

# IDEA MANAGEMENT SYSTEM TYPES AND CREATIVITY

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*There are different idea management systems (IMS) application types, although there is a lack of research how different types of these systems influence creativity in organisations. The research aims to clarify how different web-based IMS types influence creativity in organisations. Research methods: literature review (data collection: systematic data collection from scientific data bases; data analysis: content analysis) and the survey of 400 enterprises with a web-based IMS experience (data collection: a survey (conducted by the authors of the paper); data analysis: statistics). Findings: IMS tools could be used by private, public organisations, as well by higher education institutions and research institutions. By involving all these organisations in the IM process, the creativity and thus innovation potential is increasing, but meanwhile the findings show that different application types of IMS systems have different effects on creativity. Active IMS offers better results related with creativity.*

## Introduction

The use of web-based idea management systems (IMS) has become a part of the organisational culture in various enterprises. Web-based IMS are used by many well-known organisations such as Boeing, P&G, Volkswagen, Xerox, Pentax, Heineken, Panasonic, Sony, Fujitsu, Electrolux, Volvo, etc. The authors expect that throughout the following years the role of web-based IMS will grow as even more organisations will apply them. There are many good examples that show positive effects on organisations' perfor-

mance that use web-based IMS.<sup>1</sup> Idea management is one of the first steps to innovation process.<sup>2</sup> Nowadays there are many opportunities how to manage ideas by applying information technologies. One of such technologies is web-based IMS. These systems provide systematic and manageable idea generation and evaluation process.<sup>3</sup> There have been practical and academic discussions on the issue, whether technology is killing the creativity?<sup>4</sup> In this paper the authors aim to clarify how different web-based IMS types influence creativity in organisations.

The impact of technology on creativity is a very topical research theme. IMS has not been given sufficient scientific attention and it should be researched how different IMS types impact its application results.<sup>5</sup> This research is aiming at providing contribution to fill this gap.

Creativity sometimes is used as a synonym for ideas when we talk about IMS<sup>6</sup>, other authors describe research how to transfer employee creativity in an optimum way into practicable ideas<sup>7</sup>, mainly to clarify the organisational conditions how to create more qualitative and quantitative ideas. In previous studies the authors of this paper have researched how the type of IMS impacts idea quantity, and these results could highlight the possible correlation of a number of ideas as a potential creative output<sup>8</sup>. In this paper three other variables will be researched. Additionally, this research is just the next step in the research where authors apply simulations to verify results of this research in a more empirical way. In the previous studies authors have applied different methods, for example, data base analysis, for system perspective. This paper collects data using the survey to gain managerial perspective, but in the future research — simulations, to analyse user perspective. Methods are selected based on the most frequently applied methods for IMS research, according to literature studies<sup>9</sup>.

The authors use two IMS classifications: based on involved idea sources (internal, external, mixed) and based on the application focus (active, passive). To reach the aim three hypotheses will be tested that are based on the three types of IMS (active, internal, mixed) and three dimensions of the results (improving creativity, improving opportunities to identify new ideas, and improving idea development).

This paper fulfils an identified need to clarify IMS types and their impact on application results. The paper creates an academic contribution researching different classifica-

tions of IMS and their impact on creativity, as well as providing practical contribution by examining how web-based IMS application types and their results could help to overlook the potential application of IMS in different scenarios.

## Theoretical background Idea management systems

In this paper the definition of the IMS is based on the following assumptions that it is: (1) a systematic process; (2) a manageable process; (3) and the main steps of IMS are idea generation, evaluation, and repeated idea generation and evaluation. Based on these assumptions, IMS is a tool, a tool kit, or a complex system which provides IM<sup>10</sup>

Based on IMS focus, IMS could be classified as active and passive IMS. This classification reveals that there is an IMS that passively gathers ideas that are not concentrated on a specific purpose, while the active IMS provides functions to gather ideas for specific purposes<sup>11</sup>.

On the basis of potentially involved IMS idea sources, IMS may be classified as an internal, external, and a mixed one. The internal IMS provides an opportunity for the IM to involve employees or specific departments. Idea contests are among the ways how this approach is realised in organisations<sup>12</sup>. The external IMS provides an opportunity to attract external sources of IM, such as society, customers, etc. (mainly these systems have a public platform). The mixed IMS provides an opportunity to involve both an internal and external source of IM, for example, the external sources of IM create ideas, but internally assess them or vice versa. The mixed IMS offers many opportunities for governing IM sources and ensuring that both internal and external IM can be used at any time.

In previous studies the authors of this paper have researched how the type of IMS impacts idea quantity, and also these results could highlight the possible correlation of a

number of ideas as potential creative output<sup>13</sup>. In this paper three other variables will be researched.

**Creativity**

Creativity is generation of novel/new and useful/with potential value ideas or products<sup>14</sup>. Creativity is complicated and multidimensional concept with many components, such as knowledge<sup>15</sup>, cognition<sup>16</sup>, personality<sup>17</sup>, intelligence<sup>18</sup>, and motivation<sup>19</sup>. Creative economy highlights the importance of creative value development through the paradigm of convergent thinking (quantity of ideas and assumptions) to create ideas and solve problems.<sup>20</sup> In this study the authors define creativity as a set of skills to generate multiple ideas. It is aligned with the existing definitions of creativity that it is an ability to find solutions for problems<sup>21</sup>. In this study three different aspects of creativity will be tested: (1) improved creativity; (2) opportunities to identify new ideas and (3) improved idea development.

**Research methodology**

To collect data, a global survey for enterprises with a web-based IMS experience was created. The survey was created based on the Adaptive Structuration Theory, to evaluate web-based IMS in eight different blocks. In this paper authors analyse the relations between the following two spheres — IMS application types and benefits related with creativity. This survey was based on the research conducted by the authors<sup>22</sup>.

The survey was distributed to more than 100 web-based IMS developers who distributed it to their clients (enterprises that apply web-based IMS). Researchers received 400 responses from all over the world from different companies of different sizes, with different IMS experiences, which allows creating a holistic view of the research question.

The following hypothesis statements have been tested:

H1: application of an active IMS has stimulated improved creativity;

H2: application of an internal IMS has stimulated improved opportunities to identify new ideas;

H3: application of a mixed IMS has stimulated improved idea development.

Hypothesis testing approach is based on theoretical guidelines<sup>23</sup>. For hypothesis testing the authors will use the proportion ( $P_i$ ) of respondents who believe that the application of a particular type of IMS has resulted in improved creativity:

$$P_i = \frac{k_i}{n_i} \tag{1}$$

where  $k_i$  – the number of respondents who believe that the application of a particular type of IMS has resulted in improved creativity;

$n_i$  – the number of respondents applying a particular type of IMS.

Null and alternative hypothesis are defined as follows:

$$H_0: P_i - P_j \leq 0 \text{ and } H_A: P_i - P_j > 0 \tag{2}$$

As samples are simple, random and independent, and the smallest number of respondents who believe that the application of a particular type of IMS has stimulated improved creativity, improved opportunities to identify new ideas and improved idea development was 113, and the smallest number of respondents with an opposite opinion was 35, the difference of two proportions follows an approximate normal distribution and test statistics is calculated as follows:

$$Z = \frac{P_i - P_j}{\sqrt{P_c * (1 - P_c) * (\frac{1}{n_i} + \frac{1}{n_j})}} \tag{3}$$

where the pooled proportion ( $P_c$ ) is calculated as follows:

$$P_c = \frac{k_i + k_j}{n_i + n_j} \tag{4}$$

The decision rule is to reject  $H_0$  in favour of  $H_A$ , if z-statistics ( $z_{stat}$ ), is larger than z-critical ( $z_\alpha$ ):  $z_{stat} > z_\alpha$  (5)

where  $z_{stat}$  is calculated according (3);  $\alpha$  is the significance level of the test and a commonly used value in economic research, it is 0.05;

$z_{\alpha}$  is a critical value, the dividing point between the region where the null hypothesis is rejected and region where it is not rejected. For a given significance level  $\alpha$ ,  $z$  critical value is determined by the normal distribution function or, in the corresponding table in this study,  $z_{0,05} = 1.645$ .

## Results

### Application of different IMS types and improved creativity

The results of the survey by enterprises that apply IMS, which show the extent to which different types of IMS have stimulated an improved creativity, are summarised in Figure 1.

Calculated proportions of respondents who believe that applications of a particular IMS type has stimulated improved creativity, pooled proportions as well as z-statistics and corresponding  $p$ -values are summarised

in Table 1. All hypothesis are based on the comparison of different types of IMS (based on the types described in the theoretical aspects). The  $p$ -value is the probability of the test statistic being at least as extreme as the one observed given that the null hypothesis is true. The given  $z_{stat}$  is determined by the normal distribution function or the corresponding table.

As calculated z-statistics is larger than critical values for the first two comparable IMS type pairs, the authors would reject the corresponding null hypotheses and conclude that sample data provide strong evidence to support alternative hypotheses. The assumption that the application of an active IMS has stimulated improved creativity more than the application of a passive IMS is supported also by a very low  $p$ -value ( $<0.001$ ) and the reasoning that the application of an internal IMS has stimulated improved creativity more than the application of an external IMS is supported also by a low  $p$ -value (0.011).

As calculated z-statistics is not larger than critical values for the third comparable IMS type pairs, the authors cannot reject the

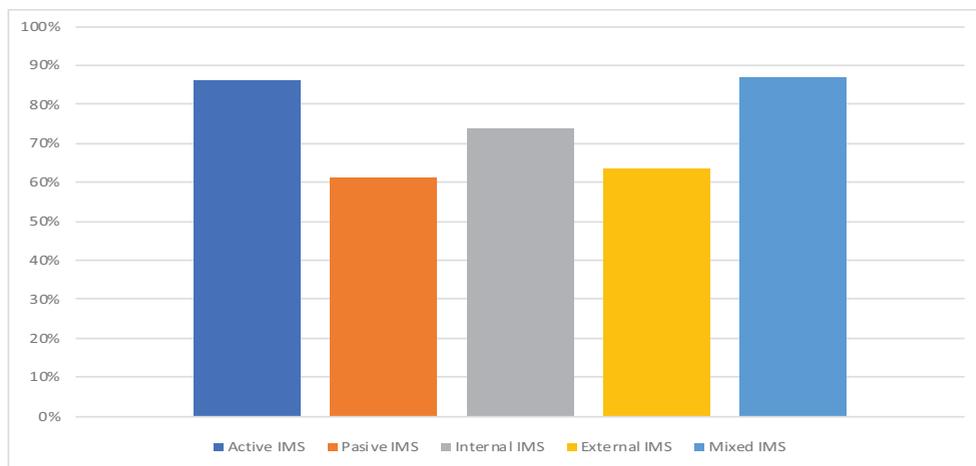


Fig. 1. The proportion of respondents who believe that application of a particular IMS type has stimulated improved creativity, %

Source: Global online survey for IMS users in 2020

Table 1. Statistics for hypothesis testing on the application of different IMS types and improved creativity

IMS type	$P_i$	IMS type	$P_j$	$P_c$	$Z_{stat}$	$p$ -value
Active	0.8595	Passive	0.6108	0.7843	6.8691	<0.001
Internal	0.7384	External	0.6373	0.6916	2.2931	0.011
Mixed	0.8677	Active	0.8595	0.8626	0.3024	0.381

Source: Created by the authors

corresponding null hypothesis and conclude that sample data does not provide enough evidence to support an alternative hypothesis: the difference in the proportions of respondents who believe that the application of a mixed IMS type has stimulated improved creativity more than the application of an active IMS type is not statistically significant.

**Application of different IMS types and improved opportunities to identify new ideas**

The results of the survey by enterprises that apply IMS, which show the extent to which different types of IMS have stimulated

improved opportunities to identify new ideas, are summarised in Figure 2.

Calculated proportions of respondents who believe that applications of a particular IMS type has stimulated improved opportunities to identify new ideas, pooled proportions as well as z-statistics and corresponding p-values are summarised in Table 2.

As calculated z-statistics is larger than critical values for the first and third comparable IMS type pairs, the authors would reject the corresponding null hypotheses and conclude that sample data provide a strong evidence to support alternative hypotheses. The assumption that the application of an

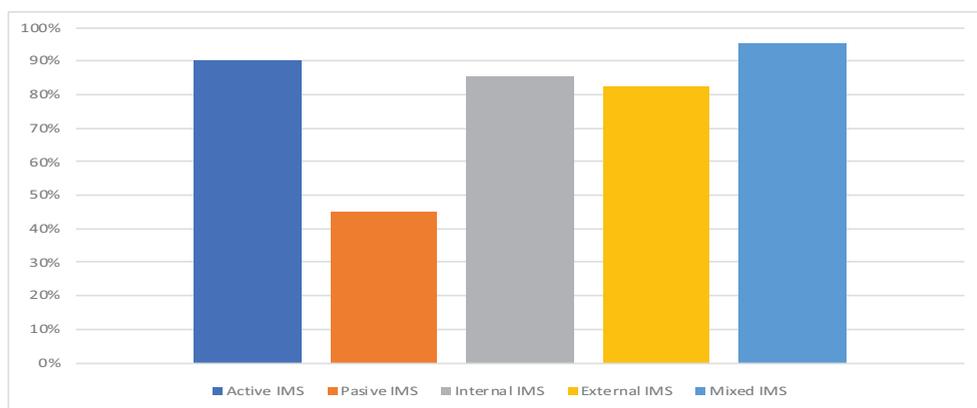


Fig. 2. The proportion of respondents who believe that application of a particular IMS type has stimulated improved opportunities to identify new ideas, %

Source: Global online survey for IMS users in 2020

Table 2. Statistics for hypothesis testing on the application of different IMS types and improved opportunities to identify new ideas

IMS type	$P_i$	IMS type	$P_j$	$P_c$	$z_{stat}$	$p$ -value
Active	0.9038	Passive	0.4497	0.7029	13.6400	<0.001
Internal	0.8565	External	0.8244	0.8416	0.9233	0.178
Mixed	0.9533	Active	0.9038	0.9224	2.3450	0.009

Source: Created by the authors

active IMS has stimulated improved opportunities to identify new ideas more than the application of a passive IMS is supported also by a very low  $p$ -value (<0.001); and the supposition that the application of a mixed IMS has stimulated improved opportunities to identify new ideas more than the application of an active IMS is supported also by a low  $p$ -value (0.009).

As calculated  $z$ -statistics is not larger than critical values for the second comparable IMS type pairs, the authors cannot reject the corresponding null hypotheses and conclude that sample data does not provide enough evidence to support alternative hypotheses — the difference in the proportions of respondents who believe

that the application of an internal IMS type has stimulated improved opportunities to identify new ideas more than the application of an external IMS type is not statistically significant.

### Application of different IMS types and improved idea development

The results of the survey by enterprises that apply IMS, which show the extent to which different types of IMS has stimulated improved idea development, are summarised in Figure 3.

Calculated proportions of respondents who believe that the applications of a particular IMS type has stimulated an improved idea development, pooled proportions as well

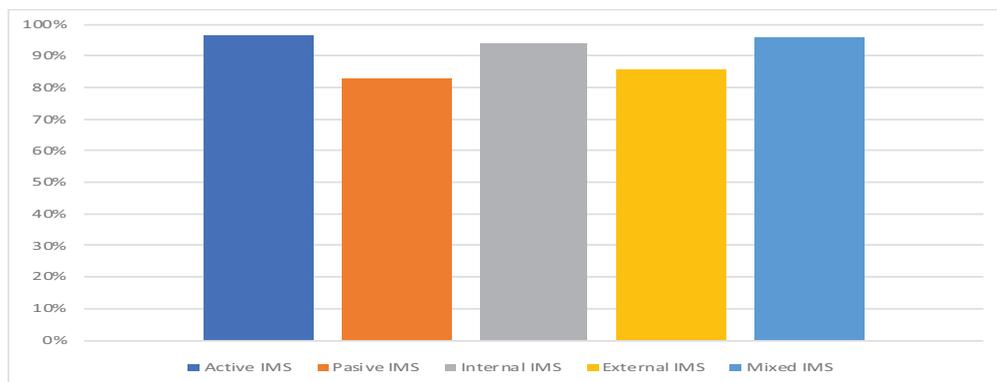


Fig. 3. The proportion of respondents who believe that application of a particular IMS type has stimulated an improved idea development, %

Source: Global online survey for IMS users in 2020

Table 3. Statistics for hypothesis testing on the application of different IMS types and improved idea development

IMS type	$P_i$	IMS type	$P_j$	$P_c$	$z_{stat}$	$p$ -value
Active	0.9651	Passive	0.8280	0.9237	5.8871	<0.001
Internal	0.9372	External	0.6373	0.8544	2.8912	0.002
Active	0.9651	Mixed	0.9574	0.9622	0.5162	0.303

Source: Created by the authors

as  $z$ -statistics and corresponding  $p$ -values are summarised in Table 3.

As calculated  $z$ -statistics is larger than the critical values for the first two comparable IMS type pairs, the authors would reject the corresponding null hypotheses and conclude that sample data provide strong evidence to support alternative hypotheses. The supposition that the application of an active IMS has stimulated an improved idea development more than the application of a passive IMS is supported also by a very low  $p$ -value (<0.001) and the reasoning that the application of an internal IMS has stimulated an improved idea development more than the application of an external IMS is supported also by a low  $p$ -value (0.002).

As calculated  $z$ -statistics is not larger than critical values for the third comparable IMS type pairs, the authors cannot reject the corresponding null hypotheses and conclude that sample data do not provide enough evidence to support alternative hypotheses — the difference in the proportions of respondents who believe that application of an active IMS type has stimulated an improved idea development more than the application of a mixed IMS type is not statistically significant.

## Conclusions

H1: The application of an active IMS has stimulated improved creativity — hypothesis is approved. The conclusion that the application of an active IMS has stimulated improved creativity more than the application

of a passive IMS is supported also by a very low  $p$ -value (<0.001) and the conclusion that the application of an internal IMS has stimulated improved creativity more than the application of an external IMS is supported also by a low  $p$ -value (0.011).

H2: The application of an internal IMS has stimulated improved opportunities to identify new ideas — hypothesis is approved. The conclusion that the application of an active IMS has stimulated improved opportunities to identify new ideas more than the application of a passive IMS is supported also by a very low  $p$ -value (<0.001) and the conclusion that the application of a mixed IMS has stimulated improved opportunities to identify new ideas more than the application of an active IMS is supported also by a low  $p$ -value (0.009).

H3: The application of a mixed IMS has stimulated improved idea development — hypothesis is approved. The conclusion that the application of an active IMS has stimulated improved idea development more than the application of a passive IMS is supported also by a very low  $p$ -value (<0.001) and the conclusion that the application of an internal IMS has stimulated an improved idea development more than the application of an external IMS is supported also by a low  $p$ -value (0.002).

## Implications

This research fulfils an identified need to clarify IMS types and their impact on the

creativity. This research delivers the following academical contribution: (1) it is the widest web-based IMS empirical research based on the survey; (2) it researches different classifications of IMS and their impact on creativity.

The practical contribution of the research results helps to understand what kind of creativity results enterprises could expect from different IMS application types. The research results highlight the benefits/implications of adopting different types of IMS for organisations. These contributions also provide managers with a richer set of theoretical tools, letting them make better decisions regarding the selection of IMS that is the best for achieving the creativity results in a given context. Web-based IMS types and their impact on the IMS results could help to overlook the potential application of these systems in different application scenarios.

### Future research directions

In the research process many future research directions have been identified. More research is needed to identify how different creativity methods are applied in these systems, how different method applications in IMS influence creativity among others. Because there are different brainstorming techniques to favor ideation<sup>24</sup>. Also, idea evaluation phase could be evaluated separately<sup>25</sup>.

There are researches that explore how feedback in online idea competitions influences idea quality<sup>26</sup>, but there are no researches how it influences creativity.

Also, a more detailed research could be done on how different groups of idea generators and creativity are interrelated. Case studies could provide more comprehensive characteristics of a web-based IMS application to foster creativity.

Additionally, it could be researched what kind of additional activities companies provide for employees to boost their creativity through IMS application. Do such activities

influence the creativity, idea quality and quantity?

It would be advisable to research an individual and group creativity (in this paper just a group creativity is considered), but there are different creativity aspects for individual<sup>27</sup> and group creativity<sup>28</sup>.

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## Par autoriem

PhD **Elina Miķelsone** ir inovāciju un ideju vadības lektore un konsultante, biedrības “Ideju un inovāciju institūts” valdes priekšsēdētāja. E. Miķelsones visas dzīves jomas saistītas ar inovācijām un ideju vadību — akadēmiskā, profesionālā un personīgā līmenī. Regulāri uzstājas kā referente dažādās starptautiskās zinātniskās konferencēs un publicējusi vairāk nekā 20 rakstus vairāk nekā 20 zinātniskajos izdevumos. Šobrīd īsteno pēcdoktorantūras projektu Eiropas Savienības fondu darbības programmas “Izaugsme un nodarbinātība” 1.1.1. specifiskā atbalsta mērķa “Palielināt Latvijas zinātnisko institūciju pētniecisko un inovatīvo kapacitāti un spēju piesaistīt ārējo finansējumu, ieguldot cilvēkresursos un infrastruktūrā” 1.1.1.2. pasākuma “Pēcdoktorantūras pētniecības atbalsts” projekta ietvaros — “IDEJU VADĪBA”, 1.1.1.2/VIAA/4/20/670

Prof. *Dr. Tatjana Volkova* ir stratēģiskās vadības un inovāciju profesore, vadošā pētniece Banku augstskolā. Viņai ir plaša praktiskā pieredze vadībizinībās un konsultācijās, tostarp viņa strādā par *Rotterdam Consult, Ltd* vadītāju, par *WOCCU* nodaļas vadītāju Rīgā. T. Volkovas pētījumu rezultāti publicēti vairākās recenzētās grāmatās un žurnālos valsts un starptautiskā mērogā, autore ar tiem ir iepazīstinājusi daudzās starptautiskās konferencēs. T. Volkova ir arī zinātnisko žurnālu recenzentu komitejas locekle (piemēram, *Journal of Business Management*, *SBS Journal of Applied Business Research and Banks* and *Banks System Journal*) un piedalījusies starptautiskos pētniecības projektos.

*Dr. oec. Aivars Spilbergs* ir Banku augstskolas Ekonomikas un finanšu nodaļas vadītājs. Iepriekšējā pieredze ietver darbu ekonomikā un finanšu pētniecībā (1976.–1996. gadā pētnieciskais darbs kibernetikā, ekonomikā un matemātikā; Latvijas Universitātes Ekonomikas fakultātē) un profesionālais darbs banku nozarē (1995–2016 — SEB bankā vairāku nodaļu vadītājs — Kredītu vadība, Riska vadība un Riska centrs).

*Dr. Elita Lielā* ir profesore un programmu direktore Banku augstskolā. Elita Lielā absolvējusi Latvijas Universitāti, Finanšu un tirdzniecības fakultāti, un ieguvusi doktora grādu ekonomikā Latvijas Universitātē. Viņai ir vairāk nekā 20 gadu profesionālā pieredze valsts sektorā (ministrijās un Latvijas valsts iestādēs), kā arī privātajā sektorā. E. Lielās pētījumi ir vērsti uz inovāciju politiku un inovāciju pārvaldību.

## IDEJU VADĪBAS SISTĒMU VEIDI UN RADOŠUMS

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### Kopsavilkums

**Atslēgas vārdi:** *ideju vadības sistēmas, uz internetu balstītas ideju vadības sistēmas, radošums*

Ir dažādi ideju vadības sistēmu veidi, kas praktiski tiek gan izmantoti, gan akadēmiski pētīti. Tomēr neizpētīts ir jautājums: kā dažādi ideju vadības tipi ietekmē radošumu? Pētījuma mērķis ir noskaidrot, kā var izmantot dažādas ideju vadības sistēmas laikā, kad ideju pārvaldība notiek attālināti un kā dažādi ideju vadības sistēmu veidi ietekmē radošumu. Metodes: literatūras analīze (datu ieguve: sistemātiska zinātniskās literatūras datu vākšana no zinātniskajām datu bāzēm; datu analīze: kontentanalīze) un 400 uzņēmumu ar ideju vadības sistēmu izmantošanas pieredzi aptauja (datu ieguve: aptauja, kuru veikuši pētījuma autori; datu analīze: statistiskā analīze). Secinājumi: ideju vadības sistēmas var izmantot privātas, publiskas organizācijas, kā arī augstākās izglītības iestādes un pētniecības iestādes. Iesaistot visas šīs organizācijas ideju vadības procesā, radošums un līdz ar to arī inovācijas potenciāls palielinās. Rezultāti rāda, ka dažādu ideju vadības sistēmu veidiem ir dažāda ietekme uz radošumu. Aktīvās ideju vadības sistēmas ir radošumu stimulējošākas nekā pasīvās ideju vadības sistēmas.