12.2 CHALLENGES AND SUCCESSES WHILE IMPLEMENTING THE AWIPS INTERACTIVE FORECAST PREPARATION SYSTEM AT WFO KANSAS CITY, MO

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1. INTRODUCTION

Advances in Information Technology (IT) have made it possible for people to quickly exchange, and process large amounts of information and data. In the world of weather forecast and warning services these advances have quickly outdated the legacy textual forecast and warning products issued by the National Weather Service (NWS). Increasingly sophisticated customers and partners of the NWS now require more detailed forecast and warning information in digital, graphic and textual forms.

In order to meet these demands the NWS has developed and improved the Interactive Forecast Preparation System (IFPS). Current versions of the IFPS provide forecasters with improved tools to graphically edit forecast fields, while the earlier versions were more highly dependent upon editing areal forecast matrices. The graphical editing capability allows forecasters to provide more meteorologically consistent forecast grids.

The IFPS allows NWS Weather Forecast Office (WFO) forecasters to provide much more forecast and warning information via a digital forecast database. This database is, or will be, made available to the National Weather Service and its partners and customers who can then process the data through formatters or decision making software which is designed for specific applications. Through the digital forecast database forecasters can share much more meteorological and hydrological information than is possible through textual products. However, the preparation of this digital forecast database is a significant change in the way operational WFO forecasters analyze and process data.

2. OPERATIONAL FORECAST PROCESS CHANGES

The forecast staff at WFO Kansas City/Pleasant Hill began using versions of the IFPS operationally in October 1997. Initially the graphical editing tools were not user friendly so the staff migrated to a process where homogeneous forecast areas were identified and the forecast matrices were edited to populate the forecast grids. While this technique allowed the forecasters to create a digital forecast database, it closely mirrored the preparation of textual products and did not provide a meteorologically consistent set of forecast grids at all times.

Newer versions of the IFPS have replaced the former graphical editing tool (GMOD) with the Graphical Forecast Editor (GFE). The GFE is a more robust software which has allowed the WFO Kansas City/Pleasant Hill forecasters to better adapt to the forecast process necessary to produce a meteorologically consistent gridded digital forecast database. In early 2001 the forecast staff began the transition of moving from matrices to graphical forecast editing as the primary means for preparing and updating the digital forecast database. From the updated grids, the legacy textual products were then produced. While an improved graphical forecast editor was key in this transition, even more important was changing the way that forecasters looked at their product preparation methods, and the acceptance of the fact that the primary NWS forecast product of the future will be a digital forecast database, not short text products.

Forecasters have had a difficult time adjusting to the forecast grids being the primary forecast product. That is, updating of the forecast grids is the action that drives updates of textual forecasts rather than vice versa. While using the matrices to prepare forecasts in the Interactive Computer Worded Forecast (ICWF) system the update of the text forecast via the matrices was the driver to update the forecast grids. While that forecast process provided sound textual forecast updates, it often times provided meteorologically inconsistent forecast grids.

The challenge facing the forecasters at WFO Kansas City/Pleasant Hill was to break the paradigm of looking at forecast and model data and then preparing forecast products, to working with forecast and model data to prepare a meteorologically consistent gridded forecast

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database from which forecast products could be formatted, either through NWS software, or software developed by customers and partners.

3. TRANSITION STRATEGY

Once the requirement for the information available in a gridded forecast database became known, the WFO staff faced the challenge of changing their forecast process so that they could more closely monitor and update several meteorological parameters. The ability to transmit gridded data as weather parameters changed directly affected the forecast process and use of forecaster resources in the office. In earlier versions of the IFPS the staff had migrated to the use of forecast area matrix manipulation as the tool of choice to prepare the legacy product suite. Unfortunately this process frequently produced inconsistent forecast grids. As the forecast grids have become available to other NWS offices it became obvious that the inconsistent grids would not be acceptable, and that inter-site coordination would bring new challenges. A key to beginning the transition from matrix adjustment to grid manipulation was the ability of the forecasters to finally see gridded and graphical products.

In order to break the matrix manipulation forecast process it was decided to develop a training program in which the IFPS office Focal Points would retrain the entire forecast staff emphasizing the use of the GFE to paint the meteorological picture of the shift. This training was developed by the Focal Points with assistance from the office Science and Operations Officer (SOO). A key part of the training process was to make sure that each forecaster was aware of the importance of a meteorologically consistent forecast database which blended with surrounding offices. Forecast preparation strategies, and use of forecaster resources also was discussed at length. The model of a short term and a long term forecaster quickly evolved as the best way to provide the forecast detail that was now possible.

To kick off the training and transition effort the office held an all-hands staff meeting to reinforce forecast strategies, to clearly identify customer and partner requirements for more detailed forecast information which is updated more frequently, and to emphasize the challenges the staff would face during the transition. The meeting generated a lot of constructive discussion and help to focus the office efforts on a common goal.

After the full staff meeting the one on one training of the operational staff began. The goal was to provide all staff with 12 to 16 hours of such training, almost entirely on the GFE and forecast grid manipulation. It took approximately six weeks for the focal points to complete the training of all forecasters. During this time members of management continued to reinforce the importance of providing a frequently updated gridded forecast database. Since the WFO was to be a participant in the National Digital Forecast Database demonstration project scheduled for late 2001 the office was able to use that as a focus for the transition to grid editing instead of matrix editing.

4. CHALLENGES AND SUCCESSES

The forecast staff adapted to the grid editing forecast process at considerably different paces. Some forecasters quickly abandoned the matrix editing for grid manipulation, and easily changed to a forecast process where the updated grids drove the updates of legacy textual products. Other forecasters struggled with releasing ownership of the text products that was associated with matrix manipulation. This is a normal progression that can be expected as NWS offices begin using the IFPS.

Work assignments and utilization of forecaster resources were a challenge for the Lead Forecasters. The workload associated with preparing a dynamic forecast database that was updated as the weather changed at times was greater than that experienced when matrix manipulation was the tool of choice. This is to be expected since NWS forecasters can provide much more detail via the gridded database than they could in textual products. While the forecaster resources needed on some shifts increased, the amount of information available via the forecast grids increased exponentially. The staff quickly moved to a forecast process where multiple forecasters were assigned to work on different time periods in the forecast database.

The most common distribution is a short term forecaster and a long term forecaster, however on occasions more than two forecasters had forecast assignments. In general the short term forecaster finished off the current weather regime, in both the current official forecast database and the upcoming issuance, while the long term forecaster picked up the database after that out to day seven. Short term forecaster responsibilities varied anywhere from six hours into the new forecast package to three days. The short term forecaster also had forecast responsibilities outside of the IFPS, specifically the Short Term

Forecast product and aviation forecast products. They issue those products since they have the best handle on the short term meteorology of the situation.

Use of the short term/long term forecaster technique brought with it coordination issues. On the plus side, forecasters began to work more as a team and to share their meteorological knowledge. But the move to multiple forecasters in the forecast database also brought challenges. Forecasters take great pride in their forecasting skills, and verification statistics. The current NWS forecast verification programs track forecasts by forecaster number for an entire forecast package and feedback is provided. Now with two or more forecasters working on a single forecast package it became an issue with some forecasters who would be held accountable for that forecast package verification. That is, who's number goes in the verification grid. While on the surface this seems trivial, with some people it becomes a hot issue which may have to be addressed. At WFO Kansas City/Pleasant Hill we normally assign the forecaster number for the long term forecaster to the verification grids, but if there is a big difference in interpretation of the short or long term weather we gave the forecasters the option of putting a "visiting forecaster" number into the verification system. While this does not happen often, it has occurred, and providing this option was relief to some forecasters and eased their transition to preparing forecast grids.

Another challenge is external coordination with surrounding forecast offices. During the fall of 2001 Inter Site Coordination (ISC) capabilities were added to the IFPS. WFO forecasters are just beginning to see the challenges of producing an NDFD that is consistent from forecast area to forecast area. Development of coordination tools in the IFPS, and mechanisms to complete inter site coordination continues, and is necessary if a usable NDFD is to be produced. When forecasters had a short text message as their primary forecast product it was possible to use generalities to make adjoining forecasts mesh. With the demand for more precise information, generalities are going away and the meshing of adjoining forecasts becomes a significant issue.

Providing additional meteorological information to customers through a gridded forecast database has some overhead associated with it. Analyzing observed and forecast model data and editing multiple forecast grids takes longer than analyzing data and typing text products. As a result, forecasters begin the forecast process earlier than in the past. As soon as model data begins to appear the forecasters are getting into the IFPS program and starting to work with the data. This redistribution of work did not mesh well with the traditional standard forecast shift times that have been used in the NWS. As a result the WFO adjusted shift times to more closely match the workload, providing forecasters sufficient time to complete their grid editing. A workload analysis and observation of forecaster processes was required to develop the optimum shift times.

5. CONCLUSIONS

With tools available in the IFPS and high speed communications capabilities it is possible for NWS forecasters to provide more detailed meteorological forecast and warning information. The ability to produce a gridded forecast database will allow NWS partners and customers to develop their own formatting and decision making software. Based upon the experience at WFO Kansas City/Pleasant Hill it is recommended that as NWS offices begin using the IFPS they start with the grid editing tools and emphasize the production of a meteorologically consistent gridded forecast database. The forecasters should be given tools to view the forecast grids and graphical forecast products to reinforce the importance of meteorologically consistent products. While it is possible to start with matrix manipulation, that path will result in a longer transition to the production of a consistent gridded forecast database.

Providing more detailed information in both time and space will require significant forecaster training and a shifting of workload. More time will be spent working with observed and forecast data, and less time will be spent formatting traditional products. The ability to provide this detailed information will require new tools and techniques to accomplish coordination of forecasts in both time and space. As customers are able to view national gridded products any discontinuities will become obvious, and will tend to diminish confidence in the forecast.

While knobology training will be required for this transition, more important will be psychological training and clear communication of the goals of using the IFPS. It is critical to emphasize that this forecast tool is not designed specifically to produce text products, but to give forecasters the ability to paint a more detailed and meteorologically accurate picture of the atmosphere.