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Data Migration Between Web Content Management Systems

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Abstract

Web Content Management Systems (WCMS) have become necessary tools for today's web oriented business world. The data migration between Web Content Management Systems, consequently, is an issue that more and more companies and organizations have to deal with while changing from an older WCMS to a newer one. This article examines the migration options and makes some useful suggestions to help with the choice of the appropriate migration method of the content from one Web Content Management System to another. The research is supported by a survey conducted with a number of large companies and organizations. The conclusions can be taken into consideration in order to evaluate the different data migration approaches.

Keywords: *Web Content Management Systems, Web Publishing Systems, Data Migration, Migration Options*

1 INTRODUCTION

In today's world, enterprises tend to concentrate on web-centric business activities; therefore, the use of Web Content Management Systems (WCMSs) is becoming widespread and popular. The WCMSs gain ground as a necessary part in the structure of the enterprises' and organizations' information systems for managing their business data. The enterprises and the organizations, though, need to migrate the data between WCMSs for various reasons (Data Migration Best Practices; Vamosa, 2006a), such as:

- The existing system does not cover the needs for the increasing volume of the content, or the functionalities of the enterprise's current system are not sufficient.
- New, more cost-effective solutions are offered in the market.
- The WCMS vendors challenge their customers to upgrade the current platform to an updated one, in order to provide them with better support services.
- The existing software is too costly to provide Return On Investment (ROI).

The data migration process, however, is quite risky. The frequency, in which the migration procedure applies, does not guarantee its success. The statistics show that 83% of data migration projects either fail or exceed their pre-decided budget and implementation plan (IBM Business Consulting Services, 2006). This is rather unacceptable, since the content that needs to be migrated is, usually, of critical significance. For example, the case of a bank, in whose WCMS take place clients' money transactions, illustrates the importance of a flawless data migration. Loss of data or duplicated records is not excused in such cases.

There are a lot of risks that the enterprises should try to avoid by choosing the appropriate migration method. The problem is that the best way to perform data migration is unknown. This is due to constraints, such as time, cost, or availability of tool support and expertise, that apply in a given situation.

But, how can somebody determine the optimum solution for the specific migration project that needs to be conducted? What are the metrics, according to which the appropriate migration way can be chosen? This article tries to form the main factors that should affect the decision when it comes to the problem

of which migration method would be the most profitable for a specific enterprise or organization project.

In section 2 there is a literature review available, presenting the background of data migration research and experiment so far. Section 3 justifies the methodology being followed for this work using case studies, the results of which are given analytically in section 4. Finally, in section 5 we conclude with the points that should be taken into consideration when it comes to decide on the most appropriate data migration method from a WCMS to a new one.

2   BACKGROUND

In the article herein, three different approaches, which can be followed in the case of a data migration, are taken into consideration. These are the manual migration, the semi-automated migration and the automated migration.

2.1   Migration Options

2.1.1   The Manual Migration

Manual data migration is accomplished through a drag-and-drop or a cut-and-paste procedure (Vamosa, 2006b). It seems to be a convenient solution, since organizations do not need to invest in buying extra software and spend time on learning how to use a new technology just for the migration project. This holds under the condition that the volume to be migrated is not big, and there are not a lot of content and metadata changes from the source to the target system. Typically, organizations should follow this approach if they have a very good understanding of the content and have the relevant skill to do it easily (Vamosa, 2006a).

In any other case, manual migration is considered a lengthy and costly procedure. If the migrated web-pages are too abundant then the project needs a big amount of time units and hence, that causes waste of resources in the organizations and the enterprises. A long task ends up being tedious and, as long as human tolerance is concerned, a long and tedious procedure is usually vulnerable to errors. The possibility of lost and forgotten data is high and so, the migration is difficult to manage.

2.1.2   The semi-automated migration

There is always the possibility for the IT department of an enterprise/organization to build an in-house migration system if it is decided that it has the skills to do so successfully. Developing pieces of code that can automatically migrate the data from the old WCMS to the new one, or, at least, developing scripts that can help with automated parts of the migration, can help an enterprise or an organization with faster migration.

Such a process, however, can be extremely costly since it takes long time until the code is ready and does not guarantee successful results. The requirements needed to build the scripts are many: business requirements, technical specifications, correct building of scripts, quality assurance and stress testing. Full method of setting the requirements, also, needs to be taken into consideration: assessment of handling specific content types and applications to control all migration activities such as control of error reporting (Vamosa, 2006a). The return on investment is not sure, since after the data migration is complete all this work is useless. It is not a repeatable procedure, especially when the code is built exactly according to the very specific requirements of the current project- as it usually happens in order to be closer to a successful program.

2.1.3   The automated migration

This approach refers to the use of a specific tool that is usually a software packet built by another company, which can perform the migration automatically from the old system to the new one. The

automated migration procedure is expected to be a frequent option, because an automated tool assembles the following strong advantages (Vamosa, 2006a):

Achieves manual and scripted processes automatically. The use of a tool-based approach instead of a custom-made solution could be a quicker process since it does not require time and resources to build and assure the correct function of the software.

Efficient and Fast migration. The utilization of possible graphical environments, testing, changing of metadata or other functionalities might offer quick results, completing the migration faster comparing to a manual or semi-automated migration.

Flexibility. The tools usually are flexible to changes in the requirements while the project is in progress. Usually, they are dynamic solutions that can adapt to new formats or metadata changes that the customer might require.

Iterative and repeatable functions. The same tool can usually be used again after a migration is complete.

Ensuring quality of results. Frequent and iterative controls help with guaranteed migration without lost or corrupted data. The quality tests that most of the tools promise can help with advanced level of assurance.

The above characteristics, however, might not outweigh the problems that an automated solution incurs. Software licensing costs and investment in trainings and skills for the possibly complicated and sophisticated tools are some of them. Besides, the tools are not "self-handled"; there is always the need for somebody who handles the functionalities of the tool and, of course, for people who make the decisions on unexpected problems and the planning of the migration.

2.2   Literature Review

As far as data migration on an academic research level is concerned, there is some work published mainly from a technical perspective. In fact, one of the most relevant academic publications studied is about data migration and analysis in enterprise systems. It focuses on the suggestion of a migration schema executed as a result of best-in-class choices of technology in business that results in a collection of data management systems (O'Conor, 2005).

In addition, there are some paper reviewed about data migration between different types of devices instead of WCMSs. For example, there is an interesting publication with the involvement of Hitachi that searches for a data migration method between storage devices according to the value of the data; this value changes within time and after many uses of the applications, so the data need to be shifted in another device (Akira et al, 2007). In July 2000 was published a report suggesting a way for migrating different types of files within different stations in UNIX versions (Prestage et al., 2000).

There is, also, some work carried out regarding data migration on the low-level of designing a migration method. For instance, the topic of a scientific research conducted is the construction of an algorithm to compute an efficient plan for moving data stored on devices in a network from one configuration to another. The objective is to minimize the sum of completion times of all storage devices when the network is fixed (Gandhi et al., 2006). This article is based on a fundamental paper about earlier, basic experimental data migration algorithms (Anderson et. al., 2001).

Computer Economics, however, published an article last June claiming that, although some of the data migration aspects are technical in nature, the whole process should not be left to technicians. Due to lack of careful managerial supervision, "failures in data migration can cause project cost and schedule overruns, as well as quality problems." (Data Migration requires Process, Tools, and Expertise, 2008). The same authors believe that data migration is often under-managed and treated as a low-level technical activity, concluding, finally, with the suggestion that successful data migration requires crafting a competent plan, selecting tools and methodologies knowledgeably.

Tony Sceals and John Morris (2008), trying to form the four golden rules for successful migration, define data migration as a business issue- not a technical one. Rule number two, in addition, says that the best technical solution is not always the best business solution (Sceals et al, 2008). Besides, according to Michael Strange (2006), who makes suggestions about how to avoid data migration delays, "the technical issues can be complex, but at least they're predictable. It's the non-technical strategy that often causes delays down the road." (Strange, 2006).

Marc Kilburn and Gavin Harvett (2005) agree that data migration is a challenging process. They point out some issues that are critical to consider when choosing a productivity tool and they encourage some research by asking questions about reference projects that applied successfully a specific methodology or used a specific productivity tool to migrate data (Kilburn et al, 2005).

There are a few more publications available from the managerial perspective, limited though to the points of how to organize the data migration project (Chester, 2006) or to the concepts to be aware of in order to improve it (Bradley, 2007).

3   METHODOLOGY

It seems that the topic about examining the factors that influence the choice of the optimum migration solution between Web Content Management Systems is quite newly addressed to the research community, and there are currently scarce academic standards and very few official comprehensive studies. So, the conducted research is based on theory building from case studies (Eisenhardt, 1989). The case studies are helpful to gain deeper understanding about a specific phenomenon under investigation (Pousttchi et al., 2006). Anyway, it is recommended to gather data directly from people when it comes to a research work (Booth et al., 2003). The opinion of the people who are directly involved in a migration project is of high significance for the evaluation of the different methods.

3.1   Who we talked to

The practical research is conducted in the form of personal in-depth interviews with experts working within the field.

The participants in the interviews are:
- Web Content Management System vendors. They can give recommendations when it comes to a migration to their Web Content Management System. If they do not have any suggestion, they can tell what their customers usually prefer doing.

- Samples of companies/organizations that have conducted a migration project. These companies can give important feed for analysis, since they could explain explicitly which method they chose, why they chose this method in specific, what kind of difficulties they met and if they would suggest it for organizations that need to accomplish a migration with similar requirements.

- IT companies that take the responsibility to migrate their clients' data. They can suggest a variety of solutions and explain in which cases they use which method.

- Migration tool vendors. The vendors can contribute to the study with their perspective of what is special with their tool and its deficiencies.

In total, there are thirteen interviews made. They are conducted in a personal, face-to-face manner when possible, or via the phone. Talking with the interviewees helps to extract hidden feelings (disappointment, satisfaction, etc.) while they are answering. In addition, direct discussions can help the interviewer take more detailed replies and realize the burden of the information given.

There are no geographical restrictions about the companies/organizations preferred to be interviewed. The location of the company might be in different countries worldwide. Besides, nowadays, most of the well-known IT companies are located in the USA.

3.2   What we talked about

The conducted survey focuses on the practical issues, which pop-up in live cases of migration. The questions were formed after analysing the theory from the literature. Common issues that were highlighted in the academic papers or the industrial white papers were asked to the experienced interviewees for verification, rejection and description of the possible solutions. For example, they were asked about the way, they usually conduct the migration (manually/automatically/semi-automatically), and if automatically, which tool they use; about the duration of the migration, the volume of the information being transferred (number of sites, number of pages), the issues/problems with the migration, the existence of downtime while migrating the data. They were, also, asked to describe their latest migration project as a real-life example.

After the results of the interviews are gathered, a deductive approach is chosen to be followed. Classification and categorization of the results can help with a cross-case, qualitative analysis that, finally, can lead to valid conclusions (Eisenhardt, 1989).

4   CASE STUDIES RESULTS

The results gathered from the interviews are presented in the following section. There are tables showing detailed data from complete migration projects categorized by the company's business orientation.

4.1   Web Content Management System vendors

Open Text followed a semi-automatic way for its described project transforming the data using XML-based modules. On the other hand, Microsoft and Oracle followed a manual method. The Microsoft representative explains that, by saying manually, "we do not only mean a copy-paste procedure, but also rewriting the whole content in the new system".

The latter believes that most of the migration work is done manually due to the change in content. He explains that there always needs to be a business decision to make if the content should be migrated exactly as it is, changed, or to be completely removed. One of the most important pre-requisites for a successful migration is having a solid, well-organized content management system so as the migration can take place more smoothly and with less effort. Therefore, the business rules set for a migration would become simpler and easier to implement. The business requirements, finally, dictate what type of migration strategy should be adopted. According to his opinion, sometimes, it is cost-effective to buy third party migration frameworks like "Tzunami" and "Quest", and then add your own business logic to them, rather than creating a tool from scratch.

 In general, the Open Text representative agrees that the use of a migration tool depends on multiple criteria, such as the actual applications that need migration, the functionalities of these applications, what kind of change needs to be done to the metadata and the structural changes that need to be done. The main challenge in the migration process is the time consumption, and this is a big disadvantage of the manual approach.

Oracle, usually, prefers a mixed way for the migration: some parts are migrated manually- massaging and adoption of the data to the new systems- and some other semi-automatically- building a code for doing the transferring of the data. There is no specific tool or framework for this part of the migration, because the source systems are multiple and not standardized; hence, there are compatibility issues. In any case, human interference is needed for cleansing the data included in the initial systems and for verification of correct migration. However, there are third-party companies that provide them with tools to define and transform the business rules.

The choice of the migration way depends on the size of the project. There is, though, the need for an automatic tool for projects involving more than one million objects. They would be very positive with the idea of cooperating with third- party companies that develop these tools for them.

	Migration method	Source/ Destination System	Volume of data	Down-time	No of resources	Duration
OpenText	Semi-automatic	Documentum/ RedDot	1 TB		1-2 technical, 1-2 support	4 weeks
Microsoft	Manual	MS CMS Server/ Updated version	22 500 web-pages	Short	content team:5-6 + technical team:5-6	3 months planning+ 6 months migration
Oracle	Manual	Vignette/ UCM	100 GB		20	5 months

Table 1.   Migration projects of WCMS vendors

4.2   Companies/Organizations that changed their WCMS

Volvo migrated around 1500 web-pages globally from approximately twenty different platforms to the Microsoft SharePoint. They chose to do the migration manually because they wanted to go through the content of all the platforms, remove the old, incorrect or duplicated data and decide on the new structure of the content. It was a pure copy-and-paste procedure that did not have any web site downtime problem. They have not regret their choice; however, for the next migration they would think of the possible use of an automatic tool as long as they preserve the current high level of structure.

	Migration method	Source/ Destination System	Volume of data	Down -time	No of resources	Duration
Folksam	Manual	Front Page/ Polopoly	5 000 web-pages		6	6 months
Sony-Ericsson	Semi-automatic (scripted)	Oracle DBMS/ Polopoly	80 web-sites	1 week content freeze	2-3	1 year
VINNOVA	Manual	Spirello/ EpiServer	600 web-pages	No	3-4	3-4 months
Volvo	Manual	Multiple/ Sharepoint	1 500 web-pages	Half Sunday	15 (5 Project Managers)	5 months

Table 2.   Migration projects of different companies/organizations that changed their WCMS

VINNOVA is the Swedish Governmental Agency for Innovation Systems. They migrated 600 web-pages of mixed types from Spirello to EpiServer in 2004. Initially, they tried to write some pieces of code, but finally, they did not succeed to have all the functions needed for the migration; so, they migrated manually. Besides, Rolf Johnson thinks that it was a good chance to revise the content and decide on a few changes they finally made.

Sony Ericsson migrated from Oracle DBMS to Polopoly. It was a global migration of Sony Ericsson of over 80 Web-sites in over 40 languages. They developed their own program and they did not really search for any tools to buy. They considered the content very customized and its business rules very strict to apply to any automatic tool.

Folksam is a Swedish insurance company. They migrated both their web site and their intranet to a unified Polopoly WCMS. They preferred to do the migration manually because they wanted to go through the actual content themselves and decide on what it will be included in the new system. They considered the amount of data small (5000 web-pages in the web site, 10000 web-pages in the intranet); finally, they would have preferred an automated choice, especially for the intranet.

4.3 IT/ consultancy companies

Samuel Eriksson Consulting AB is currently working on a migration project for Talentum[25] migrating from E-Drum to Escenic. To do the migrations they use the export and import modules within the web content management systems; they export from E-Drum into XML files, transform them into the new format and, finally, they import the data into the target system. The migration is done by one person, and it takes him only week since he is an expertise in these WCMSs. There were not serious downtime problems, but trying to match the formatting between the two systems is a main challenge and delays the procedure.

In Samuel Eriksson, they do not know about any tools that support all the WCMS they might be asked to work on, and that is why they choose the manual way. If they could, however, find an automatic migration tool, they would try it to make things easier and faster. The same challenges hold for Gnomon Informatics, which usually do the migrations manually. They are, also, unaware of possible automated solutions and they would probably be curious to try them.

Singular Logic- partner of EMC in Greece- follows a manual approach for its clients' projects (the telecommunication operator Cosmote is the client for the described project). They prefer the manual way, because they have the chance to clean the content and get rid of the unwanted data. They are experienced in migrations and know how to organize an optimum manual migration; so, they do not need to change method.

	Migration method	Source/ Destination System	Volume of data	Down-time	No of resources	Duration
Samuel Eriksson (for Talentum)	Semi-automatic (using WCMS modules)	E-Drum/ Escenic		Couple of hours	1	1 week
Gnomon Informatics	Manual	Static web-site/ gi9	3 GB	No/ Short	6	1 month
Singular Logic (for Cosmote)	Manual	Documentum/New Version Documentum	22 GB	1 day	2	3 months

Table 3.   Migration projects of IT and Consultancy companies

4.4 Migration tool vendors

As it is expected, the migration tool vendors strongly support the use of automatic tools for the migration process. Component Software represents Informatica in Scandinavia, Kapow Technologies is a Danish company, whose product- Kapow Mashup Server- is not developed precise for content migration, but it is one of its use cases. Nahava is very proud of its migration tool.

None of the above tools set restrictions with regards to the target or the destination system. They claim to migrate successfully any kind of data (jpeg, xml, html, etc.) from any and multiple WCMSs to a new

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[25] Talentum is a Swedish media company.

WCMS of any vendor. There is always a cleansing phase of the data and a solution to overcome the downtime problem. According to the interviewees the very short duration of the process compensates for the cost of the tool, which is anyway, reusable. Besides, there is an additional value if the customer needs extra support, service or training.

For both Kapow technologies and Nahava the prime driver to choose the migration method is the amount of pages needed to be migrated. For the former there is a down limit of 5000 web-pages, whereas the latter does not do migrations below 1500 web-pages; but, there are no upper limits. The main challenge for them is the addition of new data while working on a migration (the case of a dynamic migration).

According to Component Software, large companies (big scale projects) are mostly advised to use their tool, as well as projects that need high structural change. Through the metadata strategy the impact of the change (e.g. that a relation or definition changed) can be easier realized. Companies are suggested to use Informatica regarding the number of the people that need to be involved, the complexity of the environment and the complexity of the transformations need to be done. It is a metadata-driven tool

	Migration method	Source/ Destination System	Volume of data	Down-time	No of resources	Duration
Component Software	Automatic (Informatica)	Mainframe/ UNIX applications	5-10 TB	Add CPUs in the weekends	100	1 year
Kapow Technologies	Automatic (Kapow MashUp Server)	Multiple/ SharePoint	25 000 web-pages	No	1	10-11 weeks
Nahava	Automatic (Nahava AMS)	-	200 mil.	Short freeze	25	5 years

and, hence, definitions and logics can be shared between developers and graphical environments.

Table 4.   Migration projects of migration tool vendors

5   CONCLUSIONS

The examination of the topic of data migration between Web Content Management Systems shows that there is some work studied around this area. There is need, however, for defining the key criteria that are important to consider, while selecting the most suitable migration method for a specific project. When the project is still in the planning stage, it should be taken into consideration how each migration method might impact on the whole procedure and hence, organize it accordingly.

The wide use of WCMSs in enterprises leads to the existence of many industrial migration projects. These contemporary projects, enlightening various advantages and disadvantages, can be used to build theories through the combined experiences. This article makes a start in building theory about the criteria to evaluate the migration options when a specific migration case is concerned.

5.1   Research Conclusions

The main factor that affects the decision of an enterprise is the size of the project. If there are a lot of pages to be migrated then for sure there will be a need for a lot of employees and a lot of time. At this scenario, the cost of the license for the automatic software plus the consultants and the training costs of the employees for this software might be less than the cost of the salary of all the resources allocated for a long period for cutting, cleansing, mapping and pasting the content from the old system to the new

one. Besides, these resources could be allocated in another task being efficient for another project of the company.

If the volume of the data, however, is limited then a manual approach would be sufficient. According to Rick Wathen, Nahava does not take over migration projects for less than 1500 web-pages. Vamosa sets a down limit of 5000 web-pages as an advice for a cost-effective migration (Anderson et al., 2001). Kapow Technologies, also, agrees with this down limit.

The type of the data does not seem to affect the choice of the migration method in any way. Most of the times, the organizations and the companies consider it as a given that the content is of mixed types and the WCMS should include pictures, text, videos, etc. The case that the data are all of one kind- e.g. only pictures- is a simpler case that could be faced with simpler methods and cheaper tools specialized in that type of data.

According to the research, another critical factor that could determine the choice of the migration method is the level of the existing structure and the number of the changes that should be done in the content. There is not really an optimum suggestion for this case; it is a matter of perspective. On one hand, three out of seven interviewees (Volvo, VINNOVA, Folksam) that conducted the migration manually, explicitly stated that they chose this approach for a very specific reason. They considered it an ideal chance to go through the content themselves, clean it, decide on what should be migrated and structure the content in the new system from the beginning. Even in the case of an automatic tool they wanted to interfere in the content and its structure and hence, they should spend time on checking. According to Linda Nilsson (project manager in the IT department of Volvo), Volvo could not use an automatic tool because of the "cleansing" activity. They should, also, combine the content of twenty or more technical solutions to the Microsoft WCMS; after the manual migration they can guarantee high quality of structure. She states that "for the next migration they could use an automatic way since they have high level of structure. If you come from a homogeneous background then you can do an automatic migration with fewer difficulties".

On the other hand, all the migration tools in the market seem to be suitable in cases where change of structure is needed. There is a stage in the procedure of all the tools, where the content that should be transferred must be cleansed and the structure in the new system must be decided. Component Software strongly suggests Informatica in specific for projects that a lot of changes in the structure must be done. "This is because Informatica is metadata based and this way it is easy to see the impact of change (verify the correct change)". Hence, the use of the automatic tools depends on whether the customers are informed about their option of changing the structure or not, and whether they trust their results or not.

Finally, we should mention that in most of the cases downtime was not a problem. In the cases of the manual migration, the migration teams tried to find different solutions to eliminate the downtime. Volvo tried to do parallel migrations in order to limit the problem and finally, they had downtime only for half a day on a Sunday. In Samuel Eriksson, sometimes they needed to have downtime for a couple of hours while exporting the data. The automatic tools, also, seem to be focused on providing migration with no downtime. It is in the philosophy of the design and the use of many of the tools, that they should offer cost-effective solutions; avoiding employee's overtime in the weekends is within this scope. Hence, downtime should not be among the criteria in order to choose the suitable migration method, since there are solutions for this problem in all of the methods.

5.2   Further Research

Further research in this field is needed because data migration, as stated in the introduction, is a critical issue and it is worth deeper examination.

First of all, the results of this article are limited to the aforementioned case studies conducted. More case studies can add value to the theory building of specifying the criteria for evaluating the migration approaches. Probably more data migration metrics will be identified.

Secondly, an attempt to put some ordering between the metrics could be under consideration. Is there a priority relationship among these metrics? And, which metrics should not be neglected in case more than one migration method is adopted for the same project?

In addition, a more thorough study can be conducted examining from a more technical perspective, the reason why the cleansing and the transformation phase makes the migration procedure complicated influencing the selection of the migration method.

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