

# Impact of information-infrastructure mechanism of self-development management at industrial enterprises on employee engagement: empirical evidence

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**Abstract.** The work deals with the problems of a self-development organization considered as a self-organization system without hierarchy and employee position. Such kind of management is realized by self-management teams having full authority, responsibility and focus on the result. An individual and group motivation mechanism uses the employee potential to achieve one's ambition targets. The employee and one's potential are engaged with a maximum power in all fields of activity. Enterprises management explores employee engagement to estimate and manage this process. Each manager has enough cases when employee goes far beyond job responsibilities to achieve the result. This employee is engaged taking an initiative and informal responsibility. Engagement is a multidimensional construction, which demonstrates employee wishes to invest self-resources (knowledge, skills, competences, emotions and power) in enterprises activity. Engagement is a positive moment implying active involvement, loyalty and direct work. A lot of engagement investigations are aimed at management, result and employee's participation in organization management. The study of employee's initiative is a part of employee's engagement according to infrastructure and information factors at industrial enterprises in Perm region described in the article.

## 1 Introduction

Enterprises have to provide extended reproduction of internal resources mostly at the moment of unpredictable changes in all life activity spheres. It means instrument determination for initiating employee's initiative behavior based on behavioral motivation, initiative and high engagement. This human-oriented organization is a self-development structure. Self-development and self-organization concepts create a successful activity base and long-life leadership organizations of future, such as 3M, Oracle, Zappos, Haier, Amazon and others.

We describe self-organization as an enterprise process internal transformation without external impact on effective management of changes. And self-development is as a vision transformation, which defines the strategic management result with the self-organization process [1-2].

The enterprise process of internal transformation provided by engagement of the employee involves high emotional relation to enterprises [3-6]. Engagement employees make more effort to do work effectively and achieve the strategic target.

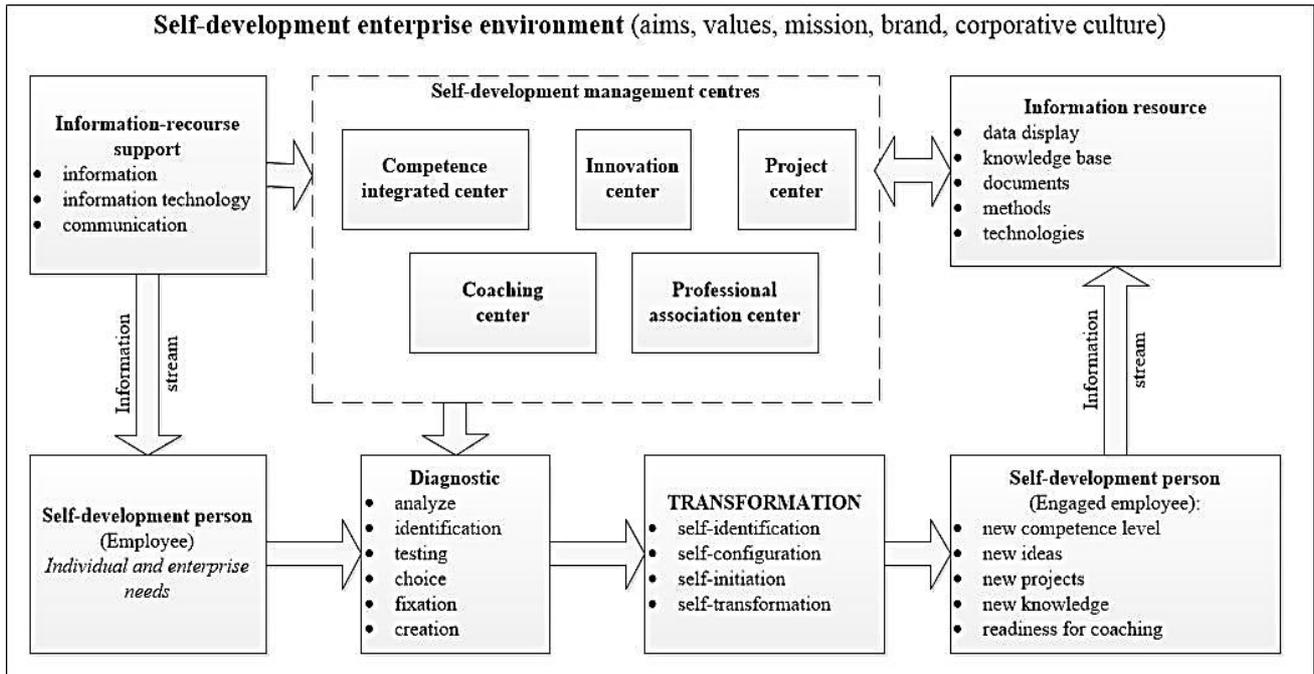
The first terminology «Engagement» was used in academic papers by W. Kahn in 1990 [4]. In 1997 C. Maslach and M. Leiter [5] continued Kahn research. In 2004 W. Schaufeli [7], in 2008 A. Saks [8], in 2008 W.

Macey and B. Schneider [9] described «Engagement» terminology.

There are some differences in engagement descriptions, but all authors mark key characteristic of engagement – positive mental state which characterizes vitality, loyalty and job concentration. Profit from employee's engagement is described by loyalty, commitment, talent, effort maximization, share of enterprise values to achieve enterprise targets. Engagement employees invest not in their job, but in enterprise success [10-11].

Engagement is a measurable category, which uses different measurable models: «Job Demands – Resources» [12], Aon Hewitt [13], «ECOPSI consulting» [14]. Engagement combines rational thinking, emotions, intention and behavior for creating optimal productivity. There are three aspects of engagement: «Tell», «Stay» and «Try».

We created an information-infrastructure mechanism (IIM) of self-development enterprise management (Fig. 1) which consists of realization conditions, a logical and temporal structure and information-resource support [15].



**Fig. 1.** Information-infrastructure mechanism of self-development enterprise management.

Enterprise culture environment consists of corporative culture, brand, values, mission, aims. Culture environment determines the mechanism of realization of condition synchronized with personnel needs. The IIM structure consists of an integrated competence center, innovation center, project center, professional association center and coaching center.

The self-development center personnel have special professional competence. They have management information on the enterprise task at the concept, strategic, tactic and operation levels. These personnel have management authority and perform special functions using information.

Self-development centers provide accumulation of personnel knowledge and experience, trying and choice of the best practice, maximum personnel engagement, personnel motivation, employee’s needs and joint achievement of enterprise aims in the shortest possible time.

Entering and outgoing information on enterprises is processed by self-development management centers: analysis, identification, testing, choice, fixation, creation. It means information management occurs by the degree of importance and new methods of prompt knowledge obtaining from key personnel, knowledge structuring and creation of the navigation system to increase competitiveness, flexibility and adaptivity of the enterprise.

These mean information stream organization for conditions creating accurate and fast management decisions, quality and fast specialist training, starting a self-development mechanism.

IIM rises personnel engagement, starts self-development and self-organization processes: self-identification, self-configuration, self-initiation, self-

transformation initiate the self-development enterprise mechanism [16].

Employee’s engagement is business success and competitiveness key factors. Conditions that increase competitiveness can be created using special management practice [17].

## 2 Theoretical background and investigation hypotheses

IIM rises employee’s engagement. The mechanism of the elements’ impact on employee engagement is different. There are key elements that strongly influence employee’s engagement. Enterprises increase employee’s engagement, improve self-development environment, achieve goals faster at the lowest cost if they work with mechanism’s components purposefully.

Taking into consideration the results of the previous studies of employee engagement, the authors put forward the following hypotheses (H).

H1: Self-development management centers, self-development environment, information, information technologies and communications positive impact on employee’s engagement.

H2: Self-development management centers and self-development environment which consist basically of IIM components influence employee’s engagement strongly. Others components influence slightly because they are structural components.

H3: Impact of IIM components on employee’s engagement depends on the employee’s category gained at enterprises. If the employee’s category is higher in the enterprise management structure, then IIM components influence highly. If the employee’s category is lower in the enterprise management structure, then IIM components influence less.

### 3 Methodology and data

The «2S System» methodology developed by Perm National Research Polytechnic University [2] is the base of the current empirical investigation. Self-development can be realized in different directions that are practically unreal to predict. Thus, IIM activity's result can be determined by IIM component's impact on employee's engagement directly.

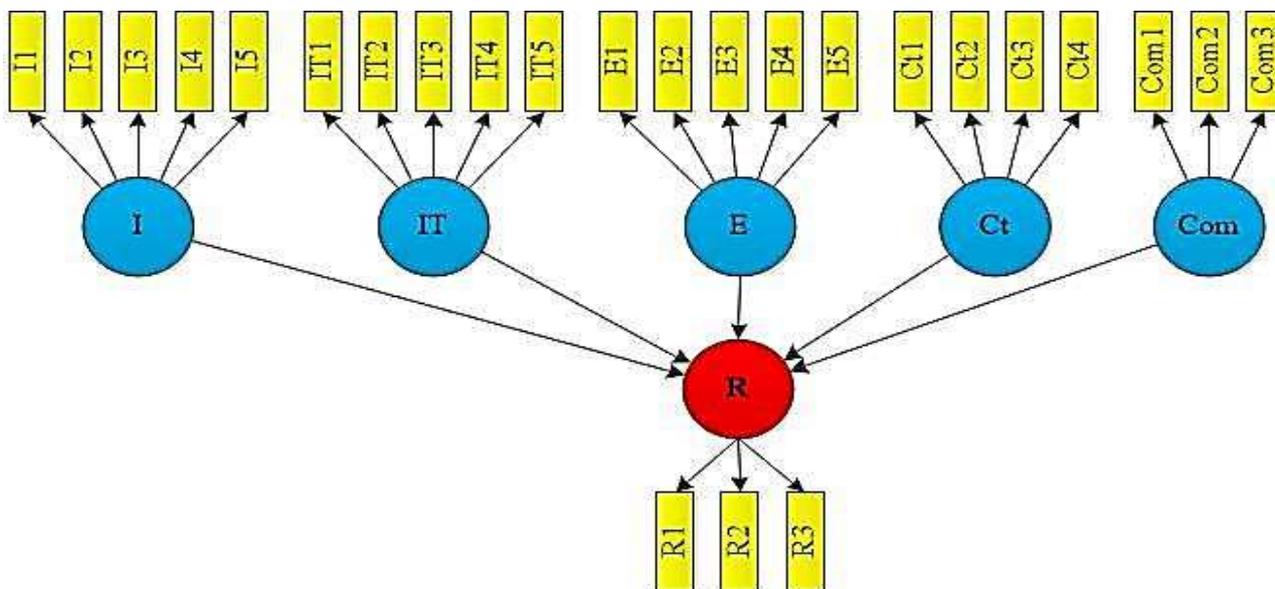
IIM impact assessment on employee's engagement is realized by a latent construction (R) which consists of the following variables (Fig. 2):

- frequency of request for the enterprise knowledge base unilaterally (R1);
- frequency of doing activities in self-development management centers unilaterally (R2);
- frequency of taking an initiative (R3).

The questionnaire survey of Perm region employee's enterprises was realized in 2020 for hypotheses validity. There were 294 respondents: 62.5% - workers, 29.3% -

specialists (engineers and office), 8.2% - managers. In the questionnaire survey there were questions which were grouped about IIM components: self-development management centers, self-development environment, information, information technologies and communications (Table 1). Likert's scale is used for evaluation answers: 1 – minimum score; 5 – maximum score.

The Partial Least Squares (PLS) method is used for evaluation of hypothesis statistics validity. The PLS method is used for creating complex variables models [18]; it determines the impact between dependent and independent variables [19-20]. We joined independent variables in latent constructions: I – information, IT – information technologies, E – self-development environment, Ct – self-development management centers, Com – communication (Fig. 2). An investigation scheme (Fig. 2) is used for creating models: General – all employees, Work – workers only, Spec – specialists only, Manage – managers only.



**Fig. 2.** Investigation scheme of employee's engagement.

Latent constructions are made preliminarily by the Least Squares (LS) method. The latent construction validity is evaluated using Principal Components Analysis (PCA). We created a dependent latent construction «Employee engagement» – R and five independent latent constructions (IIM components): I – information, IT – information technologies, E – self-development environment, Ct – self-development management centers, Com – communication. Latent constructions validity is evaluated by Cronbach's Alpha [21-22] and latent constructions of Outer Loadings

elements. Cronbach's Alphas and Average Variance Extracted (AVE) of created latent constructions are values that are sufficient for validity (Table 1).

Creating the model and calculation are realized in the Smart PLS program [23].

### 4 Results

We have summarized the results (Table 1) and obtained generalized models' characteristics (Table 2).

**Table 1.** Latent constructions characteristics.

Characteristics	Name	Model							
		General		Manage		Spec		Work	
		Outer Loadings	Mode						
<b>Employee's engagement</b>	<b>R</b>								
R-square		0.642		0.724		0.643		0.671	
Cronbach's Alpha		0.845		0.843		0.835		0.855	
Average Variance Extracted (AVE)		0.763		0.762		0.751		0.775	
Frequency of sending request to enterprise knowledge base unilaterally	<b>R1</b>	0.863	3	0.818	4	0.831	3	0.887	3
Frequency of doing activities in self-development management centers unilaterally	<b>R2</b>	0.899	3	0.912	3	0.909	1	0.900	3
Frequency of taking a self-initiative	<b>R3</b>	0.857	5	0.886	4	0.858	5	0.853	4
<b>Enterprise self-development management centers</b>		<b>0.400</b>		<b>0.635</b>		<b>0.584</b>		<b>0.331</b>	
Cronbach's Alpha		0.781		0.832		0.728		0.795	
Average Variance Extracted (AVE)		0.610		0.665		0.572		0.623	
Enterprise self-development management centers' awareness	<b>Ct1</b>	0.824	3	0.775	1	0.855	1	0.823	3
Enterprise self-development information place's awareness	<b>Ct2</b>	0.580	1	0.851	1	0.305	2	0.645	3
Professional associations involvement	<b>Ct3</b>	0.849	4	0.738	4	0.856	3	0.861	4
Enterprise self-development directions' awareness	<b>Ct4</b>	0.838	3	0.890	4	0.855	3	0.811	3
<b>Enterprise self-development environment</b>		<b>0.289</b>		<b>0.025</b>		<b>0.095</b>		<b>0.385</b>	
Cronbach's Alpha		0.761		0.802		0.747		0.769	
Average Variance Extracted (AVE)		0.515		0.549		0.498		0.525	
Enterprise values awareness	<b>E1</b>	0.773	4	0.769	5	0.786	5	0.763	4
Enterprise values sharing	<b>E2</b>	0.750	4	0.747	5	0.695	5	0.772	4
Enterprise values delivering	<b>E3</b>	0.796	5	0.760	4	0.759	5	0.826	5
Harmonization of employee and enterprise's needs	<b>E4</b>	0.643	1	0.775	1	0.639	1	0.629	3
Enterprise self-development program availability	<b>E5</b>	0.606	1	0.647	1	0.636	1	0.605	1
<b>Information</b>		<b>-0.104</b>		<b>-0.545</b>		<b>-0.149</b>		<b>-0.049</b>	
Cronbach's Alpha		0.836		0.913		0.848		0.823	
Average Variance Extracted (AVE)		0.591		0.733		0.542		0.583	
Speed of receiving required information	<b>I1</b>	0.861	4	0.933	4	0.901	4	0.829	4
Required information volume	<b>I2</b>	0.876	4	0.904	4	0.899	4	0.866	4
Required information understandability	<b>I3</b>	0.733	4	0.766	4	0.767	4	0.683	4
Required information place's awareness	<b>I4</b>	0.750	4	0.820	5	0.567	5	0.800	4
Required information employee's awareness	<b>I5</b>	0.586	5	0.848	5	0.419	5	0.609	5
<b>Information technology</b>		<b>0.180</b>		<b>0.706</b>		<b>0.139</b>		<b>0.165</b>	
Cronbach's Alpha		0.832		0.844		0.766		0.856	
Average Variance Extracted (AVE)		0.593		0.592		0.525		0.628	
Information technology completeness for working	<b>IT1</b>	0.796	4	0.801	4	0.778	5	0.805	4
Information technology rapidity for working	<b>IT2</b>	0.795	4	0.709	4	0.794	4	0.819	4
Information technologies and resources access	<b>IT3</b>	0.745	4	0.851	5	0.638	5	0.779	4
Information technology relevance	<b>IT4</b>	0.799	4	0.713	4	0.813	4	0.815	4
Information technology direction	<b>IT5</b>	0.712	3	0.762	3	0.565	4	0.741	3
<b>Communication</b>		0.184		0.283		0.266		0.138	
Cronbach's Alpha		0.882		0.865		0.915		0.861	
Average Variance Extracted (AVE)		0.809		0.788		0.855		0.783	
Communication procedure formalization (delivering enterprise values and corporate culture to employees)	<b>Com1</b>	0.891	4	0.851	4	0.917	4	0.880	4
Communication procedure formalization (receiving an initiative from employees)	<b>Com2</b>	0.932	4	0.952	5	0.959	4	0.913	4
Communication procedure formalization (feedback)	<b>Com3</b>	0.874	4	0.855	3	0.898	3	0.861	4

In Table 2 the green color shows a middle or highly positive impact, red color – middle negative impact and white color – low impact (negative or positive).

Table 2 presents impact values of IIM components on employee's engagement:

Enterprise self-development management centers highly influence the employee's engagement in all models among all IIM components.

Enterprise self-development management centers highly influence employee's engagement in terms of

managers; average influence is on specialists and the lowest – on workers. It is caused by more creative job and better self-realization at the «Manage» level than in case of «Spec» and «Work». Specialists work more

creatively than workers do. Workers work functionally, they solve specific tasks only without creating, and self-development management centers influence their needs less.

**Table 2.** Models characteristics.

Latent construction	General	Manage	Spec	Work
<b>R-square</b>	0.642	0.724	0.643	0.671
<b>Outer Loadings:</b>				
Enterprise self-development management centers	0.400	0.635	0.584	0.331
Enterprise self-development environment	0.289	0.025	0.095	0.385
Information	-0.104	-0.545	-0.149	-0.049
Information technology	0.180	0.706	0.139	0.165
Communication	0.184	0.283	0.266	0.138

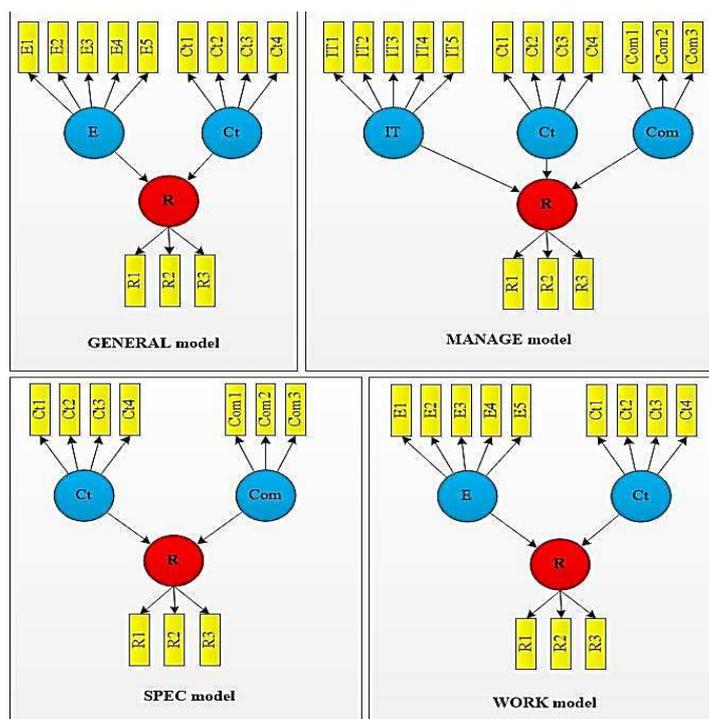
Enterprise self-development environment influences employee engagement positively, but less than self-development management centers do in general including in each model. There is a reverse dependence: environment impact on engagement workers is more than that of specialists and managers; it is greater for engagement specialists than it is for workers. It is caused by a more self-sufficient level of specialists and managers than that of workers. They determine their tasks frequently independently than workers do, who works by directions. Managers and specialists understand and share corporative goals, values and culture; they have higher education and cultural level. They form enterprise’s self-development environment themselves, but workers depend on one.

The initiative communication procedure influence employee’s engagement a little positively in all models. It is more important for managers and specialists because their job is more creative and they have communications that are more creative. Communication environment

allows more opportunity for initiative activities. For workers this IIM component is formal. They are informed about it quite well, but apply rarely.

Information affects negatively employee’s engagement in all models. It is caused by very excessive information for all employees. They prefer to solve professional tasks and to avoid additional information. Employees think that work with information increases labor expenditures. Particularly there is a tendency in the «Manage» model. Managers do office job with information and additional data increase their job volume. Additional information is additional job which requires new activities which can be not paid.

Information technologies influence employee’s engagement greater than that of managers. They work with information and strongly depend on information technologies. IT determines the quality of manager’s activity. Specialists use IT for supporting their activity. IT should be sufficient for activity and no more. Workers do not use IT in their activity.



**Fig. 3.** Models of IIM components’ influence on employee’s engagement.

**Table 3.** Models characteristics.

	General	Manage	Spec	Work
<b>R-square</b>	0.606	0.654	0.625	0.644
<b>Outer Loadings:</b>				
Enterprise self-development management centers	0.443	0.431	0.615	0.382
Enterprise self-development environment	0.413			0.498
Information technology		0.346		
Communication		0.280	0.272	

## 4 Conclusions

We have used investigation results (Table 2) and created impact models of IIM components for employee's engagement in each employee's category (Fig. 3). We determined their characteristics (Table 3).

Model characteristics (Table 3) prove the H1 hypothesis. Enterprise self-development management centers and enterprise self-development environment influence positively on employee's engagement.

The H2 hypothesis is proved. Enterprise self-development management centers and enterprise self-development environment are basic components, but environment impact of enterprise self-development is too little for managers and specialists. Other components influence slightly.

The H3 hypothesis has been proved partially. Almost all of IIM components influence stronger employee's engagement if the employee's category is higher in the enterprise management structure with the exception of enterprise self-development environment. Enterprise self-development environment's impact rises with the reduction in the employee category level.

We can recommend improvement for employee's engagement:

- for all employee: to create self-development management centers as information centers which use the intellectual product of enterprise employees, starts and supports enterprise development processes;
- for workers: to form enterprise self-development environment, to deliver enterprise goals, values and culture, to coordinate enterprise goals and needs with worker's needs, to create self-development worker programs;
- for specialists: to formalize enterprise values and corporative culture delivering procedures and receiving an initiative;
- for managers: to implement actual, high-performance information technologies with managers, requiring to provide necessary access, to formalize enterprise values and delivering corporative culture procedures and receiving an initiative.

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