Enhancing the Satisfaction Value of User Group Using Meteorological Forecast Information

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Introduction

- The satisfaction of users who use forecast information in decision-making processes is an important issue in the meteorological studies.
- The KMA is conducting a survey on satisfaction of forecast users annually to know their perception since 2008 as well.
- But that kind of surveys are not enough to explain the real perception of forecast users because the surveys are just based on a Likert scale.
- Meanwhile, forecast providers can not always make users be satisfied with forecasts and meet their personal expectations.
- So the quantitative method that can cover entire average satisfaction of user group is needed to help forecast providers.

Methods and Data

Table 1. The yearly accuracy (%) of precipitation forecasts in relation to P_ts (Seoul, Korea)

P_t	10%	20%	30%	40%	60%	70%	80%	90%	100%
Year									
2002	36.7	67.4	78.6	81.1	78.6	76.2	75.3	73.2	71.2
2003	47.4	74.0	85.8	83.8	78.6	74.2	71.8	67.9	66.6
2004	46.8	71.8	83.3	83.8	84.4	82.7	81.4	77.5	75.1
2005	45.8	68.2	82.5	82.5	81.9	80.0	78.6	76.2	73.7
2006	45.5	62.2	77.0	77.0	80.5	77.0	76.2	74.5	72.3
2007	49.0	66.6	79.2	79.2	77.3	74.0	70.4	66.8	64.9
2008	49.3	66.8	80.8	80.8	83.6	78.1	75.3	71.8	69.9
2009	62.2	75.9	83.0	83.0	81.4	76.4	74.2	72.3	69.9
2010	57.0	71.8	79.7	79.7	80.3	72.9	67.7	65.5	62.7
2011	53.2	74.8	85.2	85.2	84.4	82.2	78.9	73.4	70.4

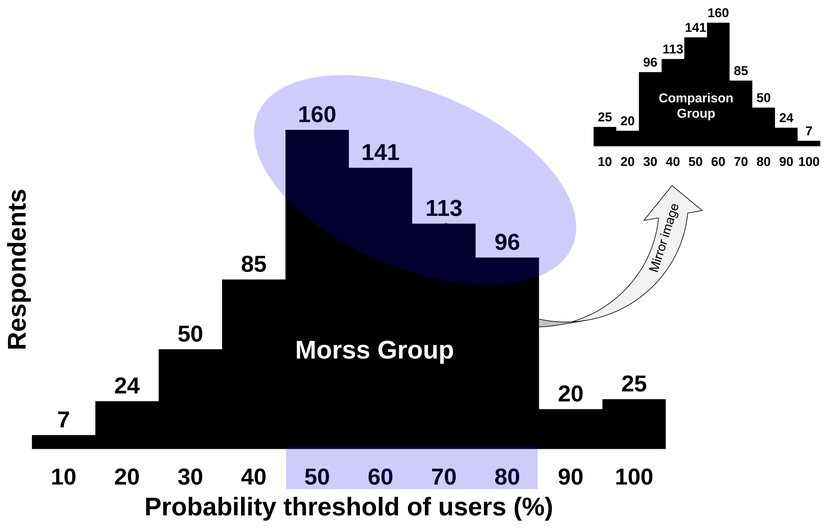

Figure 1. Respondent distribution for thresholds to take a protective action (changing an outdoor picnic plan into an indoor activity plan) in relation to precipitation forecasts (Morss *et al*., 2010).

Table 2. The 2×2 contingency table that describes the factors which are changed from economic value into satisfaction value for picnic scenario.

		Forecast rain event & change picnic plan	
		Yes	No
Rain events observed	Yes	Hit ***H*** (*h*) Satisfaction (1)	Miss ***M*** (*m*) Dissatisfaction (-***A***)
	No	False Alarm ***F*** (*f*) Dissatisfaction (-***B***)	Correct rejection ***R*** (*r*) None (0)

$$S_{forecast} = 1 \cdot h - A \cdot m - B \cdot f + 0 \cdot r$$

$$S'_{forecast} = \sum_{i=1}^{10} (h_i - A \cdot m_i - B \cdot f_i) \cdot p_i$$

VS

$$cVS = \frac{S'_{forecast} - S'_{non\,forecast}}{S'_{perfect\,forecast} - S'_{non\,forecast}}$$

- The value of forecast for a user group, called a *collective Value Score*, can be calculated by using the modified equation like above.
- Unlike a traditional Value Score, NEW terminology means the value of forecasts in relation to the distribution of P_t*s used by user group.*
- It is not the value of forecasts considering individuals' satisfaction indices

Results and Conclusions

Table 3. Averages of cVSs for 10 years of Morss group and the comparison group, and comparison between the cVSs of Morss group and the comparison group for individual combinations of *A* and *B*. *, ** and *** mean that the difference between Morss group and comparison group is significant at the significance levels of 0.1, 0.05 and 0.01, respectively.

(***A***, ***B***)	Average of cVS		Results of paired t-test between Morss and comparison group
	Morss group	Comparison group	*p*-value
(1.5, 1.5)	0.207	0.241	2.65384E-05***
(1.5, 2)	0.271	0.287	0.003157***
(1.5, 2.5)	0.321	0.325	0.24014
(1.5, 3)	0.362	0.355	0.095156*
(2, 1.5)	0.170	0.212	3.25253E-06***
(2, 2)	0.230	0.257	0.000119***
(2, 2.5)	0.280	0.294	0.007212***
(2, 3)	0.321	0.325	0.239775
(2.5, 1.5)	0.139	0.190	8.34618E-07***
(2.5, 2)	0.191	0.227	1.87046E-05***
(2.5, 2.5)	0.250	0.272	0.000276***
(2.5, 3)	0.286	0.299	0.012896**
(3, 1.5)	0.115	0.172	3.22502 E-07***
(3, 2)	0.167	0.209	1.11344E-05***
(3, 2.5)	0.216	0.247	4.55764E-05***
(3, 3)	0.256	0.277	0.000897***

Table 4. Comparison between the forecast effect and the threshold effect.

		A							
		1.5		2		2.5		3	
		Forecast **E**ffect	**T**hreshold **E**ffect	FE	TE	FE	TE	FE	TE
B	1.5	0.031	0.033	0.033	0.043	0.035	0.051	0.036	0.057
	2	0.027	0.017	0.029	0.027	0.028	0.035	0.032	0.042
	2.5	0.024	0.004	0.026	0.014	0.028	0.022	0.030	0.031
	3	0.021	-0.007	0.024	0.004	0.026	0.013	0.028	0.020

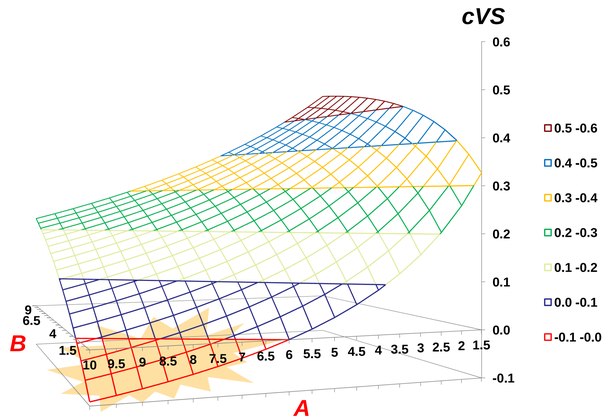

Figure 2. Result of the comparison between cVS of deterministic forecast and probabilistic forecast in Korea.

- The cVS of the comparison group was superior to the Morss group, implying that educational efforts and outreach activities are effective than technical efforts to enhance forecast accuracy.
- Although an accuracy of deterministic forecast is higher than probabilistic forecast, not always the cVS of deterministic forecast is higher than the value of probabilistic forecast.
- Maybe forecast providers can improve the satisfaction of users by controlling a frequency of ***Miss*** and ***False Alarm*** timely and properly .

References

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2. Mylne KR. 2002. Decision-making from probability forecasts based on forecast value. *Meteorol. Appl. 9: 307–315.*

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