

Modeling a Trend Pattern for E-HRM Budgets' Dynamics: Evidence from a Case Study Based on a Romanian Software Firm

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DOI Link: <http://dx.doi.org/10.6007/IJARBSS/v3-i7/7/12>

Published Date: 05 July 2013

Abstract

The global business practice has proved that the e-HRM platform implementation has a good influence on the development of an organization's HR strategy. Although the financing of many e-HRM technology projects has been affected by the current global economic crisis, many organizations have understood the utility of such state of the art IT solutions applied in the HR area, and augmented its budgets. The assignation dynamic of the e-HRM system implementation budgets is influenced by the perception that the managers might have about the tangible and intangible benefits of these systems bring to the organization. This study intends to identify a trend model for the e-HRM budgets' dynamics. In order to do that, we have developed and applied a longitudinal research aimed to determine the evolution in time that the e-HRM budgets' dynamics trend has within a software firm.

Keywords: trend pattern, e-HRM budget, variation coefficient

1. General consideration regarding the e-HRM budgets dynamics on a global scale

The global business practice has proved that the e-HRM platform implementation has a good influence on the development of an organization's HR strategy, guaranteeing the integrity of the information obtained in all the stages of the strategic human resource management process. The financing of many e-HRM technology projects has been affected

by the current global economic crisis, but luckily, many organizations have understood the utility of such state of the art IT solutions applied in the HR area, and augmented the budgets set for this type of programs, which consequently led to their revitalization.

Ball (2001) considers that the dimensions of the organizations play a definitive role in setting the e-HRM systems' complexity, thus big organizations, which can afford directing larger amounts of money towards HRM, tend to invest in more complex e-HRM systems than the smaller firms, receiving personalized consultancy for implementing the e-HRM systems they've requested. The biggest challenge for the top-management of thus organizations is represented by the integration capability of the e-HRM dedicated technologies with the ERP systems (Dery and Wailes, 2005).

The assignation dynamic of the e-HRM system implementation budgets is influenced by the perception that the managers might have about the tangible and intangible benefits of these systems bring to the organization. Some experts (Stone, Stone-Romero and Lukazweski, 2006) argue that e-HRM technology budget cutting may be caused by the almost impossible quantification of the effects that these technologies have on HRM systems' efficiency enhancement.

Administrative costs cutting represent the most relevant tangible benefit that implementing an e-HRM system has. The financial reports that the organizations make follow the existing correlation between administrative costs cutting and investment return rates within the e-HRM systems in order to determine the performance that these systems have. Generally, e-HRM projects' budgeting is only approved after a thorough operational benefits analysis (Haines, 2008).

The decision to supplement e-HRM budgets can be taken after the identification of the opportunity of efficient employee responsibility allocation within e-HRM systems and also after the top management would have been assured that the employees possess the amount of knowledge and competencies needed in order to use the e-HRM systems (Bondarouk and Rue, 2008).

In some organizations, the responsibilities for e-HRM investments are not the concern of management, in these cases, the e-HRM systems' financing are being realized in a structured manner, starting from the need to reduce HRM costs (Brandl et al., 2009).

Some experts (Schalk et al., 2013) came to realize that a technology centered approach for e-HRM systems isn't always the optimal solution on medium and long term, as it loses from sight the opportunities that may arise to take advantage of the e-HRM systems' capabilities on a strategic level.

2 Research methodology

The methodology of the research implied the identification of a trend model for the e-HRM budgets' dynamics, model that has been tested on a software developing firm. In order to do that, we have developed and applied a longitudinal research aimed to determine the evolution in time that the e-HRM budgets' dynamics trend has within the software firm. To achieve this goal, we have realized a case study that consisted in constructing a panel, represented by the e-HRM budgets, and apply repeated measurements, at a monthly pace, during two consecutive years – 2011 and 2012.

The collection of the data was made possible by the collaboration of the top-management of the firm, which has provided us with the e-HRM budget financial reports and

has agreed to send one representative to a monthly meeting with us. Within the first preliminary meeting the following three hypotheses have been stated:

The void hypothesis: H_0 - existence of the monthly e-HRM budget trend model, under the form of a linear function.

The first alternative hypothesis: H_1 - existence of monthly e-HRM budget trend model, under the form of a quadratic function.

The second alternative hypothesis: H_2 - existence of monthly e-HRM budget trend model, under the form of an exponential function.

The testing of the three above stated hypotheses, which stood at the foundation of explaining the conceptual model of the longitudinal research, implied the use of the variation coefficient method, through which we can evaluate the selection criteria for the optimal trend model.

The variation coefficient method is among the most applied statistical instruments aimed at valuing the consequences generated by group differences at an organizational level. This method is focused on comparing the internal variations of the research variables (Bedeian and Mossholder, 2000). Even if the variation coefficient is also used to determine data or samples' distributions, in the context of trend models identification, it is mostly viewed as being an analytic and measurement instrument for sampled data (Lovie, 2005).

The variation coefficient represents the index of the standard deviation from the average, and makes the samples' comparison possible, even though the averages differ a lot. In our particular case, the e-HRM budgets are being allocated by managers in correspondence with specific priorities. The main rule of the variation coefficient method states as follows: the lesser value the variation coefficient has, the greater the homogenization of the data.

3 Identifying the e-HRM budgets' dynamics trend model for a software firm for a two year period, from 2011 to 2012

The case study that we've made was based on the observation of a software development firm, based in Bucharest, which develops software utilities mostly for portable devices. The top management of the organization had agreed to work with us in this research and share information with regard to the monthly evolution of their e-HRM budgets in the two year window starting in 2011 until 2012. The main expenses they had are related to the amortization of their e-HRM technologies and personnel training. Starting from October 2011, the firm integrated a e-HRM module to communicate with the clients' representatives online, then in December of the same year, the e-HRM system received an upgrade integrated a brand new talent management module, that facilitates HR investments optimization (more accurate software developer profile hunting) and performance channeled rewarding.

The e-HRM budgets monthly evolution for the software firm, based on its internal financial reports, can be seen in the table number 1:

Table no. 1

Monthly e-HRM budgets evolution for the investigates software firm in the period between 2011 and 2012

YEAR	MONTH	MONTHLY BUDGET FOR e-HRM ACTIVITIES (LEI)
2011	January	16.140
	February	16.140
	March	16.140
	April	17.890
	May	18.200
	June	18.200
	Julie	15.940
	August	15.940
	September	17.890
	October	18.120
	November	18.780
	December	19.160
2012	January	18.120
	February	17.420
	March	17.420
	April	18.360
	May	19.580
	June	21.020
	Julie	20.250
	August	18.280
	September	21.320
	October	21.320
	November	20.280
	December	19.960

A preliminary data analysis shows that the firm has set up a larger e-HRM budget for 2012 and that there were fluctuation within the funds allocation, mostly in July and August, months that had lesser budgets allocated than the others.

Parting from table no. 1, we aim to identify the trend model that the software firm's monthly e-HRM budgets have followed in their evolution in the two year period. To do this we applied the variation coefficient method as selection criteria for the best trend model.

Within the void hypothesis H_0 which states that the software firm's monthly e-HRM budget variable X has a trend modeled by the linear function $x_{t_i} = a + b \cdot t_i$, where the parameters a and b of the first grade adjust function will be computed through the following system:

$$\begin{cases} n \cdot a = \sum_{i=-m}^m x_i \\ b \cdot \sum_{i=-m}^m t_i^2 = \sum_{i=-m}^m t_i \cdot x_i \end{cases} \quad (1)$$

Consequently, $a = \frac{\sum_{i=-m}^m x_i}{n}$ (2)

$$b = \frac{\sum_{i=-m}^m t_i \cdot x_i}{\sum_{i=-m}^m t_i^2} \quad (3)$$

Using in table no. 2 the statistical data computed in order to adjust the linear function we will determine for the a and b parameters the following values:

$$a = \frac{441.870}{24} = 18.411,25$$

$$b = \frac{233.740}{1.300} = 179,8$$

Therefore, the variation coefficient for the first grade adjusted function will be:

$$v_f = \left[\frac{\sum_{i=-m}^m |x_i - x_{t_i}^f|}{n} : \frac{\sum_{i=-m}^m x_i}{n} \right] \cdot 100 \Rightarrow v_f = \frac{\sum_{i=-m}^m |x_i - x_{t_i}^f|}{\sum_{i=-m}^m x_i} \cdot 100 \quad (4)$$

$$v_f = \frac{20.511,20}{441.870} \cdot 100 \Rightarrow v_f = 4,64\%$$

Table no. 2

The variation coefficient value determination for the first grade function, in the hypothesis of linear evolution of the software firm's monthly e-HRM budget allocation in the set timeframe, from 2011 to 2012

YEAR	MONTH	MONTHLY e-HRM BUDGET (LEI) (x _i)	LINEAR TENDENCY				
			t _i	t _i ²	t _i x _i	x _i = a + bt _i	x _i - x _{t_i}
2011	January	16.140	-12	144	-193.680	16.253,65	113,65
	February	16.140	-11	121	-177.540	16.433,45	293,45
	March	16.140	-10	100	-161.400	16.613,25	473,25
	April	17.890	-9	81	-161.010	16.793,05	1.096,95
	May	18.200	-8	64	-145.600	16.972,85	1.227,15
	June	18.200	-7	49	-127.400	17.152,65	1.047,35
	Julie	15.940	-6	36	-95.640	17.332,45	1.392,45
	August	15.940	-5	25	-79.700	17.512,25	1.572,25
	September	17.890	-4	16	-71.560	17.692,05	197,95
	October	18.120	-3	9	-54.360	17.871,85	248,15
	November	18.780	-2	4	-37.560	18.051,65	728,35
	December	19.160	-1	1	-19.160	18.231,45	928,55
2012	January	18.120	1	1	18.120	18.591,05	471,05
	February	17.420	2	4	34.840	18.770,85	1.350,85
	March	17.420	3	9	52.260	18.950,65	1.530,65
	April	18.360	4	16	73.440	19.130,45	770,45
	May	19.580	5	25	97.900	19.310,25	269,75
	June	21.020	6	36	126.120	19.490,05	1.529,95
	Julie	20.250	7	49	141.750	19.669,85	580,15
	August	18.280	8	64	146.240	19.849,65	1.569,65
	September	21.320	9	81	191.880	20.029,45	1.290,55
	October	21.320	10	100	213.200	20.209,25	1.110,75
	November	20.280	11	121	223.080	20.389,05	109,05
	December	19.960	12	144	239.520	20.568,85	608,85
TOTAL		441.870	-	1.300	233.740	-	20.511,20

For the alternative hypothesis H_1 which stated that there existed a trend model associated to the X variable of the monthly e-HRM budgets that the firm allocate, determined by the second grade parabolic function $x_i = a + b \cdot t_i + ct_i^2$, which parameters a,b and c of the adjusted second grade function will be computed applying the following system:

$$\begin{cases} n \cdot a + c \sum_{i=-m}^m t_i^2 = \sum_{i=-m}^m x_i \\ b \cdot \sum_{i=-m}^m t_i^2 = \sum_{i=-m}^m t_i \cdot x_i \\ a \cdot \sum_{i=-m}^m t_i^2 + c \sum_{i=-m}^m t_i^4 = \sum_{i=-m}^m t_i^2 \cdot x_i \end{cases} \quad (5)$$

Thus,

$$a = \frac{\sum_{i=-m}^m t_i^4 \cdot \sum_{i=-m}^m x_i - \sum_{i=-m}^m t_i^2 \cdot \sum_{i=-m}^m t_i^2 \cdot x_i}{n \cdot \sum_{i=-m}^m t_i^4 - (\sum_{i=-m}^m t_i^2)^2} \quad (6)$$

$$b = \frac{\sum_{i=-m}^m t_i \cdot x_i}{\sum_{i=-m}^m t_i^2} \quad (7)$$

and

$$c = \frac{n \cdot \sum_{i=-m}^m t_i^2 \cdot x_i - \sum_{i=-m}^m t_i^2 \cdot \sum_{i=-m}^m x_i}{n \cdot \sum_{i=-m}^m t_i^4 - (\sum_{i=-m}^m t_i^2)^2} \quad (8)$$

Therefore, applying this data in an parabolic function adjust worksheet for the second degree function, worksheet that we reflected in table no. 3, we were able to determine the a, b and c parameters as being:

$$a = \frac{121.420 \cdot 441.870 - 1.300 \cdot 24.046.500}{24 \cdot 121.420 - (1.300)^2} = 18.292,43$$

$$b = \frac{233.740}{1.300} = 179,8$$

$$c = \frac{24 \cdot 24.046.500 - 1.300 \cdot 441.870}{24 \cdot 121.420 - (1.300)^2} = 2,19$$

Table no. 3

The variation coefficient value determination for the second grade adjusted function, in the hypothesis of parabolic evolution of the software firm’s monthly e-HRM budget allocation in the set timeframe, from 2011 to 2012

YEAR	MONTH	MONTHLY e-HRM BUDGET (LEI) (x _i)	PARABOLIC TENDENCY				
			t _i ²	t _i ⁴	t _i ² · x _i	X _i = a + bt _i + ct _i ²	x _i - x _i
	January	16.140	144	20.736	2.324.160	16.450,2	310,2
	February	16.140	121	14.641	1.952.940	16.579,63	439,63
	March	16.140	100	10.000	1.614.000	16.713,44	573,44

YEAR	MONTH	MONTHLY e-HRM BUDGET (LEI) (x_i)	PARABOLIC TENDENCY				
			t_i^2	t_i^4	$t_i^2 \cdot x_i$	$X_i = a + bt_i + ct_i^2$	$ x_i - x_i $
2011	April	17.890	81	6.561	1.449.090	16.851,63	1.038,37
	May	18.200	64	4.096	1.164.800	16.994,2	1.205,8
	June	18.200	49	2.401	891.800	17.141,15	1.058,85
	Julie	15.940	36	1.296	573.840	17.292,48	1.352,48
	August	15.940	25	625	398.500	17.448,19	1.508,19
	September	17.890	16	256	286.240	17.608,28	281,72
	October	18.120	9	81	163.080	17.772,75	347,25
	November	18.780	4	16	75.120	17.941,6	838,4
	December	19.160	1	1	19.160	18.114,83	1.045,17
2012	January	18.120	1	1	18.120	18.474,43	354,43
	February	17.420	4	16	69.680	18.660,8	1.240,8
	March	17.420	9	81	156.780	18.851,55	1.431,55
	April	18.360	16	256	293.760	19.046,68	686,68
	May	19.580	25	625	489.500	19.246,19	333,81
	June	21.020	36	1.296	756.720	19.450,08	1.569,92
	Julie	20.250	49	2.401	992.250	19.658,35	591,65
	August	18.280	64	4.096	1.169.920	19.871	1.591
	September	21.320	81	6.561	1.726.920	20.088,03	1.231,97
	October	21.320	100	10.000	2.132.000	20.309,44	1.010,56
	November	20.280	121	14.641	2.453.880	20.535,23	255,23
	December	19.960	144	20.736	2.874.240	20.765,4	805,4
TOTAL		441.870	1.300	121.420	24.046.500	-	21.102,5

The variation coefficient of the second grade adjusted function was determined by computing the following formula:

$$v_{II} = \left[\frac{\sum_{i=-m}^m |x_i - x_{II}|}{n} : \frac{\sum_{i=-m}^m x_i}{n} \right] \cdot 100 \Rightarrow v_{II} = \frac{\sum_{i=-m}^m |x_i - x_{II}|}{\sum_{i=-m}^m x_i} \cdot 100 \quad (9)$$

$$v_{II} = \frac{21.102,5}{441.870} \cdot 100 \Rightarrow v_{II} = 4,78\%$$

For the alternative hypothesis H_2 which stated that there existed a trend model associated to the X variable of the monthly e-HRM budgets that the firm allocate, determined by the exponential function $x_{t_i} = ab^{t_i}$, which parameters a and b of the adjusted exponential function will be calculated by resolving the following system:

$$\begin{cases} n \cdot \ln a = \sum_{i=-m}^m \ln x_i \\ \ln b \cdot \sum_{i=-m}^m t_i^2 = \sum_{i=-m}^m t_i \cdot \ln x_i \end{cases} \quad (10)$$

Therefore,
$$\ln a = \frac{\sum_{i=-m}^m \ln x_i}{n} \quad (11)$$

$$\ln b = \frac{\sum_{i=-m}^m t_i \cdot \ln x_i}{\sum_{i=-m}^m t_i^2} \quad (12)$$

In conclusion, based on the date gathered for the exponential function, presented in table no..4, we determined the indicators, as follows:

$$\ln a = \frac{235,60}{24} = 9,82$$

$$\ln b = \frac{12,67}{1.300} = 0,0097$$

Table no. 4

The variation coefficient value determination for the exponential adjusted function, in the hypothesis of exponential evolution of the software firm’s monthly e-HRM budget allocation in the set timeframe, from 2011 to 2012

YEAR	MONTH	MONTHLY e-HRM BUDGET (LEI) (x_i)	EXPONENTIAL TENDENCY				
			$\ln x_i$	$t_i \ln x_i$	$\ln x_i = \ln a + t_i \cdot \ln b$	$x_{t_i} = ab^{t_i}$	$ x_i - x_{t_i} $
	January	16.140	9,69	-116,27	9,70	16.376,46	236,46

YEAR	MONTH	MONTHLY e-HRM BUDGET (LEI) (x _i)	EXPONENTIAL TENDENCY				
			ln x _i	t _i ln x _i	ln x _i = ln a + t _i · ln b	x _{t_i} = ab ^{t_i}	x _i - x _{t_i}
2011	February	16.140	9,69	-106,58	9,71	16.536,08	396,08
	March	16.140	9,69	-96,89	9,72	16.697,26	557,26
	April	17.890	9,79	-88,13	9,73	16.860,01	1029,99
	May	18.200	9,81	-78,47	9,74	17.024,35	1175,65
	June	18.200	9,81	-68,66	9,75	17.190,29	1009,71
	Julie	15.940	9,68	-58,06	9,76	17.357,85	1417,85
	August	15.940	9,68	-48,38	9,77	17.527,04	1587,04
	Septembe r	17.890	9,79	-39,17	9,78	17.697,88	192,12
	October	18.120	9,80	-29,41	9,79	17.870,38	249,62
	November	18.780	9,84	-19,68	9,80	18.044,57	735,43
	December	19.160	9,86	-9,86	9,81	18.220,45	939,55
	2012	January	18.120	9,80	9,80	9,83	18.577,38
February		17.420	9,77	19,53	9,84	18.758,46	1338,46
March		17.420	9,77	29,30	9,85	18.941,30	1521,30
April		18.360	9,82	39,27	9,86	19.125,92	765,92
May		19.580	9,88	49,41	9,87	19.312,35	267,65
June		21.020	9,95	59,72	9,88	19.500,59	1519,41
Julie		20.250	9,92	69,41	9,89	19.690,67	559,33
August		18.280	9,81	78,51	9,90	19.882,59	1602,59
Septembe r		21.320	9,97	89,71	9,91	20.076,39	1243,61
October		21.320	9,97	99,67	9,92	20.272,08	1047,92
November		20.280	9,92	109,09	9,93	20469,68	189,68
December		19.960	9,90	118,82	9,94	20669,20	709,20
TOTAL		441.870	235,60	12,67	-	-	20.749,20

The variation coefficient for the exponential function was determined employing the following formula:

$$v_{\text{exp}} = \left[\frac{\sum_{i=-m}^m |x_i - x_{t_i}^{\text{exp}}|}{n} : \frac{\sum_{i=-m}^m x_i}{n} \right] \cdot 100 \Rightarrow v_{\text{exp}} = \frac{\sum_{i=-m}^m |x_i - x_{t_i}^{\text{exp}}|}{\sum_{i=-m}^m x_i} \cdot 100 \quad (13)$$

$$v_{\text{exp}} = \frac{20.749,20}{441.870} \cdot 100 \Rightarrow v_{\text{exp}} = 4,70\%$$

After analyzing all the data we can note the following hierarchy for the variation coefficients that we've computed when testing the three above hypotheses:

$$v_I = 4,64\% < v_{\text{exp}} = 4,70\% < v_{II} = 4,78\%$$

Thus concluding that the **evolution described by the temporal dynamic of the X variable**, which represents *the monthly e-HRM budgets* that the firm set, is a **linear trend** with the following pattern: $x_i = a + b \cdot t_i$, therefore confirming **the void hypothesis**.

4. Conclusions and discussions

The research shows that the designing and testing of a trend model using proper statistical and mathematical tool ware in order to reflect the e-HRM monthly budget's dynamics provides a methodological framework for dynamic assessment of time evolution for e-HRM budgets.

Furthermore, the use of the variation coefficient method allows us to determine the homogenization rate for the data within our samples.

It is also important to remember that abiding by the main principle of the used methodology, the bigger the value of the computed variation coefficients, the grater the homogenization for the firm's e-HRM budget allocation rate.

Reviewing all the study we should conclude that the most tangible benefit that the e-HRM system implementation has for a firm is the downgrade in administrative costs.

We strongly suggest that more research should be done in this area and scholars should try applying other statistical and mathematical methods to e-HRM systems in order to emulate and analyze its implementation behavior.

References:

1. **Ball, K.** (2001), *"The use of human resource information systems: a survey"*, Personnel Review, Vol. 30 (5/66), pp. 677-693
2. **Bedeian A.G., Mossholder K.W.** (2000), *"On the use of the Coefficient of Variation as a measure of diversity"*, Organizational Research Methods, Vol. 3, No. 3, July, pp. 285-297
3. **Bondarouk, T. V. and Rue, H.J.M.** (2008), *"HRM systems for successful information technology implementation: evidence from three case studies"*, European Management Journal, Vol. 26, pp. 153– 165
4. **Brandl, J., Toft Madsen, M. and Madsen, H.** (2009), *"The perceived importance of HR duties to Danish line managers"*, Human Resource Management Journal, Vol. 18 (2), pp. 194- 210
5. **Dery, K. and Wailes, N.** (2005), *"Necessary but not sufficient: ERPs and strategic HRM"*, Strategic Change, Vol. 14 (5), pp. 265-272
6. **Haines, V. Y. and Lafleur, G.** (2008), *"Information technology usage and human resource roles and effectiveness"*, Human Resource Management, Vol. 47 (3), pp. 525-540
7. **Lovie, P.** (2005), *"Encyclopedia of statistics in behavioral science"*, Wiley Online Library

8. **Schalk, R., Timmerma, V. and van den Heuvel, S.** (2013), *“How strategic considerations influence decision making on e-HRM applications”*, Human Resource Management Review Vol. 23, pp. 84–92
9. **Stone, D. L., Stone-Romero, E. and Lukazweski, K.** (2006), *“Factors affecting the acceptance and effectiveness of electronic human resource systems”*, Human Resource Management Review, Vol. 16 (2), pp. 229-244