

Academic Sample – NASA Knowledge Management

Knowledge Management Within NASA

Introduction

The National Aeronautics and Space Administration (NASA) is an agency which is controlled by the United States Government. The primary responsibilities of NASA include aerospace research and the development of the civilian space program. NASA operates from a headquarters in Washington, DC and a plethora of other tertiary sites spread across the USA. Traditionally, projects undertaken by NASA can last for extended periods of time, and involve thousands of individuals. For example, the Voyager program, which was initiated in 1977 and is still active today. The sheer volume of information gathered and warehoused across the lifecycle of projects of this size is considerable, and extracting insights from this stored data is intrinsically difficult.

Knowledge management is a critical tool for NASA for a range of reasons:

- NASA has a clear need to document knowledge and learn from past lessons to help mitigate ongoing risks involved with the space program.
- NASA employs many industry experts, some of which are repositories of entirely unique knowledge which should be gathered and shared.
- Much of the original NASA workforce still holds a lot of the original knowledge from early space flights. This workforce is aging, and this knowledge needs to be gathered before it is lost.

What knowledge management system is NASA using?

NASA have taken a rather long term view of knowledge management, and have developed a number of key systems since 2000, which combine to deliver a Knowledge Management System (KMS) that brings data together from multiple sources. "Some organizations have achieved success in knowledge management through a centralized KM organization, others through an architecture that unites distributed activities." (Holcomb, et al., 2002, p. 9) NASA has clearly understood the fact that its huge pool of data, which has been gathered across decades, is best exploited through unification.

Academic Sample – NASA Knowledge Management

NASA has deployed five separate KMS in the period from 2003 to 2008, although the NASA knowledge management initiative was first begun in 2000. (Leonard & Kiron, 2002, p. 12) These KMS can be defined as:

1. NASA Portal and KMS for Space – Deployed in 2003, the NASA Portal was developed to store and make available for recall a full range of digital documents. The NASA Portal was a public facing web application, which was open for anyone to access, either internally or externally (by the public).
2. InsideNASA and Research Web – This is a group of related intranet sites which make up the InsideNASA KMS, which were deployed in 2004, and are made available to all NASA employees. These sites exploit the power of special knowledge and document management software including SunOne, WebEx and eRoom.
3. NASA Engineering Network (NEN) – Originally rolled out in 2005, NEN is a collaborative KMS which is used by engineers and project teams to warehouse data, and communicate using instant messaging (based on the Jabber protocol).
4. Communities of Practice – This is a knowledge finder application which was introduced for all employees in 2006. This is a very specialized KMS which allows employees to locate other employees or departments with specific knowledge and experience.
5. InsideNASA 2 – A 2007 update to the original 2004 KMS of the same name, InsideNASA 2 is the NASA internal intranet, which has been updated to include social networking features and document collaboration.

Additionally, since 1994, NASA has operated the Lessons Learned Information System (LLIS), which unifies knowledge from multiple sources including projects, departments, individuals and programs. All NASA program managers are required to update LLIS, and to interrogate it on a regular basis.

So we can clearly see that NASA had originally opted for a strategic approach to knowledge management, providing needed services to individual departments and key user groups. However, NASA has slowly refined its multiple KMS systems to become more unified. Indeed, NASA is currently working upon a well-defined knowledge management roadmap which is due to

Academic Sample – NASA Knowledge Management

be completed in 2025, which will result in NASA employees being able to capture knowledge, and submit it to a unified KMS in real-time, either on Earth or in off world outposts. (Holkm, et al., 2006, p. 43)

NASA has developed a fundamental framework for the sharing of knowledge which revolves around enabling people to collaborate, defining operating processes which promote knowledge sharing, and a commitment to knowledge creation as a work ethic.

The NASA knowledge management process defined

To begin to understand the value of the knowledge management process for NASA, we need to consider the critical, often dangerous nature of the projects which the agency is undertaking on a day to day basis.

Space projects are designed to run efficiently in all their aspects: development, assembly, integration and test, commissioning, normal operation, system optimization, trouble-shooting, failure understanding, and correction. (Holkm, et al., 2006, p. 39)

So it is important that the underlying methodology adopted by any knowledge management initiative be entirely robust.

The NASA knowledge management process is driven by three key points of strategy.

1. Having the ability to store knowledge across multiple projects and for an infinite period.
2. Empowering people to both share and organize their own knowledge, as well as to be able to search other people's knowledge.
3. Promote knowledge creation by providing collaboration facilities.

The driving force behind the unified NASA KMS process is an entity known as the NASA Information Clearing House. This is the central funnel for all knowledge generated across every branch of NASA. Distributed data from mission reports, planetary data and Earth climate data is sent to the clearing house, before being distributed to the appropriate repository (public facing websites, government data warehouses and internal knowledge repositories). Knowledge can also be sent to the InsideNASA KMS/intranet. Isolated content

Academic Sample – NASA Knowledge Management

produced by individual employees or project teams is also sent to this clearing house, to be dispersed in the same way, although much of this data remains internally published without being passed out to either the public or other government agencies. Data generated through agency services (such as user input to the NASA website) is also processed in the same way.

The development of the NASA Information Clearing House has enabled NASA to take several disassociated and entirely different types of KMS and unify knowledge before redistributing it.

Advantages of the NASA knowledge management methodology

There are two main advantages of the way in which NASA has developed several specialized knowledge management systems, and then unified the knowledge maintained within them using an external process.

Firstly we need to consider the sheer quantity of data which NASA needs to store within its knowledge management systems.

NASA's web site, www.nasa.gov, encompassed more than four million web pages, thousands of databases and electronic repositories, petabytes of mission and planetary data, and millions of online reports. (Leonard & Kiron, 2002, p. 14)

Consider that these volumes are for the public website only, and that internally stored data must be thousands of times larger, and we can see that more than a decade ago, there was simply no technology to warehouse such a large volume of mostly unstructured data and to query it. This kind of data has now come to be known as Big Data, and there are now mature technologies for storing it and mining it. However, the multiple KMS which NASA has developed have managed to handle the task, by segregating knowledge management by user groups. So the main advantage in the current NASA infrastructure is that it was able to deliver results long before technologies were developed to handle a task of this size in a single application.

The second main advantage stems from the fact that due to the NASA Information Clearing House being developed, the organization is able to change its knowledge distribution rules without needing to change the underlying systems. In many ways this is the single most interesting aspect of

Academic Sample – NASA Knowledge Management

the entire NASA knowledge management infrastructure from a technology point of view.

Disadvantages of the NASA knowledge management methodology

The main disadvantage to the NASA take on knowledge management is the reliance upon aged legacy systems as part of the knowledge capture, sharing and creation process. For example, the original iteration of InsideNASA, the organization wide knowledge based Intranet, was developed in 2004. Just three years later in 2007, it was redeveloped as InsideNASA 2 to take advantage of maturing technologies such as document collaboration and aspects of social networking. The original incarnation of InsideNASA is just one part of the bigger picture, and some systems are even more outdated.

However, the major disadvantage of the KMS employed by NASA is the apparent lack of buy in on the part of employees with regards to the longest standing, most established part of the overall knowledge management infrastructure, LLIS.

NASA's project managers do not routinely use LLIS to search for lessons identified by other projects or routinely contribute new information to LLIS. We found NASA's policies regarding the input of lessons learned into LLIS have weakened over time; inconsistent policy direction and implementation for the Agency's overall lessons learned program; disparate levels of funding for LLIS activities across NASA Centers; and deficient monitoring of critical Center-based LLIS activities. In addition, we found the Chief Engineer's overall strategy for knowledge management, lessons learned, and LLIS is not well defined. Consequently, LLIS has been marginalized in favor of other NASA knowledge sharing system components and is of diminishing and questionable value. (Office of Inspector General, 2012)

This is quite a disturbing situation, as it is a job requirement for NASA program managers to not only use the LLIS to gain knowledge, but also to ensure that they update LLIS regularly with their own knowledge contributions.

One of the main reasons given for this lack of commitment to the LLIS is that it is old, outdated and not at all user friendly to operate, and this ties in well with

Academic Sample – NASA Knowledge Management

our original synopsis whereby the overall NASA knowledge management infrastructure is held back by its dependence on several legacy systems.

How can NASA improve its knowledge management system?

The first improvement which NASA could make to its knowledge management methodology is neither technology nor process related; it comes down to adopting a new type of organizational culture. NASA needs to ensure that all of its employees are committed to knowledge sharing, and understand the benefits it can bring. Without this buy in, any new knowledge management project could potentially fail, in a similar way to LLIS.

From a technology point of view, NASA needs to revisit its older legacy systems and either consider updating them, or entirely replacing them with systems that are user friendly and offer true value. With the world heading towards a browser based work desktop, NASA could exploit a host of Web 2.0 technologies to deliver a slicker, more attractive and above all a more useful experience for users.

In Conclusion

There can be no doubt that few organizations have to handle either such a large volume of knowledge, or such critical knowledge on a daily basis. NASA has managed to implement a working KMS, which has been in operation for more than a decade.

However, it is very obvious that the overall picture of knowledge management within NASA is not a 100% healthy one. It almost seems as if NASA was quick off the block to adopt and develop a KMS, but has since lost commitment to the project and allowed development to dwindle.

For this reason, NASA makes a very good subject to examine when considering the viability of implementing a KMS within any organization, as NASA has faced and overcome many of the core problems which can arise during and after the deployment of a knowledge management system in any commercial environment.

Academic Sample – NASA Knowledge Management

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