating in different regions have inherited the parental architecture of the restaurant residing within the first hotel.

Such a fractal conception of an organization has very important implications for KM. Since the units-children have similar structural characteristics, they should not remain isolated with each other due to geographical barriers, but be considered as members of the same family or else referred “community of practice” (CoP), a term introduced by Brown and Duguid (1991).

CoPs are defined in organizational science by Wenger et al (2002) as:

“groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis”.

The notion of a CoP differs slightly the notion of a group or team. Members of a CoP do not need to work together on a daily basis nor be members of the same team. A CoP is rather a hub linking employees from different business units in order to enable collective knowledge sharing and problem-solving. For this reason, CoPs are typically distributed or virtual, which means that they cannot rely on face to face meetings and interactions as their primary vehicle for connecting members (Wenger et al 2002).

The following figures demonstrate in the case of the hotel chain the difference between the hierarchical model of an organization and the perception of an organization as a community of CoPs.
As the above figures show, each unit now belongs to a certain CoP, no matter if it resides in a different geographical location. For example, the Restaurant CoP consists of all the restaurant members operating from all the hotels of the chain (Figure 28).

The conception of an organization as a set CoPs has important consequences for KM. Since the members of a CoP share the same structural characteristics, they should exchange with
one another the knowledge underlying any of their attempts to reshape their architecture. As seen in the case of the hotel chain, a number of initiatives were undertaken by the managers of various units across the hotel chain with an aim to achieve a better fit of their unit with their local environment. Such initiatives for change often resulted in altering the existing architecture. No matter if such changes proved successful or unsuccessful though they incorporated knowledge which should be shared with the rest of the community members in order to retain their structural relationship.

4.4.2 Viewing Changes as Processes of Emergence

The second major implication that the complex systems model brings to KM is the importance of treating change as a process of emergence upon which the organizational architecture “emerges” into a new state. This means that any initiative for change undertaken by the members of a CoP constitutes valuable knowledge which should be captured for reuse within that CoP. Not only should all initiatives for change be recorded but emphasis should be placed on capturing the knowledge incorporated within each phase of the process of each change so that change can be easily reapplied by other members of the community. In particular, further to the knowledge created upon the brainstorming and implementation phase of change, emphasis should be placed on capturing the emergence of the organization. Such emergence in essence corresponds to the effects of every implemented change on the existing architecture and performance. As Figure 29 shows, an initiative for change undertaken at the point of time T2 leads to the evolution of the organizational architecture and performance. At the point of time T3, which corresponds to the end of the implementation of the change, the architecture and performance of the organization has evolved into a new state.
Figure 28: Capturing the evolution of the architecture and performance of an organization

Capturing the knowledge incorporated within the emergence of an organization usually remains implicit. Whittle and Myrick (2004) note that managers undertake major corporate initiatives and spending, time after time, with no supporting or incomplete enterprise blueprints and stress that by keeping models current and accurate, the holistic view of the enterprise can be achieved. This problem is referred by Alexander (1970) with the term *unselfconscious culture* in which the form of operations is “learned informally, through imitation and correction” and “without explicit rules”.

Therefore, such implicit knowledge cannot be reused by other members of the CoP, particularly when a manager leaves the organization. Given the unprecedented flexibility in the job market and the high turnover rate of managers, knowledge becomes vulnerable. O’Leary (1998) confirms that “as the employee turnover rate escalates in the overheated job market, organizations are likely to lose access to large quantities of critical knowledge”. Davies et al (2002) also warn that failure to record knowledge can lead to loss of expertise when people leave, failure to benefit from the experience of others and needless duplication of a learning process.
4.5 The Complex Systems Model and its Incorporation by KMSs in the Hospitality Sector

As seen from the case of the hotel chain and the study of the KMSs available for the hospitality sector, the KMSs had certain limitations in terms of supporting effectively the transfer of knowledge within the hotel chain. Initiatives for change were not shared between the similar units nor were captured systematically for reapplication. From a more critical perspective though, both limitations seemed to be manifestations of a more fundamental problem: the fact that the complex systems model had not been embraced yet by the KMSs available for the hospitality sector.

The KMSs available for the hospitality sector had not conceived the hotel chain as a set of CoPs and did not support the systematic sharing of the initiatives for change directly between the members of each CoP. It was extremely difficult to trace or query in a single view all the initiatives for change undertaken by a particular class of units which share the same structural characteristics. For example, it was not possible to query all initiatives for change undertaken by all the restaurant managers across the hotel chain. The similar units residing in different geographical regions remained isolated and hence valuable knowledge remained disintegrated and fragmented due to the lack of geographical proximity.

Furthermore, even if at times certain initiatives for change were found among the various changes recorded within KMSs, managers found it extremely difficult to reapply changes they were interested in for two reasons. The first reason was that valuable knowledge related to the change was not recorded systematically. The KMSs in place did not really enhance the systematic recording of the knowledge created upon each phase of the process of change. For example, the strategy management system of the hotel chain was mainly concerned to monitor the implementation plan of change rather than to enhance the recording of the rationale of the change, the alternatives considered and most importantly the assessment of change in terms of its effects on the existing architecture and performance. As a result, the strategy management system of the hotel chain did not include any initiatives for change which were interrupted, abandoned or postponed for future use.
The second reason was that knowledge was usually disintegrated and fragmented within various modules or tools. Each tool focused on providing a specific functionality and in most of the cases was not linked effectively with one another. For example, the knowledge created upon undertaking an initiative for change within the discussion forum, the chat room or within the brainstorming tool was not well organized so that it can be reusable. Despite the presence of an advanced search solution, aspects of knowledge created upon every change which was incorporated within the different tools or email conversations were difficult or very time-consuming to trace.

Consequently, the KMSs in place did not support effectively horizontal knowledge transfer. The hotel units which share similar structural characteristics did not exchange with each other the knowledge they created. In addition, the existing KMSs did not enhance the assessment of every implemented change and its impact on the architecture and performance in order to be able to capture organizational emergence. Thus, it was impossible to obtain useful insights such as a comparison of the level of alertness between the various members or reports such as the five most successful changes undertaken within the hotel chain. Such views though were crucial for promoting the reapplication of change directly between similar units without the intervention of top management or the headquarters of the hotel chain. As a consequence, it can be claimed that the contemporary KMSs did not support the self-organizing ability of organizations with a geographically distributed structure.

Recently, BI tools have been developed to integrate various sources of data and create a single repository of knowledge. After studying the BI solutions of Microsoft and SAP (see section 2.4.5) it was noticed that BI tools do provide useful functions for assessing organizational change and measuring organizational performance more systemically. Evelson (2008) recognizes the recent development of BI solutions from reporting and analytical tools to “a set of methodologies, processes, architectures, and technologies that transform raw data into meaningful and useful and useful information used to enable more effective strategic, tactical, and operational insights and decision making”. Moreover, Negash and Gray (2008) note that one of the current developments in BI is Corporate Performance Management (CPM) which refers to how well (or poorly) a business doing by using a combination of software, business processes, and measures of business success.
Nevertheless, despite the notable progress in this area, it is believed that there is still room for improvement in certain aspects. At first, existing KMSs fail to capture systematically the effects of every change on the existing architecture. More specifically, while strategy management tools support the monitoring of every initiative for change very effectively, they do not capture the effects of change on the existing architecture. Such tools include the various modules within an ERP such as the HR module which captures the existing roles and rewarding systems, the Warehouse Management and Accounting modules which capture the material resources and machinery and the Business Process Management or Workflow tools which capture the existing structure and business processes. Similarly, groupware tools focus on supporting the initial stages of the group collaboration process and do not consider mapping the impact of changes on the existing architecture.

Secondly, despite the recent incorporation of scorecards by all major software vendors which aim to assess performance more systemically and systematically, there is still space for improvement in terms of depicting the pace of innovation within an organization, as well as comparing the level of alertness between units which have similar structural characteristics.

Thirdly, existing BI tools still do not regard every initiative for change as an act of structural adjustment of the organization to its environment which creates valuable knowledge which could be very useful between similar units. Thus, the different phases of the process of change are supported by different and usually not interoperable tools.

The limitations of the contemporary KMSs have been noted by various authors. Xu at al (2006) consider the renovation of traditional ERP systems with knowledge management features as imperative. Negash and Gray (2008) confirm that research and development is needed in incorporating within the existing solutions semi-structured and unstructured data and pieces of information that are revealed upon the decision making process. Moreover, Majchrzak et al (2004) suggest that:

“KMSs that organize, represent, and provide ways to elicit recontextualized assumptions for innovation are still in their infancy and KMS should be able to be designed to support knowledge transfer for innovation, not just for routine use”.
The above findings were confirmed in an interview with an IT expert of SAP, the leading software for businesses. After getting in contact with SAP Hellas, an SAP expert who was very much in depth of all the SAP modules and solutions was allocated. The interviewee was asked a number of questions which can be found in the Appendix D2. The interviewee mentioned the incorporation of the Balanced Scorecard within SAP BI solution and the functionalities offered by SAP Netweaver for supporting group collaboration, as well as the provision of providing advanced search facilities towards structured and unstructured data. Nevertheless, he admitted that it would be very difficult to query initiatives for change across an enterprise, based on their impact on performance. Moreover, he acknowledged that SAP’s strategy management solution had not been effectively linked yet with the SAP ERP solution. He actually noted that one of the current priorities of SAP is the integration of its strategy management tool with its corporate enterprise portal solution named “SAP Netweaver”.

In conclusion, a number of different types of KMSs are required to support self-organization within a hotel chain and capture the emergence of every unit through time. However, such tools are not well integrated with one another and need to extend their functionalities towards supporting the sharing of the initiatives for change between the similar units of the chain as well as the knowledge incorporated within the process of each change. Table 11 summarizes all the above findings.

<table>
<thead>
<tr>
<th>Organizational Model</th>
<th>Key characteristics</th>
<th>Implications for KM</th>
<th>Support by KMSs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex Systems Model</td>
<td>Fractal structure for self-organization</td>
<td>Horizontal knowledge transfer between the members of a CoP</td>
<td>Combination of tools, BI tools</td>
</tr>
<tr>
<td></td>
<td>Change as a process of emergence</td>
<td>Emphasis on capturing the impact of change on architecture and performance</td>
<td></td>
</tr>
</tbody>
</table>

Table 11: Contemporary KMSs and their support towards the complex systems model
4.6 Conclusions

This chapter started by presenting the characteristics of the mechanistic and organic models which have dominated management thinking in the last centuries, as well as their implications to KM. As it was shown, their characteristics have been well supported by the contemporary KMSs. Subsequently, the evolution of organizational science towards the complex systems model and the characteristics of the new model were analyzed. Three core concepts of the complex systems model were elaborated: emergence, edge of chaos and self-organization. Next, the implications of the new model for KM and KMSs were elaborated.

The author contributed the existing discourse between complexity and KMSs by presenting two additional insights. At first, KMSs should conceive an organization with a geographically distributed structure - such as a hotel chain - as a set of CoP. This self-organization emanates from the direct interactions between the members of a CoP. Secondly, KMSs should treat every change as a structural adjustment of a hotel unit to its environment and thus should capture and share the impact of every change on the architecture and performance too.

From the study of the contemporary KMSs, including those used in the hotel chain, it was noticed that KMSs have significant space for improvement in terms of capturing and sharing every initiative for change dynamically between the members of a CoP which in turn can lead to self-organization. Wheatley (1999) notes that “one of the greatest challenges, after so many centuries of separation and fragmentation, is to discover new ways of thinking and sensing that allow us to comprehend the whole”; to her view, “comprehending the whole is still an uncharted territory which requires the earnest explorations of many of us”. This leads us to the next chapter which shall propose a Knowledge Management Architecture (KMA) which aims to embrace more effectively the concepts suggested by the complex systems model and particularly self-organization.
Chapter 5: Designing a KMA and Implementing a KMS To Support Self-Organization for the Hotel Chain

5.1 Introduction

In this chapter, a KMA is proposed aiming to improve horizontal knowledge transfer, which is an essential characteristic for self-organization. The KMA is formally represented with the use of class, use case and activity diagrams of the Unified Modeling Language (UML). A syllabus of the UML is provided in section A1 of the Appendix.

The proposed KMA is grounded on two fundamental concepts suggested by the complex systems model. The first concept, described in section 5.2, is related to how we can perceive the hotel chain as a set of communities of practice (CoP). In contrast to the conventional KMSs which treat the hotel chain rather mechanistically, the proposed KMA treats an organization as a set of self-organizing CoPs.

The second concept, described in section 5.3, suggests a re-conceptualization of organizational change. Change is now viewed as a process during which an organizational unit evolves into a new state. Thus, further to the recording of the knowledge created upon the brainstorming and implementation phase of a change, the proposed KMA emphasizes the importance of systematically capturing the effects of change on the existing architecture and performance which typically remained unrecorded.

Section 5.4 then presents a KMS which was developed on the basis of the proposed KMA. The main functionalities of the KMS are described. Emphasis is placed on the new dimensions enabled from the reporting function of the KMS. Finally, section 5.5 illustrates how the dimensions that are enabled from the KMS embrace the fundamental concepts of self-organization, emergence and edge of chaos introduced by the complex systems model.
5.2 Conceiving the Hotel Chain as a set of CoP

The first key idea of the KMA is the conception of a hotel chain as a set of CoP. As analyzed in Chapter 3, existing KMSs treat the hotel chain as a hierarchical organizational structure; each hotel unit belonged to a hotel and each hotel belonged to the hotel chain (Figures 13, 14). Hence, they focused mainly on transferring the knowledge from the top to the bottom and more recently from the bottom to the top. In contrast to the dominant hierarchical perception of the hotel chain, the proposed KMA goes a step further and views the hotel chain as consisting of eight different CoPs (Figure 30).

![Diagram of Hotel Chain and CoPs](image)

**Figure 29:** The eight CoPs within the hotel chain

Each CoP in turn consists of units which have similar purpose and structural characteristics. For example, the Restaurant CoP consists of six members, namely Restaurant 1, 2, 3, 4, 5, 6 which reside within Hotels 1, 2, 3, 4, 5, 6 respectively (Figure 31).

![Diagram of Restaurant CoP](image)

**Figure 30:** The six members of the Restaurant CoP
This means that the KMSs should also take into consideration the horizontal knowledge transfer directly between the members of a CoP. For this reason, every unit should be mapped to a certain CoP, while every CoP should have its own repository of knowledge. As Figure 32 shows, every CoP has its own knowledge base (repository) and all knowledge bases are linked with each other in a higher-level knowledge base (KB).

Figure 31: A higher-level knowledge base to connect all knowledge bases related to every CoP

5.3 Change as a Process of Emergence

The second key idea that the proposed KMA introduces is the conception of change as a process of emergence, during which we witness the evolution of the organizational architecture while it adjusts to its environment. This means that the knowledge created upon every initiative for change undertaken by a unit is valuable and should be captured systematically so that the rest of community members can reuse it easily. Like this the hotel chain can become more uniform since the members of a CoP can modify their architecture—when found appropriate—in order to improve their fit with their environment too.

Let us now revisit the process of change. From the study of the existing approaches to
change which were presented in section 2.2.4, it was concluded that the process of change includes three main phases:

i) The brainstorming phase, which refers to the justification of the chosen course of action

ii) The implementation phase, during which the change is implemented

iii) The evaluation phase, during which a manager or an auditor reflects on the effects of change on the existing architecture and performance

All three phases of the process of change are demonstrated in the form of an activity diagram (Figure 33).
Figure 32: The process of change in the form of an activity diagram
As the diagram shows, an opportunity or threat from the external environment, or an unsatisfactory result in relation to a pre-specified goal which has been set by the internal environment, leads to the consideration of an initiative for change. Next, the alternative courses of action are considered and then evaluated. The best course of action is chosen and then the decision for action is taken. If the initiative is decided to be implemented, the implementation phase of the initiative begins. Unless the implementation of the change is abandoned, the change will be completed based on the plan which has been set. As soon as the change has been implemented, it can then be evaluated. This means that one can now reflect on the impact of the change on the existing architecture and performance.

In the following sections we will look in detail at the aspects of knowledge created upon each of the three phases of change that the proposed KMA suggests.

5.3.1 Knowledge Created upon the Brainstorming Phase

The knowledge created upon the brainstorming phase of every initiative for change includes the reasoning for change, the alternative solutions considered from the various participants and the justification of the chosen solution. At first, the rationale behind every change needs to be captured. Explanations of the nature of the problem or the details of an arising opportunity should be provided to justify the reasoning of the change. As seen in section 3.2.4 (Case 5), when the manager considered for example the introduction of a welcome drink for the guests of the hotels, the rationale underlying such a change was to increase customer satisfaction but also to promote the sales of the bar of the hotel. The guests, by being offered a free voucher for a welcome drink, would visit the bar and this would increase the possibility for further sales. In addition, the guest’s satisfaction rate would increase as the guest would receive an unexpected gift.

Subsequently, the alternative solutions that were considered by all stakeholders that participated upon the brainstorming phase should be captured. This includes the alternative solutions which were examined as well as the underlying reasoning for the chosen solutions. In the example of the welcome drink, the alternative solutions that were considered referred to the choice of the type of drink to be offered. One suggestion was to offer an orange juice or a soft drink. Another one was to offer also alcoholic drinks such as
cocktails and traditional drinks. Taking into consideration the cost factor and the time required by the barman to prepare the drink, it was decided that the welcome drink would be the Greek traditional drink called “Ouzo”, or an orange juice or a soft drink. Then, the next aspect to consider was to decide upon which guests would be entitled to the welcome drink. The hotel often operates with large budget student groups which should not be given alcoholic drinks. Taking this into consideration, it was decided that the welcome drink would be offered only to individual guests and not to groups.

Part of the brainstorming phase is the choice of suppliers who shall deliver the chosen course of action. In the example of the welcome drink, the supplier of the chosen solution is internal – the bar unit. More frequent is the case where various external suppliers provide alternative solutions. For example, if the hotel decides to install a CCTV system, the alternative solutions offered shall be provided by external suppliers.

Lastly, it is important to capture whether an initiative for change will be implemented or not. In so doing, the knowledge created upon the consideration of an initiative for change, which in the end was not implemented, will have been recorded for future reference. For example, Hotel 1 considered replacing the carpets in the rooms with a wooden-laminate floor. Three offers were provided by external suppliers and the most competitive was chosen. Due to a sudden drop in sales though, the initiative was decided to be postponed for the near future. Nevertheless, the knowledge created upon the brainstorming phase (in this case the rationale of the initiative and the justification of the chosen supplier) would be available for another member of the community whose revenue would allow the implementation of such a change. Like this, significant time is saved and the pace of innovation is accelerated.

5.3.2 Knowledge Created upon the Implementation Phase

The knowledge created upon the implementation phase includes a detailed plan of the change and all the actions and stakeholders required for the delivery of the change, such as the suppliers involved-if applicable-the milestones and deadlines. The knowledge incorporated within the implementation phase also includes possible delays or any kind of problems faced during the implementation of the action. By recording such elements,
managers facilitate the reapplication of the change, since other units can reuse its plan and most importantly unforeseen problems related to structural obstacles can be avoided.

For example, the introduction of the welcome drink required the design and printing of a voucher by an external supplier. The cost of this action, the choice of the supplier, the required time for delivery, as well as any problems faced, constitute knowledge which is created upon the implementation phase.

5.3.3 Knowledge Created upon the Evaluation Phase

The aspects of knowledge created upon the evaluation phase refer to the effects of every change on both the existing organizational architecture and performance. By the time the implementation of a change has been completed, the existing architecture or the existing performance has evolved to a new state. To illustrate the point, let us first revisit the main components of the organizational architecture.

After studying a number of models for capturing the architecture, some of which were presented in section 2.2.2, the main architectural components applicable in the context of the hotel chain were five: i) structure, ii) roles iii) resources, iv) rewards and v) business processes. This means that an implemented change may alter one or more of these five elements. Any alteration constitutes useful knowledge which should be recorded.

Returning back to the example of the introduction of a welcome drink, such a change affected the architecture of more than one unit. More specifically, the check-in process now included the provision of the voucher for the welcome drink upon the arrival of individual guests. Moreover, the process of drink offerings at the bar also changed since the barman now would need to provide the welcome drink without charge, as well as to specify at the back of the voucher the chosen item and the room number of the guest for monitoring purposes. Moreover, a new material resource was added to the existing inventory. Thus, by capturing the changes of the organizational processes in both the reception and bar unit, as well as the new resource which has been added (voucher), any manager who wishes to reapply the change would be informed about the rationale behind the change and its effects on processes and performance. Furthermore, any newly manager at the bar or the reception unit would be able to find documented and up-to-date the existing form of operations.
By recording the effects of every change on the architecture, one who wishes to reapply the same change would be now aware of the consequences that such a change caused to the existing architecture. Hence, a manager who wishes to reapply a change will be better prepared to deal with any structural obstacles. As a result, the reapplication of change becomes smoother.

Coming back to the effects of a change on organizational performance, the four perspectives suggested by the Balanced Scorecard methodology were found the most suitable for assessing systematically and systematically the performance of the hotel chain. As explained in section 2.2.3, the Balanced Scorecard methodology suggested four perspectives for capturing the adjustability of an organizational unit to its environment: i) the financial, ii) the customer, iii) the business process and iv) the learning and growth perspectives. This means that a change which has been implemented may alter one or more of these four aspects. Again, any alteration constitutes useful knowledge which should be recorded. For this reason, the proposed KMA places every change by default on a pending evaluation status until the effects on performance have been made manifest and can be safely reflected.

Coming back to the example of the welcome drink, such a change proved positive. Six months after the introduction of the welcome drink, the change increased the actual sales of the bar by 5%. Moreover, in a period of six months, a number of guests expressed their gratitude for the free offering which led to an increase of the satisfaction rate to 10%. The increase of the cost of the bar budget by 2% was found acceptable and overall the welcome drink offering was decided to be continued.

The assessment of the impact of such a change means that any member who belongs to the same CoP can learn the outcome of all initiatives for change undertaken within the CoP much easier. Thus, members of a unit can now find easily the evaluation of every action which has been carried out by any other member belonging to the same community. Such knowledge is now externalized and can be particularly useful irrespective of whether the change has been successful or not: if it has been successful it should be easily reapplied, if not managers should know what actions to avoid and why.
To summarize, all the aspects of knowledge that the third step of the proposed KMA suggests are shown in Figure 34.

Figure 33: Main use cases for capturing the process of change
Before proceeding to next section, it is considered useful to explain the key actors involved in the creation of knowledge upon the process of change. As soon as a manager considers an initiative, he or she may often want to discuss it and thus justify it with the top manager or with other decision makers. If they decide to implement the initiative, a supplier is usually required to deliver it. As soon as the change is implemented, the manager should record its effects on the existing architecture. Subsequently, after a certain period of time which will allow top management to draw safe conclusions, an auditor should assess the impact of the change on the existing performance. All three actors are described in Table 12, while the main use cases are depicted in Figure 35.

<table>
<thead>
<tr>
<th>Actors:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Manager" /></td>
<td>The Manager corresponds to the person in charge of a particular unit at all levels of the organization. This means that it can be the manager of a unit within a hotel, the manager of a hotel, as well as the general manager of a hotel chain.</td>
</tr>
<tr>
<td><img src="image" alt="Supplier" /></td>
<td>The Supplier corresponds to the chosen person or organizational unit which will be responsible to implement the plan of an initiative for change. The organizational unit may be internal (residing within the organization) or external (outside the organization)</td>
</tr>
<tr>
<td><img src="image" alt="Auditor" /></td>
<td>The Auditor corresponds to the chosen person who will be responsible to evaluate the impact of an implemented change on the existing performance. It could be an individual consultant outside the organization or a member of top-management in the headquarters. It should not be any of the managers who undertook the initiative, as their evaluation would probably not be objective.</td>
</tr>
</tbody>
</table>

Table 12: Main actors contributing to knowledge creation upon change
5.4 Implementing the KMS for the Hotel Chain

The dynamic viewpoints suggested by the proposed KMA necessitated the presence of a technological tool. Hence, a KMS was developed to embrace the proposed KMA. The KMS was developed with the use of MS Access 2010. The development cycle of the KMS took two years and included a number of iterations. As Figure 36 shows, its key functionalities are grouped under three main menus: i) Record New Change ii) Reporting and iii) Setup. A brief description of each menu is now provided.
5.4.1 Record New Initiative for Change

The first and most important function of the KMS is the recording of every initiative for change undertaken either by the top - by the managing directors or the hotel managers – or by the bottom from the managers of the hotel units of the hotel chain. As soon as a manager considers an initiative for change, he or she clicks on the button “Record New Initiative” in the main interface. Then, a screen appears with four different tabs which correspond to the three phases of the process of change: i) Brainstorming phase, ii) Implementation phase) and iii) Evaluation phase. All four tabs are depicted in Figure 37.
Starting from the brainstorming phase, the tab “Brainstorming Phase” captures the rationale of the change, the alternatives considered and then justification of the chosen solution. All the aspects of knowledge recorded upon the brainstorming phase are demonstrated in Figure 38.

![Record Initiative for Change](image1)

Figure 38: Supporting the recording of the knowledge upon the three phases of change

The tab “Implementation Phase” captures the aspects of knowledge created upon the implementation of a change and includes the plan of change, the suppliers responsible for delivering the tasks required as well as any problems faced upon the implementation phase (Figure 39).

![Record Initiative for Change](image2)

Figure 39: Capturing the knowledge created upon the brainstorming phase
Finally, the tab “Evaluation” captures the aspects of knowledge incorporated within the evaluation phase. Figure 40 demonstrates the recording of the alteration of the components of the existing architecture and performance from the implementation of an implemented change such as the welcome drink initiative.

Figure 38: Capturing the knowledge created upon the implementation phase

Figure 39: Capturing the knowledge created upon the implementation phase
5.4.2 Reporting

The second main functionality of the KMS is the Reporting. By capturing and sharing all the aspects of knowledge created upon all three phases of change, a number of useful insights are now enabled. At first, conventional reports such as the pending initiatives for change, the pending controls that need to be performed or the cases where performance has not achieved its goal can obviously be provided. Such views are provided in the Appendix E. Most importantly, the KMS enables new dimensions of knowledge which were previously not available or very difficult to derive. As Figure 41 shows, by choosing the CoP or the hotel unit and timeframe of interest, one can derive useful reports, the most important of which are analyzed in the following subsections.

![Figure 40: Reports per chosen hotel unit/hotel or CoP and timeframe](image)

5.4.2.1 Enriched History of every Hotel Unit

The first view that the KMS enables is the history of every hotel unit. This means that all present and past initiatives for change which have been initiated by a particular unit can be presented in chronological order. In contrast though to the existing KMSs, the KMS which was developed provides an enriched history of every unit. This means that every initiative for change is now accompanied with all aspects of knowledge created during the process of
change by simply clicking on the button “Trace Change”. Such a view provides a rich repository of knowledge to any manager who wishes to have an overview of all the changes which have been undertaken by his/her predecessors in the past. As Figure 42 shows, the manager of a hotel unit can easily trace all the present and past initiatives for change undertaken within his unit.

<table>
<thead>
<tr>
<th>Initiative for Change</th>
<th>Date</th>
<th>Affected Component</th>
<th>Description of Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator operation - Reception not aware how to enable it</td>
<td>1/8/2010</td>
<td>Processes</td>
<td>Process Emergency: New scenario if power is off</td>
</tr>
<tr>
<td>Payment method with CC for reservations from Expedia</td>
<td>1/7/2010</td>
<td>Processes</td>
<td>Check out Process: Charge credit card of Expedia instead of issuing a DEBTORS</td>
</tr>
<tr>
<td>Provide map for guests coming for tourism</td>
<td>15/5/2010</td>
<td>Processes</td>
<td>Check in process improved by adding the offering of a map for tourists</td>
</tr>
<tr>
<td>Member Club not very attractive</td>
<td>10/5/2010</td>
<td>Processes</td>
<td>Check out Process: Ask guest if he wants to become a member</td>
</tr>
<tr>
<td>Welcome drink to increase customer satisfaction and sales in bar</td>
<td>10/6/2010</td>
<td>Processes</td>
<td>Check in Process: if customer is an individual guest (not member of a group), THEN offer a welcome drink for every</td>
</tr>
<tr>
<td>Hotel Software not updated for 2 years</td>
<td>2/10/2010</td>
<td>Resources</td>
<td>PC Updated</td>
</tr>
<tr>
<td>Express Check-in - Returning guests to provide their details upon their arrival several times - delays</td>
<td>14/2/2010</td>
<td>Processes</td>
<td>Check in process: Registration form is not filled with customer’s details</td>
</tr>
</tbody>
</table>

Figure 41: Enriched history of a hotel unit (Reception 1).

5.4.2.2 The Dynamic Performance of every Hotel Unit

The second view that the KMS enables is the projection of the dynamic performance of every hotel unit. This corresponds to the alertness and adjustability of every hotel unit, which can be estimated by capturing the frequency of change as well as the impact of every initiative on the existing performance. In contrast to the deterministic approach to change incorporated by the contemporary KMSs which focus on supporting the implementation plan of change and any deviation from the initial goals typically related to the financial element, the proposed KMS supports the explicit evaluation of the impact of every change on the sustainability of the organization. Hence, the impact of every initiative for change is now projected more systemically since performance is assessed in terms of the four perspectives suggested by the Balanced Scorecard rather than solely the financial
perspective. Figure 43 demonstrates the impact of the changes undertaken by the restaurant unit which belongs to Hotel 1.

![Impact of changes of the Restaurant unit in Year 2010](image)

**Figure 42: Impact of changes of the Restaurant unit in Year 2010**

Such a projection is very useful for both the hotel managers and directors of the hotel chain. The hotel managers can obtain additional insights in terms of the actual performance of the hotel units residing within their hotels. In turn, the directors are also able to evaluate the performance of their hotel managers more effectively. The hotel managers are now evaluated not only based on the actual results which often depend on external factors but also in terms of achieving a better fit with their external environment. Thus, initiatives for change which aim to improve the organization in terms of productivity, customer satisfaction or the development of human resources will now be captured and thus appreciated.

### 5.4.2.3 Enriched History of a CoP

The third and perhaps most important view that the KMS enables is the projection of all the initiatives for change undertaken by a certain CoP. All the initiatives for change undertaken by any member of the CoP can now be displayed in chronological order so that they can be easily traceable by any other member of a particular CoP. By having mapped all units to a
CoP and by having captured systematically all their initiatives for change, every member of a CoP is now aware of every change initiated by any other member in the same community. By choosing a certain CoP and the preferred timeframe, a manager of the hotel unit can easily trace all the initiatives for change undertaken by his peers. For example, as Figure 44 shows, the manager of a reception unit can view all the initiatives undertaken by the other managers of the reception in other hotels in the year 2010.

Most importantly, a member of a CoP can easily reapply a change which was undertaken by his peers and which could be applicable to his/her unit too, since the knowledge created upon all phases of the process of change has now been captured systematically. Such knowledge includes all the aspects of knowledge created upon the brainstorming, the implementation and evaluation phase of each change.

In addition, the systematic recording of the effects of change on performance enables the possibility to query the most successful changes undertaken within the hotel chain. For example, a view which depicts the five most successful changes undertaken within the restaurant units during the last five years is now possible.

5.4.2.4 Dynamic Performance per CoP

Finally, by having mapped all initiatives for change to a certain CoP, the KMS makes it possible to project in a single view and compare the alertness of every unit belonging to a CoP. For example, it is now possible for a manager or director to view the impact of all the initiatives for change undertaken by the “Reception” CoP (Figure 45).
Figure 44: Overview of Dynamic Performance for the CoP “Reception”

### 5.4.3 Setup

The last function provided by the KMS refers to the “Setup” of the architecture and performance of the hotel chain. The menu “Setup” aims to capture the existing architecture and performance of the hotel chain at all its organizational levels. This is important in order to be able to monitor the evolution of both the architecture and performance of every hotel unit within the hotel chain.

Figure 46 shows how the KMS captures the existing structure of the hotel chain which includes all the units residing within the hotels and headquarters (Figure 46).
Using the same function, the KMS captures also the CoP that exist within the hotel chain. This is done by simply linking every hotel unit to the respective CoP in which it belongs to. Furthermore, the KMS supports the recording of the roles, resources, rewards and processes within the hotel chain. Screenshots of such functions are provided in the Appendix F1.

Finally, within the menu Setup, the KMS captures also the measures for capturing the actual performance of every hotel unit. The type of performance measures in place, their method, priority, frequency, as well as the goals which have been set and tolerance limits are also captured (Figure 47).

Figure 45: Set up of overall organizational structure

Figure 46: Capturing the measures in place for capturing the performance of a hotel unit
After having analyzed the core functions of the KMS, it is now useful to correlate them to the characteristics of the main organizational models described in Chapter 4.

5.5 Discussion

As concluded in Chapter 4, existing KMSs in hospitality have well incorporated the core concepts of both the mechanistic and organic organizational models. The KMS did not neglect the value of the characteristics of the mechanistic and systemic models and provided some basic functions for supporting their key ideas.

More specifically, the KMS incorporates the main characteristics of the mechanistic model by capturing the organizational hierarchies within the hotel chain (“Setup” function – Figure 46) and by supporting the recording of all the changes decided from the top (‘Record New Initiative’ – Figure 37), as well as their implementation details (Figure 39). At the same time, with functions such as “Pending Performance Audits” (Figure 59), “Performance Alerts” (Figure 60), “Pending Changes” (Figure 61) and Pending Tasks (Figure 62) it provides some basic support for monitoring the divergence of the actual results from the set goals, as well as the implementation plan of changes.

The KMS provides functions for supporting the key characteristics of the systemic model too. It treats every unit as a separate autonomous system and captures its purpose and its holistic nature by recording its architectural components (Figure 63-66). Furthermore, through the function ‘Record New Initiative’, it supports the recording of the changes initiated from the bottom too (Figure 37). Additionally, it also considers capturing the knowledge created upon the brainstorming phase, as well as some general feedback (evaluation) from the process of change (Figure 40).

Most importantly though, the KMS provides support for embracing the fundamental concepts of emergence, edge of chaos and self-organization introduced by the complex systems model.

It may have been understood by now that the enriched history of every hotel unit corresponds to the “emergence” of a hotel unit (Figure 42). As seen in section 4.3.1, the
The notion of emergence refers to the appearance of a novel and coherent state. Thus, all the changes which were implemented within a chosen hotel unit correspond to novel and coherent versions of architecture. This means that the versioning of the organizational architecture in essence corresponds to the emergence of an organizational unit.

Furthermore, the dynamic performance of every hotel unit approaches to a certain extent the concept of “edge of chaos” (Figure 43). As discussed in section 4.3.1, the “edge of chaos” corresponds to an intermediate state where systems inject novelty continuously up to the point where they are not overwhelmed by change. Hence, by capturing systematically every initiative for change, as well the impact of every change on the four perspectives of performance suggested by the Balanced Scorecard, it becomes possible to obtain a better indication of the extent to which a hotel unit or the hotel chain as a whole approaches the “edge of chaos”.

Finally, the enriched history and dynamic performance of every CoP constitute key dimensions for enabling self-organization. By enabling community members to view all the details of the initiatives for change undertaken within their CoP (Figure 44), changes can be reapplied much easier. The members of a CoP become more “intelligent” to deal with the challenges raised by the external environment, since the collective knowledge of their community is now easily traced. In addition, by providing comparisons of the performance of all members of a CoP (Figure 45), the hotel chain self-organizes in the sense that managers are attentive to change, since the performance of their unit is continuously contrasted to the performance of the rest of the community members.

Table 12 summarizes the functions provided by the KMS in relation to the key concepts suggested by the three organizational models and their implications for KM.
<table>
<thead>
<tr>
<th>Organizational Model</th>
<th>Key Characteristics</th>
<th>Implications for KM</th>
<th>Support by the New KM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanistic</td>
<td>Hierarchical structure and top-down approach to change</td>
<td>- Top-down knowledge sharing and communication</td>
<td>- Setup of Organizational Structure&lt;br&gt;- Record New Initiative</td>
</tr>
<tr>
<td></td>
<td>Deterministic approach to change and performance: change as a linear implementation plan</td>
<td>- Emphasis on the monitoring of the implementation plan and on the divergence from the goals which have been set</td>
<td>- Record Implementation Phase&lt;br&gt;- Pending Changes&lt;br&gt;- Pending Tasks&lt;br&gt;- Pending Performance Audits&lt;br&gt;- Performance Alerts</td>
</tr>
<tr>
<td>Systemic</td>
<td>Network structure and bottom-up approach to change</td>
<td>- Bottom-up knowledge sharing and communication</td>
<td>- Setup of Architecture&lt;br&gt;- Record New Initiative</td>
</tr>
<tr>
<td></td>
<td>Change as a process of learning and experimentation</td>
<td>- Emphasis on brainstorming through groupwork and on feedback</td>
<td>- Record Brainstorming, Implementation and Evaluation phase</td>
</tr>
<tr>
<td>Complex Systems Model</td>
<td>Fractal structure for self-organization</td>
<td>Horizontal knowledge transfer between the members of a CoP</td>
<td>- Enriched History and Dynamic Performance of every CoP</td>
</tr>
<tr>
<td></td>
<td>Change as a process of emergence</td>
<td>Emphasis on capturing the impact of change on architecture and performance</td>
<td>- Recording the Effects of Change on the Existing Architecture and Performance</td>
</tr>
</tbody>
</table>

Table 13: Main functions of the KMS for supporting the key characteristics of the organizational models
5.6 Conclusions

A KMS for designing KMSs to support the complex systems model and particularly self-organization was proposed. The proposed KMA was based on two key concepts. The first concept was to conceive the hotel chain as a set of CoPs. All units which share the same purpose and have similar structural characteristics are now mapped to a specific CoP. The second concept was to conceive every change as a process of emergence during which a hotel unit attempts to improve its fit with its environment. Hence, the KMA emphasizes the recording of the effects of every change on the existing architecture and performance during the evaluation phase.

A KMS was developed on the basis of the proposed KMA to demonstrate the dimensions that are now enabled. The main functions of the KMS were presented and then correlated to the concepts of the complex systems model. This brings us to the next chapter which shall evaluate the KMS in terms of enabling new dimensions of knowledge and supporting self-organization in the case of the hotel chain.
Chapter 6: Research Validation

6.1 Introduction

This chapter aims to evaluate the impact of the proposed KMS-and thus the KMA it embraces-in terms of identifying the problems identified in the case of the hotel chain. Initially, the application of the KMS in the hotel chain is described. All the details from the application of the KMS in the hotel chain, including the solutions to the socio-technical problems that appeared are analyzed. Subsequently, section 6.3 examines the impact of the KMS in terms of i) facilitating the sharing of initiatives for change between similar units and ii) capturing every initiative for change systematically for reuse.

Then, section 6.4 critically examines the impact of the KMS in terms of supporting more effectively self-organization within the hotel chain. More specifically, the impact of the KMS is reflected in terms of four aspects: i) the number of changes initiated from the bottom, ii) the pace of innovation and level of cohesion, iii) the integration of new managers and iv) the level of alertness of managers. Finally, the chapter ends with some conclusive remarks.

6.2 The Application of the KMS in the Hotel Chain

KMS was installed in the hotel chain’s server at the end of 2009. A period of two months was spent in order to capture the existing architecture and performance of every hotel unit of the hotel chain. This was done through the function “Setup” and required the active participation of top management. Once the main elements of the existing architecture and performance were captured, a two hour training session was arranged with the users of the KMS in order to familiarize the users with the main features as well as the theoretical foundations of the KMS. The KMS was finally applied in the hotel chain in the beginning of 2010. Access to the KMS was provided to the two managing directors, three hotel managers and three departmental managers. The application of the KMS in the hotel chain lasted fourteen months.
During the initial stages of the application of the KMS, a number of socio-technical issues related to the input of the initiatives into the KMS by the users emerged. At first, it was noticed that certain managers of hotel units such as the restaurant and maintenance managers lacked basic IT skills. Thus, they were not able to record the changes they initiated in the KMS. In order to tackle this problem, a hardcopy form which captured the most important knowledge aspects of the process of change was designed and then provided to those users who were not very familiar with IT. In essence, the printed form included all the fields from the three phases of the process of change. The form which was provided to the users is presented in section F4 of the Appendix. Every month, the managers of the hotel units who were not IT literate, documented their initiatives or any status updates on their ongoing actions. The form was then handed in to their hotel manager who in turn updated the KMS on their behalf.

The second issue which could undermine the application of the KMS was the incentives in place for the input of the knowledge in the KMS. The critical role of incentives for knowledge sharing has been discussed in section 2.3. As it has been noted, it is important to motivate not only individuals but groups too. Indeed, in the beginning of the application of the KMS, it was noticed that some managers were a bit skeptical on whether they should share their initiatives on the system, as by doing so they could become less competitive. Such a phenomenon is referred in literature with the term “coopetition” (Tsai 2002) and implies simultaneously cooperative and competitive behavior by the units-members of a CoP. This means that a manager may be unwilling to share the knowledge he or she obtained, since this will make other members more competitive. As Lee and Ahn (2007) note, such cases may inescapably arise, especially in the presence of downsizing and job insecurity.

In order to deal with this soft issue, the managing directors of the hotel chain decided to put in place two types of rewards: an individual and a group reward. The individual reward was non-monetary. The manager who contributed to the creation of knowledge with the most initiatives for change recorded in the system would be appointed as the “Manager of the Year” and would be awarded a complimentary three days stay in one of hotels of the chain. Moreover, the members of the most active CoP, in terms of knowledge creation, would be rewarded with a complimentary daily excursion (group reward).
The provision of hardcopy forms for recording initiatives to the users who lacked IT skills, as well as the introduction of both individual and group rewards proved vital in terms of overcoming the initial skepticism of users related to the input of knowledge in the KM.

After fourteen months of use, interviews with the same stakeholders who were interviewed before the application of the KMS were performed in order to evaluate its impact. All the questions which were raised towards the managers and managing directors of the hotel chain are provided in the Appendix (F2 and F3). Overall, users recognized from the beginning the value and functions of the KMS and frequently made suggestions for improving certain functionalities. Through the passage of time, it was noticed that the usage of the KMS was increasing. Up to the date this thesis is written, the KMS is extensively used and new users have been added. In order to understand the benefits brought by the new KMS, the impact of the KMS to the hotel chain is now analyzed.

6.3 Evaluating the KMS in terms of Facilitating the Sharing of Initiatives for Change between Similar Units

The KMS proved successful in terms of sharing more effectively the initiatives for change between the similar units. As seen in Figure 46, every unit residing within a hotel has now been mapped to a particular CoP. Hence, it is now possible to capture in a single view all present and past initiatives for change undertaken within a CoP. By choosing the CoP and timeframe of interest, one can easily obtain a view of all the initiatives for change undertaken by the members of that CoP during the chosen period. For example, a manager of a reception unit can easily view all the initiatives for change undertaken by his colleagues in Year 2010 by choosing the relevant timeframe and the report “Initiatives per CoP (by Date)” (Figure 48, 49).
Figure 47: Initiatives for change undertaken within a chosen CoP and timeframe

Figure 48: Initiatives for change undertaken within the reception CoP within for year 2010.

Instead of spending considerable time in searching within different sources such as emails, the documentation of the ISO standard, the minutes of meetings or within the various databases of the KMSs in use, managers can now find in a single KMS all the initiatives for change undertaken within their CoP. For example, the initiative undertaken by the maintenance unit of Hotel 1 for reducing the electricity bill can now be easily found by the other maintenance managers belonging to the same CoP.

It is worth pointing out here the benefit of tracing initiatives for change undertaken within a CoP in the past. Any future hotel or hotel unit managers who may join the hotel chain are now able to trace easily and learn all the initiatives from their predecessors. Moreover, the KMS provides the possibility of tracing the initiatives for change of a CoP which were
abandoned during their implementation or the ones that have been postponed for the future. For example, the knowledge created upon case 7 (described in section 3.2), where the manager of Hotel 5 considered joining the Golden Tulip brand of hotels but did not proceed with such an action is now recorded and available for future use.

The geographical barriers that existed between the managers are not anymore present. The users do not have to wait for a physical meeting to take place in order to share their initiatives for change. Instead, they can input their ideas in the KMS and then receive feedback from managers of the similar units belonging to the same CoP. There are no constraints such as a pre-specified time schedule or a specific agenda of topics but a free flow of knowledge exchange.

Most importantly, every initiative for change undertaken within a CoP is directly linked with all the details related to the process of change. In contrast to other KMSs, by clicking on the button “Go to Change” of Figure 49, a manager can easily trace all the details of the knowledge he or she is interested in. This feature will be analyzed in more detail in the section that follows. Before that, the answers received from the interviews with the users regarding the support provided by the KMS in relation to the sharing of the initiatives for change between similar units are analyzed.

Overall, the answers from the interviewees confirmed the effectiveness of the KMS in terms of supporting the sharing of the initiatives for change between the similar units, including those which were postponed or abandoned. E.C. stated that with the new KMS it is very easy for her to find the history of the unit she was responsible for. M.P. also said that it is now possible for him “to obtain a thorough history of all initiatives for change which had been undertaken in the past, as well as to find actions that had been postponed for the near future”.

In addition, both managing directors of the hotel chain noted the importance of tracing the history of every CoP. P.L. continued by saying that “it was frequently noticed that new managers repeated actions that had been implemented in the past” and suggested that the KMS may well lead to significant savings in intellectual and financial resources, as the repetition of “expensive” actions may be avoided.
In conclusion, the users confirmed that the KMSs had solved the major problem of dynamic sharing of initiatives for change between the managers-members of a CoP.

6.4 Evaluating the KMS in terms of Supporting the Reuse of Knowledge Incorporated within every Initiative for Change

Most importantly, the KMS proved effective in terms of capturing for reuse the detailed aspects of knowledge created upon the process of every change. A manager can now find in an organized way the knowledge created upon the brainstorming, implementation and evaluation phase of every initiative for change. This can be done simply by clicking on the button “Go to Change” next to the change of interest (see Figure 49).

The example of the introduction of the welcome drink is now revisited to demonstrate how the KMS captured systematically for reuse the knowledge incorporated within every initiative for change. Starting from the brainstorming phase, Figure 50 demonstrates how the KMS captures the knowledge such as the rationale of the change, the alternatives considered, the justification of the chosen solution and the decision for action.

![Record Initiative for Change]

Figure 49: Capturing the knowledge created upon the brainstorming phase

Then, in relation to the knowledge created upon the implementation of a change, Figure 51
shows how the KMS captures aspects such as the plan of change, the suppliers responsible for delivering the tasks required as well as any problems faced.

**Record Initiative for Change**

![Image of a table showing initiative for change](image)

Figure 50: Capturing the knowledge created upon the implementation phase

Finally, Figure 52 shows how the KMS captures the aspects of knowledge related to the evaluation of change, such as the effects of a change on the existing architecture and performance. The KMS allows the recording of the impact of a change on one or more of the five components of the architecture, namely structure, roles, resources, rewards and processes. In addition, the KMS incorporates the four perspectives suggested by the Balance Scorecard as a method for assessing the impact of every change on performance.
Figure 51: Capturing the effects of change on the existing architecture and performance

The KMS enhances the systematic evaluation of every initiative for change by providing a report with all the initiatives which have not been evaluated yet. Thus, the auditor who has been appointed to evaluate the impact of every change can find a comprehensive list of all initiatives which have not yet been evaluated. Figure 53 for example presents all the changes which have been implemented within the hotel chain but have not yet been evaluated.

Figure 52: Pending Evaluations for Completed Changes
By having captured systematically the knowledge created upon all three phases of the process of change, it becomes much easier for a manager to reapply a change. Instead of searching within the various tools of the intranet, within emails or within the rigid documentation of the ISO standard adopted by the hotel chain, a manager can now find all the knowledge related to a particular initiative for change in a single and well organized KM repository. The KMS organizes the knowledge created upon every change into the three phases of the process of change and therefore a manager can learn all the aspects related to the different phases of the change. For example, by clicking on the change of the payment method for reservations from Expedia, the KMS developed directs the user to the details from the process of that particular change (Figure 54).

![Figure 53: Linking the history of every hotel unit with the details from every change undertaken](image)

The cases of change presented in Table 7 are now revisited to understand how the KMS achieved to manage knowledge more effectively. Any hotel of the chain that aimed to attract British guests could reapply the initiative undertaken by Hotel 1 by finding easily all the details related to the implementation of that particular change, such as the local suppliers for preparing English breakfast and the installation of Sky sports TV channel. The best practice related to a more effective operation of the mini-bar service which was initially introduced by the manager of Hotel 3 (case 2) could now be easily followed by the other hotels of the chain. The form which was added by the restaurant manager of Hotel 3 (case 3) and which would prevent cases where an expired product would be served to a
guest could be easily traced and reapplied across the hotel chain too. Similarly, the incentives given to the restaurant staff (case 4), as well as the introduction of the welcome drink (case 5), which had led to improved financial results and customer satisfaction could now be easily reapplied in other hotels too. The knowledge related to all the above examples of change had now been documented systematically and structured so that it can be easily traced.

In addition, the KMS capture effectively unsuccessful changes too. The knowledge incorporated within an unsuccessful change can be equally important as it could prevent new managers from repeating actions which have proven unsuccessful in the past. For example, the introduction of a Pay-TV system from Hotel 3 (case 8) which was considered as a failure can now be shared with the other hotel managers. The other managers can easily find the reasons of the failure and avoid repeating such an action. They can also reuse the knowledge obtained from the initiative such as the course of action followed or the supplier chosen, and then re-attempt the same initiative by choosing alternative options.

Furthermore, the KMS proved effective in terms of capturing systemically the impact of every change on the existing architecture. As explained in section 3.2.2, the documentation of the organizational architecture of the chain was often found out-of-date. The main reason was that the impact of every change on the existing architecture had not been systematically documented but usually remained implicit. In contrast, as seen from Figure 49, the KMS sets all initiatives for change on a pending evaluation status until they are evaluated. Like this, every manager is reminded to record the architectural components which were affected from an implemented change. Therefore, the effects of change on the components of architecture (structure, roles, resources, rewards and processes) are now systematically captured. As a result, the organizational architecture of the chain is kept up-to-date and hence new managers can now find the existing form of operations of their units with ease and accuracy.

Lastly, the KMS proved effective in terms of capturing systemically the impact of every change on the existing performance. As seen in the case of the hotel chain and from the study of the contemporary KMSs, organizational change was treated in a rather deterministic manner. The focus with these systems was mainly on measuring the gap
between the target (goal) and the actual result. Thus, the evaluation of most of the initiatives for change on performance had not been captured. In particular, those initiatives for change that had an impact on customer satisfaction, business performance and the development of staff were typically left unrecorded. Hence, management’s performance was based on the assessment of short-term financial results, which could be frequently determined by external random factors such as the increase of tourist arrivals or a large exhibition in the city. The efforts of managers in terms of improving the performance of their unit were not really appreciated.

In contrast, the KMS which was developed considers recording the impact of every initiative for change on additional elements of performance rather than solely short-term financial results which could be frequently determined by external random factors. Initiatives for change are now evaluated in terms of their impact on customer satisfaction, on productivity, as well as on the development of staff. Hence, a more systemic and dynamic perception of the performance of every hotel unit and hotel was achieved.

The above conclusions were confirmed by the users of the KMS too. V.K. thought that now his initiatives are appreciated more, while S.K. stated that he can assess the performance of the unit managers of his hotel more effectively. The interviews also agreed that the assessment of every initiative for change in terms of its impact on the customer, business processes and learning perspectives was critical for the sustainability of their unit. Most importantly, they recognized that the KMS which was implemented provided a more systemic perception of the performance of their unit. M.P. emphasized the utility of the functionality “Pending Evaluations” which acted as a reminder for management to evaluate every initiative undertaken.

Overall, the effectiveness of the KMS in terms of facilitating the reapplication of changes was evident. All interviewees admitted that it has now become much easier to reapply a successful initiative for change which was undertaken by the manager of a similar unit, as access to useful knowledge underlying the process of change was now available.

The enriched history of every hotel unit proved very beneficial to both the managers and the directors of the hotel chain. The managers of hotel units and hotels and particularly those who had recently joined the hotel chain appreciated the value of the KMS in terms of
tracing the underlying assumptions, implementation plan and the impact of every initiative for change which previously remained implicit. V.K. mentioned that he could now learn the experiences obtained during the three phases of the process of change. In particular, he emphasized the value of having access to all the alternative courses of action which were considered before proceeding with a certain solution. K.P. appreciated especially the possibility of learning the outcome of every initiative for change. As he stated, “the lessons learnt from every initiative for change and the impact of every change on performance was very useful for avoiding the repetition of initiatives which had been unsuccessful in the past. M.P stated that “the knowledge created upon an initiative for change was organized in a more effective manner – in one single repository – rather than disintegrated in different sources and admitted that this enabled him to obtain additional insights for every initiative for change undertaken by his colleagues in the present or past”. S.K. claimed that the KMS allowed him to easily reuse existing knowledge and thus save considerable time and resources. P.K. stressed the importance of being able to trace the details of a change such as the plan of the change, its duration and the obstacles faced. As he stated, “by having access to such knowledge, I can be better prepared to reapply a successful change”.

Other useful conclusions derived from the interviews included the feedback received from the users in relation to the methods chosen for capturing the architecture and performance of a hotel unit, as well as “cost” of inputting knowledge within the KMS.

The interviewees were asked to assess the extent to which the KMS and hence the proposed KMA captures the evolution of the organizational architecture and performance. In essence, this question aimed to reveal any possible limitations on the theories used to capture holistically the process of change, including the effects on the organizational architecture and performance of every organizational unit. For example, did the aspects of knowledge created upon the three phases of change prove sufficient for reapplying a change? All users replied that the KMS captured successfully all aspects of knowledge they could think of upon the process of change.

The interviewees were also asked to reflect on the extra effort required to input not only their initiatives for change, but also the detailed aspects of knowledge created upon every change. Surprisingly, all managers agreed that the extra effort required inputting their
initiatives for change would be offset by the long-term benefits that the new dimensions of knowledge would establish. As M.P. emphasized, “the extra work required is minimal but the benefits are vast”.

Consequently, the answers from the interviews performed were positive in relation to the ability of the KMS to capture more effectively every initiative for change so that it can be easily reapplied in a similar context.

**6.5 Evaluating the KMS in terms of Supporting Self-Organization**

As explained in chapter 3, the knowledge incorporated in a successful initiative for change undertaken by a hotel unit would typically flow towards the top: to the hotel manager and then to the headquarters. The headquarters would then decide whether to reapply such a change in the other hotels of the chain. The headquarters would then issue instructions and thus knowledge would then move towards the bottom. However, such a process was slow and bureaucratic. Frequently, the knowledge was never transmitted to the rest of the members of a CoP for several reasons. Top management often faced increased workload and did not have the resources to pass and monitor the change across the hotel chain. Also, top management did not always understand the “language” of the hotel units and transmitted unclear information regarding a particular change. In addition, in a number of cases, an initiative for change was never communicated across the hotel chain due to employee turnover.

In contrast to the dominant top-down approach to knowledge transfer which was observed before the application of the KMS in the hotel chain (see Figure 22), the impact of the KMS which was applied in the hotel chain was significant. As Figure 55 demonstrates, knowledge is now easily conveyed also horizontally and dynamically among the members of a CoP.
By having captured systematically the knowledge created upon every initiative for change and by having enabled horizontal knowledge transfer, it became possible for hotel units to reapply changes which have been implemented by other units that share similar characteristics and purpose. The managers of the hotel units can now find an initiative for change undertaken by any other member belonging to the same CoP and reapply a change if found adequate. They can also contribute with suggestions during or after the implementation of the change. The knowledge incorporated within the changes which were initiated is not anymore fragmented and disintegrated within various repositories. Hence, the members of a CoP can exchange dynamically the intelligence they obtain with each other and stop operating anymore in isolation.

By achieving horizontal and dynamic flows of knowledge between hotel units with similar purpose and characteristics, it now becomes possible for change to emerge from the bottom of the hotel chain, without the intervention of top-management. And this in essence is the main property of self-organization. Novel behavior within the hotel chain now emerges from the dynamic interactions of the members of a CoP. Moreover, the members of a CoP retain their structural ties through the passage of time and adjust their behavior with one another.
Given that self-organization is a key property of all living systems, one would expect that it would lead to benefits such as competitiveness in the case of the hotel chain too. Indeed, the application of the KMS in the hotel chain led to bottom-up change, improved cohesion, pace of innovation and overall performance. The next four sections analyze the evidence collected from the case study in terms of the ability of the KMS to support more effectively self-organization.

6.5.1 Number of Changes Initiated from the Bottom

Over the fourteen months application period, the total number of initiatives for change recorded in the KMS was ninety-two (92). Twenty nine changes were initiated from the headquarters (top) and sixty three were initiated from the bottom, either from the hotel managers or the hotel unit managers. Eighty one initiatives were implemented, while the rest were either abandoned or postponed for the future. Most of the changes can be considered as incremental improvements to the existing architecture. In most of the cases, the changes referred to small improvements in the existing roles, resources, rewards and processes. Only one major change in terms of structure was noticed and this was the outsourcing of the laundry unit.

From the ninety-two initiatives for changes, twenty six of them were reapplied within the period of the study, while the reaplication of another seven changes had started but their implementation had not been completed by the end of this study. In all twenty six changes which were reapplied, the managers found easily all the relevant knowledge created upon the brainstorming, implementation and evaluation phase of the change within the KMS. In fact, the headquarters were mostly involved in terms of authorizing decisions for change that initiated considerable expenditure. It can be said that the role of the headquarters was gradually changing from “leading” to “listening”.

6.5.2 Improved Pace of Innovation and Cohesion

Another characteristic which was noticed during the period of application of the KMS in the hotel chain was the improved pace of innovation and cohesion. Changes are now reapplied faster across the hotel chain as the managers interested in a certain change don’t
have to “reinvent the wheel”. All the details related to a particular initiative such as the implementation plan and obstacles faced during the change have now been well documented.

In fact, during the last four months of the application, it was also noticed that the members of a CoP collaborated actively in order to decide jointly about the best course of action of an initiative for change. This was achieved through the asynchronous (Moderator, Forum) and synchronous (Chat) tools provided within the intranet of the hotel chain. More specifically, increased collaboration during the process of change was noticed in four cases of change.

The improved paced of innovation and cohesion was confirmed by the users of the KMS. All interviewees answered that the KMS had the ability to reduce significantly the need for top management intervention, especially in cases which required the reapplication of best practices across the hotel chain, as such knowledge was now transferred not only vertically, but horizontally too. This accelerated the pace of innovation, since successful actions were reapplied with greater ease, while unsuccessful ones were disregarded. P.L. said that the KMS is making the hotel chain more uniform and is enhancing the pace of innovation, as every manager is now able to trace knowledge directly from his or her colleagues. P.K agreed that the KMS has increased the homogeneity among the organizational units of the chain. S.K. stated that the KMS has the potential to enhance both similarity and innovation but more time is required in order to measure the extent to which the organization becomes more uniform. Moreover, the hotel managers and particularly the two managing directors acknowledged the utility of the enriched history of a CoP which is now enabled by the KMS. P.L. said that by sharing the history of every hotel unit with the rest of the members of his community, the pace of innovation is increasing and change will now emerge more easily from the bottom.

6.5.3 Improved Integration of New Managers

Another aspect which demonstrated the improved ability of hotel chain to self-organize was the possibility for new members to integrate in their role easier. A smooth integration of new managers would mean that top management would not be required to put significant
effort into training and explaining the rationale of the existing organizational architecture.

In fact, the users and particularly the members that had recently joined the hotel chain considered this as the biggest asset of the KMS. As E.C. underlined, the KMS assisted her significantly in terms of grasping more easily the “big” and up-to-date picture of the hotel she was managing. M.P. stated that “the KMS was a very useful tool for management, as it helped him to understand his role more effectively”. S.K. said that the KMS will save him a lot of time and effort in terms of tracing past actions and that this will make the integration of new members much easier. P.L. said that the KMS will help managers substantially to integrate faster in the organization and correlated the KMS to a dynamic corporate manual. E.L. also considered the ability to facilitate greatly the integration of new members and business continuity as the biggest asset of the KMS.

6.5.4 Level of Management Alertness

Finally, self-organization was also enhanced by the ability of the KMS to project dynamic views that enabled the comparison of the performance between the members of a CoP. Such comparison acted as a mechanism for motivating managers to be more alert and undertake more initiatives which shall improve the sustainability of their units. With the new KMS in place, managers now needed to be more alert, to monitor the initiatives of their colleagues and reapply them when found applicable.

Such comparisons were found particularly useful by the managing directors of the hotel chain, as they were now in the position to assess the performance of the managers of the hotels of the chain more effectively. In particular, E.L. stated that such a view reveals situations of increased creativity but most importantly of inertia among the members of a CoP. For example, it is easier to notice that although a hotel did well in terms of the financial performance, its level of initiative and adjustability was very minimal. E.L. continued by stating that by being able to compare the dynamic performance of every hotel unit, management can be assessed more objectively. E.L. concluded that management’s assessment is not based solely on short-term financial results but additional perspectives are now considered such as customer satisfaction, productivity and staff development, as well as the alertness and true value added to the hotel chain by every manager.
6.6 Conclusions

From the fourteen months study of the application of the KMS in the hotel chain it can be concluded that the KMS had a positive impact in the hotel chain. The KMS proved effective in terms of sharing initiatives for change between the members of a CoP. All present and past initiatives for change are now easily traceable by any manager belonging to the respective CoP. The KMS proved equally effective in terms of capturing the knowledge created upon a change for reuse. All the important aspects of knowledge created upon all three phases of the process of change are now captured systematically. In particular, knowledge which previously remained implicit or tacit such as the effects of change on the existing architecture and performance is now externalized. This enabled a smoother and faster reapplication process of change, which did not necessitate the intervention of top management.

Through the passage of time, the hotel chain was demonstrating a self-organizing behavior. Evidence of the improved ability of the hotel chain to self-organize was the increased number of changes emerging from the bottom, the improved pace of innovation and cohesion, the improved integration of new managers and last by not least the increased level of alertness and initiative across the hotel chain. Vital for the successful application of the KMS in the hotel chain was the consideration of socio-technical factors such as the IT literacy of the users and the rewarding schemes in place for promoting the input of knowledge.

Finally, although the hotel chain demonstrated indications of self-organization, it can be said that a longer period of application would be required in order to measure the benefits that the improved ability for self-organization brought to the hotel chain. More time was required for successful changes to be reapplied across the chain and for uniformity to appear. This was not possible however due to the time constraints imposed by this research. As Wheatley (1999) confirms, “the changes occurring locally at every geographical region, initially will not look the same; but over time, as their individual solutions are fed back into the system, as learning is shared, we can expect that an orderly pattern will emerge”. Hence, it is believed that the benefits that the KMS would be even more significant after a longer period of use which would involve all managers at all organizational levels too.
Chapter 7: Reflections and Conclusions

7.1 Thesis Overview

The introductory chapter of the thesis started with a presentation of the aim, motivation and contribution of this research. Chapter 2 introduced us to the fundamental notion of the research which is the management of architectural knowledge. A number of areas such as organizational change, organizational architecture and corporate performance management were visited with an aim to understand how architectural knowledge is created within an organization. Then, the soft factors that influence the management of architectural knowledge were analyzed in order to demonstrate that IT is not a panacea and that aspects related to the human nature are critical for even the most sophisticated KMS. Lastly, the most important types of the contemporary KMSs for managing architectural knowledge were presented.

Subsequently, Chapter 3 addressed the first objective of this research which was to identify the limitations of the existing KMSs in terms of supporting self-organization in the hospitality sector. The case of a hotel chain was chosen as the main research methodology. In particular, the KMSs used by the hotel chain, as well as the most important KMSs available in the hospitality sector were studied. Two main limitations were identified. At first, with the existing KMSs in place, the initiatives for change undertaken by hotel units were not shared with the other similar units which operated in different geographical locations. Secondly, even if the initiatives for change had been recorded, they could not be easily reapplied by other hotel units since valuable aspects of knowledge underlying the process of change had not been systematically captured. Details related to the brainstorming, implementation and evaluation phase of the process of change typically remained implicit. Both limitations resulted in delimiting horizontal knowledge transfer which constitutes a key prerequisite for self-organization.

Next, Chapter 4 demonstrated that the limitations of the KMSs identified in the case of the hotel chain are attributed to a significant extent to the fact that complexity theories have not
yet been embraced by the contemporary KMSs. In order to be able to understand the problem, the transition of organizational science from the mechanistic model, towards the systemic and then towards the complex systems model was analyzed. The characteristics of all models were discussed alongside their implications for KM and KMSs. Given the socio-technical nature of KMSs, their fundamental design is influenced by the characteristics of the prevailing organizational models at the time they were designed. As expected, the characteristics of the mechanistic and systemic organizational models were found to be thoroughly embraced. Nevertheless, it was concluded that the contemporary KMSs in the hospitality sector have significant space for improvement in terms of embracing concepts from complexity such as *self-organization, emergence* and *edge of chaos*.

The key characteristics of the complex systems model and their implications to KM constituted the basis for proposing a KMA for self-organization. This brings us to the second objective of this research which was to develop a KMA to support more effectively the ability of a hotel chain to self-organize. The proposed KMA was represented in Chapter 5 and was based on two key ideas. The first idea was the conception of the hotel chain as a set of CoP. The hotel chain was not anymore as a rigid and hierarchical system by as a fractal system which is self-similar across its geographically distributed structure. For example, the reception unit of Hotel 1 belonged to a wider CoP named “Reception” which included all reception units operating within the rest of the hotels of the chain.

The second key idea of the proposed KMA was the conception of every change as a process of emergence during which the organization attempts to achieve a better fit with its environment. This means that every initiative for change incorporates valuable knowledge which should be carefully captured so that it can be reused with the respective CoP. In particular, emphasis was placed on capturing the effects of every change on the existing architecture and performance – aspects which typically remained implicit.

By having captured and shared every initiative for change among the members of a CoP, new dimensions of knowledge were enabled. The dynamic nature of such dimensions necessitated though the development of a KMS to support the proposed KMA, which led us to the third objective of this research. The development of a KMS for the case of the hotel
chain was described. Screenshots of the key functions and reports of the KMS were provided to illustrate the horizontal knowledge flows within the hotel chain.

Additionally, the support provided by the KMS in terms of embracing the key concepts of the prevailing organizational models was demonstrated. While the emphasis was placed on the concepts of the complex systems model, the functions of the KMS in terms of supporting the concepts of the mechanistic and systemic organizational models were also provided. This was important in order to demonstrate the need of incorporating in a KMS the characteristics of all three models. As Jackson (2006) notes, “KM practitioners would make the most from the theoretical pluralism of all three models”.

Finally, Chapter 6 evaluated the impact of the proposed KMA and KMS in the case of the hotel chain. At first, the application of the KMS in the hotel chain was described. The actions taken with regards to soft issues such as the level of IT skills and the rewarding systems for knowledge input were analyzed. As Knight and Halkett (2010) suggest, “the application of the complexity paradigm needs to be fully discussed in relation to the human and management aspects of the IS research”. Then, the KMS was evaluated in terms of targeting every initiative for change to the members of a CoP and in terms of capturing the knowledge created upon the process of every change. The answers received from the interviewees were all very positive. Most importantly, the extent to which the KMS improved the ability of the hotel chain to self-organize was elaborated. The increased number of bottom-up changes, the improved pace of innovation and cohesion, as well as the improved level of integration and alertness of managers constituted evidence of self-organization.

This brings us to the current chapter, which in the following sections justifies the contributions of this research, discusses its limitations and provides numerous insights for future work.

7.2 Justifying Research Contributions

The proposed KMA proved successful in terms of solving the main problems related to the internal transfer of knowledge within the hotel chain. From a more critical perspective though, the proposed KMA contributed to the existing research by demonstrating how
complexity theories can be adopted to re-conceptualize KMSs and ISs towards enabling new dimensions of knowledge.

In contrast to most of the existing approaches which have related the concepts borrowed by complexity to the “hard” aspects of IS design, such as artificial intelligence and algorithms, this research suggested that complexity theories can be used as a basis to re-conceptualize an organization as a self-organizing system. In fact, the proposed KMA attempted to conceptualize the hotel chain under study as suggested by Spender (1996): “as an evolving, quasi-autonomous system of knowledge production and application, with emergent and self-organizing properties that are derived from the interactions of its semi-autonomous elements with one another and the external environment”.

In fact, the author suggested that the concept of self-organization is disguised within the KM field and particularly within the stream of internal knowledge transfer. When considering self-organization through the lenses of organizational science, the agents which share a path-dependent history correspond to the members of a CoP, while the interactions between the agents correspond to the exchange of knowledge between the members of a CoP. Therefore, if organizational theorists and managers wish to incorporate the key concepts from complexity into ISs, they are encouraged to re-conceptualize the fundamental design of KMSs towards supporting more effectively the transfer of knowledge among the members of the CoPs residing within an organization.

Contemporary KMSs provide nowadays extensive support towards the key characteristics of the mechanistic and systemic organizational models. However, it seems that contemporary KMSs are still grounded in the main assumptions of these two models and pale in terms of embracing the key concepts of the complex systems model. Knight (2008) confirms that “Information Systems (ISs) for the most part are still utilizing the original models employed to develop the first computer languages, business, systems and management models”.

Therefore, this research attempted to embrace within KMSs - which are a more specific class of ISs - certain fundamental concepts from complexity theories. First and foremost, it illustrated how KMSs within a hotel chain can be enhanced to support more effectively self-organization. Wheatley (1999) notes that:
“one of the greatest challenges, after so many centuries of separation and fragmentation, is to discover new ways of thinking and sensing that allow us to comprehend the whole”. To her view, “this is still uncharted territory, and it requires the earnest explorations of many of us” (ibid).

By conceiving the hotel chain as a set of CoPs and by capturing systematically every initiative for change for future reuse, the need for management intervention in order to promote the reapplication of a successful action within a CoP has been significantly reduced. Knowledge is not anymore fragmented or disintegrated in various sources but well organized and structured so that the members of a CoP is able to access all the detailed aspects of knowledge that were required for reapplying a change. Hence, the role of top management gradually changes from leader to listener, since change now emerges from the bottom of the organization and is shared across all members of a CoP. As Wheatley (1999) puts it,

“by distributing knowledge across the organization, it is no longer the leader’s task to deal with all problems piece by piece nor is the leader’s task to move information carefully to someone else”.

Consequently, it can be claimed that the proposed KMA and thus KMS enhanced the ability of the organization to self-organize.

Furthermore, the proposed solution incorporated successfully the concept of ‘emergence’ since it captured systematically any novel and coherent alteration of the existing architecture which was caused by the implementation of a change. The KMS developed provided a detailed history of all the initiatives for change that were undertaken within every hotel unit. Moreover, every initiative was accompanied by the knowledge created upon the process of change. A manager of a hotel unit could thus trace very easily the rationale behind a particular action which was carried out in the past, the alternative solutions considered, the implementation plan, as well as the effects of the change on the existing architecture and performance. The history of all initiatives for change undertaken, combined with the details from the process of change though correspond in essence to the concept of emergence.

The proposed solution attempted to incorporate another ambiguous concept: the edge of chaos. As explained in Chapter 4, the edge of chaos refers to an intermediate zone that
exists between order and disorder, which in essence corresponds to the level of alertness and adjustability of a hotel unit to its environment. By providing functions for enhancing the systematic assessment of every change, it became possible to observe more effectively the level of alertness of every hotel unit and the extent to which it remained stable or vigilant.

In conclusion, the research contributed to the evolving discourse between IS and complexity by providing an alternative approach on how core concepts from complexity, such as self-organization, emergence and edge of chaos, can be embraced by the IS field. The value of this contribution can be further supported through the words of a number of IS scholars that perceive the need for a paradigm shift in the IS community using as a basis the science of complexity. Merali (2006) suggests that “the emergence of the network economy and network society necessitates a paradigm shift in the IS discipline, and that complexity science offers the apposite concepts and tools for effecting such a shift”. Jacucci et al (2006) “acknowledge complexity as a phenomenon and not as a marginal feature of IS designs”. Fingar (2006) questions the first principles of Enterprise Architecture and BPM and suggests that “it is time for IS to model a self-organizing, self-governing, adaptive, nonlinear organization, the behavior of which harmoniously blends characteristics of both chaos and order”. Finally, Knight and Halkett (2010) conclude that the complexity paradigm “offers the opportunity to the IS discipline to become truly innovative” and that “without such a discourse, IS may stagnate in the detail, and (alas) in the relative monotony, of the deductive analysis of that which is already known”.

7.3 Limitations and Further Work

The proposed KMA has been developed by taking into consideration a number of areas within both the IS and Management science, such as KM, organizational change, organizational architecture and corporate performance management. The KMA proved very successful in the case of a hotel chain and the KMS developed continues to be extensively used. Nevertheless, due to the multidisciplinary nature of this research and the time constraints of every PhD research, there is still significant space for improving the proposed
KMS and backing it up with organizational practices and technology. In the following sections, the limitations of this research as well as numerous areas for further research are analyzed.

7.3.1 Length of the Study

The most important limitation of this research is the length of the application period of the KMS in the case of the hotel chain. The actual application of the KMS in the hotel chain lasted for a period of fourteen months. The fourteen months were proven enough for the users to appreciate its value and the new dimensions it provided. However, more time would be preferable to draw safer conclusions and measure the extent to which the hotel chain achieved self-organization and became more uniform. It is believed that the actual benefits of the KMS would be appreciated after a longer period of use which would involve all the managers at all organizational levels.

7.3.2 Applicability of the Proposed KMA in Different Contexts

An interesting element which is worth exploring is the applicability of the proposed KMA in other sectors. After having applied the proposed KMA successfully in the case of the hotel chain, further research is required to explore its suitability for organizations operating in other sectors of the economy. As Flyvbjerg (2006) highlights, “a case study cannot provide reliable information about a broader class, but it may be useful in the preliminary stages of an investigation since it provides hypothesis which may be tested systematically with a larger number of cases”. Hence, the applicability of the proposed KMA may well extend to all large and complex organizations with a geographically distributed structure in other sectors of the economy.

There is strong evidence that the proposed KMA could well be applied to a large number of other private organizations which face the challenges of knowledge fragmentation, disintegration and vulnerability. In particular, it is believed that the proposed KMA could be useful to organizations operating in the retail industry which have similar characteristics such as increased responsiveness to local culture, direct contact with the end-consumer, a large number of products and services offered and dispersed nature of operations (e.g
Dawson 2000, Elg 2003). Also, it would be interesting to apply the proposed KMA in the manufacturing industry, which usually has a more centralized structure and more standardized products.

Moreover, it is strongly believed that the proposed KMA could be useful for the public sector too. Particularly in countries where the change of the governing party often signifies the change of the persons employed in key positions of the economy, the knowledge transfer is a real challenge. Further research is thus required to apply the proposed KMA in a public organization or even within the government itself.

Lastly, the proposed KMA was applied in a hotel chain which had its operations dispersed within the boundaries of one country. Further research is required to evaluate the benefits derived in the application within an organization which operates globally. As Dafoulas et al (2009) suggest, global teams are characterized by a number of unique features that differ significantly when compared with traditional collocated teams such as distance (from each other), time-zone differences and national culture. As a consequence, it would be interesting to observe the knowledge transfer between managers of units that have similar properties but different culture or language.

7.3.3 Incentives for Knowledge Transfer

Another important area for further work is the role of “soft” factors such as the role of incentives for supporting a KMS. As Mc Dermott (1999) suggests, ICT appears instrumental to the support of knowledge work, but is, on its own, not a panacea to solve intrinsic KM problems. Markus (2001) advises that for successful knowledge re-use, close attention needs to be placed on the incentives provided to knowledge producers in order to contribute to knowledge repositories.

The proposed KMA was applied in the hotel chain with the use of both individual and group based rewards for those who shared the knowledge they obtained. Further research could be done to examine the effectiveness of different incentive systems taking into consideration the complex phenomenon of coopetition, which as explained refers to simultaneously cooperative and competitive behavior by the units-members of a CoP.
7.3.4 The Nature of Knowledge Being Transferred

Another aspect that needs further investigation is the type and relevance of knowledge that should be transferred across the hotel chain. Lee and Ahn (2007) suggest that it is not necessarily desirable to encourage workers to share as much knowledge as possible and that the balance between the benefit and costs of increasing knowledge sharing should be considered. This means that every user should be trained in terms of understanding which initiatives he or she should record. Bloodgood and Salisbury (2001) warn that it is important to identify tacit knowledge that exists in the organization and decide the extent to which the organization can or should codify it in a computer usable form. Moreover, there might be cases that a certain initiative should not be recorded at all if the knowledge itself has a large commercial value. Nonaka and Takeuchi (1995) suggest that the very act of making tacit knowledge more explicit to facilitate transfer makes it more readily imitated by external entities (competitors). In the case of the hotel chain, there were only a few initiatives, mainly undertaken by the headquarters that were decided not to be captured. The rest of the managers were willing to share their initiatives not only because of the incentives in place, but mainly due to the fact that their performance evaluation was now taking into consideration their level of initiative.

In addition, further research is required to examine the extent to which we can generalize that knowledge reuse between the members of a CoP is always beneficial. March (1972) asserts that “bad choices can also be made even from good memories if the circumstances surrounding the original development have changed”. Therefore, emphasis should be placed on considering the relevance of knowledge retrieved for use.

7.3.5 Methods for Capturing the Organizational Architecture and Performance

As explained, the proposed KMA was derived after studying thoroughly a number of architectural models from both the management and software field. However, upon reflecting on the application of the KMS in the hotel chain, the author identified certain areas for improvement in terms of the methods used to capture the impact of every change on both the existing architecture and performance.
With regards to the architectural components, five elements were identified as the most relevant for an organization in the hospitality sector (structure, roles, resources, rewards and processes). However, one can argue that additional aspects should be considered. For example, the management of risks within the hotel chain such as the emergency plans in place often incorporates knowledge which would be useful to record. Therefore, further research is required in terms of identifying other possible components of architecture that may be altered by an initiative for change. It should be noted though that the addition of many more elements could make the input of the knowledge more cumbersome and this factor should not be disregarded.

With regards to the method used to assess the effects of a change on performance, the Balanced Scorecard was applied in order to measure the impact of change on four specific perspectives of organizational performance. Although the users did not identify any deficiencies, the author identified certain limitations, particularly in terms of achieving a truly dynamic projection of performance. The Balanced Scorecard did not consider the evaluation of initiatives which could result in organizational effectiveness, but had been postponed for a later date. For example, as seen in case where management of Hotel 5 considered the listing of the hotel in the Golden Tulip brand of hotels, such an initiative for change created useful knowledge which could be reused by the rest of the members of the CoP. Despite the fact that such a change was never implemented, the knowledge created and the time spent by a manager to examine similar brands was not really appreciated. As Galunic and Rodan (1998) and Szulanski (1996) note, knowledge assets by their nature, are hard to evaluate.

Moreover, the Balanced Scorecard did not really consider assessing the fit of the organization with its environment and thus its true sustainability. As Hoverstadt (2008) confirms, the Balanced Scorecard does not address the more fundamental flaws inherent in the deterministic approach to change. Wheatley and Kellner Rogers (1998) note the lack of dynamic performance management:

“We tend to limit our explorations by collecting information from measures that tell us how we are doing, whether we are up to standards, whether we are meeting our goals. But these measures lock us into learning about a predetermined world. They keep us distracted from questioning our experience in a way that could create greater possibilities”.

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The Balanced Scorecard which was applied definitely provides a more systemic perspective of performance but there is still room for further research in terms of identifying theories which assess more effectively the true fit of an organization to its environment. Such a method could well be the Triple Performance Index proposed by Beer (1981). A more detailed presentation of the Triple Performance Index is presented in the Appendix (G). Further to the traditional perception of performance in terms of actual results (actuality), the Triple Performance Index methodology provides two more dimensions in performance management: the capability and potentiality. The capability of an organization refers to what an organization should do now, with existing resources, under existing constraints, while the potentiality of an organization refers to what an organization ought to be doing by developing its resources and removing constraints. Thus, the Triple Index suggests capturing the changes occurring also in terms of their impact on the capability and potentiality of an organization. Hence, further research is required in terms of indentifying a method to assess more effectively the dynamic performance of an organization such as a hotel chain.

7.3.6 Automation Tools for Knowledge Input

Another significant area for further research is the exploration of text-mining technologies which would automate the input of knowledge in a KMS. For example, an email conversation between different users about the rationale behind a particular initiative for change should be automatically mapped to the respective initiative for change that has been recorded within the KMS. The discussions related to the consideration of new initiatives, their implementation plans or their overall assessment, which are typically recorded within documented minutes should also be automatically linked to the respective initiatives for change of the KMS. In fact, the input of knowledge within the knowledge repository provided by a KMS should be automated in the sense that management would create knowledge which would be automatically organized and structured. Wizards and pop-up messages could appear to confirm the operation of the tool related to artificial intelligence.

Also, given the increased diversity of the existing KMSs, further research is required in terms of integrating more effectively the different types of contemporary KMSs such as
emails, groupware, BI and strategy management tools. Interoperability between the different KMSs is a key element for knowledge integration.

### 7.3.7 Corporate/Enterprise Social Network Tools

A new type of KMSs which has very recently emerged under the term “corporate” or “enterprise” social network tools should be considered, as it is very relevant to this research. There are a number of software vendors which offer such tools. Notably, SAP has launched an enterprise social network solution named “SAP Jam” only in November 2012. Such web-based tools refer to business organizations and have similar characteristics to famous social media tools such as Facebook. They support very effectively the dynamic interactions between the members of an organization and they provide certain useful functions for organizing the knowledge created by the users. They also use various incentives for encouraging users to input knowledge such as badges and praises. In addition, some of these tools offer integration with other commonly used systems such as Microsoft Sharepoint Server.

Enterprise social network tools are definitely an important step towards embracing more effectively the complex systems model and should also be examined from this perspective. Nevertheless, they still have significant space for improvement particularly in terms of capturing the knowledge created upon the different phases of change so that such knowledge can be traced and reused.

### 7.3.8 Further Concepts from the Complex Systems Model

Last but not least, another area for further research is the study and application of additional concepts from complexity theory in ISs. In this research three fundamental concepts from complexity, namely emergence, edge of chaos and self-organization have been embraced in the development of the proposed KMS. Such concepts provided new insights for the managers and directors of the hotel chain which were proved particularly useful. It is strongly believed though that there are more concepts that could be embraced within the design of KMSs for providing even more exciting dimensions. For example, it would be very useful to capture the level of self-similarity between the units belonging in the same
CoP. Also, it would be interesting to have a view that would present the number of times successful actions have been reapplied by the members of a CoP. To finish, it would be particularly useful to relate every version of architecture with a performance index. In so doing, one can study the various past and present states of the architecture across the organization and conclude on which version has produced the best performance.
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Appendix:

A. UML Syllabus
Class Diagram: Interfaces

- Abstract Class
  - Type
  - Client of Type

- Implementing Class

- Interface Name

- Dependency

- Client Class

Class Diagram: Parameterized Class

- Template class `T`
- Set

- Bound element
  - Set<Integer>

Association Class

- Class
- Class
- Association Class

Activity Diagram

- Activity
  - Activity
    - Activity
      - Activity
        - Activity
          - Activity
            - Activity
B. Organizational Modeling and Knowledge Management Systems


Flowcharting

Flowcharting is among the first graphical modelling techniques, dating back to the 1960s (Schriber, 1969). The advantages of flowcharts center on their ability to show the overall structure of a system; to trace the flow of information and work; to depict the physical media on which data are entered, produced, and stored; and to highlight key processing and decision points (Jones, 1986).

Despite its advantages (familiarity and ease of use), flowcharting no longer is a dominant modelling technique, because it can provide only basic facilities in representing processes.

IDEF techniques (IDEF0, IDEF3)

The IDEF family of modelling techniques was developed as a set of notational formalisms for representing and modelling process and data structures in an integrated fashion. The IDEF suite consists of a number of independent techniques, the most well-known being IDEF0 (function modelling), IDEF1x (data modelling), and IDEF3 (process description capture). In this section, IDEF0 and IDEF3 will be described, as they related primarily to business process modelling.

The IDEF0 method is designed to model the decisions, actions, and activities of an organization or other system, and as much, it is targeted mostly toward the functional modelling expert involvement and consensus decision making through simplified graphical devices. IDEF0 supports process modelling by progressively decomposing higher-level ICOMs into more-detailed models that depict the hierarchical decomposition of activities.

Despite its advantages, IDEF0 has a number of limitations that may render the technique unsuitable for process analysis. More specifically, IDEF0 models are static diagrams with no explicit or implicit representation of time. Even the sequence of ICOMs is not meant to
depict the temporal relations among activities. As such, IDEF0 models cannot represent the behavioural or informational modelling perspectives.

IDEF3 was developed to overcome some of the limitations of IDEF0 models. IDEF3 describes processes as ordered sequences of events or activities. As such, IDEF3 is a scenario-driven process flow modelling technique, based on the direct capture of precedence and causality relations between situations and events (Mayer et al., 1995). The goal of an IDEF3 model is to provide a structured method of expressing the domain experts’ knowledge about how a particular system or organization works (as opposed to IDEF0, which is concerned mainly with what activities the organization performs).

IDEF3 uses two complementary diagrammatic representations of process models. Process flow diagrams depict the flow of activities within a process, while object-state transition diagrams represent the different states of entities as the flow through the process.

**Petri nets**

Basic Petri nets are mathematical/graphical representations of systems, aiming at assisting the analysis of the structure and dynamic behaviour of modelled systems, especially systems with interacting concurrent components. A basic Petri net graph is composed of a set of states and a set of transitions.

Basic Petri Nets, it has been recognized, are not succinct and manageable enough to be useful in modelling high-level, complex business processes (Leymann and Latenhuber 1994). To this end, a number of extensions to the basic Petri net formalism (usually to include the notions of color, time, and hierarchy) have been proposed. These extensions collectively are referred to as high-level Petri nets.

**Simulation**

The basic idea behind simulation is simple (Doran and Gilbert 1994). We wish to acquire knowledge and reach some informed decisions regarding a real-world system, but the system is not easy to study directly. We therefore proceed indirectly by creating and studying another entity (the simulation model) that is sufficiently similar to the real-world system that we are confident that some of what we learn about the model will be true of the
system. Simulation can have many forms (for example, discrete-event simulation, continuous simulation, system dynamics, Monte Carlo simulation, and quantitative simulation).

**Knowledge-based techniques**

In the last few years, techniques based on artificial intelligence (AI) have started to appear as building blocks in business process modelling applications (Hedberg 1996). These techniques are targeted mainly to the issue of linking business processes to organizational rules and business objectives in a formal manner (Yu, Mylopoulos, and Lesperance, 1996). Along the AI techniques proposed, knowledge-based systems (KBS) and qualitative simulation seem to have attracted the most attention by researchers and are reviewed here.

- **Knowledge-based systems:** Ba, Lang, and Whinston (1997) present a knowledge-based enterprise modelling framework to support organizational decision making in the context of strategic change. This framework bases its reasoning about a particular organization on a “library of knowledge”, representing significant organizational phenomena from different perspectives and at different levels of detail.

- **Qualitative simulation:** Nissen (1994, 1996) follows a similar approach and employs the AI technology of qualitative simulation to develop models of organizational processes for informing the process of analysis and redesign. Qualitative simulation enables entities and relationships to be modelled and codified even with only minimal understanding or information regarding them. The output of qualitative simulation is an “envisionment”, in other words, a description of all possible behaviours for the modelled process.

**Role activity diagramming**

Role activity diagrams (RADs) are diagrammatic notations that concentrate on modelling individual or group roles within a process, their component activities, and their interactions, together with external events and the logic that determines what activities are carried out and when (Huckvale and Ould, 1995).

RADs differ from most other process diagrammatic notations in that they adopt the role, as opposed to the activity, as the primary unit of analysis in the process model. Due to this
focus, they are suitable mostly for organizational contexts in which the human element is the critical organizational resource addressed by that process change. However, they cannot accommodate the explicit depiction of an experimentation with other organizational perspectives (for example, functional or informational), restricting their role to being mostly complementary in the context of business engineering.

**Responsibility-Driven Design**

Responsibility-driven design focuses on what actions must get accomplished, and which objects will accomplish them. A good starting point for defining an object is describing its role and purpose in the application. Responsibility-Driven Design was conceived in 1990 as a shift from thinking about objects as data and algorithms, to thinking about objects as roles and responsibilities. The study by Sharble and Cohen shows convincingly that data-driven methods do influence the thinking of designers and that they tend to produce un-reusable classes as a consequence. The usual effects are that:

- behaviour is concentrated in controller objects that resemble main routines; this makes systems much harder to maintain due to the amount of knowledge that these controllers store about other objects;

- other objects have few operations and are often equivalent to normalized database tables: not reflective therefore of sound object-oriented design.

A responsibility-based model, objects play specific roles and occupy well-known positions in the application architecture. It is a smoothly-running community of objects. Each object is accountable for a specific portion of the work. Objects collaborate in clearly-defined ways, contracting with each other to fulfil the larger goals of the application. By creating such a “community of objects,” assigning specific responsibilities to each, a collaborative model of the application is built. Objects are more than simple bundles of logic and data. They act as service-providers, information-holders, structurers, coordinators, controllers, and interfacers to the outside world. Thinking in terms of these object role stereotypes enables the creation of powerful, flexible applications which can then easily be extended.
B2. Information systems Modeling Techniques

Data flow diagramming

Data flow diagramming (DFD) is a technique for graphically depicting the flow of data among external entities, internal processing steps, and data storage elements in a business process (Kettinger et al., 1997). DFDs are used to document systems by focusing on the flow of data into, around, and outside the system boundaries. In that respect, DFDs are comparable to flowcharts, differing from them basically in the focus of analysis (DFDs focus on data instead of activities and control).

DFDs have been widely used for data modelling and have become the standard notation for traditional systems analysis and design (Yourdon, 1989). However, they present a number of limitations. First, they focus exclusively (or at least primarily) on data and provide no modelling constructs on which to base representation of work flow, people, events, and other business process elements. Second, they provide no information on decisions and event sequences (temporal or precedence relationships). Finally, DFDs have no beginning or end points, nor execution paths. In other words, they are static representations of a system and the system’s functions that involve data manipulation; therefore, they do not lend themselves easily to analysis or decision making. To facilitate such analysis, data flow diagramming sometimes is complemented by structured textual descriptions of procedures in which data are to be used; these descriptions are called process specifications (Yourdon, 1989).

Entity-relationship (ER) diagrams

Entity-relationship (ER) diagrams are another widely used data modelling technique. ER diagrams are network models that describe the stored data layout of a system (Yourdon, 1989). ER diagrams focus on modelling the data in a system and their interrelationship in a manner entirely independent of the processing that may take place on that data. Such separation of data and operations may be necessitated in cases where the data and their interrelationships are sufficiently complex. For the system analyst, ER diagrams have
another advantage: They highlight relationships between data stores in the DFD that otherwise would be visible only in the (textual) process specification.

For business process modelling, ER diagrams pose limitations similar to DFDs. More specifically, they focus too much on data and their interrelationships and, hence, provide no constructs for modelling other process elements. Even more important, they provide no information about the functions depicted that create or use these data (as DFDs do). Finally, they are entirely static representations, providing no time-related information that could drive analysis and measurement.

**State-transition diagramming**

State-transition (ST) diagrams originate from the analysis and design of real-time systems. ST diagrams attempt to overcome the limitations arising from the static nature of DFDs and ER diagrams by providing explicit information about the time-related sequence of events within a system. The notation used by standard ST diagrams is very simple, consisting of only rectangular boxes that represent states and arrows that represent changes in state (transitions).

Although ST diagrams overcome some limitations of the other IS modelling techniques (such as DFDs and ER diagrams), they still focus primarily on the data portion of a system, ignoring aspects of work flow, control, decision making, and so on. Therefore, ST diagrams continue to be applicable mainly in systems design and are rather inappropriate mechanisms for capturing business process modelling aspects, let alone the wider-encompassing area of integrated BPM/ISM.

**IDEF techniques (IDEF1x)**

IDEF1x was designed as a technique for modelling and analyzing data structures for the establishment of information systems requirements (Mayer et al, 1995). IDEF1x differs from traditional data modelling techniques in that it does not restrict modelling in the data elements being manipulated by computers, but extends its application to modelling manual-handled data elements as well. IDEF1x utilizes simple graphical conventions to express sets of rules and relationships between entity classes in a fashion similar to entity-relationship diagrams.
The power of IDEF1x diagrams for integrated BPM/ISM can be harnessed when these diagrams are combined with IDEF0 and IDEF3 business models. Since they belong to the same family of techniques, IDEF models complement each other effectively and, when combined, can provide a holistic perspective of a modelled system. However, this facility comes at a potentially high complexity of developing and maintaining many different models for a single system.

**Unified Modelling Language**

Introduced in 1997 and supported by major industry-leading companies, the unified modelling language (UML) rapidly was accepted throughout the object-technology community as the standard graphical language for specifying, constructing, visualizing, and documenting software-intensive systems (Booch, Rumbaugh, and Jacobson, 1999). UML utilizes a wide array of diagrammatic notations, including:

- Use case diagrams, which capture system functionality as seen by the users
- Class diagrams, which capture the vocabulary of the system
- Behaviour diagrams (for example, statechart, activity, and interaction diagrams)
- Implementation diagrams (for example, component and deployment diagrams)

**B3. Multi-Perspective Modeling**

Multi-perspective modeling enables a number of techniques to be used together, each technique being the most appropriate for modelling that particular aspect of knowledge. Multi-perspective modelling is supported by an Information System Architecture framework. The two most famous multi-perspective modeling frameworks are the Zachman (Zachman 1987) and TOGAF frameworks (TOGAF 2002).

The Zachman framework has six columns representing who, what, how, when, where and why perspectives on knowledge, and six rows representing different levels of abstraction.
The Zachman framework helps to define what aspects of organizational memory need to be represented. The appropriate modelling technique for multi-perspective can be selected from: business management techniques (such as soft system modelling and PERT charts), software engineering techniques (such as flow charts, entity-relationship diagrams and object-oriented analysis and design) and knowledge engineering techniques (such as CommonKADS) (Kingston and Macintosh 2000).

In contrast, the Open Group Architecture Framework (TOGAF 2002) developed by the Architecture Forum of the Open Group is also gaining recognition as a framework for enterprise architecture. It provides a comprehensive approach to the design, planning, implementation, and governance of an enterprise information architecture. The architecture is typically modelled at four levels or domains; Business, Application, Data, Technology.

<table>
<thead>
<tr>
<th>Objectives/Scope “contextual”</th>
<th>Data “what”</th>
<th>Function “how”</th>
<th>Network “where”</th>
<th>People “who”</th>
<th>Time “when”</th>
<th>Motivation “why”</th>
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<td>Enterprise “conceptual”</td>
<td>e.g. Semantic Model</td>
<td>e.g. Business process Model</td>
<td>e.g. Business legacy systems</td>
<td>e.g. Work Flow model</td>
<td>e.g. Master Schedule</td>
<td>e.g. Business Plan</td>
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<td>System “logical”</td>
<td>e.g. Logical data model</td>
<td>e.g. Application Architecture</td>
<td>e.g. Distributed Systems Architecture</td>
<td>e.g. Human Interface Architecture</td>
<td>e.g. Processing Structure</td>
<td>e.g. Business Rule Model</td>
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<tr>
<td>Technology constrained “physical”</td>
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<td>e.g. System Design</td>
<td>e.g. System Architecture</td>
<td>e.g. Presentation Architecture</td>
<td>e.g. Control Structure</td>
<td>e.g. Rule design</td>
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<td>e.g. programs</td>
<td>e.g. Network architecture</td>
<td>e.g. Security Architecture</td>
<td>e.g. Timing Description</td>
<td>e.g. Rule Specification</td>
</tr>
<tr>
<td>Functioning enterprise</td>
<td>e.g. Data</td>
<td>e.g. Function</td>
<td>e.g. Network</td>
<td>e.g. Organization</td>
<td>e.g. Schedule</td>
<td>e.g. Strategy</td>
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Figure 55: The Zachman Framework
Figure 56: The TOGAF Framework

<table>
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<th>Data backbone</th>
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<th>Security</th>
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<td>Microsoft SharePoint (<a href="http://SharePoint.microsoft.com">http://SharePoint.microsoft.com</a>)</td>
<td>SharePoint Sites, SharePoint Communities, SharePoint Content, SharePoint Search, SharePoint Insights, SharePoint Composites, SharePoint Designer, SharePoint Foundation, SharePoint Workspace</td>
<td>Windows Share-point Services Data Integration through platforms such as Mambo MashPoint or Microsoft SharePoint Integrator</td>
<td>Microsoft Office, Lotus Notes, Domino</td>
<td>wiki, blog</td>
<td>Secure Sockets Layer (SSL), IP Security, Windows Security Account</td>
</tr>
<tr>
<td>Google Apps (<a href="http://www.google.com/apps">www.google.com/apps</a>)</td>
<td>Google Calendar, Google Docs, Google Groups, Gmail, Google Sites, Google Videos</td>
<td>Data integration through Google Secure Data Connector</td>
<td>Microsoft Outlook, Lotus Notes</td>
<td>wiki, blog, video</td>
<td>HTTPS, SSL, Message Security through Postini technology</td>
</tr>
</tbody>
</table>

B5. Comparison of the Most Widely Used ERP System (Source: WhatisERP.net 2012)
B6. Comparison of the Enterprise Business Intelligence Platforms (Source: Evelson 2008)
C. Interviews with Key Stakeholders before the Application of the KMS

C1. List of Interviewees

<table>
<thead>
<tr>
<th>Initials:</th>
<th>Role:</th>
<th>Unit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.L.</td>
<td>Managing Director</td>
<td>Headquarters</td>
</tr>
<tr>
<td>E.L.</td>
<td>Managing Director</td>
<td>Headquarters</td>
</tr>
<tr>
<td>M.P.</td>
<td>Manager</td>
<td>Hotel 1</td>
</tr>
<tr>
<td>E.C.</td>
<td>Manager</td>
<td>Hotel 5</td>
</tr>
<tr>
<td>S.K.</td>
<td>Manager</td>
<td>Hotel 6</td>
</tr>
<tr>
<td>K.P.</td>
<td>Restaurant Manager</td>
<td>Restaurant 1</td>
</tr>
<tr>
<td>G.M.</td>
<td>Restaurant Manager</td>
<td>Restaurant 5</td>
</tr>
<tr>
<td>P.K.</td>
<td>Restaurant Manager</td>
<td>Restaurant 6</td>
</tr>
<tr>
<td>V.K.</td>
<td>Maintenance Manager</td>
<td>Maintenance 1</td>
</tr>
<tr>
<td>E.K.</td>
<td>Maintenance Manager</td>
<td>Maintenance 5</td>
</tr>
<tr>
<td>C.P.</td>
<td>Maintenance Manager</td>
<td>Maintenance 6</td>
</tr>
</tbody>
</table>

Table 14: List of interviewees
C2. Interview Questions to Managers

1. Which mechanisms exist in the organization to record org. knowledge (i.e. files, emails, ISO, intranet, minutes of meetings etc)?

2. How easy has it been to trace initiatives for change (actions) that were undertaken in the past within your organization?

3. How easy has it been to trace the following aspects of knowledge created upon every initiative for change undertaken in the past?

   i. Rationale and alternatives considered for every change?

   ii. The implementation plan for every change?
iii. The effects of every change on the main components of the existing org. architecture (i.e. 
structure, processes, roles, resources, rewards)?

iv. The effects of every change on the existing org. performance?

4. How would you describe your integration in the organization (hotel chain) in terms of 
understanding the existing architecture (form of operations)? Have the main components of 
the existing architecture been recorded?

5. To what extent were the documented aspects of the architecture found to differ from actual 
practice (out of date)?
6. How easy has it been to trace the initiatives undertaken by the units that have the same properties across the chain (i.e. all changes undertaken by all restaurant units of the chain)?

7. How easy has it been to trace the most successful or unsuccessful changes undertaken by a particular unit across the chain (i.e. the top five changes undertaken by the restaurant units across the chain)?

8. To what extent does your performance depend on your level of innovation and creativity (initiatives you have undertaken)?

Thank you very much for your time.
C3. Interview Questions to Directors

1. What mechanisms, methods or tools do you use to capture and share knowledge in the hotel chain?

2. To what extent do you think knowledge remains implicit (not recorded)?

3. Are you aware of the actions undertaken by the management in all units of the hotel chain?

4. From the actions that have been undertaken across the chain, how easily can you trace the following aspects of knowledge which is created?
   i. The rationale of every initiative and the alternative solutions considered?
   ii. The implementation plan of the change?
iii. The effects of every change on the existing components of the architecture (structure, processes, roles, resources, rewards)?

iv. The effects (impact) of every change on the existing performance?

5. Have you ever noticed that the actual practice differs from the documented processes? If yes, why is this?

6. How easy is it for new managers to trace knowledge obtained from actions undertaken in the past?

7. Have you ever noticed that the actual practice differs from the documented processes? If yes, why is this?
8. Do you think that implicit knowledge makes the integration of a new manager in the organization difficult?

9. How frequently is the top management (headquarters) required to intervene to facilitate knowledge sharing between the similar units?

10. If successful initiatives have been shared, to what extent are they reapplied without the intervention of the top-management?

11. To what extent do you evaluate managers in terms of their level of initiative (further to the financial results they produce)?

Thank you very much for your time.
D. The Viable Systems Model and an Interview with a SAP Expert

D1: The Viable Systems Model (VSM)

System 1: Implementation - Refers to the primary activities which are responsible for producing the products or services implied

System 2: Co-ordination – Refers to co-ordination, in a sense of mutual adjustment, which is necessary between the different functions/primary activities of the system

System 3: Control – Refers to the need for supervisory control and two-way communication between sub-unit and meta-level unit. This is the channel through which resources are negotiated, management instructions are issued and accountability reports flow upwards to keep the meta-level management in touch with events. It is important though to prevent major interference by management in the running of operation. It is also valuable to assure the accountability reports received by management are accurate, thus it is advisable to corroborate the information with an alternative source sporadically, rather than a regular and anticipated occurrence.

System 4: Intelligence – Refers to the channel between the system and its external environment. The system’s identity and interface should be projected to the environment while continuous feedback on marketplace conditions and other external factors should be obtained and exploited appropriately. Furthermore, System 4 is concerned with the future planning and strategy setting in order to confront effectively external environmental changes and possibilities for improvement.

System 5: Policy – Refers to function which defines the policy of the organization, its direction, values and the purpose of the system. It provides closure to the system as a whole and assures its effectiveness. The information received is highly selective and derives from the conclusions of System 3 and 4. The policy function usually takes place through the gathering of multi-function workgroups which debate and reach critical decisions after taking into consideration all the proposed perspectives.
Figure 57: The Viable Systems Model
1. Every organization, in an aim to adjust effectively to its environment and remain viable undertakes continuously initiatives for change (strategies). Is there sufficient support towards capturing every initiative for change as well as the knowledge each initiative has created?

i) The rationale of every initiative and the alternative solutions considered

ii) The plan of every change that is being implemented

iii) The effects of every change on the existing architecture (effects on structure, processes, roles, resources and rewards)
iv) The effects of every change on the existing performance

2. To what extent can your tools capture the past versions of the organizational architecture of a global enterprise at all its levels (emergence of the organization)?

3. To what extent can your tools capture the level of alertness and viability of a global enterprise at all its levels?

4. To what extent can your tools provide in a single view the initiatives for change undertaken by a particular family of units (i.e. all marketing units across the global enterprise), accompanied with knowledge (brainstorming, implementation and evaluation phases) obtained from every such initiative.
E. Conventional Functionalities of the KMS

E1. Pending Performance Audits:

<table>
<thead>
<tr>
<th>Hotel</th>
<th>Unit Name</th>
<th>Control Name</th>
<th>Next update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HT1 Housekeeping</td>
<td>SPOT CHECK CONTROL</td>
<td>3/31/2009</td>
</tr>
<tr>
<td>1</td>
<td>HT1 Reception</td>
<td>SATISFACTION RATE</td>
<td>3/2/2009</td>
</tr>
<tr>
<td>1</td>
<td>HT1 Reservations</td>
<td>SATISFACTION RATE</td>
<td>6/25/2008</td>
</tr>
</tbody>
</table>

Figure 58: Pending Performance Audits

E2. Performance Alerts (Results out of Goal)

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Unit Name</th>
<th>Control Name</th>
<th>Goal</th>
<th>Tolerance</th>
<th>update on</th>
<th>results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel 1</td>
<td>HT1 Reception</td>
<td>SATISFACTION RATE</td>
<td>80</td>
<td>5</td>
<td>2/1/2008</td>
<td>72</td>
</tr>
<tr>
<td>Hotel 1</td>
<td>HT1 Reservations</td>
<td>SATISFACTION RATE</td>
<td>80</td>
<td>5</td>
<td>5/26/2008</td>
<td>55</td>
</tr>
</tbody>
</table>

Figure 59: Alerts for Performance which is out of goal

E3. Pending Changes (Not yet Completed)

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Unit Name</th>
<th>Issue</th>
<th>Priority</th>
<th>Deadline</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headquarters</td>
<td>Reservations</td>
<td>Express Check-in - Returning guests to provide their details upon their arrival several times - delays</td>
<td>1</td>
<td>2/15/2010</td>
<td>Go to Change</td>
</tr>
<tr>
<td>Hotel 1</td>
<td>Accommodation</td>
<td>Projector in Conference Room not sufficient for conferences of more than 125 people - too small resolution and screen</td>
<td>1</td>
<td>2/15/2010</td>
<td>Go to Change</td>
</tr>
<tr>
<td>Headquarters</td>
<td>IT</td>
<td>Installation of E-Cards on a second PC for Ennertine</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotel 1</td>
<td>Management 1</td>
<td>Assistant Reception not too expensive</td>
<td>2</td>
<td></td>
<td>Go to Change</td>
</tr>
<tr>
<td>Headquarters</td>
<td>Sales &amp; Marketing</td>
<td>Member Club not very attractive</td>
<td>2</td>
<td>1/4/2010</td>
<td>Go to Change</td>
</tr>
<tr>
<td>Headquarters</td>
<td>Sales &amp; Marketing</td>
<td>Photo of renovated room</td>
<td>2</td>
<td></td>
<td>Go to Change</td>
</tr>
<tr>
<td>Hotel 1</td>
<td>Kitchen 1</td>
<td>Kitchen messy - A lot of people in the kitchen disturbing and opening the fridges - increased cost and dissatisfaction by kitchen</td>
<td>3</td>
<td></td>
<td>Go to Change</td>
</tr>
<tr>
<td>Hotel 1</td>
<td>Reception</td>
<td>Generator operation - Reception not aware how to enable it</td>
<td>2</td>
<td></td>
<td>Go to Change</td>
</tr>
<tr>
<td>Hotel 1</td>
<td>Management 1</td>
<td>New Booking Engine / Channel Management Tool</td>
<td>2</td>
<td></td>
<td>Go to Change</td>
</tr>
<tr>
<td>Hotel 1</td>
<td>Kitchen 1</td>
<td>Increase cost and unprofitable operation of F&amp;B department</td>
<td>3</td>
<td>1/4/2010</td>
<td>Go to Change</td>
</tr>
</tbody>
</table>

Figure 60: Changes that have not been completed

E4. Pending Tasks
F. The Application of the KMS in the Hotel Chain

F1. Functions for Capturing the as-is Architecture of every Hotel Unit
Figure 63: Capturing the resources of every hotel unit

Figure 64: Capturing the rewards within a hotel unit

Figure 65: Capturing the business processes of a hotel unit
F2: Interview Questions with Managers after the Application of the KMS

1. Did the KMS enable you to trace initiatives for change undertaken by your organizational unit in the past?

2. Did the KMS enable you to trace the knowledge created upon every initiative for change which has been undertaken by your organizational unit in the past?
   i. Did the KMS enable you to trace the rationale and alternatives considered for every change that has been undertaken?
   ii. Did the KMS enable you to trace the implementation plan for every change that has been undertaken?
   iii. Did the KMS enable you to trace from the past the effects caused by every change that has been undertaken on the main components of the org. architecture?
iv. Did the KMS enable you to trace from the past the effects of every change that has been undertaken on the performance?

3. Did the KMS enable you to trace the initiatives for change that are being undertaken by the similar units (peers) across the chain?

4. Did the KMS enable you to trace the knowledge created upon every phase of the process of change that is being undertaken by the similar units (peers) across the chain?

5. To what extent do you believe the KMS helped you to understand your role as an org. architect and to conceive change as an act of alteration of the existing architecture?
6. To what extent do you think that the KMS can:

i. Enhanced the pace of innovation (through the sharing of the initiatives between the similar org. units)?

ii. Reduced the need for management to intervene for reapplying a particular change at a lower org. level (self-organization)?

iii. Increased similarity between the org. units?

iv. Facilitated the integration of new members?

v. Facilitated growth and expansion (architecture will be more easily transmitted)?
8. Do you think the benefits that are derived from such a system would have been possible without the use of IT?

9. Do you think that the extra work required for the input of knowledge in a repository would be offset from the benefits it brings?

10. Do you think that further incentives should be provided to support the input of knowledge in the system? If yes, which incentive do you recommend?

11. Do you think that such a system may lead to the phenomenon of “coopetition” (managers do not input the knowledge obtained as they feel that this would make them less competitive to other managers?)
12. What do you think overall about the KMS? Any suggestions or concerns?

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Thank you very much for your time.
F3. Interview Questions with Directors after the Application of the KMS

1. To what extent do you think knowledge now remains implicit?

2. Did the KMS support more effectively the monitoring of the actions undertaken by the management in all units of the hotel chain?

3. Did the KMS support more effectively the traceability of the following aspects of knowledge that every initiative for change creates?
   i. The rationale and alternative solutions considered for every initiative?
   ii. The implementation plan of the change?
iii. The effects of every change on the existing components of the architecture (structure, processes, roles, resources, rewards)

iv. The effects of every change on the existing performance; is every action systematically evaluated

4. Can the KMS act as a dynamic corporate manual and thus diminish the cases the actual practice differs from the documented processes?

5. Did the KMS help new managers to trace knowledge obtained from actions undertaken in the past?
6. Do you think that the use of the KMS facilitated the integration of a new manager in the hotel chain?

7. Do you think that the use of the KMS reduced the need for management to intervene in order to share the knowledge created upon the best practices across the chain?

8. Do you think that the use of the KMS enhanced the pace of innovation across the chain?

9. Do you think that the use of the KMS enhanced cohesion (increased similarity) within the hotel chain?

10. Do you think that the use of the KMS improved the alertness and level of initiative within the hotel chain?

11. Do you think that the benefits that are derived from such a system would have been possible without the use of IT?
12. Do you think that the extra work required for the input of knowledge in a repository would be offset from the benefits it brings?

13. Do you think that further incentives should be provided to users for inputting knowledge in the system? If yes, which incentive do you recommend?

14. Do you think that the KMS led to the phenomenon of “coopetition” (managers do not input the knowledge obtained as they feel that this would make them less competitive to other managers?)

15. What do you think overall about the KMS? Any suggestions or concerns?

Thank you very much for your time.
## F4. Form for Inputting Initiatives for Change

### Details of Change

<table>
<thead>
<tr>
<th>Details of Change</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit in Focus:</td>
<td></td>
</tr>
<tr>
<td>Title of Initiative:</td>
<td></td>
</tr>
<tr>
<td>Rationale of Change:</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td></td>
</tr>
<tr>
<td>Manager:</td>
<td></td>
</tr>
<tr>
<td>Priority:</td>
<td></td>
</tr>
<tr>
<td>Status:</td>
<td></td>
</tr>
</tbody>
</table>

### Brainstorming Phase

<table>
<thead>
<tr>
<th>Brainstorming Phase</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Solutions:</td>
<td>Evaluations:</td>
</tr>
<tr>
<td>Solution 1:</td>
<td></td>
</tr>
<tr>
<td>Solution 2:</td>
<td></td>
</tr>
<tr>
<td>Solution 3:</td>
<td></td>
</tr>
<tr>
<td>Solution 4:</td>
<td></td>
</tr>
<tr>
<td>Choice of Solution:</td>
<td></td>
</tr>
<tr>
<td>Decision for Action:</td>
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</tr>
</tbody>
</table>

### Implementation Phase

<table>
<thead>
<tr>
<th>Implementation Phase</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Deadline:</td>
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</tr>
<tr>
<td>Actor/Supplier:</td>
<td>Action:</td>
</tr>
<tr>
<td>Actor/Supplier 1:</td>
<td></td>
</tr>
<tr>
<td>Actor/Supplier 2:</td>
<td></td>
</tr>
<tr>
<td>Actor/Supplier 3:</td>
<td></td>
</tr>
<tr>
<td>Actor/Supplier 4:</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>

### Evaluation Phase

<table>
<thead>
<tr>
<th>Evaluation Phase</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Status:</td>
<td></td>
</tr>
</tbody>
</table>
## Effects on existing Architecture

<table>
<thead>
<tr>
<th>Affected Unit:</th>
<th>Description of Effect:</th>
<th>Affected Component:</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected Unit 1:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected Unit 2:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected Unit 3:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected Unit 4:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Effects on existing Performance

<table>
<thead>
<tr>
<th>Affected Type of Performance:</th>
<th>Description of Effect:</th>
<th>Impact (in %):</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Perspective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer Perspective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff Development Perspective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Process Perspective</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
G. The Triple Performance Index Methodology

The Triple Index suggests that organizational performance can be measured with three ratios: actuality, capability and potentiality which are defined by Beer as follows:

Actuality: What an organization manages to do now, with existing resources, under existing constraints.

Capability: What an organization could be doing still right now with existing resources, under existing constraints, if its’ members really worked at it.

Potentiality: What an organization ought to be doing by developing its resources and removing constraints, although still operating within the bounds of what is already known to be feasible.

If we take a very simple example of a hotel unit, the actual room sales of the last month were 70000 Euros, with an occupancy rate of 70%. If occupancy rate was 100% the maximum capability of the hotel would be 100000 Euros. If Management invested in new equipment and improved its services, the average rate of a room could increase and consequently the monthly room sales could reach the potential of 140000 Euros.

Beer then defines operational performance as the ratio of actuality and capability; latent performance as the ratio of capability and potentiality and organizational performance as the ratio of actuality and potentiality, and also the product of latency and productivity (Figure 4.8). Therefore, the main value of using the Triple Index is the monitoring of the change of the three measures through time, which actually correspond to the fit of the organization to its environment.
Figure 66: The Triple Index