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# Information system due diligence data as an input for knowledge management

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## Abstract

*This paper presents a study on how to use a specific information system due diligence framework (ISDDF) to facilitate information system knowledge management. More specifically, the study demonstrates how to collect relevant and important data on the current state of the organization's information system in an efficient way, and how these data can be useful in the initial phase of the information system knowledge management life cycle. General information system due diligence can be seen as an explanatory theory that helps the stakeholders to obtain detailed information on what, how, why, when, and where, all concerning the matters of their information system. In contrast, the initial information system due diligence only acts as a prediction theory that helps the stakeholders to get a high-level picture on the current and desired state of the information system. The article outlines definitions of due diligence, various information system due diligence types and briefly presents the ISDDF, which was founded in Slovenia several years ago for conducting information system due diligences in financial industry. With this framework information system due diligence can be conducted in a very short time frame in a small or large-sized organization. The paper presents the hypothesis that the ISDDF can be applied as a knowledge collection tool in knowledge management life cycle. In order to prove this hypothesis, general information system due diligence activities were carried out in two organizations. Moreover, the paper describes a case study of information system due diligence in the selected organization. Finally, the results of this case study are presented and they confirm the hypothesis that the Framework is also suitable for knowledge collection in different organizations.*

**Keywords:** Information system, due diligence, framework, knowledge management

## Introduction

The next step beyond data and information is knowledge (Gray, 1999). Nowadays organizations recognize that knowledge constitutes a valuable intangible asset for creating sustaining competitive advantage (Tsai & Cheng, 2012). Gray (1999) argued that knowledge is imbedded not only in people, but also in documents, repositories, and organizational routines, processes, practices, and norms. Knowledge is an asset, but its value is much harder to assess than that of physical assets. Tacit knowledge is known as knowledge that resides in individuals within each organization, and successful knowledge management has to convert this knowledge into explicit codified knowledge in order to be effectively stored and shared within the organization (Nonaka & Takeuchi, 1995). Tsai and Cheng (2012) argued that knowledge sharing in the high technology industry, and in particular in information technology departments (ICT), is a key

component of organization's knowledge management strategy. Sharif and Al-Karaghoul (2011) argued that it is now an undisputed fact that we are living in the knowledge age – yet there are still some open issues as to where and how knowledge can be used efficiently and effectively.

Knowledge management efforts in organizations are focused on improved performance, competitive advantage, better innovation, sharing the experiences and lessons learned integration and continuous improvement. Literature review of knowledge management presents different phases of knowledge management (Sedera, 2009). The granularity of the frameworks varies from three to seven. The first phase is usually creation / collection / generation or acquisition of knowledge.

There is a question on how to generate the knowledge either from within or outside the organization (Mehta et al., 2003). Knowledge management is a natural progression from data and information management. This management is an important new area for both organizations and information systems (IS). IS has a major role in providing the needed technology and infrastructure (Gray, 1999). And as Ray et al. (2012) argued, knowledge becomes a valuable organization asset only when it is stored and shared via organization's IS.

Majority of organizations are faced with the issues of ICT governance. Marks (2011) argued that ICT governance is, or should be an integral part of enterprise governance. Hamaker and Hutton (2005) argued that executive enterprise governance functions with respect to ICT also include - responsibility for the ownership of business decisions related to ICT by the degree of knowledge management implementation (intellectual property, record managements, etc). Remus (2012) argued that poor knowledge management has been considered a failure for enterprise resource planning projects. On the other hand knowledge management is a vital part of ICT Service delivery. As Anantha Sayana (2005) mentioned, a good knowledge management system can help resolve problems quickly and can be a trigger for many preventive actions. In order to obtain effective information on the status of ICT, ICT project or IS in general, organizations can perform IS due diligence activities.

One way to collect and identify the knowledge within the organization is to deliver due diligence. There are several approaches on how to deliver due diligence, for IS due diligence there are not due diligence approaches used worldwide. In Slovenia we have developed a framework for information system due diligence.

This paper is organized as follows: first data collection through IS due diligence is described. Then Slovenian's IS due diligence framework is presented. Within the next chapter two case studies are described. Finally, the conclusion and limitations are presented.

## **Gathering Data**

ICT due diligence is an IT analysis whose aim is to obtain information about the current status of ICT: assets, resources, processes, documentation, regulatory compliance, risk identification, etc. Since ICT due diligence does not review just ICT areas but also has a much wider scope, the

term IS will be used in this paper. An IS due diligence can be an IS analysis, type of IS audit or even an IS research. The IS audit is primarily designed to determine the status of controls and risk management in this area, while due diligence, among other things, brings added value to IS financial assessments of the status of the organization in addition to risk identification and the description of processes and information resources. In addition, compared with an IS audit, IS due diligence provides an opinion on human resources, SWOT (Strengths, Weaknesses, Opportunities, & Threats) analysis and also information about the knowledge in the organization. In a way, IS due diligence is an upgrade or enlargement of an audit. IS due diligence may not go into details of the existence of IT controls, but brings added value due to the previously noted differences.

There are several types of IS due diligence: *General*, *Initial*, *Technology*, and *Vendor*.

IS due diligence may be referred to as “*general*” when it is used upon the request of stakeholders or an organization’s top management to get the status of an important part of IS or complete status of IS in the organization in terms of their objectives (e.g. vision, strategy, tactical plans, knowledge, etc.). Generally, the “*initial*” IS due diligence should be conducted prior to the merger & acquisition of any organization, irrespective of the industry or region of the globe. This activity should protect investors and shareholders from making any wrong decisions or underestimating their resources before acquiring the target organization. These activities also result in knowledge collection in the observed organization “*Technology*” due diligence (Andriole, 2007) is performed on prospective technology investments. Andriole’s explanation of technology DD is: “... the process by which alternative technologies and technology services are vetted” (p. 371). With these activities also the knowledge about specific knowledge within organization is analyzed.

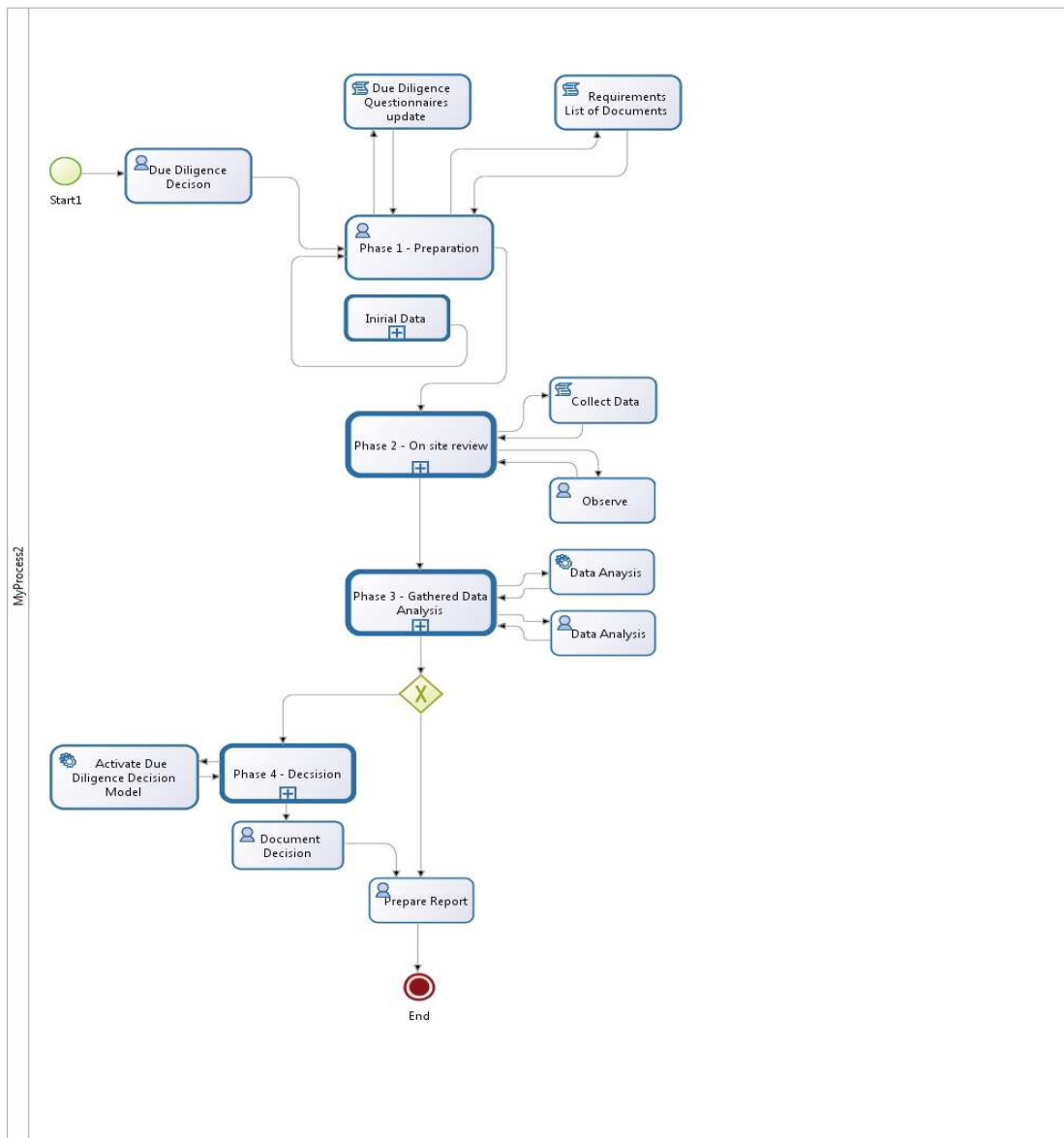
When an organization is deciding to outsource some or even all its IS processing activities, ‘*vendor*’ IS due diligence (Bayuk, 2009) should be performed prior to the actual IS outsourcing and also afterwards on an annual basis to mitigate the risks related to IS and data exposure. These activities also result in knowledge collection in the potential outsourced organization. For knowledge management data collection / creation and capture within the organization, general IS due diligence could be the proper method.

### **Framework for Information System Due Diligence**

From 1998 to 2012, we conducted more than 40 general IS due diligence and more than 25 initial IS due diligence engagements in Central and Eastern Europe, mainly in developed countries but also in some transition economies. The term transition economy refers to economies that are in transition from a communist style central planning system to a free market system (Roztocki & Weistroffer, 2008). Through the engagements enough data were gathered to form sufficient basis for the tools required for our IS due diligence approach, regardless of the individual country where IS due diligence was going to be performed was in.

The ISDDF is not a completely new method to be put alongside the others, but it is an attempt at creating a comprehensive synthesis method using the existing approaches. In a way it is an

integration of good practice in individual smaller areas into a comprehensive method. Our framework was created in a similar way to ITADD, although it all started in the late 20th century with a simple questionnaire as a list of IT assets, and then (with information obtained by the integration of IT Infrastructure Library (ITIL) best practices) it was updated regularly with audit techniques (Control objectives for Information and Related Technology (COBIT), & Committee of Sponsoring Organization of the Treadway Commission (COSO) and other publications that began to appear on the World Wide Web in the early 21st century.



**Figure 1:** Process part of approach for information system due diligence

This framework consists of four phases: preparation, realization / on-site review, analysis, and decision. Each of these phases involves specific activities, sub-processes, supporting documents (questionnaires, templates, etc.), and results. The time frame for each phase may vary depending on the size of the observed organization, the location(s) and available documentation. The ISDDF allows the IS due diligence process to be conducted in a relatively short period of time. Figure 1 graphically illustrates various phases of the framework, with the rough time estimates required for each phase. At the same time this figure also indicates the inputs and outputs for each phase.

The knowledge data information is gathered in the first and second phase. The IS Status questionnaire is sent, in the first phase in advance, to ICT manager to fulfill all the data. The questionnaire contains several questions regarding documentation, processes, resources among which are human resources, their experiences, responsibilities, intellectual property and others, which are somehow basic for organizational internal and tactic knowledge. This questionnaire is optimally fulfilled by ICT manager and his/her team. The rest is completed by the ICT manager and IS due diligence team during the on-site review, where the IS Status questionnaire is updated during interviews and on site data gathering. The IS Status questionnaire is divided into 12 chapters. It is in Microsoft Excel with 13 sheets, from empty to converted to the document it exceeds more than 50 pages. At the end of the IS due diligence from the site visit this document has between 80 to 110 pages or even more. During the IS due diligence the IS due diligence team also prepare SWOT evaluation for the organization's IS.

## **Case Studies**

The ISDDF was evaluated with an observational method during general IS due diligence activities carried out in financial industry organizations in Bulgaria (Case Study A) and in one non-financial organization in Slovenia (Case Study B). When conducting the IS due diligences, we used all of the approach's predefined processes, activities, procedures, questionnaires, templates. The fourth phase of the ISDDF was not used as these IS due diligences were general IS due diligences.

In case study A, general IS due diligence was conducted in May 2008 in three phases excluding decision-making in phase 4 (Figure 1). The observed organization was a small financial institution, i.e. universal bank. On-site IS review lasted three working days. The total time spent to complete the general IS due diligence carried out according the proposed approach was seven man-days. Analysis of the different data sets and questionnaires revealed the following results. The Strengths and Weaknesses questionnaire analysis contained 11 answers (3 from IS experts and 8 from end users), which comprised 30.56% of all employees. This questionnaire did not show major differences in answers. The average mark was fixed at 2.44. This revealed that there was considerable room for improvement. The calculated IS risk degree was 2 and calculated product diversity degree was 15. General IS due diligence produced 22 findings with 34 recommendations, which was presented to and discussed with the local management, and was well accepted. Some of them were related to knowledge as well.

An action plan for implementation of the recommendations was prepared and all recommendations were implemented in the following year. Answers to the questions about the status of the IS after the improvements have been implemented show that as a result of due diligence all the recommendations have been implemented, information security has improved, and the system is more stable now. They also started some activities to implement knowledge management but a very basic one. The documentation drawn up during the IS due diligence is in use and was met with approval by internal and external auditors.

In case study B, where the observed organization was a non-financial institution, the situation was completely different. Some questionnaires needed to be adapted to the industry, which was done quickly. Delak and Bajec (2012) presented the activities in detail. The greatest difference was that in the above-mentioned financial organization where 3 – 8% of employees were ICT specialists and others were ICT end users. In the non-financial organization the ratio was almost reverse; only 9% of employees were ICT end users and the other 91% were ICT specialists.

In case study B general IS due diligence was conducted in January and February 2012 in three phases excluding decision-making in phase 4 (Figure 1). On-site IS review lasted six working days. The total time spent for complete general IS due diligence provided by the approach was thirteen man-days. Analysis of the different data and questionnaires revealed the following results. The Strengths and Weaknesses questionnaire analysis contained 21 answers (15 from IS experts and 6 from end users), which comprised 18.75% of all employees. This questionnaire did not show major differences in answers. The average mark was 2.44. This revealed that there was considerable room for improvement. The calculated IS risk degree was 6.1. General IS due diligence produced 52 findings with the same number of recommendations categorized in four groups – high important (14 from 52), medium important (22 from 52), important (13 from 52) and the rest as less important. Some of them were related to knowledge, knowledge transfer and knowledge sharing as well.

All the findings with recommendations were presented to and discussed with the local management, and were well accepted. An action plan for implementation of the recommendations was prepared and all the recommendations with high and medium recommendation's level were implemented in one year. Answers to the questions about the current IS state are: the result of due diligence showed that all the recommendations with higher and medium recommendation's level were mostly realized, information security has improved, and the system is more stable now. Top management is aware of the level of knowledge sharing and they are preparing a project to implement knowledge management. There are still some important and less important recommendations to be realized.

Information regarding knowledge and knowledge management was gathered through the predefined ISDDF questionnaires and interviews. Knowledge management was not in place in any of the organizations and there was no Chief Knowledge Officer (CKO) appointed either.

## **Contribution**

The presented framework is not a completely new method to be placed alongside others, but an attempt at creating a comprehensive synthesis method designed on the basis of existing approaches and extensive personal experience. In a way, it is an integration of good practices from individual smaller areas in a comprehensive method providing solutions for areas that were in the past considered too complex for rapid due diligence into a simple decision model. The main benefit of this paper is the finding that the ISDDF can also be used for gathering data about knowledge in the organization. As Sedera (2009) described different activities for the first phase of knowledge management life cycle, ISDDF can be used for creation / collection / generation of knowledge. The ISDDF can also be used for knowledge gathering within initial IS due diligence activities (Delak & Bajec, 2013).

The results indicate that the framework supports differences in individual units of the observed organization in different countries might have: the level of IS implementation, maturity of the implemented IS, organizational approaches to the IS, cultural differences, processes supported by IS, etc. But, as the case studies show, all these differences do not influence the ISDDF. This indicates that the framework is designed in a way that allows for differences.

Nagm et al. (2009) aimed to demonstrate that IS evaluation methodology in practice has a dual nature; that it is simultaneously science and art. These case studies confirm their findings, as ISDDF is an IS artifact and it can be effectively used in practice. Some initial information about knowledge, knowledge sharing and employees attitudes can be collected with this approach. Budai et al. (2007) explained that the SWOT methodology should be used in the first step for selecting the knowledge management projects. The ISDDF also uses SWOT methodology for organization evaluation and the results are presented in the IS due diligence status reports.

Several factors are to be considered before fully confirming the ISDDF as a general approach for due diligence and the tool for knowledge gathering. First, the case studies were only carried out in Central and Eastern Europe. Even though the ISDDF was developed based on our experiences from conducting due diligences mostly in developed countries, it still needs formal verification for these countries. Second, organizations planning to implement knowledge management should use this tool in the first phase of knowledge management life cycle. Third, some experiences should be obtained from IT specialists using the framework to get additional ideas on how to enhance the framework. Fourth, an automated tool for data analysis will replace the existing spreadsheets in the framework's analysis phase.

## **Conclusion**

IS due diligence is similar to the IS audit process; however due to its inherent complexity, it requires the approach presented in the paper for its delivery. The ISDDF represents a comprehensive approach that can be used for IS due diligence activities that need to be done in a short period of time. The integrated decision model used in our approach is a novelty compared

with other approaches and it provides clear answers to the persons who have ordered IS due diligence and intend 'to invest' or 'not to invest' into the reviewed organization.

The approach presented in the paper offers a detailed description of the IS due diligence process, clearly defining the procedures for each phase of review, the tools (questionnaires) and the report templates that guide the IS due diligence performers and enable an efficient presentation of IS due diligence findings. Using the ISDDF, due diligence activities can be performed more easily and in a more systematic manner, which was one of Bhatia's (2007) findings identified for IS due diligence frameworks. In addition, these activities contribute to collection or better identification of knowledge, as this framework is intended for short and rapid IS due diligence exercises. The knowledge collection, creation and generation take much more time than is reserved for ISDDF.

The main contribution of this paper is the finding that ISDDF provides for identification of knowledge, presence of knowledge transfer level and SWOT analysis. These findings were confirmed through two studies presented in the paper. The approach presented in the paper could be used for further research in this area and development of another, more mature approach, which would clearly indicate the alternatives, deficiencies and guidelines on how to evaluate, validate and present them.

Our future work includes an in-depth analysis of ISDDF components (e.g. IS risk evaluation, product diversity evaluations, knowledge management), the data analysis part will be upgraded with automated data analysis tools and analysis of different new due diligence delivery approaches will be undertaken regularly. Moreover, this framework will be tested in knowledge management implementation projects - in the first phase where knowledge identification activities are planned. The applicability of the ISDDF and its generalizability will be further validated by studies focused on its application in financial and also non-financial organizations in Europe and even outside Europe.

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## Biographies

**Boštjan Delak** received his PhD in 2012 at the Faculty of Computer & Information Science, University of Ljubljana, Slovenia. His topic was due diligence. He works as a senior consultant for IS advisory and IS audit at ITAD, Technology Park Ljubljana, Slovenia. In 2004, Boštjan was appointed Certified Information System Auditor and in 2008 he received certificate for CIS Information Security Manager. From 1998 till 2012, he had delivered more than 65 IS due diligences in 15 countries across Central and Eastern Europe. His research interest is IT due diligence.

**Marko Bajec** is an Associate Professor at the Faculty of Computer & Information Science, University of Ljubljana, Slovenia. His past research concerned the problem of IT Governance and, specifically, the problem of high failure rate in IS development. He has developed different approaches and methods that help measure, formalise, and improve the process of software development. He has received several awards and recognitions for his achievements in transferring knowledge to industry. Since 2009, Marko Bajec is the Head of Laboratory for Data Technologies where he manages research in the fields of data integration, analyses and visualisation.