

OUTCOMES OF ROLE STRESS: A MULTISAMPLE CONSTRUCTIVE REPLICATION

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Responses from four separate samples of accountants and hospital employees provided a constructive replication of the Bedeian and Armenakis (1981) model of the causal nexus between role stress and selected outcome variables. We investigated the relationship between both role ambiguity and role conflict — as specific forms of role stress — and job-related tension, job satisfaction, and propensity to leave, using LISREL IV, a technique capable of providing statistical data for a hypothesized population model, as well as for specific causal paths. Results, which support the Bedeian and Armenakis model, are discussed in light of previous research.

An especially rich and diverse literature investigating the relationship between role perceptions and work-related attitudes and behaviors has appeared over the past decade. Researchers have linked two specific forms of role stress, role ambiguity and role conflict, to many dysfunctional work-related variables (for recent reviews, see Fisher & Gitelson, 1983; and Jackson, Zedeck, Lyness, & Moses, 1983.)

CAUSAL MODELS OF ROLE STRESS

Despite abundant research, understanding of the nomological niche of role stress has lagged. Love and Beehr (1981) suggested that a principle reason for this slow development was that few studies have examined role stress and job-related strain within a multivariate causal framework. Increasingly, causal modeling has become important to the formulation and evaluation of theoretical models in all areas of the social sciences (Bentler, 1980). As a method of theory testing, it can help determine whether sample data sufficiently represent a hypothesized population model. Causal modeling methods are particularly helpful in locating specification errors, that is,

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improper inclusion or misplacement of variables within a causally related network. Adequacy-of-fit criteria are the usual means employed to statistically test appropriateness of hypothesized causal relationships. In addition to their value in testing the plausibility of sample-based models, causal models are especially well-suited to evaluating competing models that cannot be completely specified (Huba, Woodward, Bentler, & Wingard, 1978). Understanding role stress will require developing adequately specified explanatory models that broaden our knowledge of its relationship to various job-related variables. Lacking such models researchers cannot justify strong conclusions about the antecedents and consequences of role stress.

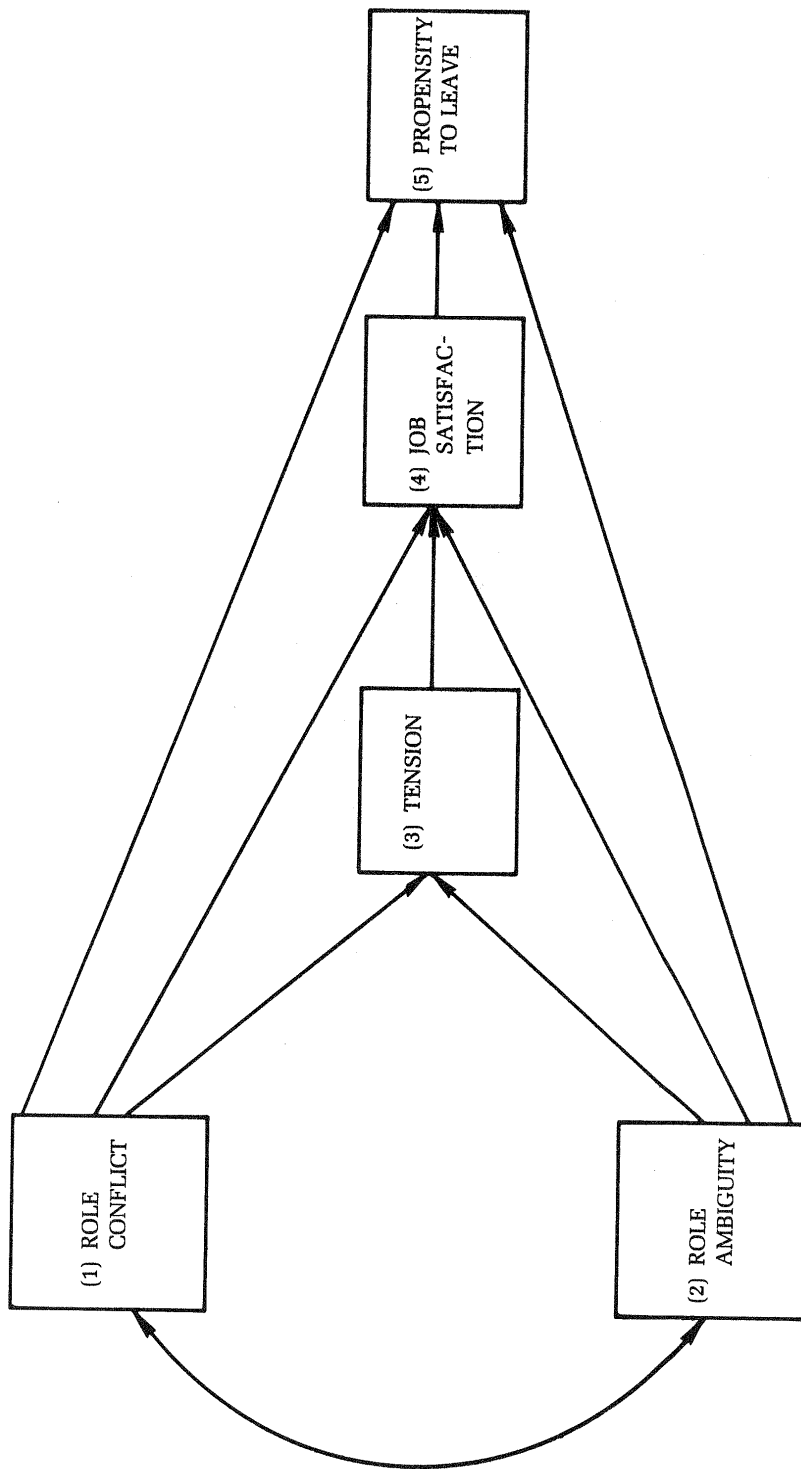
An example of the application of causal modeling methods within a role scheme is Bedeian and Armenakis's (1981) path analysis of a proposed causal model describing the effects of role conflict and role ambiguity on job-related tension, job satisfaction, and intention to leave. A large-sample chi-square test of significance revealed that the hypothesized paths fit the data obtained, thereby providing support for the model.

More recently Jackson (1983a) reported a study employing path analysis to investigate role-related variables. In conjunction with an experimental design, she used path analysis to describe the effect of participation in decision making on role conflict, role ambiguity, job satisfaction, absenteeism, and intentions to leave for 126 hospital employees. A test of her model revealed that the hypothesized paths did not fit the data obtained, a result suggesting that certain paths had been inappropriately omitted. After Jackson revised the model using intercorrelations of study variables and relevant path coefficients, chi-square tests comparing the variance explained by the new model with that explained by the original model confirmed that the revision adequately represented her data. Commenting on this result, Jackson noted because she had postulated the revised model post hoc, the model should be independently retested.

Jackson's (1983a) revised model somewhat overlaps with Bedeian and Armenakis's (1981) causal model, depicted in Figure 1, in which role conflict and role ambiguity exert direct causal influence on job-related tension, job-satisfaction, and propensity to leave an organization. According to this model, job-related tension directly influences level of job satisfaction, which in turn influences propensity to leave. Jackson found support for several of these causal paths — role conflict and role ambiguity leading to emotional strain, emotional strain leading to lack of job satisfaction, and lack of job satisfaction leading to intention to leave.

Since Jackson's final model was formulated post hoc, the possibility remains that the reported findings were spurious. A number of researchers have expressed the belief that independent replication is the only satisfactory solution for establishing whether empirically-based modifications represent genuinely valuable information about a model (e.g., Bentler, 1980). As Bentler and Bonett (1980:604) state, "when a model is modified empirically rather than theoretically, cross-validation or another method for assuring that the statistical theory is not grossly violated becomes essential." Since

FIGURE 1
Bedeian and Armenakis's Causal Model
of the Consequences of Role Conflict and Ambiguity



independent replications do not violate a priori assumptions of hypothesis testing, they provide a means for determining whether an empirically derived model has capitalized inordinately on sample specific covariation. Hence, when particular patterns of results are duplicated with some consistency despite the inevitable definitional or operational disparities that occur across replications, it is generally held that the results represent a relatively robust phenomenon (Keppel, 1982).

The present study is an attempt to provide a constructive replication (Lykken, 1968) of the Bedeian and Armenakis (1981) causal model across four separate samples: three samples of accountants, and Jackson's sample of hospital employees.

METHODS

Subjects

Subjects for the accountant samples were randomly drawn from membership lists of the Association of Government Accountants, American Society of Certified Public Accountants, National Association of Accountants, and American Association of Woman Accountants. From these lists, we identified three samples of accountants: public accountants ($n = 275$), government accountants ($n = 254$), and industrial accountants ($n = 459$). The fourth sample employed in this investigation was derived from Jackson's (1983a) posttest 2 data ($n = 66$) from hospital employees.

Measures

Role conflict and role ambiguity for the accountant samples were, respectively, measured by 6- and 8-item scales developed by Rizzo, House, and Lirtzman (1970). Role conflict and role ambiguity were measured in Jackson's (1983a) study using a new instrument developed by House, Schuler, and Levanoni (1983).

We measured job-related tension for the accountant samples with a 9-item index obtained from Lyons (1971) that was designed to assess the frequency with which a person reports being bothered by work-related variables. The counterpart to this measure in the Jackson (1983a) study was overall emotional strain, measured through responses to the 30-item General Health Questionnaire (Goldberg, 1972). Each item describes a medical symptom.

The Minnesota Satisfaction Questionnaire (MSQ), short form (Weiss, Dawis, England, & Lofquist, 1967), assessed job satisfaction in all four samples. Although the MSQ derives three scores for each respondent (intrinsic, extrinsic, and overall satisfaction), we used only the overall satisfaction score in our analysis.

For the accountant samples, we measured propensity to terminate employment with a 3-item scale developed by Lyons (1971). Jackson assessed intentions to leave for the hospital sample through responses to the question, "Are you planning to quit your job at (organization) in the near future?"

Analysis

Covariance matrices for each sample were evaluated by LISREL IV (Jöreskog & Sörbom, 1978), a program that yields a maximum likelihood solution for the parameters of a hypothesized model, and allows statistical analysis on two levels, the individual and the comprehensive. This program provides path coefficient estimates along with approximate *t*-values to determine the statistical significance of hypothesized individual relations. For comprehensive analysis, the program computes a chi-square goodness-of-fit statistic to assess whether all of a model's hypothesized relations considered together provide an appropriate description of population data.

Even though LISREL IV can analyze multisample covariance structures simultaneously, we decided to examine samples individually for two reasons. First, the focal constructs were not measured by the same instruments for all samples. To control for measurement differences, we would have had to analyze correlation rather than covariance matrices, which would have been tantamount to standardizing the data and eliminating any mean group differences. Analyzing correlation matrices, rather than covariance matrices, could have resulted in a solution that appeared to be a better fit across sample than was actually the case. Second, having used only a single indicator of each construct in this study, we expected a certain degree of variability in path coefficients (due to measurement error) across samples — a variability that could conceivably have inflated the chi-square goodness-of-fit statistic, suggesting that the proposed model did not provide a plausible representation of the system of influences among variables in the population.

The hypothesized model tested in the present study (illustrated in Figure 1) included two exogenous variables (role conflict and role ambiguity), and three endogenous variables (tension, job satisfaction, and propensity to leave). Consistent with past research and theory, we omitted the causal path from tension to propensity to leave for all four groups (Van Sell, Brief, & Schuler, 1981).

RESULTS

Mean scores, standard deviations, and coefficient alpha reliability estimates were computed for each measure by sample.¹ Inspection of coefficient alphas was necessary, as a wide divergence in reliabilities could have resulted in an analysis that placed the most reliable indices at the center of a hypothesized model. We calculated standard deviations of the reliabilities obtained with the four samples for each instrument. The resulting standard deviations ranged from .05 to .06, indicating that instrument reliabilities were similar and relatively homogeneous across all samples.

Chi-square values resulting from LISREL goodness-of-fit analyses were as follows: public accountants, 5.97 with 1 *df* ($p < .02$); government

¹A table giving mean scores, standard deviations, and reliability estimates for each measure by sample is available from the authors.

accountants, 1.50 with 1 *df* ($p < .23$); industrial accountants, 5.53 with 1 *df* ($p < .02$); Jackson's hospital employees, 8.10 with 1 *df* ($p < .004$). In each instance but one (government accountants), the test statistic was significant. Although this result might be viewed as disconfirmatory evidence, Jöreskog (1978) and others (e.g., Maruyama & McGarvey, 1980) have warned that since the chi-square statistic is a direct function of sample size, the probability of rejecting a hypothesized model increases as *N* increases. Consequently, with large samples, virtually all models would be rejected as statistically untenable.

In response to this dilemma, previous researchers have recommended two alternatives to the chi-square statistic for assessing goodness-of-fit with causal models: a χ^2/df ratio (Boruch & Wolins, 1970) and an incremental fit index (Bentler & Bonett, 1980). Boruch and Wolins suggest that dividing the degrees-of-freedom for a causal model into the chi-square value produced by the application of that model indicates goodness-of-fit. Since degrees of freedom for our hypothesized model equal one, the χ^2/df ratios are equal to the chi-square values resulting from the LISREL goodness-of-fit analyses. Schmitt and Bedeian (1982), and others, have considered a 10:1 ratio or less to be an acceptable fit; by this criterion, our results, with no ratio larger than 8.10:1, represent a reasonable fit. A second recommended means for estimating the fit of a causal model is to assess its explanatory power over-and-above a null model that postulates independence among focal variables. Applying this notion, Bentler and Bonett (1980) developed an incremental fit index, delta (Δ), which can be expressed as

$$\Delta_{nm} = \frac{(F_n - F_m)}{F_n} \quad (1)$$

where F_n refers to the chi-square value under the null model previously proposed, and F_m refers to the chi-square value obtained from the hypothesized model. The resulting difference index (Δ_{nm}) lies in the interval $0 < \Delta_{nm} < 1$ and represents the incremental fit of a causal model. The use of delta also provides a measure of the remaining increment in fit possible by the use of a better model, in that the remaining possible increment is equal to $1.0 - \Delta$. While the distribution of delta is unknown, Bentler and Bonett suggest that an incremental value less than 0.9 can usually be improved. In the case of samples larger than 100, Bearden, Sharma, and Teel (1982) contend that an incremental value less than 0.95 indicates a poor fit.

For each sample, we used LISREL IV to generate chi-square values for a null model of "modified independence," one that allows exogenous variables to correlate (Bentler & Bonett, 1980: 596). Table 1 displays these values for each sample, along with the chi-squares and incremental fit indices for the hypothesized model. In contrast to Jackson's sample, the three accountant samples support the hypothesized model according to Bentler and Bonett's incremental fit index.

TABLE 1
 Summary Statistics for Chi-Square Goodness-of-Fit
 Tests and Incremental Fix Indices^a

Sample	n	Null Model		Hypothesized Model		Incremental Fix Index	
		χ^2	df (1)	χ^2	df (2)	Δ	(3)
Government accountants	254	571.96**	9	1.50	1	.997	
Public accountants	275	579.58**	9	5.97*	1	.990	
Industrial accountants	459	902.88**	9	5.53*	1	.994	
Jackson's hospital employees	66	58.14**	9	8.10**	1	.861	

^aBentler and Bonnett (1980).

* $p < .05$

** $p < .001$

Table 2 shows maximum likelihood parameter estimates for the model in the Figure for each sample, as well as the approximate *t*-statistic for each path (obtained by dividing its path coefficient by its standard error) and associated *p* levels.

Several comments regarding the reported goodness-of-fit criteria are in order. From Table 1, it should be clear that the calculated fit indices do not support uniform conclusions. First, as mentioned above, the chi-square tests

TABLE 2
Maximum Likelihood Estimates on Four Samples for Model in Figure 1^a

Parameter	Sample	Estimate	<i>t</i> -value	<i>p</i> ^b
13 ^c	Public accountants	.587	13.119	.005
Role conflict	Government accountants	.590	13.511	.005
→ Tension	Industrial accountants	.628	18.565	.005
	Jackson's hospital employees	.215	1.811	.050
23	Public accountants	.282	6.308	.005
Role ambiguity	Government accountants	.320	7.327	.005
→ Tension	Industrial accountants	.231	6.824	.005
	Jackson's hospital employees	.346	2.918	.005
14	Public accountants	-.076	-1.124	n.s.
Role conflict	Government accountants	-.043	-0.552	n.s.
→ Satisfaction	Industrial accountants	-.001	-0.026	n.s.
	Jackson's hospital employees	-.302	-2.659	.005
24	Public accountants	-.556	-9.975	.005
Role ambiguity	Government accountants	-.479	-7.342	.005
→ Satisfaction	Industrial accountants	-.438	-10.137	.005
	Jackson's hospital employees	-.170	-1.439	n.s.
34	Public accountants	-.063	-0.884	n.s.
Tension	Government accountants	-.119	-1.400	n.s.
→ Satisfaction	Industrial accountants	-.249	-4.382	.005
	Jackson's hospital employees	-.261	-2.254	.025
15	Public accountants	.224	4.409	.005
Role conflict	Government accountants	.250	5.025	.005
→ Propensity to leave	Industrial accountants	.224	6.001	.005
	Jackson's hospital employees	.068	0.500	n.s.
25	Public accountants	.108	1.792	.050
Role ambiguity	Government accountants	.093	1.656	n.s.
→ Propensity to leave	Industrial accountants	.067	1.587	n.s.
	Jackson's hospital employees	-.048	-0.362	n.s.
45	Public accountants	-.488	-8.526	.005
Satisfaction	Government accountants	-.541	-10.375	.005
→ Propensity to leave	Industrial accountants	-.543	-13.277	.005
	Jackson's hospital employees	-.328	-2.409	.010

^aBedeian and Armenakis (1981)

^bOne-tailed test

^cCodes refer to paths in the model.

of significance suggest that data from only one sample — government accountants — supported the model in question. Second, the magnitudes of the χ^2/df ratios (Boruch & Wolins, 1970), supported the hypothesized model across all four samples. And finally (as shown in column 3 of Table 1), Bentler and Bonett's incremental fit index supported the Bedeian and Armenakis model in the three accountant samples but not Jackson's hospital employee sample. Since choice of index will obviously influence inferences made regarding the fit of sample data to a hypothesized model, which fit index should be used? Bentler and Bonett (1980) circumvent this problem by suggesting that goodness-of-fit be based on multiple criteria. A clearer picture emerges when the results presented in this paper are viewed within this context.

For the government accountant sample, the problem of which fit index to use is not an issue: the data fit the hypothesized model using all three criteria. The results obtained from the remaining three samples highlight the importance of employing multiple criteria. The chi-square goodness-of-fit test rejected the null hypothesis for the public accountant, industrial accountant, and hospital employee samples. As previously mentioned, this result was possibly an effect of sample size. The χ^2/df ratios suggested that fit was adequate in all three cases, so we had to turn to Bentler and Bonett's incremental index to determine the degree of fit of the sample data to the hypothesized model.

As Table 1 shows, calculated incremental fit indices indicated that the hypothesized model represented a substantial improvement over the null model for both the public and industrial accountants. The fit index of .861 for Jackson's hospital employee sample indicates that the hypothesized model could be improved substantially. Since both the χ^2/df ratios and incremental fit indices indicate that the hypothesized model appropriately captured the data for the industrial and public accountant samples, it seems likely that significant chi-square values for them were due to large sample sizes. Given this fact, we can reason that these samples supported the hypothesized model. However, since Jackson's hospital employee sample yielded a significant chi-square value and an unacceptable incremental fit index, we can reason that it did not support the proposed model.

DISCUSSION

Data from three of the four samples tested supported the Bedeian and Armenakis (1981) model. With respect to Jackson's hospital employee sample, besides the small sample size ($n = 66$), the most likely reason for the lack of fit was variation of measures: job-related tension was measured in the accountant samples, but Jackson (1983a) measured overall emotional strain. Our failure to find support for the hypothesized model from hospital employee sample suggests that job-related tension and overall emotional strain are differentially related to the other measured variables, which is understandable, since job tension is but one component of overall emotional strain. Further, we can attribute the lack of fit to the fact that Jackson administered a 30-item

health questionnaire to measure overall emotional strain. Physical (medical) symptoms are not equivalent to the degree an individual is bothered by job-related tension. Moreover, Kemery, Benson, and Sauser (1983) reported physical symptomatology to be a consequence of role conflict, role ambiguity, and job satisfaction.

As regards the three accountant samples, statistical evidence supported the causal paths in the hypothesized model in almost all cases, the weakest support being that for the causal paths between role conflict and job satisfaction and those between role ambiguity and propensity to terminate employment. Within the context of the proposed model, role conflict and role ambiguity exerted a direct influence on job-related tension, job satisfaction, and propensity to leave an organization, and at the same time appeared to have indirect influences as well. Increases in role conflict, for example, led to decreases in job satisfaction both directly and indirectly because role conflict also results in greater job-related tension. This conditional relationship is interpretable in the context of what is known about the generation of work tension (Brief, Schuler, & Van Sell, 1981). Kahn, Wolfe, Quinn, Snoek, and Rosenthal (1964) have shown that role conflict is partly a cognitive variable tied to task responsibilities. Consequently, job-related tension that is task specific would be expected to occur first and then decrease general job satisfaction. This same argument may well apply to role ambiguity.

Several other implications of the hypothesized model are also noteworthy. The proposed model suggests that one way to increase job satisfaction and decrease employee propensity to terminate employment is to attenuate role-based stressors. Such adjustments, however, may not be possible in certain occupations; role conflict may be inherent in some jobs, such as nursing (Jackson, 1983b), and role ambiguity may be inherent in others — for instance, upper management.

Another implication of the proposed model is that when modifying situational factors cannot eliminate potential stressors, focusing on intermediate variables in the hypothesized causal chain can minimize their impact. The present model suggests that reducing felt job tension can minimize the impact of role-based stressors. For instance, introducing effective coping strategies, such as communication improvements or stress management skills, would likely increase employees' job satisfaction and decrease their desire to leave an organization. Intervening further along the causal sequence has another advantage. To the extent that other job-related variables cause an increase in job-related tension, interventions geared toward tension reduction will attenuate their eventual effect. Therefore, use of this prescription may also reduce the effects of potential stressors not included in the model.

Additionally, it should be noted that not all causal paths were significant in each sample, a finding that suggests several possibilities. First, there may be situational or personal characteristics that are important moderators within the context of the hypothesized model. Second, the nonsignificant causal paths could be due to sampling error: obtained path coefficients, because they are based on imperfect measures, are expected to vary across

samples. Thus, the obtained coefficients may be underestimates of the true relationship between these variables within the context of the Bedeian and Armenakis model.

We could have deleted one or several of these paths and retested the fit of a restricted model. This procedure, referred to as theory trimming (Pedhazur 1982), is an empirically-based procedure of model construction that capitalizes on sample-specific covariation. Since the purpose of this investigation was to constructively replicate the Bedeian and Armenakis model, attempts to modify the hypothesized model in a post hoc fashion could have led to spurious findings. A scientifically more acceptable approach would be for future investigators to specify different a priori models that draw on sound theoretical rationale and then collect data to test each of them. However, the improvement in fit made possible by the use of a better model is, in practical terms, quite small. Considered in the context of each sample, the incremental fit indices for the public ($\Delta_{nm} = 0.990$), government ($\Delta_{nm} = 0.997$), and industrial ($\Delta_{nm} = 0.994$) accountants indicate virtually perfect fit. Even in the case of Jackson's hospital employess ($\Delta_{nm} = 0.861$), the improvement ($1.0 - .861 = .139$) that a better model might yield is relatively insignificant from a practical viewpoint.

We minimized concerns related to sample-specific covariation (e.g., Schmidt & Hunter, 1977) using a total sample of more than 1000 subjects. Nevertheless, caveats germane to causal modeling should be noted. First, the fact that a hypothesized model is consistent with the obtained data does not indicate unequivocal support, as the observed data may well also support other network orderings. This concern is minor in the present instance as the proposed model was based on reasonably sound a priori theoretical considerations (Bedeian & Armenakis, 1981), and it yielded both statistically as well as practically significant results. A second concern is the appropriateness of the hypothesized causal paths — more specifically, the self-containment of the structural equations explicit in the model. A structural equation is said to be self-contained when all relevant endogenous variable determinants are measured (James, Mulaik, & Brett, 1982). Given practical constraints, we did not include all known determinants of job-related tension, job satisfaction, and propensity to terminate employment in the present analysis. The consequence of these omissions is a potentially biased estimate of the structural parameters relating the endogenous and exogenous variables in the models investigated. The effect that bias will have on the usefulness of the hypothesized model cannot be determined until data are collected on additional unmeasured variables.

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