Knowledge transmission under temporal constraint: yearly changeovers in Antarctica

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1. Introduction

Our research focuses on the transmission of professional experience under temporal constraints, in a French scientific base in Antarctica. The technical staff changes every year, at summer. The shift changeovers are critical for the transmission of the knowledge built during overwintering. The time available for transmitting experience depends on the rotation of the boat (Astrolabe) bringing people, food and fuel at the Dumont d’Urville station, between November and March (summer in the southern hemisphere). The Dumont d’Urville station is managed by the French Polar Institute (Institut Paul Emile Victor).

Ergonomics has often investigated shift changeovers (Grusenmeyer, 1991, 1995, 1996; Le Bris, 2010). Le Bris and Barthe (2013) describe three stages in the changeover process: (1) end of the post (preparation of the information to pass on), (2) meeting between the coming and leaving staff (verbal exchanges), (3) the coming staff set out (they have to collect information about the process, corroborate it with the information passed on and take charge the work process (Perry, Wears and Patterson, 2008)). Thus, the changeover is part of a system resting on the cooperation between successive staff. To ensure the reliability of the system, verbal exchanges between the successive staff are essential (Le Bris, 2010). Yet, the written traces are part of the changeover process (Delcambre, 1993, 1997), as it sum up the memorable past events.

In Dumont d’Urville station, the replacement conditions are very different from the standard changeover situations (hospital, air traffic, chemical industry, industrial production...)(Table 1): the frequency of the shift changeover is one per year; the length of the station for technicians is twelve months; the leaving and coming staff don’t know each other; the time of shift changeover is unpredictable; the new staff are not familiar with the working equipment and the environment.

Table 1. Main differences between the shift changeover in Dumont d’Urville station and the standard changeover.

<table>
<thead>
<tr>
<th>Changeover in Dumont d’Urville Station</th>
<th>Standard changeover</th>
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<tr>
<td>One per year</td>
<td>One per day</td>
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<tr>
<td>Time at the post: twelve months</td>
<td>Time of the post: six-eight hours</td>
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<tr>
<td>The coming and leaving staff don’t know each other</td>
<td>The coming and leaving staff know each other</td>
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<tr>
<td>Time of the shift changeover is unpredictable</td>
<td>Time of the shift changeover is stable</td>
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<tr>
<td>Ignorance of the general environment</td>
<td>Knowledge of the environment</td>
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Security and reliability are high stakes on the base, especially because of the environment (weather conditions are extreme and the base is isolated during several months). Therefore, efficient development and transmission of the competences in the base are crucial. Our research aims at creating an enabling changeover, the general purpose being to ensure safety.
2. Method

The study began in October 2013. We stayed in Dumont d’Urville station from November 2013 to January 2014, in order to study the kind of work that was performed and the way in which replacement of the technical department took place.

2.1 Population

The technical department is composed of eleven overwinterers: computer scientist, cook, baker, head of the technical department, plumber, electrician, carpenter, mechanic, milling machine operator, chief of powerhouse and his assistant. They present varied profiles in terms of age, professional experience, responsibility in Dumont d’Urville station, motivations for coming to Antarctica. Indeed, the more the responsibilities are important, the more experienced are the overwinterers: cook, head of the technical department, plumber, electrician and chief of powerhouse were at least 25 and had at least five years of professional experience. Moreover, they were recruited as contract workers for the French Polar Institute. On the contrary, the overwinterers with a non-vital post (baker, carpenter, milling machine operator, chief of the powerhouse assistant, mechanic and computer scientist) were recruited as civic volunteers service. They were also younger and less experienced.

2.2 Data collection

For the data collection, videos were made during the changeover, completed by note taking. We also used a camera and a handheld recorder to record the interviews of the overwinterers.

The data collection consisted in three phases. During the first phase (November 2013), we observed the leaving overwinterers working. These observations were made during one day (8 am to 12 am/ 2 pm to 6 pm) per member of the technical staff (except for the plumber and the mechanic: the observations were made on a half-day of work). An observation guide had been made so that the note taking was focused on several specific aspects of the work in Dumont d’Urville station: resources, constraints, hazards, stakes, general working organization. These observations were all completed with individual interviews, using the notes taken. These interviews aimed at identify the work characteristics and the memorable events of the overwintering. The purpose was also to understand how the leaving overwinterers anticipated the future changeover. With this objective, the overwinterers also participated in two working groups. The subjects broached were the conditions of an efficient changeover and how the coming overwinterers could be better prepared. The plumber, the milling machine operator, the computer scientist and the mechanic made up the first group. The head of the technical department, the carpenter, the electrician and the baker made up the second group. The cook and the chief of powerhouse weren’t available. Both of the meetings lasted one hour and were recorded.

The second stage was the changeover survey, when the new overwinterers arrived, in December 2013. During five days, we observed the changeover, making videos and/or taking notes. We conducted interviews with leaving overwinterers too. For four overwinterers (milling machine operator, carpenter, mechanic and baker), the interviews were conducted using the videos of the changeovers. For the other overwinterers, the interviews were conducted using the notes we took during the changeovers observations. All interviews were recorded and lasted between thirty minutes and one hour.

The last stage (January 2014) occurred after the departure of the leaving overwinterers. Interviews post-changeover were conducted with the eleven new overwinterers. The goal was to identify the difficulties that were felt during the changeover, and the improvements that could be made. All interviews were recorded.

3. Results

The data coding and processing is in progress, the results should be soon presented with precision. Yet, we can highlight some facts. First of all, there are no instructions about the changeover process. Indeed, during the individuals interviews, none of the leaving overwinterers said that they will anticipate their future replacement. They do not think about what they will transmit and how they will do the changeover. Further,
during their overwintering, they did not write anything about their work experience, difficulties that were met, ways to overcome them, etc.

4. Discussion

This study aims at understanding the proceeding of the shift changeover in Dumont d'Urville station, in Antarctica.

Dumont d'Urville station was established in 1956, and the French Polar Institute was created in 1992: we expected that some procedures governed the way the replacement had to be executed. However, this is not what these first results suggest. The changeover is not a priority, for the workers, nor for the organization. Actually, the replacement is not an opportunity for learning: the overwinterers have to face the difficulties later, when the environment will constrain them to adapt.

As far as the feedback deficiency is concerned and considering this particular context, we wonder about how the security and the reliability are ensured on the base. Until now, no material or human catastrophe happened. Yet, a minor habitual problem can quickly worsen in case of difficult circumstances. Thereby, security questions are directly related to the quality of the transmission of experience during changeovers.

References

Le Bris, V., Barthe (2013). Ecrits de relève de poste : une activité continue. @ctivités, 10 (1), 31-54.