



## ORIGINAL ARTICLE


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## Idea management system application types in local and global context

**JEL Classification:** M190; M150; M110

**Keywords:** idea management system; local; global; application

### Abstract

**Research background:** Web-based idea management systems provide local and global idea management potential for many well-known and established companies, such as Boeing, Panasonic, Volkswagen, Volvo and P&G. Based on previous research done by the authors, there is an existing gap in the available literature and research on the subject: (1) there is a lack of evidence on how different idea managements system types materializes in local and global contexts; (2) there is a lack of research on how frequent these systems are applied in the global context.

**Purpose of the article:** The paper aims to clarify which of the web-based idea management system types produce significantly better results when applied in the local and in the global context.

**Methods:** The following research attempts to close the existing research gap empirically by conducting a survey. In the research paper analysis of 447 responses was included — global companies that use idea management systems. The respondents were reached through idea management system providers.

**Findings & Value added:** The research results suggest that there is a difference between the intensity of different web-based idea management system types (based on involved sources and process focus) of application if these systems are used for the global or local context. The study contributes theoretically and practically to the discussion about the potential idea management system application types in different contexts.

## Introduction

Web-based idea management systems (IMS) fall in line with current developments (e.g. growing importance of ICT, the spread of open innovation and co-innovation, etc.). In short, IMS is a manageable systematic tool to generate and evaluate ideas. The use of web-based IMS has become a part of the organizational culture in various enterprises. Web-based IMS is used by many well-known organizations such as P&G, Volkswagen, Xerox, Pentax, Heineken, Panasonic, Sony, Fujitsu, Electrolux, Volvo, etc. The authors are expecting that throughout the following years the role of web-based IMS will grow, and even more organizations will realize (from the research that is being conducted) the benefit of a well-established IMS. As a result, they may also consider implementing web-based IMS in their company and ensuring that it becomes a part of its culture. Many good examples show positive effects on the performance of the organizations that use web-based IMS for ideas management aiming at delivering innovations.

For example, BT Group is using its IMS WebStorm, due to this the company has generated 10,000 new ideas in the seven years between 2005 and 2012. These companies are large global entities with employees and clients worldwide, in many different environments. That is the reason why it is important to research how different IMS types materialize in local and global contexts.

The research aim: by conducting a survey and statistical analysis, the authors are aiming to contribute to the available literature on the subject matter identifying if there is a difference between the intensity of different web-based IMS types (based on involved sources and process focus) and their application in a global or local context.

In the research paper, an analysis of 447 responses was included — worldwide companies that use IMS. Respondents were reached through IMS providers.

In the next paragraphs the authors highlight the theoretical framework and research methodology. In the result part, IMS application types in local and global context are analysed. Discussion paragraph overlooks the paper's main findings: assesses and critiques the current findings. Addi-

tionally, the presented empirical contribution is compared to the findings of other authors. Conclusions provide a neat summary and possible directions for future research.

## **Literature review**

Interconnected global market, due to globalization, pushes enterprises to innovate and adapt their habits to stay competitive with the best from around the world, both in domestic and foreign markets (Wijen, 2012, pp. 127–166; Schwenninger, 2009, pp. 30–32; Belova & Mickiene, 2008, pp. 75–77). One way how to do that is to use web-based IMS locally and/or globally.

IMS is a complex concept and there is no common agreement on its definition. The authors consider IMS as a management tool, tool kit or complex system which provides systematic, manageable process of idea generation, evaluation and further delivering of different processes of innovation management.

There are different types of IMS: passive and active, internal, external and mixed. The main difference between passive and active IMS is that passive IMS is focusing on idea generation, while active IMS focuses on all of Idea Management (IM) dimensions. Internal IMS allows the involvement of internal IM sources, but external IMS are those systems, which involve external IMS sources, for example, clients, crowds, etc. external idea management sources. Mixed IMS are designed for involvement with both internal and external IM sources. In Table 1, previously verified, IMS types that will be analysed in this article are characterised.

Creativity is a key to global and regional economic development (Isaksen & Akkermans, 2011, pp. 161–187) and it's important to research if there are differences when IMS on a global or local level are used. It is important to research IMS from globalization (global application) and de-globalization perspective (local application) (Michael, 2019, pp. 1053–1077), and whether IMS is more effective when applied by global or local teams (Gibson & Dunlop, 2019, pp. 1021–1052).

Banalieva and Dahanjar (2019) had concluded with rising digitalization, that the network plays a dual role — as a governance model and as a strategic resource (Banalieva & Dhanaraj, 2019, pp. 1372–1387). Hennart shows the importance of network advantage (Hennart, 2019, pp. 1388–1400). It means that it is important to research how internal, external and mixed IMS works at the local and global level. In this paper, the authors will concentrate on how companies apply IMS globally and locally (question raised by

Chandra, 2017, pp. 423–451). Foreign actors are very important contributors to innovation management (Klos *et al.*, 2016, pp. 3007–3016), but there is no clear research evidence about their impact on IMS results or if there is a difference by application location.

Gish (2011) acknowledged that there is a growing interest of researchers, directly in terms of IM, their effectiveness in different countries and areas (e.g., Bailey *et al.*, 2010; Hrastinski *et al.*, 2010; Westerski *et al.*, 2013; Sandriev *et al.*, 2014), but still there is a lack of academic research papers about many crucial aspects of IM. However, there are not many studies pooling information and comparing the various commercially available IMS. Moreover, while IMS is changing on the Internet, their fundamental nature has not changed since their inception in the early '90s, that is, these systems ensure that ideas are created, evaluated and developed. Over time, new functionality and support mechanisms are coming in, which makes IMS more effective.

IMS could also be integrated with other programs, such as resource planning (Klos *et al.*, 2016, 3007–3016) or quality-environment-safety system (Maier *et al.*, 2017, pp. 302–314), customer community-based innovation system from business management and computer engineering perspectives (Tian & Dragsten, 2015, pp. 276–280). In 2016, authors conducted the study in local country level in Latvia (Mikelsone & Liela, 2016a). The authors suggest to research if there is a difference when IMS is integrated with these systems in the local or global perspective.

Efficient use of IMS can contribute to the success of the company if it is strategically planned and implemented (Fairbank & Williams, 2001; Brem & Voigt, 2009), but in this paper, authors will research how different IMS types are used and with what kind of results in a local and global context.

## **Research methodology**

Based on literature review, the following research 2 hypothesis were formulated:

H1: *The IMS type has an impact on the average number of ideas created, ideas selected, and involvement for both local and global application.*

H2: *The IMS application type (local vs global) has an impact on the average number of ideas created, ideas selected and involvement for the same IMS type.*

To test the hypothesis, the survey was conducted on the survey platform 'The QuestBack' (<https://www.unipark.com/>) created by UNIPARK. This platform was chosen because (1) it focused on academic surveys; (2) widely recommended by world-class researchers; (3) provides data security required by IMS representatives — BSI-certified data centre in accordance with ISO 27001; (4) complies with the requirements of the EU General Data Protection Regulation.

It should be noted that to reach the target audience more accurately, the authors asked IMS developers to distribute the survey to their clients. It was stipulated that the survey should only be sent to companies using the system in question to the person in charge of the IMS (mostly think-tanks, innovation managers or business managers). In the authors' private communication with 107 IMS developers and the information published by the IMS concerned, it was concluded that the IMS employs around 70, 000 — 100,000 companies (derived from the average number of IMS clients). Invitation for their system applicants to involve sent to 107 IMS developers.

To validate data for the further analysis, the pre-analysis was conducted by using the following methods: frequency distribution, mean of the group to get the average value of the group, standards deviation — to measure the spread of a set of observations. To test hypothesis following data analysis methods were applied: ANOVA, significance tests for a population mean number for the result variable, the t-test was used to measure statistically significant variations between IMS types. In addition, p-values were calculated for given test statistics and degrees of freedom. The p-value is the probability of obtaining a value of the test statistic as extreme as, or more extreme than the actual value obtained when the null hypothesis is true. Thus, the p-value is the smallest significance level at which a null hypothesis can be rejected, given the observed sample statistic.

## **Results**

Comparing the average number created and selected ideas through different IMS application types, the authors conclude that active and mixed IMS could provide more ideas in the global application level. Other differences between the means shown in Table 2. The authors wish to divide the paper into sections shown in Table 2.

### *ANOVA tests for ideas created*

The ANOVA test results can be seen for average ideas created based on different IMS types (groups) in Table 3. As  $F$ -statistics  $> F$ -critical and  $p$ -values  $< 0,001$  the authors can conclude that IMS type has a significant impact on the average number of ideas created for both local and global idea management application. It can be said with high confidence that this result did not occur due to pure chance alone and that there is strong evidence that there is a difference in average ideas created between the different IMS types.

### *ANOVA tests for ideas selected*

The ANOVA test results can be seen for average ideas selected based on different IMS types (groups) in Table 4. As  $F$ -statistics  $> F$ -critical and  $p$ -values  $< 0,001$ , the authors can conclude that IMS type has a significant impact on the average number of ideas selected for both local and global IM application. It can be said with high confidence that this result did not occur due to pure chance alone and that there is strong evidence that there is a difference in average ideas selected between the different IMS types.

### *ANOVA tests for involvement*

ANOVA test results can be seen for average involvement based on different IMS types (groups) in Table 5). As  $F$ -statistics  $> F$ -critical and  $p$ -values  $< 0,001$  the authors can conclude that IMS type has a significant impact on average involvement. It can be said with high confidence that this result did not occur due to pure chance alone and that there is strong evidence that there is a difference in average involvement between the different IMS types. Furthermore, this result persists in both locally and globally applied IMS.

### *Pairwise comparison by IMS type and apply type*

Based on the results, it is established using ANOVA that one or more of the compared IMS types is significantly different from other IMS types. This is applicable for both globally and locally applied IMS. Two options were considered when selecting a statistical test for comparing different groups (Pairwise comparison). Tukey's HSD and Paired sample student  $t$ -test ( $t$ -test). Tukey's HSD adjusts the  $p$ -values for multiple testing and thus would lead to a reduction in family-wise error rate (probability to coming

to a false conclusion in a series of hypothesis tests) and type-1 error rate (probability of false positive). Tukey's HSD uses Pooled variance estimates from the whole set of data which is more robust and precise when compared to an individual estimate from just a part of the whole set of data that is used with *t*-test. However, in this case, the number of groups compared is minimal, and the purpose is to individually compare the averages of two groups (e.g. External vs Internal and External vs. Mixed separately), for this reason, *t*-test is the better testing method to be used.

The following pairs will be compared and tested using a paired sample *t*-test:

- Active IMS – Passive IMS,
- External IMS – Internal IMS,
- Mixed IMS – Internal IMS,
- External IMS – Mixed IMS.

The following hypothesis was put forward at the start of the study:

- Null hypothesis: There is no difference between the pairs tested.
- Alternative hypothesis: There is a difference between the pairs tested.

The hypothesis testing is done by comparing the *p*-value of test statistics and the desired confidence level. In this case, if Test statistics *p*-value is  $\leq 0.05$ , the null hypothesis is rejected, and the alternative hypothesis holds true. In case the alternative is accepted, it is possible to draw conclusions of which IMS type statistically produces a better result.

#### *Average ideas created by IMS and apply types*

Table 6. contains the aggregated results of *t*-test statistics when comparing average ideas created by IMS type and application type. Active IMS can provide more ideas than Passive IMS in both local and global application. External IMS can provide more ideas than Internal IMS in both local and global application. Mixed IMS can provide more ideas in both local and global application. There is no statistical difference in average ideas generated between Mixed and External IMS in both local and global application.

#### *Average ideas selected by IMS and apply types*

Active IMS leads to more ideas selected on average than Passive IMS in both Local and Global application. Internal IMS can lead to more ideas selected than External IMS only in local application. There is no statistical difference in average ideas selected between Internal and External IMS in a global application. Mixed IMS can lead to more ideas selected than both

Internal and External IMS in both local and global application. Table 7. contains the aggregated results of *t*-test statistics when comparing average ideas selected by the IMS type and application type.

*Average involvement by IMS and apply types*

Comparing *t*-values with *t*-critical, we can conclude: 1) Active IMS leads to higher involvement on average than Passive IMS in both local and global application ( $7,3901 > 1,6531$ ,  $p < 0,001$  and  $5,5700 > 1,6654$ ,  $p < 0,001$  respectively); 2) External IMS leads to higher involvement than Internal IMS in both local and global application ( $8,2881 > 1,6531$ ,  $p < 0,001$  and  $6,3842 > 1,6654$ ,  $p < 0,001$  respectively); 3) External IMS leads to slightly higher involvement on average than Internal IMS in local application ( $2,0351 > 1,6531$ ,  $p < 0,022$ ). However, in global application there is no evidence of statistically significant difference between average involvement for External and Internal IMS ( $p > 0,45$ ); 4) Mixed IMS leads to higher involvement than Internal IMS in both local and global application ( $7,6179 > 1,6531$ ,  $p < 0,001$  and  $5,7676 > 1,6654$ ,  $p < 0,001$  respectively).

*Apply type pairwise comparison by IMS type*

It is established that by using ANOVA, one or more of the compared IMS types is significantly different from other IMS types. This is applicable for both globally and locally adapted IMS.

The purpose of this chapter is to showcase whether there is a statistical difference in IMS types when comparing Local and Global application. The same paired sample *t*-test is used for this as in previously.

Based on the *t*-test results in Table 8. In all cases, there is no significant difference in the average ideas created between Local and Global IMS type.

Comparing *t*-values with *t*-critical for ideas selected — apply type by IMS type, we can conclude that there is no significant difference in the average ideas selected between Local and Global IMS type: 1) Active IMS ( $0,7182 < 1,9784$  and  $p > 0,23$ ); 2) Passive IMS ( $1,4933 < 1,9710$  and  $p > 0,06$ ); 3) Internal IMS ( $0,0862 < 1,9787$ ,  $p > 0,46$ ); 4) External IMS ( $0,1614 < 1,9752$  and  $p > 0,43$ ); 5) Mixed IMS ( $0,2808 < 1,9771$  and  $p > 0,38$ ).

Comparing *t*-values with *t*-critical for involvement — apply type by IMS type, we can conclude that there is no significant difference in the average involvement between local and global IMS type: 1) Active IMS ( $0,8718 < 1,9773$  and  $p > 0,19$ ); 2) Passive IMS ( $0,2731 < 1,9704$  and  $p > 0,39$ ); 3) Internal IMS ( $0,1839 < 1,9719$ ,  $p > 0,42$ ); 4) External IMS ( $0,3063 < 1,9747$  and  $p > 0,37$ ); 5) Mixed IMS ( $0,8670 < 1,9777$  and  $p > 0,19$ ).



## Discussion

Based on research results that the mixed IMS can lead to more ideas selected than both Internal and External IMS in both local and global application the authors agree with Banalieva and Dahanjar (2019) that the network plays a dual role — as a governance model and as a strategic resource (Banalieva & Dhanaraj, 2019, pp. 1372–1387). The use of the network as a strategic resource for idea management has to be considered for improving the results of IMS. Most common theory used in IM and IMS literature is the network, for example, Deichmann (2012) concludes that network connectivity in organisations is very important factor that impacts the IM results, these results proves the results of internal IMS application, but disagrees with the idea that also external IMS could provide equal results. This aspect should be researched in detail.

Hennart shows the importance of network advantage (Hennart, 2019, pp. 1388–1400). This paper contributes to Hennart research by adding that the network advantage could be reached by using External IMS through the involvement of network actors for providing more ideas in both local and global application. Based on research, the authors conclude that IMS is used mostly in manufacturing (13.31%), wholesale (11.15%), ICT (10.37%), accommodation, catering (7.44%), finance and insurance (6.46%), real estate (6.26%), so IMS can be used in almost all industries. Most of them are large (36,74%), average (31,83%), small (18.27%) and micro-enterprises (13.16%). Therefore, the authors agree with the researchers stressing the necessity of strategic approach to the use of IMS and emphasizing that the efficient use of IMS can contribute to the success of the company if it is strategically planned and implemented (Fairbank & Williams, 2001, pp. 68–74.; Brem & Voigt, 2009, pp. 351–356). Consequently, IMS could be used in companies of different sizes and the geographical context shows more local application cases (77% of use cases in this research data) then global application.

Involvement of foreign actors as very important contributors to innovation management (Klos *et al.*, 2016, pp. 3007-3016) from the authors perspective at an early stage of idea management by use of external IMS leads to a higher level of ideas selected. Therefore, the understanding of the role of foreign actors in idea management different stages of the process could be studied further.

The authors agree with Isaksen and Akkermans (2011) that creativity is the key to global and regional economic development (Isaksen & Akkermans, 2011, pp. 161–187). In addition to that, the authors consider that there is an unlocked potential to build networks among different industries

and size of companies to create a network advantage for the benefit of all through use of active IMS thus enhancing creativity as a source for generating ideas and in the process of idea management.

Further research is required to research not only the global and local dimension of IMS application, but also the size of enterprises and industries of these companies, because at the moment there are pieces of research and case studies of large organisations.

## **Conclusions**

Comparing the average number of created and selected ideas through different IMS application types, the authors could conclude that active and mixed IMS could provide more ideas in the global application. IMS type has a significant impact on the average number of ideas created for both local and global idea management applications. It can be said with high confidence that this result did not occur due to pure chance alone and that there is strong evidence that there is a difference in average ideas created between the different IMS types. The IMS type has a significant impact on average involvement. It can be said with high confidence that this result did not occur due to pure chance alone and that there is strong evidence that there is a difference in average involvement between the different IMS types. Furthermore, this result persists in both local and global applied IMS. Active IMS can provide more ideas than Passive IMS in both local and global application. External IMS can provide more ideas than Internal IMS in both local and global application. Mixed IMS can provide more ideas in both local and global application. There is no statistical difference in average ideas generated between Mixed and External IMS in both local and global application. Active IMS leads to higher involvement on average than Passive IMS in both local and global application.

External IMS leads to higher involvement than Internal IMS in both local and global. External IMS leads to slightly higher involvement on average than Internal IMS in local application. However, in the global application, there is no evidence of a statistically significant difference between average involvement for External and Internal IMS. Mixed IMS leads to higher involvement than Internal IMS in both local and global application. Active IMS leads to more ideas selected on average than Passive IMS in both local and global application. Internal IMS can lead to more ideas selected than External IMS only in local application. There is no statistical difference in average ideas selected between Internal and External IMS in the global application. Mixed IMS can lead to more ideas selected than

both Internal and External IMS in both local and global application. IMS type has a significant impact on the average number of ideas selected for both local and global idea management apply.

In all cases, there is no significant difference in the average ideas created between local and global IMS type. In 2016 the authors based on 40 IMS analysis proved that these tools could be applied to solve globalization challenges locally (Mikelsone & Liela, 2016). The current research also supports that idea.

The limitations of the research been set: (1) researched only web-based IMS; (2) survey respondents are only commercially available web-based IMS users; (3) survey conducted in 2018 impact the research results Therefore, the further study orientation has to answer several questions that arise from this paper results: (1) how do different industries use different types of IMS, with what results; (2) how do companies of different sizes use IMS types, with what results; (3) does the experience of using IMS affect the results of IMS; (4) does the mode of moderation affect the results of the IMS?

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## Annex

**Table 1.** IMS Application Types classification criteria and characteristics

<b>Classifications</b>							
<i>Classification criteria: based on the application focus</i>							
<b>Passive IMS</b>				<b>Active IMS</b>			
<b>Functions:</b>	<b>Type of focus:</b>			<b>Functions:</b>	<b>Type of focus:</b>		
Focus on idea generation	Unfocused process			Focus on all IM dimensions	Focused process		
<i>Classification criteria: based on the involved IM source</i>							
<b>Internal IMS</b>			<b>External IMS</b>			<b>Mixed IMS</b>	
<b>Description:</b>	<b>Main IM source:</b>	<b>IM</b>	<b>Description:</b>	<b>Main IM source:</b>	<b>IM</b>	<b>Description:</b>	<b>Main IM source:</b>
IMS that allows involving only internal IM sources	Employees		IMS that allows involving only external IM sources	Crowds, experts, clients, etc.		IMS that allows involving internal and external IM sources	Employees; clients, experts, crowds, etc.

Source: Mikelsone and Liela (2016, pp. 1370–1377).

**Table 2.** Average numbers of ideas created, selected and involvement (numbers)

	Average ideas created		Average ideas selected		Average involvement	
	Local	Global	Local	Global	Local	Global
<b>Active IMS</b>	51 21	58 21	23	26	1 29 95	1 53 45
<b>Passive IMS</b>	7 54	10 32	10	7	20 76	22 68
<b>Internal IMS</b>	15 81	12 21	16	15	13 94	15 06
<b>External IMS</b>	47 54	43 34	13	13	1 34 50	1 42 13
<b>Mixed IMS</b>	44 25	47 80	23	24	1 18 00	1 40 10

**Table 3.** ANOVA for ideas created

<b>ANOVA for ideas created (global apply)</b>						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	13 85 89 17 60	4	3 46 47 29 40	33,7348	0,0000	2,3967
Within Groups	36 97 37 78 73	3 60	10 27 04 94			
Total	50 83 26 96 33	3 64				
<b>ANOVA for ideas created (local apply)</b>						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	28 87 07 14 04	4	7 21 76 78 51	33,7348	0,0000	2,3967
Within Groups	92 72 40 74 26	8 90	10 41 84 35			
Total	1 21 59 47 88 30	8 94				



**Table 7.** *t*-tests for pairs of average ideas selected by IMS and apply types

	<b>Pairs tested</b>	<b>Mean 1</b>	<b>Mean 2</b>	<b>df</b>	<b>Pearson Correlation</b>	<b><i>t</i> Stat</b>	<b><i>t</i> crit</b>	<b><i>P</i>-value</b>
Ideas selected - local apply	AIMS vs PIMS	23	10	1 58	0,6765	10,5696	1,6546	0,0000
	IIMS vs EIMS	16	13	1 58	0,7202	2,5796	1,6546	0,0054
	MIMS vs EIMS	23	13	1 58	0,7383	6,7178	1,6546	0,0000
	MIMS vs IIMS	23	16	1 58	0,7467	4,5978	1,6546	0,0000
	AIMS vs PIMS	26	7	72	0,6444	8,8428	1,6663	0,0000
Ideas selected - global apply	IIMS vs EIMS	15	13	72	0,5781	1,2219	1,6663	0,1129
	MIMS vs EIMS	24	13	72	0,6596	4,3627	1,6663	0,0000
	MIMS vs IIMS	24	15	72	0,6620	3,4109	1,6663	0,0005
	IIMS vs EIMS	24	15	72	0,6620	3,4109	1,6663	0,0005

**Table 8.** *t*-test, average ideas created - apply type comparison by IMS type

	<b>Local</b>	<b>Global</b>	<b><i>t</i></b>	<b>df</b>	<b><i>t</i> crit</b>	<b><i>P</i>-value</b>
Active IMS	51 21	58 21	1,3964	130	1,9785	0,0825
Passive IMS	7 54	10 32	1,0907	132	1,9782	0,1387
Internal IMS	15 81	12 21	1,1545	147	1,9763	0,1251
External IMS	47 54	43 34	0,8288	150	1,9759	0,2043
Mixed IMS	44 25	47 80	0,6236	124	1,9794	0,2670