Knowledge Management in the Aviation Industry

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Good evening ladies and gentlemen.

Today, I invite you to think about a subject that is omnipresent in our day-to-day activities and has a profound impact on how more efficient and effective we could all be in those activities.

I would like to share my thoughts and experiences on knowledge management in the aviation industry.

I will present three topics that I feel are worth considering, and at the end of this presentation I hope you will have a new perspective on knowledge management and what it can do for you.

Just a short background on myself, I have worked over 8 years in the aerospace and defense industry, 6 of which as a consultant in business process re-engineering. My particular areas of expertise are sales and distribution, logistics, and materials management. Over my young career I have been involved in 9 major re-engineering projects.

I have a bachelor in commerce, major in management information systems, minor in e-business, and I recently obtained my aviation masters in business administration, all from this wonderful institution that is the John Molson School of Business.

I am a Level I candidate in the CFA Program, and I am also an SAP certified consultant. And very soon, I will soon be a full member of the Royal Aeronautical Society: the panel for full membership gives its responses in July.

In our day-to-day tasks, we are constantly faced with integrated events, figures, facts, and statistics... We make decisions or take actions that trigger other integrated events, figures, and so on. We want to replicate successful actions and decisions, and avoid repeating mistakes. We are born with that basic instinct of learning. But what if the competing pace of business did not allow us enough time to learn; after all, learning gives us the competing edge, as long as the competition does not learn it faster.

Many scholars call it the information age and there is much debate on when it actually started; after the invention of the Internet, the PC, the television, the movies, the telephone, or the telegraph. Suffices to say that the information age...
is the period after the industrial age, a period where information became faster than physical movement.

At the peak of the digital revolution, in the aviation industry, like in any other industry, we are overwhelmed with data. We are equally swamped with information. However, knowledge is a rare commodity, and wisdom, when it exists, is more often an exercise of reminiscence. Thus it is important to understand where knowledge comes from, to then plan to transfer it, and even explore the future phases its evolution.

Today, I will briefly cover three points:

• Knowledge management, the different definitions and what we will not discuss
• A basic explanation of knowledge management
• And issues of knowledge management in the industry

There are two main uses for the term knowledge management:

• One, which is the subject matter of this presentation and we will explain in more details later, refers to the ability of companies to collect, create, manage and utilize the knowledge they acquire.
• The other use refers to an approach that draws on intellectual capital and its intrinsic relationship with the corporate outcomes.
This last definition is where I want to pause for while and briefly taunt your curiosity with a series of concept that you might have heard or read about in technological, financial, or management mainstream publications, and that we will not discuss in detail today.

After the Y2K bug frenzy, the e-commerce frenzy, and the business warehouse frenzy, came the knowledge management frenzy.

I want to make a disclaimer before I tell you what knowledge management is in this context: it is not my intention to discredit any of these initiatives. In my view they all add lots of value if these initiatives have 100% commitment from the whole organization.

Knowledge management, in this case, is about capturing and leveraging acquired knowledge across an organization to improve corporate efficiency. Under this concept, knowledge is treated as an asset.

The new millennium has given birth to a new breed of senior executives: V.P. Supply Chain (a hybrid between operations, purchasing, logistics, and sales); V.P. Customer Experience (formerly known as sales and marketing); related to this topic and my personal favorite Chief Knowledge Officer.

Usually, organizations that have a Chief Knowledge Officer have gone through a Knowledge Management Program. This type of program re-shapes a company into an organization that continually and consciously evaluates and controls the process of accumulation and application of intellectual capital.

You have all heard at some point the term knowledge transfer; this is nothing new and has existed since the birth of humanity. On-the-job learning, internships, mentoring are all more formal forms of knowledge transfer. But under this umbrella, knowledge transfer refers to knowledge bases and repositories, or expert systems.

Invariably, technology is a huge enabler of knowledge management. I have already mentioned knowledge bases and expert systems, but there are also corporate portals, document management systems, content management systems, computer based training, to name a few.

I have just started to brush the surface of what today provides employment to thousands of software developers, consultants, and all sorts of experts and specialists in the field of knowledge management.

My intentions are just to give you an idea that something different from what comes shortly exists, and that next time you hear knowledge management you can make the distinction: “Is it the one related to knowledge as an asset, or the one I was explained in detail in a lecture I attended?”.
So now, let us move on to the concept of knowledge management that I really want you to comprehend.

Knowledge management is the means by which an organization gathers, manages and uses the knowledge it acquires or generates. This concept is based on a framework known as the Knowledge Hierarchy.

"Where is the Life we have lost in living? Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?"

This quote, extracted from Thomas Stearns Eliot's The Rock, written in 1934, summarizes very poetically the concept of knowledge management.

Over 50 years after Eliot's essay, scholars in the domains of information science and knowledge management formalized the concept of knowledge hierarchy or DIKW Hierarchy. Some debate exists on who is the original author of the DIKW Hierarchy; some argue that it is Russell Ackoff, other that it is Milan Zeleny. So, if you heard "Ackoff Hierarchy" or "Zeleny Hierarchy", we are talking about the same things because they both have the same basic elements.
Allow me to explain each element of this hierarchy and how each level builds on each other.

At the bottom of the pyramid we have data. We all understand what data is; anything that is encoded and recorded. Even if DNA is a very good example of data, but we will focus more on data that is collected, processed, stored and accumulated through functional processes of an organization.

Then we have information. Information is nothing less than organized and structured data. On an individual basis, data provide no meaning. But data in conjunction with other data, or accumulated into meaningful context provides information.

The next level is knowledge. Knowledge is more than data or information. It is a collection of information that has meaning beyond the information itself. Knowledge is the understanding of consequences from a collection of information. These consequences can be experienced or deduced, but in either case they are known to us. And this is where we go back to what I mentioned at the beginning of this presentation, the competitive nature of business does not grant the time to experience. In this particular case, the survival of any organization is at stake. Obviously, any executive would rather deduce than having to experience, especially if the outcome is not favorable.

Finally, wisdom is the top most level of the hierarchy. Some would argue that there exists another level above wisdom, which is compassion, but for the sake of this presentation we will limit ourselves to wisdom. Wisdom is the usage of accumulated knowledge. In other words, it is the ability to select the best alternative under limited circumstances considering both short and long term consequences. This definition implies the ability to judge among a set of given alternatives based on qualitative, quantitative and even abstract information and knowledge.

Now that we have learned the different levels of the hierarchy, let us explore how we transition from one level to another with a very simple example. First, I will show you some random data. 
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Intuitively you can start giving some context to some of the data shown. Now, I will organize it and put it into some context.

Here, we have transitioned from data to information, organizing and structuring the given data. A hygrometer measures the humidity in the air, a clock indicates the time, and a thermometer determines the temperature. At different times of the day, these measurements are collected, and this is how we now have gathered some information.

What knowledge can be extracted from this information? For example, after many observations and given a certain temperature and a certain humidity, it rains. This knowledge can be further expanded as to why the
temperature fluctuated and how winds affected this result. Thus more knowledge is inferred and generated.

Finally, the transition to wisdom is not a simple one. It draws on acquired information and knowledge, and on the capacity to establish abstract links and relationships.

In this specific case, an example of wisdom would be: it rains, because it rains. The human mind has that capacity, which singles our kind out of the animal kingdom. We have the capacity to judge generated knowledge and information and make cause-and-effect relationships that are not necessarily obvious. That is why we talk about knowledge management, and not wisdom management. Technologically, baby steps have been made in order to emulate the knowledge generation process. Several generations will pass before we can verbalize a model where instinct is codified, or thoughts and beliefs rationalized. What would make a machine continue doing something? What would be its primary drive or motivator? What gets you up every morning?

This is a very interesting philosophical topic, yet let me bring you back to knowledge management. Now that you understand where knowledge comes from, you will appreciate even more the nature of the challenge that we are presented every day in our activities.

I will give you some examples in our industry where data and information abound, yet knowledge is very limited.

Airline marketing: airlines have terabytes of passenger information; where they come from, where they are going, how long they are going for, how much they pay, purpose of their travel, etc... Yet, most airlines have either empty seats or denied boarding on most of their flights. Most forecasting models have a probability component that enables airlines to mechanically select the best alternative, and at the same time they also have a manual override component that allows a forecasting analyst (a human) to overrule the system.
Fleet maintenance management: every aircraft flight schedule is determined months in advance, their maintenance routines planned well in advance, most parts on those aircraft have measured life-cycles units as per the OEM certification, etc… Yet we always encounter spare parts shortages. Most mathematical models that estimate spares demand requirements based on countless parameters, include provisions for unforeseen events and include some safety buffers.

Capital investment in ground infrastructure: the construction of an airport or an additional runway is no small potatoes in terms of capital investment. Only the feasibility studies run in the millions. Entire forests of data and information are printed out. Yet, some airports do not meet the expectations after many years of operations; Mirabel and Kai Tak being a few examples.

Is it that hard to know how many seats will be filled on every single flight, the number of spares to hold in inventory, or if the construction of a new runway is justified? Now that you know how knowledge is generated, you also know that the answer to this question lies in the process to acquire and derive knowledge.

Then why is knowledge management an issue in our industry? Our industry is relatively young compared to other industries, and even though it has grown, and keeps on growing, very rapidly, our capacity to generate knowledge does not follow the pace of growth.

The changing market landscape is a very strong driver for knowledge generation: low cost carrier models, open skies policies, security concerns, airline capacity, increasing fuel prices, all these are rapidly changing the shape of our knowledge and pre-conceived notions.

Let us not forget technological advances that not only made us more efficient and effective but have also have changed the way we operate. Pilots and first officers spend countless hours in a simulator before they are given the responsibility of hundreds of lives on every flight; likewise for air traffic controllers. Engineers test several models before they even cut the first metal sheet.

All this translates in cumulated knowledge that in big part escapes an organization when the carrier of this knowledge leaves or retires. The main challenge we face in our highly regulated and complex industry is to be able to generate and retain knowledge to cope with the pace of changes.

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We have made the distinction between the two main types of knowledge management.
We have explored the basics of knowledge management and the knowledge hierarchy.
And we have discussed some issues pertaining to our industry.

My objective was for you to make the distinction between the different levels (data-information-knowledge-wisdom), and for you not to spend more time that you should in the data and information levels, but rather concentrating more on the knowledge aspect, since it will lead to the generation of more knowledge.

So tomorrow, ladies and gentlemen, when you go back to your respective occupations, you will no longer look at that brick of paper on your desk, which supposedly is a report, with the same perspective.

From now on, you will always have that little voice in the back of your mind inquiring, where, in the knowledge hierarchy is the content of your thoughts placed and how do they contribute to the ultimate goal of generating wisdom.

I thank you very much for your attention, and now invite you to ask any questions you might have related to today’s presentation.

References

1. T.S. Eliot. The Rock (Faber & Faber, 1934).
Summary Bio

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Alexandre Fainberg completed his Aviation Master’s in Business Administration at the John Molson School of Business in 2006. Through his Montreal-based consulting firm, he is currently working with leading aerospace and defence companies in the area of business process re-engineering. He is also catering his services to major players in the telecommunications industry.

Alexandre started his aerospace career at the age of 21 as a systems analyst at Pratt & Whitney Canada. After founding his consulting practice in 2002, he landed his first major account, Bombardier Aerospace. Throughout his young professional career, he has always kept solid ties with the academic world; sometimes as a student and some other times as a contributor (invited lecturer, speaker, or adviser). He has authored many whitepapers on behalf of his customers in the areas of logistics and forecasting.

He is a strong advocate of integration of business processes and technology, knowledge management, and corporate excellence.