A Pragmatic Risk Assessment Method Supported by the Business Model Canvas

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Abstract: This paper presents a pragmatic risk assessment method based on best practice from the ISO 31000 family of standards regarding risk management. The method proposed is supported by established risk management concepts that can be applied to help a data repository to gain awareness of the risks and costs of the controls for the identified risks. In simple terms the technique that supports this method is a pragmatic risk registry that can be used to identify risks from a Business Model Canvas of an organization. A Business Model Canvas is a model used in strategic management to document existing business models and develop new ones. The risk assessment method is then applied to a Civil Engineering Laboratory to illustrate the benefits of such a method.

1 INTRODUCTION

The purpose of this research is to make good use of risk management concepts to raise awareness of repository costs of digital curation. Costs are what we have to give up for controls, which in turn are the measures that we have to put in practice to minimize loss or to maximize gain. In that sense, a control is anything we are considering applying to either minimize negative impacts or to take advantage of opportunities to produce value and thus bring gains. However, we must also agree that, in most of the usual digital curation scenarios, it is usually very difficult to estimate the absolute value of an asset. For that reason, we are here ignoring the measurement of value, and focusing only in the identification of controls as the source of costs.

The technique behind this method analyses an archive with the support of a risk registry and is based on Business Model Canvas (BMC). A BMC allows organizations to fill their business model in a visual canvas that allows for easy understanding of their business in nine building blocks. The motivation behind it is to understand both what can positively affect the value propositions of your business (opportunities) and what can negatively affect those same value propositions (risks).

The idea is to identify and understand the risks and their impact (positive and negative) on each of the nine building blocks of the BMC. We demonstrate how the BMC technique can be used in the method above to find risks and then controls for those risks. This in turn makes it possible to estimate the related costs as part of the overall costs of curation. Digital curation "involves maintaining, preserving and adding value to digital research data throughout its lifecycle. The active management of research data reduces threats to their long-term research value and mitigates the risk of digital obsolescence." (DCC, 2014) The main steps done are:

1. Formulation of related risk questions: for each of the building blocks of BMC some questions are provided to facilitate the identification of risks for each of the building blocks.

2. Generic Risks and Controls for the Generic BMC: after the formulation of the risk questions, the next step is to identify the related risks, and then the respective controls.

Generic risks and controls were identified after analyzing the results of the DRAMBORA (DCC/DPE, 2007) report. The risks and controls that better align with the generic BMC model were selected.

The result is a generic BMC, with an associated generic registry of risk questions and common related controls, relevant for the domain of digital curation to cost evaluation. The pragmatic method was applied to estimate costs of curation focusing on risks and controls to three case studies: two data archives and one web archive. However due to space restrictions this paper focus on just one case. The other cases are available at http://4ctoolset.sysresearch.org.

In conclusion, our contributions here proposed for the digital curation problem are:

- A pragmatic method for risk assessment, based on the main references from the risk management domain;
- A generic BMC for the business of an OAIS repository: This BMC can serve as template for organizations where digital curation has an important role, which can make local instances of it;
- A generic risk registry for scenarios of OAIS repositories, created after analysing DRAMBORA (DCC/DPE, 2007) and comprising.

This paper is structured as followed. Section 2 presents the related work on the topic of the paper. Section 3 details the method used to extract and identify risks based on a BMC of an organization. Section 4 presents the generic BMC for Digital Curation based on the Open Archival Information System (OAIS). Section 5 details the collection of risks extracted from DRAMBORA. In Section 6, a case study and the application of the method are presented. The paper in finalized by presenting the conclusions.

2 RELATED WORK

In this section we present the relevant related work on the topic this paper addresses, namely risk management and the business model canvas.

2.1 Risk Management

The main references on Risk Management (RM) from the International Organization for Standardization (ISO) are:

- ISO Guide 73: Vocabulary for risk management (ISO, 2009);
- ISO 31000: Risk management principles and guidelines (ISO/FDIS, 2009a);

- ISO 31004: Risk management—Guidance for the implementation of ISO 31000 (ISO/TR, 2013);
- IEC 31010: Risk assessment techniques (ISO/FDIS, 2009b).

According to those sources, organizations (that find RM relevant to their governance) should define an internal RM process taking as a starting point the generic method proposed in ISO 31000 (ISO/FDIS, 2009a). IEC 31010 catalogues a set of techniques for risk assessment (ISO/FDIS, 2009b).

Controls are measures implemented by organizations to modify risk that enable the achievement of objectives. Controls can modify risk by changing any source of uncertainty (e.g. by making it more or less likely that something will occur) or by changing the range of possible consequences and where they may occur." (ISO/TR, 2013)

So, even if we are not following a specific RM method as part of the governance framework of a repository, we cannot avoid having to deal with the identification of risks and controls. However, as a complete RM methodology can be complex and expensive to implement, we are here proposing a simplified method that can be used at least for a preliminary phase of costs estimation. If, after the application of this method, the stakeholders of a repository feel the RM principles are valuable for the governance of their case, and it is worthy to consider a proper and full RM method, then at least these preliminary results can be reused for that purpose.

The definitions for risk management are defined in the ISO Guide 73. (ISO, 2009) Figure 1 provides a view of Risk Management as a conceptual map.

2.2 Business Model Canvas

The Business Model Canvas (BMC) is a model used in strategic management to document existing business models and develop new ones. (Osterwalder, 2009) A BMC comprises nine building blocks that describe an organization, as illustrated in the Figure 2.

The BMC is designed to "allow a group of people to fill it in through brainstorming sessions and thus create a relevant understanding of their business model." (Osterwalder, 2009) At the end of such a process each block must have at least one shared assumption about the business. It is even possible to develop more than one BMC in order to represent different, alternative views of the business.
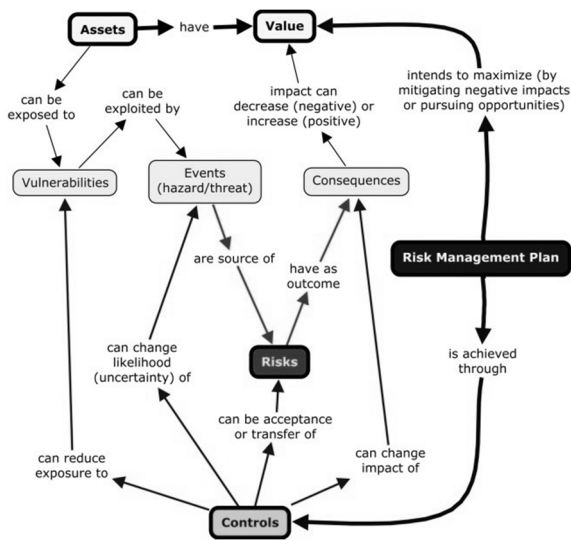
Figure 1: Conceptual map showing controls as the cost entities in a risk management perspective.

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segment
	Key Resources		Channels	
Cost Structure			Revenue Streams	

Figure 2: The generic structure of a Business Model Canvas.

The BMC was first proposed in Osterwalder thesis ("The Business Model Ontology—A Proposition in a Design Science Approach"). (Osterwalder, 2004) After that, several authors developed or adopted this canvas approach for other purposes, such as, the Lean canvas (LeanStack, 2014). In the meantime it has been suggested that doing a BMC exercise is already in some sense performing a risk assessment (Parrisius, 2013) (McAfee, 2013).

Some authors have gone even further and proposed the hypothesis that the BMC concept can even be extended to support a pragmatic risk analysis. This is illustrated in (Schliemann, 2013) where the author scopes the business model risk canvas. The motivation behind it is to understand both what can positively affect the value propositions of your business (opportunities) and what can negatively affect those same value propositions (risks).

The idea is to identify and understand the risks and their impact (positive and negative) on each of the nine building blocks of the BMC, as well as the risk appetite of the stakeholders upon which a business depends. Stakeholders in this context can be regulators and investors. There is a huge body of knowledge from the risk management community on how to assess and measure risk through analytical tools but this new technique fills the need to introduce risk assessment at a higher level, scoping it visually in consideration for each of the building blocks of the BMC.

When applying this technique to identify the risks and their impact there should be a series of risk-related questions for each of the nine building locks of BMC. Simple examples of these questions
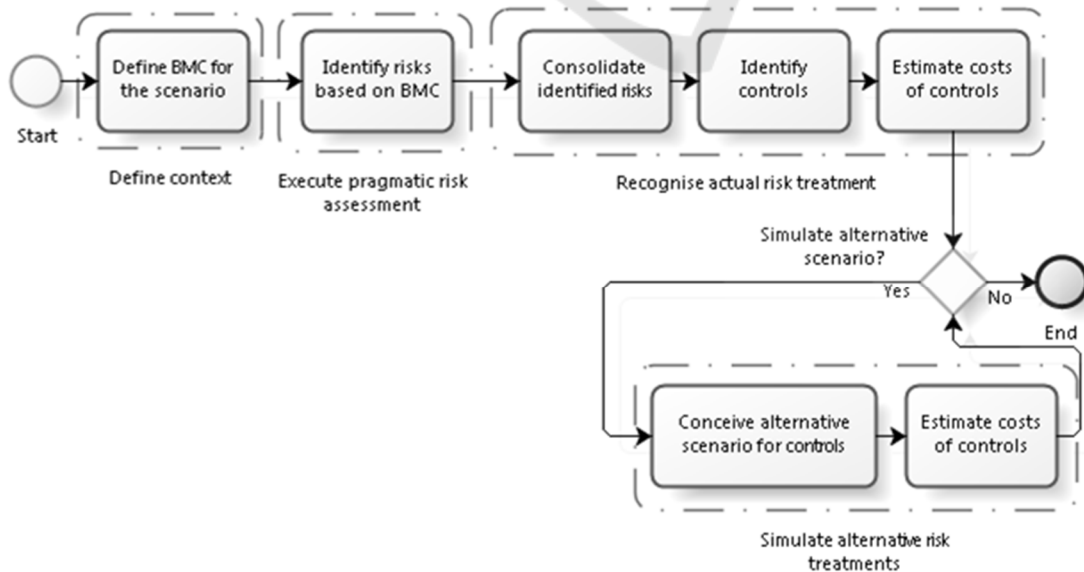

Figure 3: BPMN diagram of the pragmatic method to estimate costs of curation focusing on risks and controls.

are proposed in the original business model risk canvas, but for real use these should be scoped for the business in question.

3 A METHOD TO IDENTIFY RISKS BASED ON A BMC

This section describes a method for estimating costs of curation in two different scenarios:

- "Current" scenario, where the costs of controls already exist in the repository as a means to reduce the impact of a consequence of a risk, change the likelihood of an event, or reduce the exposure to a vulnerability;
- "Future" scenario, where the costs of controls do not yet exist, but where repository managers are able to consider alternative scenarios of repository governance.

The foundations of this method draw from relevant sources, such as the ISO 31000 standard and the Business Model Canvas (BMC).

The core stages of the method are:

1. Define the Context: Define the requirements of the main elements: the organisation (mission, etc.); the assets (data and services), and the external stakeholders— and, for each of these elements define the BMC for the scenario.
2. Execute a Pragmatic Risk Assessment: Use

a risk repository, or consult experts, in order to identify relevant risks associated with the BMC.

3. Recognize Actual Risk Treatment (the "Current" scenario):
   o Consolidate the risks identified (mainly, to detect repetitions and overlaps). Note: This is probably the best stage to identify potential positive impacts (if the identification of positive impacts is desired).
   o Use internal information, and (if necessary) also consult a risk repository or experts, to identify the controls to apply for the consolidated risks.
   o Estimate the costs for these controls (the ideal is to calculate these costs precisely, however, best estimates can also be useful).
4. Simulate Alternative Risk Treatments (an optional activity, to be executed as many times as needed, to explore possible alternative "Future" scenarios):
   o Use internal information, eventually also consulting a risk repository or experts, and according to the businesses strategic view and governance rules, conceive alternative scenarios for controls of the identified risks. Note: This is probably the best stage to explore
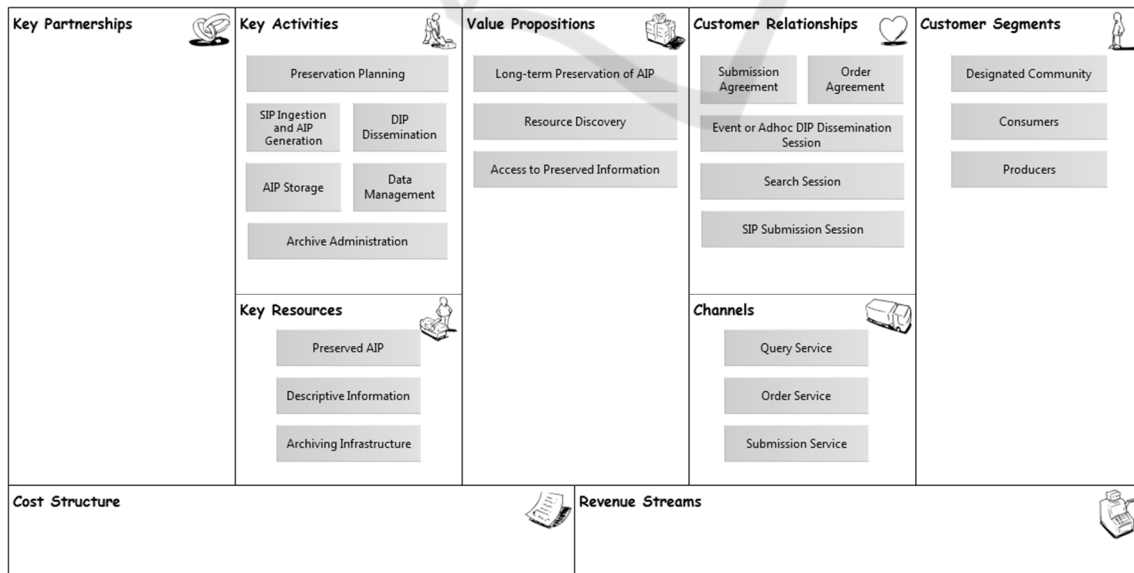

Figure 4: The generic BMC for OAIS.

opportunities to exploit positive impacts (if the exploitation of positive impacts is desired).

o Make your best estimate for the costs of this new scenario.

Steps 1 to 4 are illustrated in Figure 3 in the form of a business process diagram (expressed in the BPMN – Business Process Modelling Notation language).

4 GENERIC BMC FOR DIGITAL CURATION BASED ON THE OAIS

The purpose of this BMC is to represent a generic Business Model that can be applied to Archives, serving as a template that can be instantiated to specific organizations. To develop the OAIS BMC the recommended practice CCSDS 650.0-M-2 from the Consultative Committee for Space Data Systems (Magenta Book) was used. The objective of this BMC is that organization which have archival as one of its core services can use this BMC to build its business model by instantiating it to their context.

Figure 4 depicts the generic BMC based on OAIS. For details on the BMC please visit http://4ctoolset.sysresearch.org, under OAIS Template. The BMC uses definitions from OAIS (CCSDS, 2012).

5 RISKS AND CONTROLS REPOSITORY

Generic risks and controls were identified after analysing the results of the DRAMBORA (DCC/DPE, 2007) report. The Digital Repository Audit Method Based on Risk Assessment (DRAMBORA) represents an effort to conceive criteria, means and methodologies for risk assessment of digital repositories. The risks and controls were selected and can be found at the Holirisk tool in http://4ctoolset.sysresearch.org a sample is provided in Table 1

Table 1: Generic risks and controls identification.

Id	Generic risks	Generic controls
R1	Business fails to preserve essential characteristics of digital assets	Define main characteristics of digital content for information preservation
R2	Business policies and procedures are inefficient	Document and make available business policies and procedures
R3	Enforced cessation of repository operations	Plan for continuation of preservation activities beyond repository's lifetime
R4	Activity allocates insufficient resources	Use mechanisms to measure activity efficiency in terms of allocated resources, procedures and policies
R5	Community requirements change substantially	Identify, monitor and review the understanding of the community requirements and of the repository objectives
R6	Community feedback not received	Use mechanisms (e.g. email, surveys) for soliciting feedback from repository users community
R7	Community feedback not acted upon	Define policies to acknowledge community's feedback
R8	Loss of key member(s) of staff	Appoint a sufficient number of appropriately qualified personnel
R9	Personnel suffer skill loss	Implement mechanisms to identify ongoing personnel training requirements
R10	Budgetary reduction	Define a financial preservation plan to assure self-sustainability of repository
R11	Software failure or incompatibility	Install software updates
R12	Hardware failure or incompatibility	Monitor hardware performance
R13	Obsolescence of hardware or software	Maintain hardware/software up to date to meet repository objectives
R14	Media degradation or obsolescence	Allocate resources to monitor media storage lifetime and assess potential value of emerging technologies
R15	Local destructive or disruptive environmental phenomenon	Implement physical security measures (e.g. video-record)

Id	Generic risks	Generic controls
R16	Non availability of core utilities (e.g. electricity, gas)	Define internal means to nullify disruption of service, monitor and review contract agreements of provider's services
R17	Loss of other third-party services	Document and review service level contracts or service commitments with utility provider
R18	Loss of authenticity/integrity of information	Monitor, record and validate integrity of received content

6 CASE STUDY: CIVIL ENGINEERING LABORATORY

The Civil Engineering Laboratory is a public Science and Technology institution, which is subject to Government supervision. Its activity is developed in the various fields of civil engineering and its main assignments are the execution, supervision and promotion of scientific research and technological developments to achieve progress, innovation and good practices in civil engineering. The institution is

also responsible for providing an unbiased and suitable scientific and technical support to the executive power, in its governing and regulatory activities. The laboratory undertakes research in the following areas:

- Usage of monitoring technologies to gather observation data and automatic communication systems;
- Risk analysis of dam construction and operation;
- Characterisation and modelling of future deterioration of dams and their foundations.

The BMC presented here (Figure 5) is an instantiation of the generic BMC based on OAIS. For some of the objects in the canvas there are specific case-dependent instantiations of the object between square brackets. For example, if there is an object with Producers [Dam Owners] this means that for that specific case the producers are the dam owners. There are also objects in blue, this means that these objects were not present in the generic OAIS BMC and are specific for the case study depicted by the BMC.

For the other object that do not have neither square brackets nor are depicted in blue this means that these are present in the respective case however there is no need to provide an example as there is no added value in doing so and the OAIS definitions (from Section 4) cover their definition. The details
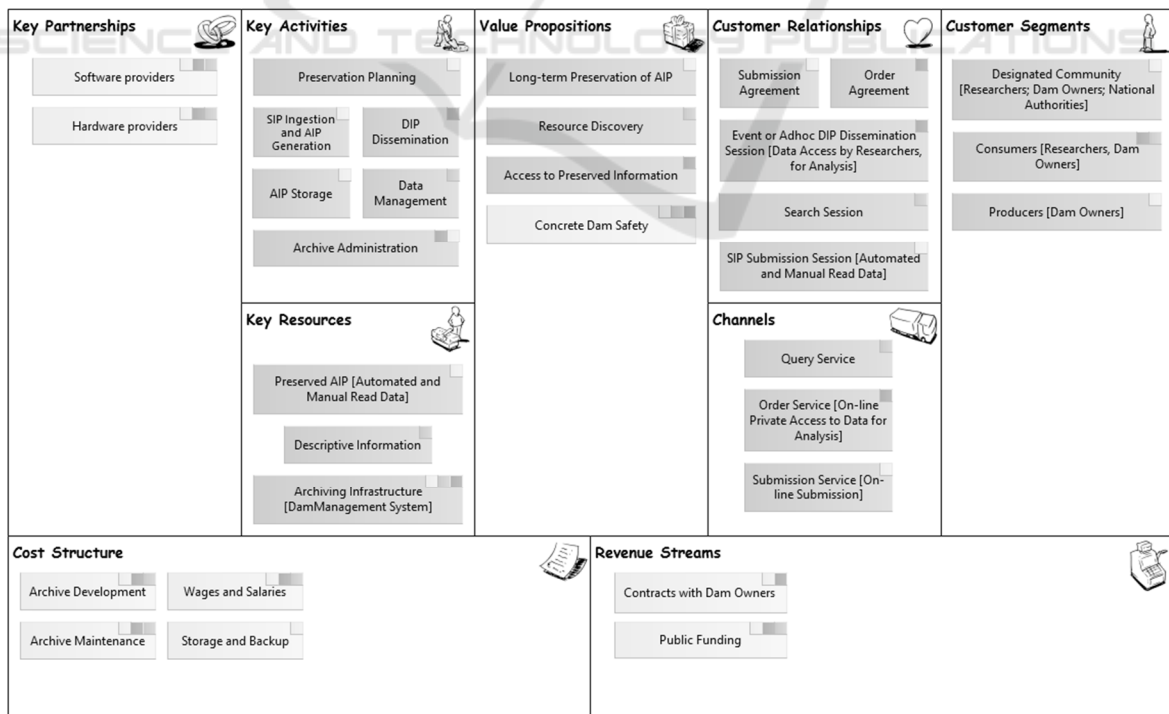

Figure 5: Civil Engineering Laboratory Business Model Canvas.

of the instantiation of the BMC for this case study can be found at http:// 4ctoolset.sysresearch.org.

The risks were identified through the analysis of the BMC for the case study and identified by their Id from Table 1. Regarding the controls for the risks identified, refer to Table 1. For a more detailed analysis of the risks and controls for both the case study visit the Holirisk tool in http:// 4ctoolset.sysresearch.org in the page of the BMC for this case study.

- **Revenue Streams** - Risks related to the worth of a repository business and the value it offers to the community: R10.
- **Cost structure -** Risks regarding the cost to support the repository business: R8; R13; R16; R18.
- **Channels -** Risks related to the communication and dissemination of the business provided by a repository: R6.
- **Customer Segments** - Risk that relates with what the repository should deliver within the community vision: R5.
- **Customer Relationships -** Risks associated with the community that makes use of the repository for their research work: R7.
- **Key Resources** - Risks related to the resources of infrastructure and personnel which sustain the repository business: R15; R3; R8; R9; R11; R12.
- **Value Propositions** - Risks regarding the vision and value of a repository: R1; R2.
- **Key Partnerships** - Selected risks regarding the outsourcing services repository may depend on to deliver the preservation business: R13; R17.

Using Table 1 and the detailed risks and controls from http:// 4ctoolset.sysresearch.org as well as the list of consolidated risks we can identify potential controls for the identified risks.

7 CONCLUSIONS

This paper proposed a pragmatic method for identifying risks from a Business Model Canvas which is based in two different scenarios, (1) "Current" scenario, where the controls already exist in the repository as a means to reduce the impact of a consequence of a risk and; (2) "Future" scenario, where the controls do not yet exist, but where repository managers are able to consider alternative scenarios of repository governance.

The foundations of this method make use of relevant sources of literature, such as the ISO 31000 and the Business Model Canvas. The focus of this paper was to present the method as a pragmatic technique, and provide some example for a case study. This paper also provided two tools to accomplish the goals of the method proposed: (1) A generic BMC, which can be used as a template for organization to instantiate to their specific context and (2) A risk registry for digital curation: a registry of risks derived, and also common related controls.

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